International conference
Information and Communication Technologies for Small and Medium Sized Enterprises (ICT-SME's2011)
Arandjelovac, Serbia, September 22, 2011

ISBN 978-86-7672-140-5

International conference

Information and Communication Technologies for Small and Medium Enterprises

Arandjelovac, Serbia, September 22, 2011

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Publisher
University of Novi Sad
Technical Faculty "Mihajlo Pupin"
Djure Djakovica bb, Zrenjanin, Serbia

CD Printed by PC Centar Magus, Zrenjanin
Printing 80 copies

Zrenjanin, 2011

Government of the Republic of Serbia, Ministry of Education and Science by the resolution no. 451-03-02793/2010-02 from July 18th, 2011 partially funded organization of the Conference and the Proceedings.

CIP – Каталогизација у публикацији
Библиотека Матице српске, Нови Сад

004:658.1(082)

International Conference Information and Communication Technologies for Small and Medium Enterprises (2011 ; Aranđelovac)
International Conference Information and Communication Technologies for Small and Medium Enterprises, Aranđelovac, September 22, 2011 / organizer University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin. – Zrenjanin : Technical Faculty "Mihajlo Pupin", 2011 (Zrenjanin : Magus).
- 343 str. : ilustr. ; 23 cm

Napomene i bibliografske reference uz tekst. – Bibliografija uz svaki rad.

ISBN 978-86-7672-140-5
1. Technical Faculty "Mihajlo Pupin" (Zrenjanin)
a) Информационе технологије - Мала и средња предузећа - Зборници

COBISS.SR-ID 266724103

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Using Business Management Flight Simulators as a Teaching Tool for Entrepreneurs

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Abstract – Decision-making in entrepreneurship is often very risky because consequences of entrepreneurs' actions are visible only after longer time (months or even years). Ideal education tool in entrepreneurship would allow entrepreneurs to compresses time and space in non-risk environment and to gain experience and make mistakes without fear of real damage. Such tool would allow potential entrepreneurs to see the consequences of his/her actions in few minutes or hours, and to detect possible wrong presumptions about the real world venture capitalism. This paper argues that management flight simulation models could meet the educational challenge in entrepreneurship and allow entrepreneurs to avoid intuitively correct decisions that are actually not optimal. Paper will present the system dynamics model of supply and demand.

I. INTRODUCTION

Decision-making in entrepreneurship is very complicated because costs of managers' decisions are visible only after longer time. For example, if new product is released it will take some time until it becomes accepted from the customer base. In addition, acceptance of new products industry is influenced to the great extent by the many factors. Some of them are relative price of the product compared to similar products, substitute products, attractiveness of marketing campaign compared to competitive products, sales – promotion, word of mouth, friendly salesman, etc.

Entrepreneurs would benefit from more effective education that would improve the quality of the decisions making. The purpose of this article is to describe and demonstrate applicability of system dynamics models as decision and learning support tools for entrepreneurship organizations that permit controlled experimentation and enhance understanding of reality.

II. USING SYSTEM DYNAMIC MODELS AS MANAGEMENT LEARNING TOOLS

System dynamics is a powerful tool that enhances learning about company, market and competitors, portrays the cognitive limitations on the information gathering and processing power of human mind, facilitates the practice of considering opinions, and supports building of "What if" scenarios.

Over the past thirty years, the growth of computer technology has facilitated the wide application of system dynamics modeling as sophisticated tools for simulating business environments and situations. The basic goal of management simulation games is to apply experiential learning to the commercial world. They are designed in order to allow the player to experiment with the model on a compressed time basis while reducing costs and personal risk. The participant is able to see the consequences of his/her actions in few minutes or hours. In real world such consequences are visible only after much longer time (months or years).

In order to achieve educational objectives, simulation should start with adequate briefing, which introduces the rules of the game and helps the players to vividly imagine themselves in described situation. Learning objective of the game should be clearly defined. For example, one of the learning objectives of Fish Bank Ltd. is to show how competitive behavior can destroy renewable resources (Meadows, 1989). Simulation games are equipped with different technology that could include game boards, sheets to contain with decisions or computer-based system dynamics models. Duration of play could be hours, or could be few minutes and different number of players could be involved. Important part of the game is debriefing, which helps players to construct their experience into knowledge that can be re-applied.

It seems that simulation games are very useful in helping players to learn, but according to the opinion of several authors there is still present a doubt that knowledge acquired can be applied in real work situation (Summers, 2004; Zapalaska et al. , 2008). The real payoff from simulation games can be achieved if attention is paid to number of possible difficulties and problems: (1) no clarity regarding learning objectives, (2) materials support an event without learning, (3) neglect of other teaching methods, (4) inappropriate emphasis on technology, (5) too many elements mixed, (6) inadequate briefing, (7) inadequate debrief, (8) offering operators too little training, and (9) under-estimating time and money needed to create materials.

There are numerous management games with high potential for application in entrepreneurship, and some of them will be described.

People Express Airlines was established in 1981. In only five years the company had grown to be the fifth largest airline in the United States (Sterman, 2001). Yet by September of 1986, People Express was nearly bankrupt, and was acquired at the last minute by Texas Air. The People Express Management Flight Simulator gives the

players the opportunity to find out the reasons for the failure. Each simulated time period the player has to make strategic and operational decisions on: pricing, marketing efforts, hiring policy, financing in the time of crises, financing in order to grow. At the end of the game players gain insights into difficulties of coordinating operations and strategy in a growth market and to understand the dynamic interactions among a firm, its market and its competitors.

Beer distribution game, originally called the "production-distribution game", is played on a board that portrays the production and distribution of beer. Each team consists of four sectors: Retailer, Wholesaler, Distributor and Factory arranged in a linear distribution chain. The goal of the game is to meet customer demand and order enough from your supplier to keep your inventory low while avoiding costly backlogs (Sterman, 1992).

CreditSim is a powerful tool to study dynamics and explore possible options using all financial statements to improve results. It allows the player to overview on how the business can develop in time. Trough the analysis of scenarios, managers can assess upcoming decisions like, a price increase, the purchase of fixed assets, a decrease of raw material or increase of labour costs, and, a new invoicing or credit management strategy (Melse, 1997).

Professional Services Microworld will be described in detail (Strategy dynamics, 2001). The game is designed in order to experience the challenges of a professional service organisation named the Partner team with the aim to grow the business in size and reputation over 30 years, creating wealth for the firm's partners. In order to achieve this objective, player will try to manage the growth of professional staff (consultants, assignment managers and partners) to match growth of the client-base.

III. CASE STUDY OF USING SUPPLY AND DEMAND MODEL IN THE CLASSROOM

Last year I taught Economics and I tried to explain relation between supply, demand and price. Somebody asked me what is the practical use of the analysis of the demand and supply curves, and in few moments whole class was discussing how equilibrium price is determined. Our intuitive answer was that supply and demand curves are useful in long term. The reason is that when supply or demand changes equilibrium price is disturbed, and oscillations occur. For example, when demand is higher than supply, price will increase. But, producers will react and produce more goods that will increase supply more than demand. Customer will not buy all the products offered on the market and excess supply will again lower the price. But, we could not agree on how equilibrium price will be again achieved because we were discussing supply as if it is determined with production, and we did not take into account inventory. Finally, we have agreed that equilibrium price is achieved only in long term, and that in short term price, demand and supply oscillate around it. If we had system dynamics model presented in the paper we could confirm our hypothesis and enhance our analysis by taking inventory into account. ffective decision-making contributes to better performance of entrepreneurs. It is important that entrepreneurs understand that although demand depends on a number of exogenous factors, there are also variables that entrepreneurs can control like price, service quality and advertising.

A. *Supply and demand system dynamics model*

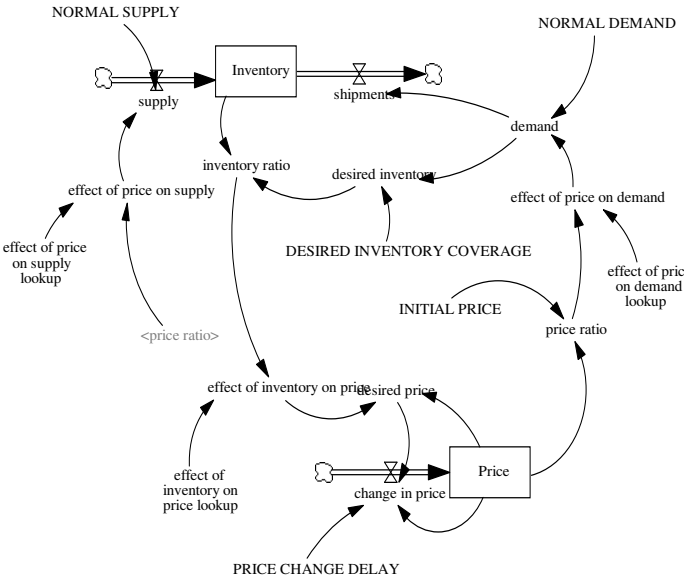

Fig 1. Supply and demand system dynamics model

Model contains number of feedback loops in the model:

- **positive feedback loop 1** – As Price increases, change in price also increases, which in turn increases Price.
- **positive feedback loop 2** – As Price increases, desired price increases, which increases change in Price and finally Price increases.
- **negative feedback loop 1** – As Price increases, price ratio increases, which increases effect of price on supply. This is the reason why supply increases, which also increases Inventory. As Inventory increases, inventory ratio also increases, effect of inventory on price decreases, which decrease desired price and change in price. Finally, Price decreases.
- **negative feedback loop 2** – As Price increases, price ratio increases, which decreases effect of price on demand. Therefore, demand decreases, which is the reason why desired inventory decreases. As desired inventory decreases, inventory ratio increases, which decreases effect of inventory on price and desired price also decreases. Finally, Price decreases.
- **negative feedback loop 3** – Increase in Price increases price ratio which decreases effect of price on demand. This is the reason why demand decreases, which decreases shipments. Inventory and inventory ratio increase. Therefore effect of inventory on price decreases, which decreases

desired price and change in price. Finally, Price decreases.

B. Model equations

In this part of the paper model equations will be presented. Equations are automatically generated by the software Vensim that has been used for designing the model for supply and demand.

change in price=(desired price-Price)/PRICE CHANGE DELAY
Units: $/shirt/Week
Change in price is determined by the difference between desired price and current price and number of weeks needed to change the price.

demand=NORMAL DEMAND*effect of price on demand
Units: shirt/Week
This is the rate at which consumers wish to purchase clothing from the suppliers.

desired inventory=demand*DESIRED INVENTORY COVERAGE
Units: shirt
Desired inventory is how much inventory the suppliers would like to have. It is calculated as how many weeks worth of demand they would like to store in inventory.

DESIRED INVENTORY COVERAGE=4
Units: Week
Number of weeks of demand that suppliers would like to keep in inventory.

desired price=effect of inventory on price*Price
Units: $/shirt
This is the equilibrium price as set by the inventory ratio. The actual price will reach this value after a delay specified by the price change delay.

effect of inventory on price=effect of inventory on price lookup(inventory ratio)
Units: dmnl
When the ratio of inventory to desired inventory is greater than 1 price increases, an opposite.

effect of inventory on price lookup
([(0.5,0)-
(1.5,2)],(0.5,2),(0.6,1.8),(0.7,1.55),(0.8,1.35),(0.9,1.15),
(1,1),(1.1,0.875),(1.2,0.75),(1.3,0.65),(1.4,0.55),(1.5,0.5))
Units: dmnl
Lookup function for the effect of inventory on price.

effect of price on demand=effect of price on demand lookup(price ratio)
Units: dmnl
Demand for shirts depends on price of the product. When the price is higher, demand is lower and opposite.

effect of price on demand lookup
([(0,0)-(4,2.5)],
(0,2.5),(0.33,1.754),(0.67,1.281),(1,1),(1.33,0.789),
(1.67,0.614),(2,0.491),(2.33,0.386),(2.67,0.316),(3,0.246)
,(3.33,0.175),(4,0.175))
Units: dmnl
Lookup function for effect of price on demand.

effect of price on supply=
effect of price on supply lookup(price ratio)
Units: dmnl
Supply of shirts depends on price. When price is higher, more shirts are produced, and opposite.
effect of price on supply lookup
([(0,0)-(4,2)],
(0,0),(0.33,0),(0.67,0.702),(1,1),(1.33,1.193),(1.67,1.351),
(2,1.474),(2.33,1.561),(2.67,1.649),(3,1.702),(3.33,1.754)
,(4,1.754))
Units: dmnl
Lookup function for the effect of price on supply.

INITIAL PRICE=15
Units: $/shirt
Initial price at which consumers were willing to buy number of shirts equal to normal demand, and firms were willing to produce number of shirts equal to normal supply.

Inventory= INTEG (+supply-shipments, desired inventory)
Units: shirt
Inventory is the stock of produced clothing in the company's warehouse.

inventory ratio=Inventory/desired inventory
Units: dmnl
Ratio of inventory to desired inventory.

NORMAL DEMAND=57
Units: shirt/Week
Number of shirts that consumers are willing to purchase at initial price.

NORMAL SUPPLY=57
Units: shirt/Week
Number of shirts that firms are willing to produce at initial price.

Price= INTEG (change in price,INITIAL PRICE)
Units: $/shirt
Current price of shirts in the market.

price change delay=15
Units: Week
Number of weeks at which price changes to desired price.

price ratio=Price/INITIAL PRICE
Units: dmnl
Ratio of price to initial price.

shipments=demand
Units: shirt/Week
Number of shirts shiped per week is equal to the demand.

supply=effect of price on supply*NORMAL SUPPLY
Units: shirt/Week
Number of shirts produced each week.

C. *Lookup functions*

Lookup functions explain the relation between two variables that are nonlinear. On Fig.2. there is a relation between inventory and price, which indicates the lower price in case of higher inventory. On Fig.3. there is a relation between price and demand, which indicates the higher price in case of higher demand. On Fig. 4. there is a relation between price and supply, which indicates the lower price in case of higher supply.

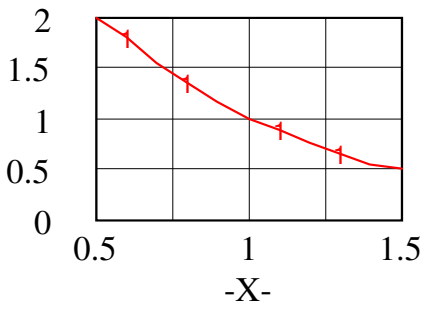

Fig. 2. Effect of inventory on price lookup

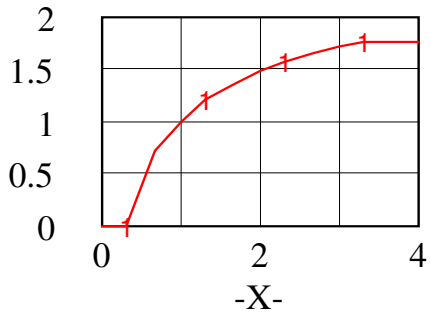

Fig. 3. Effect of price on demand lookup

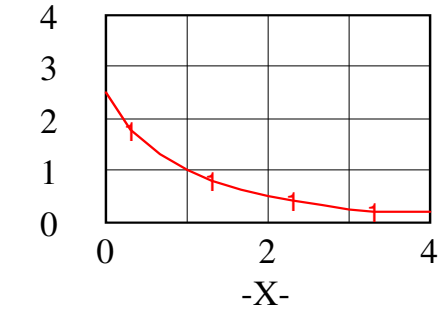

Fig.4. Effect of price on supply lookup

D. *Experiments with the model*

In this part of the paper experiments with the model will be presented in case of four scenarios: (1) increase in demand, (2) different values of desired inventory coverage, (3) different values of price change delay, and (4) damped and sustained oscillations.

- **Increase in Demand**

If we want the system to be in equilibrium inventory should be 228 shirts. Initial price is 15$, and at that price demand is equal to supply which are 57 shirts. Desired inventory coverage is 4 weeks, and therefore inventory should be 228 shirts. Price change delay does not have any effect on value of inventory needed for equilibrium.

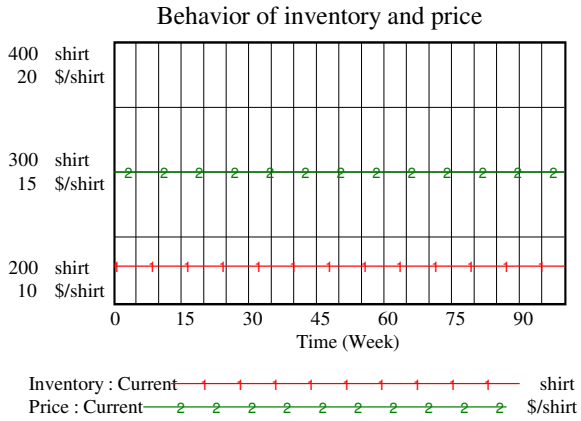

Fig. 5. Behavior of inventory and price in equilibrium

If demand increases permanently for 10 articles per week, new equilibrium value for price is $16.97, and equilibrium value for demand is 61.36 shirts per week. Therefore, equilibrium value for inventory is 245.44 shirts, and it is four times larger than demand because desired inventory coverage is still 4 weeks. Before inventory reaches equilibrium value it will exhibits sustained oscillations.

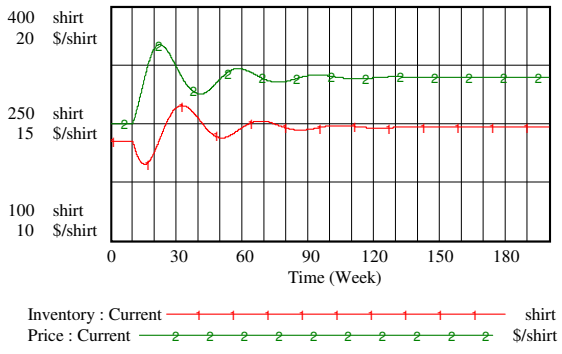

Fig.6. Behavior of inventory and price after increase in demand

- **Desired Inventory Coverage**

Value of desired inventory coverage influences inventory equilibrium level, amplitude of oscillations, and period of oscillations. For shortest desired inventory coverage, inventory equilibrium level is lowest, amplitude of oscillations is smallest, and period of oscillations is shortest. For longest desired inventory coverage opposite occurs.

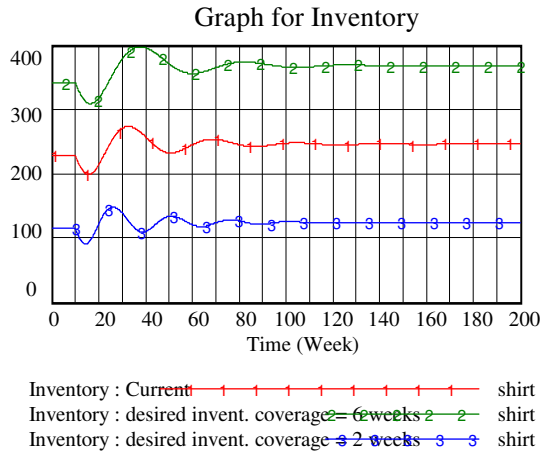

Fig.7. Behavior of Inventory under influence of desired inventory coverage

- **Price Change Delay**

When system is in equilibrium, value of price change delay does not have any effect on price and inventory. Change in price is calculated as the ratio of difference between desired price and current price and price change delay. When system is in equilibrium Price is equal to desired price and difference between them is 0. Therefore, change in price is always 0 despite of value of price change delay.

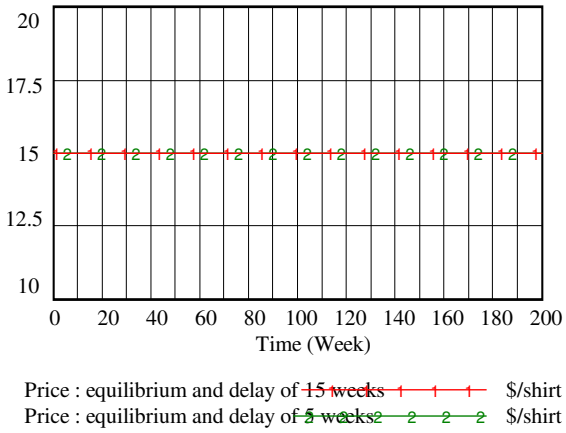

Fig.8. Graph for price when system is in equilibrium

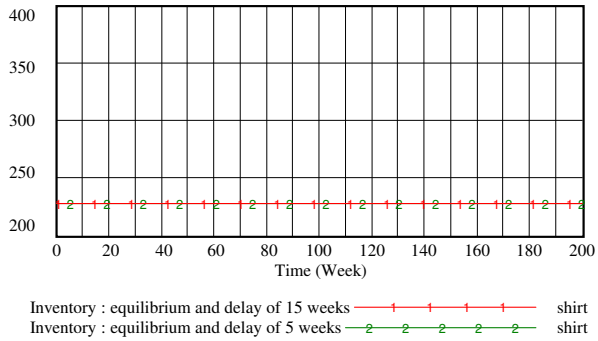

Fig.9. Graph for inventory when system is in equilibrium

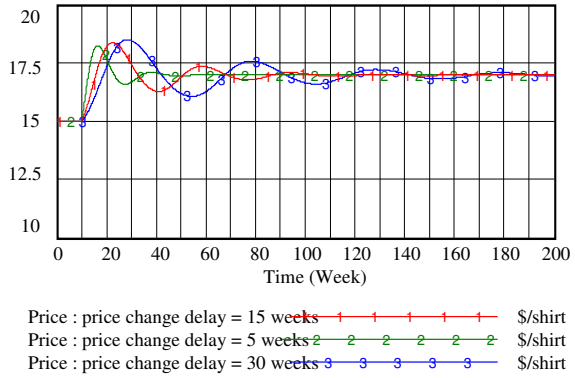

Fig.10. Behavior of price in case of price change delay

One would expect the system to reach equilibrium more quickly when the price change delay is equal to 15 weeks. For example, if current price is $10 and desired price is $25, and if price change delay is 15 weeks, after first week price would change for $1 ((25-10)/15=1). If price change delay is 30 weeks, after first week price would change for $0.5 ((25-10)/30=0.5). Therefore, when price change delay is shortest, system will reach equilibrium in shortest time, and period of oscillations would be shortest. Opposite happens when price change delay is longest.

- **Damped and sustained oscillations**

In order to generate sustained oscillations, system must be a negative feedback loop and must have at least two stocks. If model has sustained oscillations generic structure with an additional feedback loop damped oscillations occurs. This is what happens in the Economic supply & demand model.

Negative feedback loops 1 and 3 are essential to the behavior of the model. Therefore, I wanted to compare what happens with model behavior if negative feedback loop 2 is removed. According to the graphs of the model behavior, when negative feedback loop 2 is removed (desired inventory is defined as constant and set to 228 shirts) model exhibits sustained oscillations.

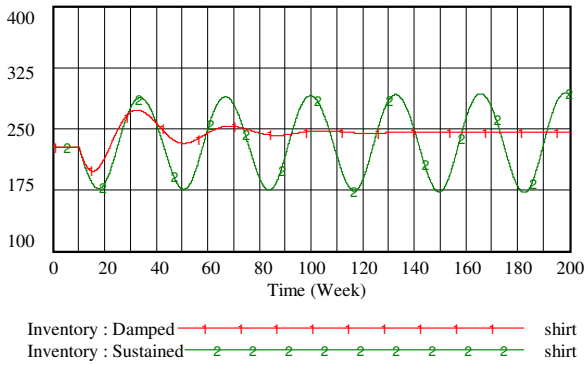

Fig.11. Behavior of Inventory under damped and sustained oscillations

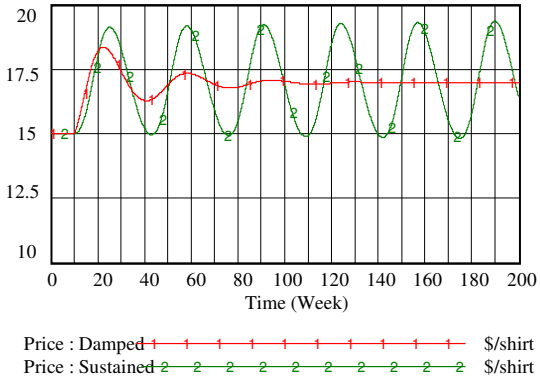

Fig.12. Behavior of Price under damped and sustained oscillations

IV. CONCLUSIONS

Management flight simulators are designed in order to initiate active, student-oriented learning which is especially important in entrepreneurship education. Entrepreneurs seek information that is useful in achieving a goal of the game, and during that process their understanding of the system increases. Therefore management flight simulators could be useful in education of entrepreneurs.

Case study of using supply and demand model in the entrepreneurship class is presented. In addition, many equilibrium models contain feedback loops. For example, when Fed enlarges money supply, interest rates decreases, which in turn decreases costs of investments. Therefore, firms increase investments and people buy more houses. But, savings decrease partly because some is invested and partly because of lower interest rates. Lower savings could in the long run increase interest rates and investments would again decrease. Also, higher money supply could also increase rate of inflation, which also influences investments and savings. In the long run, increase in money supply would only result in higher rate of inflation and production and investments would return to the initial level. It would be interesting to design such model that could be useful in education and analysis of monetary policy.

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Model Driven Architecture is a Complex System

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Abstract – An abstract formalization of the software development life cycle (process) in the theory of complex systems and complexes is considered. The formalization highly depends on so called reference set, which is a basis of bundle of the life cycle into a set of structures, e.g., various software model representations. An example, which appears to be a generalization of Model driven architecture (MDA), is considered, as well as the present approaches and technologies for the software development if the proposed model implied.

I. Introduction

Any software development life cycle consists of distinct stages and involves various agents (manages, software developers, users, etc.) and technologies, such as mathematical modeling, information representation modeling, information processing and visualization, user interfaces. At the very beginning the problem stated represents an ideal object, which is specified during the stages as various linguistic, mathematical and information models. At the stages of implementation the models are represented as algorithms and data structures, which are realized as program objects and components. At the testing and deployment stages the software is used by testers and users. In the general case new ideas and problems affect the life cycle at any stage. For example, new requirements are analyzed on the basis of the obtained experience and new software life cycle is constructed; new implementation technology implies reconstruction (translation) of the source code into new language and corresponding data structures adaptation; the user's suggestions of the user interface modifications imply data structure and source code reconstruction.

Various combinations of stages form a number of life cycle schemes, such as waterfall and spiral models, 'V'-model, agile and extreme approaches, iterative and incremental development, and various improvement models [1]. All the approaches use models of various degrees of abstraction and formalization. We consider a general case of life cycle as a process of adaptation of new ideas, requirements and specifications implies modification of all the models (formalized and implied). Thus, the software development process is represented as propagation of the modifications.

The problem we consider in the paper is to construct an approach to describe the process of the modification propagation as a basis of a corresponding instrumental environment. The necessity of the modification propagation results from application of the theory of complex systems and complexes to software life cycle.

II. The Theory of Complex Systems and Complexes [2]

Complexes (compositions) and systems of compositions (configurations) X_i are formed from combinations of various elements, components, systems, complexes, systems-complexes. Configurations X_i are different kinds of complex system's polymorphism. The universal structure X contains all X_i, and in this case it is analogous to notion of set of all subsets or category of all the subcategories. The connections between compositions are represented by means of mapping (morphism) $F_{ij} : X_i \to X_j$. The composition connected with morphisms (represented a category in the mathematical sense) form a complex. The comparison of the two compositions X_i and X_j, namely $\Delta X_{ij} = X_j \setminus X_i$, shows the dissimilarity between *j*-th composition and *i*-th one. For example, let X_i, X_j be different UML models of software before and after adding a new structure, so ΔX_{ij} reflects a complex of the current development step. If X_i, X_j are two UML models of different software systems, then ΔX_{ij} fixes, in particular, their structural dissimilarity, and F_{ij} is a comparison relation. The structure ΔX_{ij} is also a composition and belongs to the set of all the comparisons ΔX. The set F is a set of all possible mappings F_{ij}.

There are also a reference set of comparison I; it is the interval [0, 1], which is a metric linearly ordered inductive continuous bounded above and below set of points. The one-to-one correspondence of compositions and reference set points is denoted by relation ($\leftrightarrow$), for example, $I \leftrightarrow I$ means that each point I turns into itself; $X \leftrightarrow I$ means that any composition from set X is one-to-one corresponded to a definite point of the interval [0, 1]. In the latter case I is a bundle (fibration) basis of X, in other words the differentiation X onto compositions is

conducted by means of comparing them with points (numbers) from the interval [0, 1].

The axioms of complex systems' theory are to compare compositions and their connection functions with an identification index of an order and together.

$$1)\ X \leftrightarrow I;\ 2)\ F \leftrightarrow I;\ 3)\ \Delta X_{ij} \leftrightarrow F_{ij}. \qquad (1)$$

The axioms 1 and 2 transfer all the order properties of the set I to the sets of all compositions $X_i \subset X$, their comparisons $\Delta X_i \subset X$, and mappings $F_{ij} \subset F$. This also implies that all the combinations are toposes, i.e. they are linearly ordered structures with the individual measure from I. By means of I the structures, their comparisons and mappings are one-to-one connected to each other.

$$X \leftrightarrow F \leftrightarrow \Delta X \leftrightarrow I.$$

This emphasize a necessary moment of complexing, the complexes, their comparisons and mappings are equivalent (identical in the sense of dialectical logics), and have the single identification index in I. The complexes are self developing systems, where each alteration is based on its structure $\Delta X \leftrightarrow X$. Complexes are static formations, the transitional states with partially formed connections cannot be related to them.

Complexes are linear sequences of morphisms (categories)

$$\cdots \rightarrow X_i \rightarrow X_j \rightarrow X_k \rightarrow \cdots;$$

the contained compositions form homologous series of comparison, as each composition has a measure from I, this series is also homotopic. Homologo- homotopic series form comparisons and mappings. All the elements of the series are functionally similar, that's why they can be considered as series of analogs.

Any fragment of a homological series $X_i \rightarrow X_j$ is a complex, which corresponds to a complex of comparison of the dissimilarities $\Delta X_i \rightarrow \Delta X_j$. Consequently, a similarity of the structure implies similarity of modifications and vice-versa. Therefore, observed similarity in the structure must be caused by similarities of the processes and their models. The search of structural and dynamical similarity is the main subject of the theory of complexes.

A. Application to Software Life Cycle

In the field of software development the theory could be implemented in various aspects. If we choose the reference set I as detail level of software model representation, then 0 could mean a completely abstract level (just an idea), and 1 denotes completely realized software complex. Further, X_i will correspond to informational models of various abstraction. For example, X_0 is the original idea, X_1 is a textual representation of the requirements, X_2 is an UML model, …, and at the end of the interval, e.g., X_9 is a completely realized software system. The configurations X_0, $X_1, \ldots, X_9$ correspond to points $i_0 = 0, i_1, \ldots, i_9 = 1$, (for each $i_k < i_{k+1}, k = 0,1,...,9$) of the interval [0, 1].

The idea X_0 is explained by means of its terminological basis of formalization, and references to the software domain and problem stated. The reference could be an existing ontology or a textual representation of the problem. The dissimilarity ΔX_{01} denotes the additional information about requirements to the software under development. This is a result of the problem and domain decomposition. As X_1 one can understand as IDEF0 model extended with formal or informal specification of its structural elements. The morphism F_{01} is a creative function done by system analyst under restriction of some technique, e.g., SADT [3].

The dissimilarity ΔX_{12} denotes the result of system designer's activity F_{12} of conversion IDEF0 model with the requirements into set of UML diagrams. All ΔX_{ij} have their corresponding interpretations.

Theory's axiomatic basis here is realized as follows:

- Axiom 1 in (1) denotes, that any software system can be considered (modeled) at various abstraction levels denoted by I, and the inverse direction means, that for any set of models the bundle basis I could be constructed;
- Axiom 2 means that it is possible to develop software as model transformations and refinements, as well as having developed a sound in some sense software, then it has sound model set representation (formalized or just implied);
- Axiom 3 for each model specialization or transformation a set of methods (techniques, tools) to carry out the development could be found or developed, as well as methods and instrumental software used to develop software by means transformation of corresponding models.

The interpretation of the identity $X \leftrightarrow \Delta X$ means that the process of software development is based on its structure, ΔX results from testing and exploitation, and the software development is an improvement of the set of the models. The complex in this example also form a homologous (homotopic, analog) series, in other words, one can make advantage of the same steps as in an early project using the same set of models X to develop new software.

There are various approaches to automatic transformation of the models in the field of software development, such as IBM Rational Unified Process, Model Driven Architecture (MDA) [4] and formal methods [5]. The approaches are aimed at automation of creative activity of designers and programmers and implemented in instrumental software. The software development tools having a model at input generate a model or source code, which also we consider as a model. Most of the transformations are formal and deductive; the MDA approach requires a Platform Model and a scenario to specify a variant of the transformation.

A translation of the properties of the theory of complexes to the processes of MDA-transformations results in following conclusions.

- In developing software any state of X, including ΔX should be stored for later usage in transformation
- The stored results of the transformations should be analyzed to extract new knowledge about the transformation specific of the current task and also general templates about designing software.
- Complex ΔX is of especial interest and subject of analysis. Namely, as transformation $X_i \to X_j$ corresponds to the dissimilarities $\Delta X_i \to \Delta X_j$, then the instrumental software should correct all the models in X as soon as some ΔX_{ij} has been fixed by a developer.

Thus, it is of purpose to construct instrumental software based on analysis of analogy and propagation of the modifications ΔX.

B. An Example Project

To investigate the possibilities of the software development approach we started a pilot project of notarial office automation. The task selected among stated as the development of the software is deeply depended on users' desire to change: creating instances of documents, correct errors, forming new document classes, composing new document workflows, as well as refinement of user interface aimed at raising the office productivity.

From the functional point of view the notarial office is primarily an organization for document preparation, storage, and retrieval; tracking of the individual's data is the secondary aim that allows producing the document more agile. There exist four user roles in the office; they are "secretary", who fills in the templates, "template modifier", who is an experienced user allowed to construct forms and describe new regular structures found in documents, "programmer", who understands information modeling and implements the routine tasks as program modules, and "notary", who validates and signs the documents. As usual the roles define the set of activities and responsibilities for corresponding users.

During the exploitation of the information system secretaries gain experience, and can evolve in template modifiers. Shifting a user from first role to another can be done as a result of his/her qualification assessment. The assessment can be performed by notary and programmer or by means of testing, for example, answering a set of tests and/or doing test exercises.

Each instantiation of a template can be considered as a copying a document in the storage and its refill with new data or even just an edition of the copy. Modification of the second kind can be interpreted in several ways. Firstly, as mentioned before, it is just refill of the template. Secondly, it is a template body text error correction or a further improvement of the document. Thirdly, the modification could touch the form structure giving rise a new template of existing kind (class), or form even a new class of templates, e.g., fixing some parameter or substructure.

The modification propagation process is based on a number of document models. Secretaries will fill in documents as HTML forms and edit the generated instances in a WYSIWIG HTML editor. HTML is widely used and support necessary level of the notarial document representation. There are many useful methods of HTML generation and modifications. The difference between documents of various versions is to be propagated to other models. Such models represent the document layout and presentation (CSS), structure of the document class (what parts should be presented in the document and in which order), structure of the form of the template, fixed data structures stored in a rational database, and so on. The structural models are based on corresponding ontologies, e.g., ontology of structure elements of a document, ontology for expression individuals' data, etc.

The system should control the process of the document designing in a dialog with user, acquiring the additional information on user's intention and acting in concordance. Complex problems are described by users as texts for programmers, who implements new features of the software after confirmation of the requirements.

III. IMPLEMENTATION TECHNOLOGIES

Since 2001 OMG exploits Model Driven Architecture (MDA) of software development. MDA [4] is a part of the model considered in the section 1.A. MDA exploits three levels of abstractions to represent software: CIM, PIM and PSM.

The Computation Independent Model (CIM) reflects software's external requirements – its interfaces. CIM hides structural elements, and can be used for define specifications and checking requirements.

The software designing technique of MDA is based on multistage transformation of Platform Independent Model (PIM) into a number of Platform Specific Models (PSM). PIM is a model of the software reflecting most of the structural and some semantic aspects of the software, but the model contains no information about implementation of the structures on the target program architecture. UML Class Diagram extended with some tag values and additional stereotypes is an example of PIM. The extension allows one to denote implementation hints for structures. PSM is a model, which can be implemented as source code of the subsystems, e.g., it could be a physical structure of a rational database, which is directly (deductively or by means of code templates) translated into DDL SQL-requests.

The transformation of the PIM into PSMs is carried out under control of a Platform Model (PM) and a transformation scenario. PM contains information and algorithms of PIM's structure analysis and generation of corresponding structures in PSMs. Sometimes PSM is understood as specified variant of PIM. The tag values and stereotypes are used to direct the transformation of a structure into desired frame.

PMs in most of commercial MDA systems have been implemented on the basis of algorithmic approach. They

are not far from CASE systems translating UML diagrams into a source code by various plug-ins. The main idea of MDA is to allow developer to modify PM according his/her preferences and task properties. Our experience shows that usage of present logical languages and PMs based on formalized knowledge [6] allows us to affect the transformation in an efficient way by means of changing a rule set content.

We use [6] a logical approach to implement transformation. The source PIM is represented as XMI-file version 1.2. As it is a variant of XML, the file is parsed by means of libxml XML parsers into a tree. The tree encapsulated inside a LogTalk module, which processes queries to PIM structure. The transformation procedures and PM is represented as set of LogTalk modules connected with messages. Each module contains a knowledge base to recognize an aspect in the PIM and its derivate structures. The results of recognition form new facts about PSM. The transformation scenario is a set (sequence) of the leave modules, which generate source code and other data structures.

Thus, the generated PSM is represented as set of facts consisting of the subset describing the original PIM, which is obtained while querying the XML tree, and the subset describing the implementation aspects of the software under development. The resulting source code is generated by leave modules by means of templates, so the templates play the similar role as CSS in web, it represents PSM as texts of source codes.

Main advantages of MDA usage in the software development are as follows:

1. Design stage independence of the implementation platform; capability to replace the platform without redesigning PIM.
2. Formal definition of PM: programmers' knowledge is represented as rules and algorithms.
3. Raising the automation level of the life cycle: early stage modifications (design stages) are less expensive to implement in PSMs.

MDA is a great approach and successfully used in development complex software, but it has significant disadvantage, which we are to overcome:

1. Using the MDA in simple projects usually extends time of software construction, although obtained formal PIM and PM models when analyzed could be used in other projects;
2. Currently MDA is of little use in already constructed and implemented systems and systems based on stored data manipulation, e.g., existing informational systems, as modification of information data model results in database structure modification like adaptation to new data structures;
3. Modification of PIM and source code is ignored by the procedures of transformations.

The support of the above mentioned propagation of dissimilarities ΔX_{ij} and modeling whole life cycle's homology should overcome the disadvantages, and it means, in particular, that the instrumentation software should support the transformation in both directions.

IV. Sources of Modifications

When a MDA tool generates a source code, the problem appears when the generated code was modified by a programmer. The modification can be easily lost because of likely following regeneration. One of the ways to conserve modifications is to represent the generated software framework as a library and allow programmers to inherit the code. Changing sources is useful because of programmer can more comfortable figure out the correct data types and names the entities "in place", adjust the procedures to improve performance.

Controlling changes in source code can be realized through using version control systems that can efficiently compare the source code versions, and through developing compilers, which could be aware of the PSM and PIM existence. In the simplest case the difference of the versions is stored as a patch; the patch reapplied each time after the source code regeneration; conflicts are resolved interactively by programmer. Another way is to analyze both versions of the source code as parsing trees, the difference propagated into a PSMs' and PIM's versions. The propagation should be made under programmer's supervision: programmer must supply the information on the meaning of the difference.

To support the propagation on the level of the source code one can take advantages of the literate programming tools and data formats, which can be thought of as a way of hypertext markup of the source code generated from PSMs. Literate programming is a way of source code construction, where the programmer mixes a task description and the task solution – the program – in the same source text file or a tree structure. The program is also constructed from structural parts. The literate programming transformational tools analyze the source structure and generate source code tagged as special cases of comments of the generated program to reconstruct the original structure in case of generated source modification. Some literate programming tools can generate a whole project from one tree (see for example Leo editor [7]) and track some source code modifications.

In MDA case the source structure is a PIM, transformation modules include data about original structure of the PIM as tags into comments of the generated source code. These tags are semantic marks of the source code intervals. In this case the difference of the source codes can be directly associated to the structural element of the source model.

The theory of complex systems states that $\Delta X \leftrightarrow X$. In our case this means, that the structures for the models representation can be used to represent the modifications, also the algorithms of transformations of the models can be used to transform of the modifications. The modifications can be represented in the similar way as patch files as groups <removed substructure/context of removal, added substructure>.

Another way of obtaining new information for models is the texts related to the software domain. New notions could be extracted by means of text analysis of new requirements, as the texts are based on the steady (in time) terminological basis, allowing human beings to understand each other. Texts contain artifacts referencing informational structures of the software, e.g., template word sequences denoting concrete user interface or data structures. There are approaches constructing formal taxonomies (ontologies) from analysis of appearance frequency of terms, see, e.g., [8]. The requirements contain both new restriction and new terms, which possible be a new classes or instances. Two versions of the ontology compared and the difference - new notions and classes shifting in the hierarchy - will reflect the new requirements.

Let us briefly consider a technique [8] for text analysis and thesaurus extraction. The technique's input is a set of texts and output is a thesaurus, where for all terms a subset of the source text set corresponding to the term is associated. The technique consists of four steps:

1. Construction of the stemmed word index of the texts' set.
2. Form a terminological basis as a set of terms; the terms are represented as a sequence of adjacent stemmed words.
3. Hierarchical clustering of the text set, where the texts are described in the space of frequencies of the terms (the sequences) appearance.
4. Association of the cluster nodes to the terms, as semantic value of the node, thus, forming a thesaurus.

Textual representation also used by programmers using revision control systems to describe work done. The description can be considered as a text block of corresponding literate programming source code. There are developer groups, which have agreements of tagging text with special words (such as “UPD:”, “TODO:”, “FEATURE:”) to define modification semantics more formally. Analysis of the descriptions allows one to connect ontological notions to source code components and functions of the new structures to its implementation.

The history of the development process is to be stored in a revision control system. Its branching structure will reflect the natural structure of the software development process. Comparing the branching structure with existing formal taxonomies gives rise of relation of the object classes to their implementation approaches. Open source distributed concurrent versioning system Git [9] has most powerful commit approach, which allows one to fix changes partially, and powerful branching model, merging, pushing/pulling changes, and repository cloning.

User interfaces are also the sources of the modifications as they are parts of the software reflecting all structures of the software projects. The main role of the user interfaces in the software development process is adaptation to the software structures and user requirements. So, the allowing user to modify the user interface will result in the new set of modifications related to layout of the widgets, grouping the common components, and fine adjustment of the behavior of the widgets.

CONCLUSION

Software development life cycle has been considered as subject of the theory of complex systems and complexes [2] implying that the software development is a natural process. The life cycle is represented as system of models and morphisms between them. Analysis of the theory’s properties realization in the model shown, that the present instrumental software productivity could be extended by means of developing techniques for analysis of the passed life cycle stages, analysis and propagation of modification of the models.

In the last section of the paper we considered some existing sources of modifications in the framework of Model Driven Architecture (MDA) and software utilization, for example, joining the code generation stage of MDA and compilation stage of programming language allow one to propagate modification of previously generated source code to the abstract models of the software; extraction formal taxonomy from analysis of textual representations of users’ requirements and logs of concurrent versioning systems [9] allows one to figure out new notions from new requirements.

For some tasks appearing in the paper a variant of the solution is presented as a methods or informational technology. The problem of the software development history analysis is not considered and is a subject of further investigation, as well as implementation of the considered ideas as an open-source MDA software development tool.

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IS/ICT of an SME in Auto Transport Services

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Abstract - This paper presents a model of an information system, developed within an integrated model (IM) of information system (IS) and process structure of an enterprise specialized in road transport of goods and passengers by motor vehicles. IM approach is important because of the increasing dependency between services and information and communication technologies (ICT) in this industry. Implementation of GPS/GPRS technologies are elaborated within IS/ICT system development. Besides, IM approach is a holistic approach that involves three important dimensions of contemporary enterprise: process orientation, IT support to operations and quality system requirements. Applied object-oriented analysis of main processes of an auto transport enterprise resulted in the design of common conceptual model of enterprise information system. Experimental research on the implementation of IS model of Transport services process in an SME was also conducted and results are presented in this paper. The research confirmed managerial value of IS model as a tool that provides data and information needed for real time management of transport services business process (BP).

I. INTRODUCTION

Integration of the core business processes in an enterprise becomes the key success factor in modern business environment. Process oriented enterprise is a highlighted characteristic of a modern enterprise that ensures greater flexibility, comparing to functional organizational structure recognized by management and administration hierarchy. Process modeling of Quality Management System (QMS) defined by ISO 9001:2000 (updated version from 2008) contributed to a strict definition of end-to-end processes of product or service realization (from customer demand to the delivery of product/service to a customer) and strict definition of performance measurement of processes and enterprises as such. Information system/ information and communication technologies (IS/ICT) are inevitable component of modern enterprises and a foundation of completely new enterprise business concepts. This specially relates to service oriented enterprises [1].

It is well known that service sector is widely present in GDP structure of developed countries, and lately, the same trend is noticed in the economies of developing countries [2].

ICT also contributed to connecting "end-to-end" transport process that spread over different enterprises, thus supporting the concept of sustainable development (in the sense of availability to maintain the balance among three areas: economics, ecology and social) [3].

This paper presents a model of an information system, developed within a business integrated model (IM) of information system (IS) and process structure of an enterprise, specialized in road transport of goods and passengers by motor vehicles. IM approach is important because of increasing dependency between services and information and communication technologies (ICT) in this industry. Identified "end-to-end" processes: Transport services; Technical maintenance and Calculation of income and cost per vehicle are the most important processes for the management in an auto transport enterprise. This is because services cannot be stored in a warehouse and one of the key success factors is a high level of vehicles' availability [4].

Experimental research on the implementation of transport business process in an SME (small and medium enterprise) was also conducted and results are presented in this paper.

Project results are applied within Autotransport doo, Kostolac (further in text referred to as: Autotransport) [5].

The research confirmed managerial value of IS model within IM model as a tool that provides data and information needed for real time management of maintenance services business process (BP).

Besides Introduction section, this paper includes the following sections: IM model and approach (consideration of a problem and solution directions; developed model of integration), IS model (logical architecture of the IS), IS model implementation of Transport services process (experimental research in an SME), Future trends and further research and development (R&D) and Conclusion.

II. INTEGRATED MODEL AND APPROACH

It is important for a service oriented SME to integrate customer relationship management (CRM), resource management, service providing and financial management into a unified management process. All these processes generate and use large sets of different data to facilitate efficient enterprise's operations and development. Integration of BP and IS has to be achieved.

Research on the relation between a process structure and IS within the development of an IM of an enterprise that provides services in road transport, is conducted on characteristics of an enterprise which scope of services include following services: services of public transport of passengers and goods and other services for which, own heterogeneous fleet is used; services of public transport of goods with own resources and subcontracting of services in the same domain.

IM approach is a holistic approach that involves three important dimensions of contemporary enterprise: process orientation, IT support to operations and quality system requirements. IM is an integration model of BP and IS which shows that BP and IS interact to realize business goal. This is illustrated at the Fig. 1 [1,6].

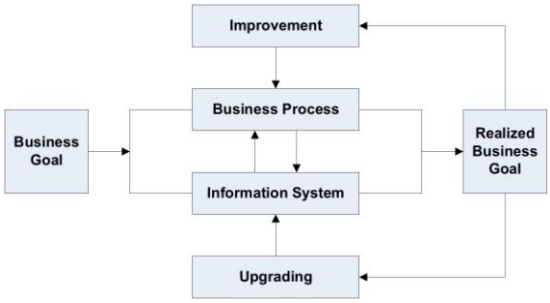

Figure 1. Global business integration model

III. IS MODEL

Information system modeling is an activity which products are models – various views on IS development. Modern IS are being developed by applying object-oriented method. Object-oriented modeling and Unified Software Development Process [1], present a development process of software-intensive systems, and enable achieving a stable architecture that allows iterative and incremental system development. Therefore, with the implementation of additional functionalities, the system is being upgraded without significant change in its architecture. So this object-oriented IS development approach is appropriate for IM development and implementation.

As it was previously said, IM approach is a holistic approach that involves three important dimensions of contemporary enterprise: process orientation, IT support to operations and quality system requirements. Applied object-oriented analysis of main processes of an auto transport enterprise resulted in the design of the common conceptual model of enterprise information system.

The group of main processes that contributes to the mutual goal is defined as a scope of a single IS. Logical architecture of an IS of auto transport enterprise (ISAT) consists of following constitutive subsystems [1,7] with studied relations (Fig. 2, [1]): S1 – Customer Requirements Fulfillment and Service Realization System, S2 – Integrated Logistics Support System, S3 – Vehicles Incomes and Costs Calculation and Analysis System, S4 – Financial Resources and Analysis and Documentation Management System, S5 – Information System Management, S6 – Top Management Decision Support System, S7 – Service Design and Development System, S8 – Document Publishing and Management System, S9 – Services Measurement and Analysis System, S10 – Human Resources Management (HRM) System.

System for Customer Requirements Fulfillment and Service Realization System – S1. The purpose of this system is to ensure efficient communication with customers and processes of an auto transport enterprise (AT) in order to ensure that the customer receives correct information on possibilities and commercial conditions of AT for fulfillment of its order, status of realization of its order and solving potential problems (customer complaints) and to provide with data and information necessary for efficient realization of customer order and ensuring the quality of service, in accordance with expectations of both customer and AT. This system includes information support to transport services realization process.

Integrated Logistics Support System – S2. The purpose of this system is to provide necessary and sufficient data and information for the realization of processes "service sales" and "service realization" at any moment of their realization. Data and information include documents (licenses, travel orders…), physical subjects (drivers, vehicles, equipment…). To realize these requirements quickly and correctly in modern business environment is possible only through modern IS/ICT systems, i.e. application software. It should be pointed out that in this system, the most important is information support to technical maintenance process [4,8].

Vehicles Income and Costs Calculation and Analysis System – S3. The purpose of this system is to provide with calculation and analysis on income and cost of vehicles, in the shortest period, after realization of single transport service. So this system supports the process of calculation of income and cost per vehicle.

Financial Resources and Analysis and Documentation Management System – S4. The purpose of this system is to provide with accurate data on financial means of AT in every moment and to provide with accurate processing of financial documentation and automated bookkeeping in accordance to the legal framework in this field. This is how the enterprise ensures the efficient management of income, control of costs and makes other important decisions based on which the financial conditions for the successful management of AT are ensured.

Information System Management – S5. The purpose of this system is to administer ISAT and should provide with accurate data on components of the entire ISAT during its development and exploitation, to preserve system's integrity and ensures the availability, security and protection of data, as resources of AT.

Top Management Decision Support System – S6. This system provides executive management with data and information necessary for identification of operational and business problems, based on enterprise and process performance indicators and for making operational and tactical management decisions.

Service Design and Development System – S7. The purpose of this system is to ensure intensive communication with environment and provide data (external and internal) in order to identify needs for new service, its economic justification and making conditions for realization of that service within AT.

Document Publishing and Management System – S8. The purpose of this system is to ensure managing of selected set of documents that are relevant for achieving AT's business goals and to ensure electronic publishing and distribution of relevant information on the matter. System should also enable efficient issuance of other

relevant information form ISAT system. This system provides support to the QMS.

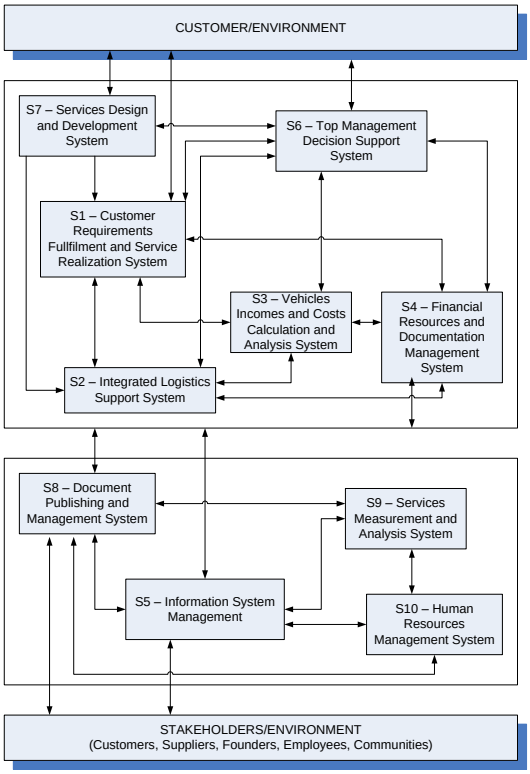

Figure 2. Logical architecture of ISAT

Services Measurement and Analysis System – S9. The purpose of this system is to contribute to the improvement of AT's services based on the measurement and analysis of realized services of AT (in accordance with QMS requirements), from the view of AT's business goals achievement.

Human Resources Management System – S10. The purpose of this system is to support HRM through ensuring that the staff is educated and skilled for assigned positions, as well as to organize further education during the employment. System needs to enable noting and keeping track of all relevant business data during the employee's engagement, analysis of elements of specification of positions and elements of improvement of effectiveness and motivation of employees.

Systems that are defined like this, in the IM's planning phase, support main business processes and main information flows between them, and are the basis for the planning of development and implementation of ISAT application software [1,5], based on defined business goals and priorities. ISAT logical architecture defined like this, with methodological and technological solutions in design and implementation of software solutions, ensures ISAT's flexibility and interrelation between business goals and IS goals, with regards to the IM approach and model depicted at figure 1.

Key concepts of ISAT domain model are: Transportation service, Business partner, Suppliers contract, Client service contract, Travel order, Vehicle, Employee, Travel order calculation, Invoice for client, Monthly calculation on income and costs per vehicle, Spare part, Warehouse, Vehicle maintenance. For example, Travel order class, is responsible for providing with all data input for travel documents and travel documents itself (electronic and/or print paper form) for available vehicle from the class Vehicle and driver's availability from the class Employee [1,7].

IV. IS Model Implementation of Transport Services Process

The application of developed IM approach and model itself is realized in the enterprise for transport services and maintenance of motor vehicles Autotransport, Kostolac, Serbia (further referred to as ATK). It is a „spin-off" enterprise, established within a process of restructuring of the Electric Power Industry of Serbia, by separating organizational divisions that were providing support to core business processes in the field of transportation of passengers, goods, materials and freight, back in 2003 [6,8].

Defined priorities in business and IS development are aligned, aiming at creating a common ground for integration of CRM, resource management, service realization and financial management into a unified management process in order to reduce costs and increase income of this SME.

In ATK, the organizational structure follows the streamline business processes, in which, the data on business objects, activities and documents are available through IS and a modern ICT infrastructure. It is a dynamic component of a modern enterprise and enables flexibility and agility, which for an SME in service sector means "survival" and development.

It is observed those actors' responsibilities in business processes increase when business process is supported by IS. *Transport services* process is a business process of high priority for the IM realization in an SME in auto transport for the following reasons [6]:

- enterprise makes revenue with transport services,
- this process realizes contact with a customer and it remains in contact with a customer during service realization,
- this process must "know" how many resources are available (relation with Maintenance process) when accepting a customers' request and whether it needs to rent resources through outsourcing,
- this process must perform a service,
- this process must gather data for the calculation of cost of realized service.

Aiming at realization of business processes based on the quality principles and requirements, following documents are being defined and implemented through the application software [6,8]:

- input documents (e.g. Contract with customer, Order receipt)
- business documents relevant for the process (e.g. Travel order for a vehicle, Shipping document),

- reports and overviews - data on request (data on Key Performance Indicators (KPIs) and other data for management in real time).

Based on the direct insight into status of realization of a service (from the request to completion of transport service realization), realized vehicles and drivers schedules and insight into status of available resources (fleet), with flexible selection of vehicles and drivers, one can efficiently manage the process of realization of transport service for every customer.

KPIs in realized IM Transport Service (for e.g. data for KPI - Increased vehicle productivity or Reduced fuel consumption per vehicle) are components of set of data and information for making business decisions for operational and top management of the enterprise. The focus is on KPIs, data sets from processes in real time, that management uses for decision making and its availability through the application Management, so called "managers' application" (for example) [6,8] include:

- (current) availability of vehicle fleet in the ATK,
- (current) availability of drivers and working machine operators in the ATK,
- mileage and work expressed in motor-hours (for working machines) from the beginning of current year,
- number of opened travel orders for vehicles on a given date.

Elaborated implementation of IM and ISAT at the ATK has characteristic that ISAT applications are integrated at data level they reflect, but also at the level of business processes they support. To that effect, the correlation within application software for business processes Transport service realization, vehicle Maintenance (with vehicle fleet) has been provided. Key performance indicators of Transport services process and Maintenance process - vehicle productivity (in terms of number of tones transported multiplied by the number of kilometers) and availability of a single vehicle and vehicle fleet as a whole are available to the "owners" of stated processes and to the top management of the enterprise.

Experimental research on IS model development and implementation, based on IM model of Transport services process simultaneously and synchronized with vehicle Maintenance in the ATK – this SME had confirmed managerial value of IS as a tool that provides data and information needed for real time management of transport services business process.

V. FUTURE TRENDS AND FURTHER R&D

It can be expected that new technologies in transport industry, new business models in services industry in general and IT services in specific, will be developed further, with the stress to the following:

- IM and software tools for faster implementation of changing business processes in service-oriented architecture (SOA) environment,
- IM models and process "outsourcing" – the transport companies shall be connected to the extranet business networks,
- IM and business integration aspects research, having sociological aspect added to organizational and technological aspects of business integration.

IT development and IM research directions in the auto transport industry will refer to: application software (in the domain of predictive analytics and transport simulation); different location software (based on GPS/GPRS technology implementation, e.g. an example at Fig. 3) and the increased presence of RFID devices and software; IM maintenance and "Software as a Service" business model in cloud computing environment [9].

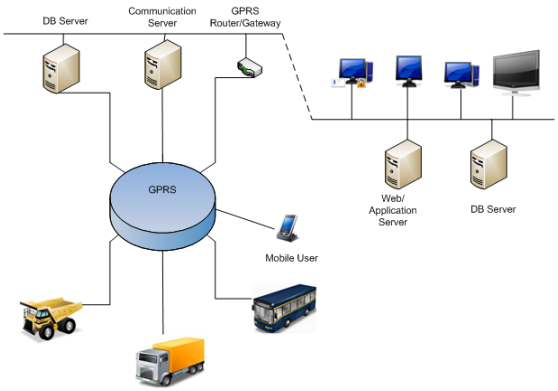

Figure 3. Integration of new technologies into IS/ICT system of an SME

VI. CONCLUSION

Transport services' system with ISAT includes business processes with integrated operational activities supported by application software through which the business documents are generated. This approach provides: data on realized events (activities) regarding transport services operations to be stored in databases, as well as data on vehicle maintenance operations and management. From that point data become available to the management in real time (e.g. vehicle and fleet productivity as KPIs of fleet effectiveness, as well as vehicle and fleet availability as an indicator of vehicle maintenance process performance, and availability of a certain vehicle for transport services).

Some of, already achieved, effects of data analysis obtained from IS for transport services management system relate to the introduction of new services and increase in enterprise income. Besides, transparent data on service realization increase confidence that customer has in a transport operator and improve cooperation between drivers and supporting staff during service realization.

Presented Transport services system of motor vehicles with modeled business processes and IS, i.e. conceptual solution of the system, can be applied in other transport companies because it is based on business process management approach and object-oriented IS.

ACKNOWLEDGEMENT

Research presented in this paper is realized within Projects TR 14021, TR 13004 and TR 35030 supported by the program of technological development of The Ministry of Education and Science of the Republic of Serbia.

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Strategic Development Trends of E-commerce in the Republic of Serbia

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Abstract - Strategic development trends of e-commerce relate to the perception and follow-up the dynamic environment with special emphasis on considering consumers' requirements. In case of e-commerce, trends have an extraordinary importance because it stimulates new technologies development, innovativeness, as well the total increase of national economy competitiveness. Formulating successful strategy relates to the estimate of Critical Success Factors (CSF) for the needs of multilevel business model of e-commerce in the Republic of Serbia. Therefore, for Serbia, it is very important to recognize e-commerce development models according to the strategy of national economy development.

I. INTRODUCTION

The strategic development trends of e-commerce in the Republic of Serbia start with identifying the possibilities and risks in commercial firms business. To identify possibilities of e-commerce in Serbia, many enterprises ask questions and try to achieve answers. Among them, special attention is paid to the following:

- What is the efficiency of consumers' services via the Internet technologies?
- What is the possibility to retrieve information on individual consumers with a view of successful interactivity?
- What kind of help based on the experience of e-commerce with other consumers can we give consumers?

These questions point to the presence of many CSF for the needs of e-commerce in Serbia. CSF relates to business, technologic and personnel factors that contribute to realizing set goals of e-commerce.

Leading factors of e-commerce development are competition, technical infrastructure, software solutions, characteristics of products and services, top management support, e-commerce project costs, etc [1].

Based on the cited, we can state how to increase e-commerce possibilities in an enterprise through the strategic approach to technological applications.

II. BUSINESS STRATEGIES OF E-COMMERCE DEVELOPMENT IN THE REPUBLIC OF SERBIA

The essential question for successful e-commerce programs relates to the possibilities of strategic approaches to technological applications in the global market. Possibilities for successful e-marketing channels are created only in the conditions of existing global markets, which enable constant data harmonization defined according to determined standards between business partners.

The Global Data Synchronization Net (GDSN) is based on standards of the global environment, providing all the participants of e-marketing channels consistent data for developing business strategy systems. Business strategies for e-commerce development can be competitive and cooperative business strategies [2].

Competitive business strategies provide the market survival relating to other competition. Competitive strategies are mostly planned to be offensive or even defensive. Offensive strategies provide the competitive position in the market by attacking competition. Large traditional traders assault, through e-commerce, the frontal attack with a view of expelling virtual traders who take a significant part of their market. The other form of attack strategy includes the side maneuver, where it starts with the frontal attack where competition is the weakest.

The defensive strategy takes the place in the framework of the current position, in order to provide defense from competition attacks. Defensive strategies decrease the intensity of attacks and exert influences on its defeat. These competitive strategies lay a foundation for the long-term business profitability.

Cooperative strategies, through cooperation with other companies, strategic associations and partnerships, enable the realization of competitive advantages. Strategic associations in the segment of e-commerce include associations of the largest traditional and virtual traders. Many companies in Serbia should orient their cooperation toward home and foreign partners.

The e-commerce development strategy in Serbia relates to:

- Promotion of products and services through interactive contacts with consumers;

- New electronic marketing channels where the two-way communication is provided;
- Direct savings thanks to the realization of delivery of digitalized products and information on the Internet.
- Reduction of time cycle of digitalized products and services delivery;
- Web activities to stimulate the image of commercial firm brands.

E-commerce realizes competitive advantages by mass adaptation to the global market [3]. The global e-market provides a row of competitive advantages in relation to traditional methods of disposal of goods.

III. THE ESSENTIAL FORMS OF E-TRADE DEVELOPMENT BUSINESS MODELS IN THE REPUBLIC OF SERBIA

There are many e-commerce business models, where we should emphasize that most companies are near two basic business models B2B and B2C.

Therefore, it is important for Serbia to recognize these business models according to the strategy of national economy development, and it proposes the following question:

- How to win in the Serbian market for the strategy of sustainable competitive advantage offering the assortment of products and services in the global electronic market, where every consumer is unique in his/her requirements (1:1)?

The B2B model of e-commerce in Serbia gives the possibility of selling products and services thanks to the Internet technology [4]. The business B2B model of e-commerce has the characteristics of supplier, consumer or intermediary market. Market oriented toward consumers has a special importance in Serbia for large companies, which through e-shops and e-centers research and compare supplies with a view of adequate acquisition of products and services via the Internet.

The following model being interesting for Serbia are e-distributors who represent companies which supply consumers directly with products and services. Money transfer online is a prerequisite and it has grown accustomed to life in Serbia, and in this way the B2B business model gets a chance for its further development.

The B2C e-commerce model includes business transactions between companies and consumers, and it is oriented toward the strengthening of interrelations with consumers through personalization and marketing 1:1 [5].

Thanks to the B2C model, some possibilities of reaching consumers outside of borders of the traditional market appear. The socio-demographic, psychological and social determinants make specific elements in the framework of the consumer policy [6]. Great changes in Serbia with the new global economy create big possibilities to win new consumers' trust.

Besides the cited two e-commerce business models, we can meet other business models as B2A, C2A, C2C, C2B P2P, mobile commerce, etc. The leading advantage of mobile commerce (also known as M-Commerce) is connected with the approach at anytime and anywhere, thanks to the high degree of interactivity and personalization with consumers. Location-based M-Commerce gives possibilities of an easier approach to information in the environment.

Online interactive communications realize the possibilities of applying new marketing business strategies oriented toward the new seller-buyer relation, with a view of realizing competitive advantages. Creating the strategy of interdependent relations with consumers enables to become acquainted and interactive relationship on the individual basis.

Adapting to the global market conditions is realized through the answer to question:

- How to answer consumers in the new e-market in a profitable way?

Establishing interactive relationships between sellers and buyers (consumers), new relationships are built, where an unbreakable connection between participants in marketing channels creates. New online communications give new chances with the emphasis on the individual strategy through Customer Experience Management (CEM). New points of contacts through online communications in e-commerce business models are realized by advertizing in electronic media, which must be two-way ones.

The key component of relationships between suppliers and buyers is information technology, which, thanks to globalization, brings to integrated two-way interactive communications. Feedback information from buyers through the experience of online buying and website visits advances the quality of products and services. The strategy of CEM enables unbreakable connections of all the participants in e-commerce business models, by which competitive advantage in the global e-market realizes.

IV. WEB ACTIVITIES IN MANAGEMENT OF E-COMMERCE MARKETING

E-commerce gives significant possibilities for implementing brand strategy. In other words, brand management goes to the virtual environment, and it is followed by new challenges for its creators. Challenges are primarily present in finding new forms for the personalization of "offer package" to individual consumers. It is based on high-quality information about consumer behavior on the Internet. Present differences in consumer behavior in traditional trading in relation to the consumers in online shopping require the change, i.e. the redefinition of brand performance and its brand promise.

Brand performance advance in e-commerce supposes the application of some principles:

- Listening to communities rather than telling customers;
- Recognizing that communities co-create brand value, rather than passively consuming brands;

- Becoming more community focused and rapidly responding to new suggestions;
- Relaxing control over brands.

The analyses of beginning experiences of e-commerce during brand introduction on Internet marketing points to prevailing strategic approaches in accordance with policy making of low prices and price percent for brands relating to different geographical market segments. The possibilities of comparing brand prices on the Internet represent the basis for e-brand strategy development adapted to price-oriented consumers.

The segment of price-oriented consumers, although dominant, does not represent the limiting factor for e-brand development planned on the value added of products/services. The strategy of price-oriented e-brand is suitable for the initial consumers' attraction, while for their loyalty, it is necessary to develop e-brand based on the concept of value added for consumers.

The weaknesses of price-oriented e-brand strategies are visible in their blunder of the fact that consumers exchange information on brand prices and their own experiences on perception and satisfaction of e-brand buying through different forum groups and social nets.

It is interesting to emphasize the results of web researches of Marketing proof 2011 [7], according to which 53% of enterprises plan social media marketing, while 26% of them plan the implementation of these web activities in the next 12 months. At the same time, enterprises show the high interest to the application of m-commerce; 44% already apply mobile applications, and 31% plan its introduction in the course of 2011.

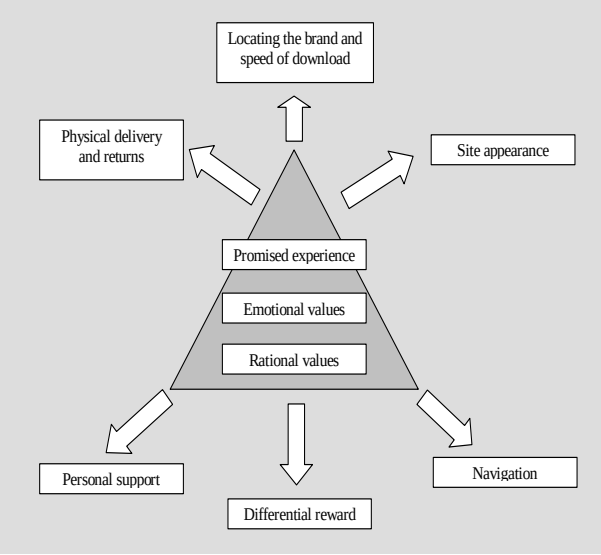

Figure 1. Promise brand management in online environment

The basic task of e-brand creators is to define the characteristics of brand promise in relation to the rational value – emotional value. The strategic framework for e-brand development is the choice of optimal element combination, the so-called Brand triangle, illustrated in Figure 1.

E-brand differentiation points to the choice of the essence of its value added and determination of the way for its positioning into three types – services, search goods and experience goods [9].

V. CONCLUSION

The strategic trends of e-commerce in the Republic of Serbia show the high degree of compatibility with the global e-commerce trends. Following up the requirements of Internet consumers and the personalization of relationships with them, represent the key point of innovative performance of e-commerce. Formulating the successful e-commerce strategy is necessary to realize through the choice of optimal business models as the answer to the present Critical Factor Success (CFS). All available business models offer possibilities for positioning e-commerce offer/brand, which should be in accordance with recognized expectations of online consumers. Among available models applying in Serbian markets, mobile commerce is distinguished. The reason for it is its advantage in relation to other business models. It also relates to an unlimited approach and territorial availability originating from the high interactivity and personalization with consumers.

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Business consulting model for SME in South Eastern European Countries

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Abstract - Business consulting, aimed at achieving business success, presents equation which is composed of the following variables: innovation, education, risk management and focus of control; need for education , risk-taking and proactiveness.

The paper is based on a theoretical model of how to develop a business consulting model as a point of knowledge in a transition environment of South East European Countries. Fundamental focus of the model is aimed at creating a knowledge point of fluctuating market environment. The model presents interaction among entrepreneurs' individual characteristics, cultural burden, and transition of digital economy environment, entrepreneurial ethics and influence of a political involving.

Key words: business consulting, business process, SME, transition economy, ISO, model,

I. INTRODUCTION

A transition economy or transitional economy, by definition, presents an economy which is changing from a centrally planned economy to a free market. Transition economies undergo economic liberalization, where market forces set prices rather than a central planning organization and trade barriers are removed, privatization of government-owned enterprises and resources, and the creation of a financial sector to facilitate the movement of private capital.

The transition process is usually characterized by the changing and creating of institutions, particularly private enterprises; changes in the role of the state, thereby, the creation of fundamentally different governmental institutions and the promotion of private-owned enterprises, markets and independent financial institutions.[1]

According to the IMF, the main ingredients of the transition process are:

- Liberalization – the process of allowing most prices to be determined in free markets and lowering trade barriers that had shut off contact with the price structure of the world's market economies.

- Macroeconomic stabilization – bringing inflation under control and lowering it over time, after the initial burst of high inflation that follows from liberalization and the release of pent-up demand. This process requires discipline over the government budget and the growth of money and credit (that is, discipline in fiscal and monetary policy) and progress toward sustainable balance of payments.

- Restructuring and privatization – the creation of a viable financial sector and reforming the enterprises in these economies to render them capable of producing goods that could be sold in free markets and of transferring their ownership into private hands.

- Legal and institutional reforms – redefining the role of the state in these economies, establishing the rule of law, and introduce appropriate competition policies.[2]

Ideally, this process leads to macroeconomic stabilization after immediate high inflation is brought under control. In practice, these changes have often led to increased inequality of incomes and wealth, dramatic and ongoing inflation, pervasive corruption in both the public and private sectors, and a fall in GDP.

II. BUSINESS CONSULTING MODEL

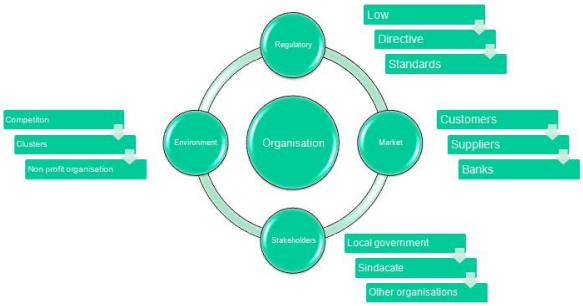
Business Consulting [3], [4] is the process of helping Business Organizations for improving the overall performance of the company by identifying and analyzing any Specific Business Problems that the company is facing and to develop Plans and strategies to overcome the specific Business problem and to implement the strategies planned in these companies. *Business Consulting Services* covers a wide spectrum of areas including implementation of Best Practices, Benchmarking, Using Analytical and statistical Techniques for problem solution, Management of Change, New Technology Implementation, Development of Plans and Strategies etc. Business Consulting Organizations suggests a more effective and efficient methods for performing specific Tasks in the Business by bringing a framework or a Methodology for identifying and analyzing the specific Business Problems.

The business consulting model for small and medium sized enterprises in transition countries should include next steps:

a) Activity frame definition.

Activity frame [3], [4] for companies in modern environment is very complex. Demands and expectations are very rigid and some of them are:

-Regulatory requirements
  -lows
  -directives
  -standards
-Market requirements
  -customers
  -suppliers
  -financial institution (banks)
-Stakeholders requirements
  -Local government
  -Syndicate
  -Other organizations
-Interested parties requirements
  -Competition
  -Clusters
  -Non profit organizations



Picture 1. Activity frame in such environment

b) Organization position's definition

Organization position[3], [4] is defined by activity frame but it is also determined by its interactions with internal, direct and wider environment.
Internal environment includes internal activities in the company considering quality requirements, health and safety requirements, environmental requirements and information security requirements.

Picture 2. Organization position

c) Organizational process analysis

Total quality management system is based on customer's satisfaction and out doing its expectations. Customer's demands are inputs for business processes of the company. The result of the processes can accomplish the basic demands of the system, or not.
Business processes are structured to find the way to satisfy customer's needs. Structuring of business processes considers process logic as the best model to accomplish customer's satisfaction.
Organizational structure defines basic business processes, but it does not define its cohesion and bottlenecks, eventually.
Organizational structure is demonstrated by flowchart that shows organization units and incorporated functions of the company.

3.1. Process markings

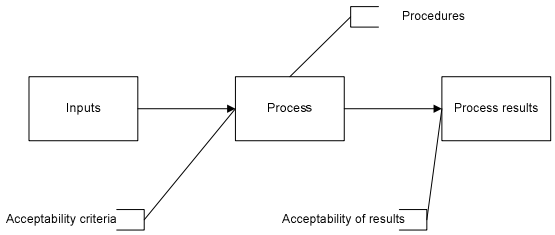
Definition of business process that includes organizational position and purpose of the process. It also represents its connection with other business processes in and out of the organization.

3.2. Process involving

Process participants are executants of operational activities that should accomplish certain result. Process inputs consider materials and information as a fundamental condition for running processes.

3.3. Acceptability criteria

Acceptability criteria determine level of acceptance for material and information input flows, within the process.



Picture 3. Acceptability criteria

3.4. Process goals

Defining business objectives that process attains in organization business domain, and its importance in relation to the other processes.

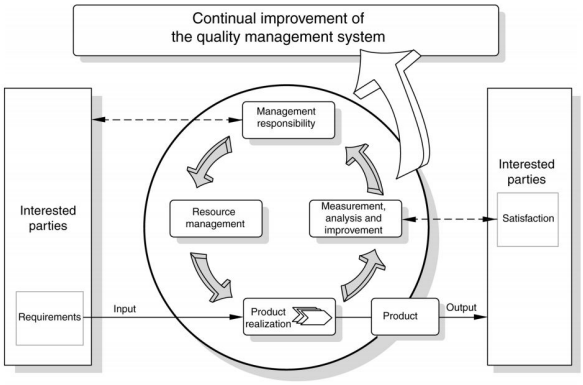
3.5. Rules definitions

Rules for business processes are set of methods, working procedures, customs and profession rules

that determine running of business processes and enable reaching goals of the process.
The procedures in running core-business processes are well known and defined, but in tacit form. During standardization process tacit form should be settled to the explicit form.
One of the possible ways is a graphical representation of process by using flowcharts.

d) Cohesion of the system

The organization with structured processes and defined interactions between them should have strong cohesive factor for incorporation of organizational uniqueness, considering essential goals of entire organization and its employees.
System integrity and its strength must be imperative of the organization.



Picture 4. Organizational cohesion

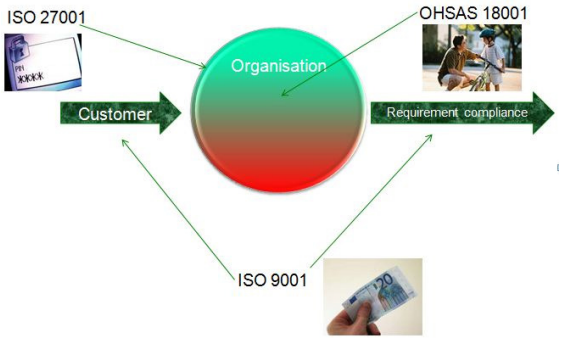
e) Standardization

Standardization is a process of using earlier defined rules during the process activities. Standardization of business organizations is an inevitable process for Croatian integration process to EU. Standardization of business processes can be presented in inner interactions within organization and with environment.

5.1 Inner interaction

Inner interaction within organization processes is a result of activities that were started by customer's demands and needs. First relations customer-organization-customer is defined through the ISO 9001 [5]-quality demands.

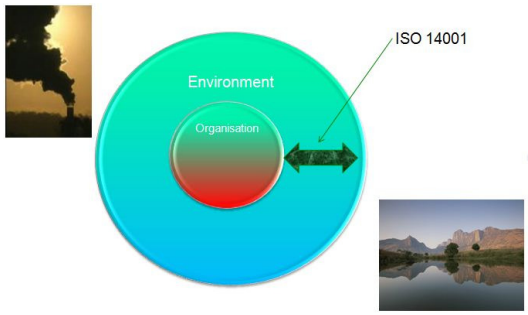
Internal relations between processes and its participants are regulated by OHSAS 18001 [7], by defining health and safety requirements. The third is ISO 27001 [8] that defines rules for information safety and preventive measures.



Picture 5. Inner interaction

5.2 Interaction with environment

Interaction with environment is defined by parts of the process and its side effects that can cause exploitations of natural resources, generation of waste and pollutions of soil, water and air.

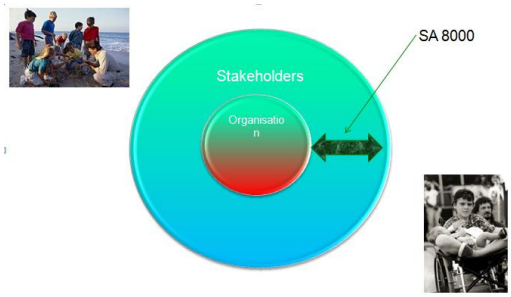


Picture 6. Interaction with environment

Process of standardization of organization with environmental requirements is defined by ISO 14001 [6] standard. This standard defines rules in processes that comply with demands of preventing pollution of environment.

5.3 Interaction with interested parties (stakeholders)

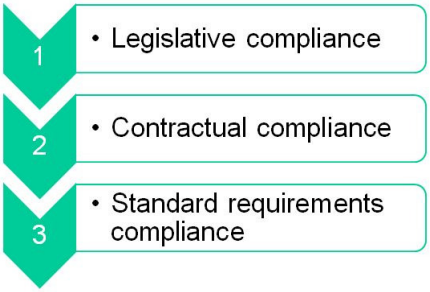
Social responsibility, regulated by SA8000 [9], standard, presents postulate for creating stable environment and organizations. Organization that fulfill its obligations towards customers, market and state of law, is only at the half way.
Many obligations consider subtitle relations between organization and interested parties. These relations carry out on the edge of so called official relations.
Social responsible organizations present the base for further economic growth.



Picture 7. Interaction with interested parties

f) Way out indications

As the last step in defining the business consulting model for small and medium sized enterprises in transition countries we indicate the obligations that make modern organization environment as it is shown on picture 8.



Picture 8. Obligations of modern organization environment

By defining (and following) presented six steps business consulting model for small and medium sized enterprises in transition countries present the point of knowledge in learning on „how to survive“ within the fluctuating environment of transitional market.

III. CONLUSION

Business consulting as the part in progress of transitional environment can contribute a lot to painless transition in the society of developed Business rules, customs and ethics.

Business consulting methods must be adapted to actual conditions and burden of a cultural heritage of organization environment, considering positive measures that can improve entire process. Standardization as the global process represents one way road for further development of Business systems. It presents management tools to:

- ✓ follow up with actual laws
- ✓ following, understanding and realization of market conditions
- ✓ ecological consciousness
- ✓ fair relations between interested parties
- ✓ market positioning as a reliable partner
- ✓ status of reliable employer
- ✓ generating of motivational market climate

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[9] SA8000, Social accountability, international standard

BUSINESS IN SERBIA PRESENTED THROUGH THE RELATIONSHIP WITH E-ADMINISTRATION AND INDIVIDUAL

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Abstract – The inevitable process of changes in various markets, globalization and development of new technologies that ensure fast exchange of information, has caused new conditions of business to be created in our country. Development of information technology creates a whole range of changes and it implies a new way of living and working for the users, especially in the sense of collecting information. In an environment that perceives the accelerated technological development as a condition that must be met, the industry and economy growth and development can survive only if they are constantly present in the center of the global IT happenings. IT has become a major initiator of changes and resolutions of problems in economy, social sphere and other, as well as a means of connection with the international community. This study will analyze the notion of e-business in the sense of legislative solutions that are proposed by the EU and the United Nations with a special attention paid to Serbian legislation; it also deals with the e-administration from the legislative standpoint together with the relationship between e-business- e-administration- individual. What receives special attention in this study is the relationship between an individual and e-business and e-administration so as to attempt to explain its position against these new phenomena in the society and, if possible, to try and discover new methods that would be beneficial in the attempt to clarify and make their relationship equal.

I. INTRODUCTION

The basic aims and directions of Serbian politics in the field of IT society development are defined in the document entitled" The Strategy for Development of the IT Society in Serbia". Based on the basic principles of European Administration Framework, this document defines the basic principles of the reformation in this field. As a member of the initiative for the Electronic South-East Europe that functions in the scope of the Pact for Stability of the South-East Europe, in the close of 2002 Serbia signed the South-East Europe IT Society Development Agenda. The aim of this Agenda is definition of state policy priorities and encouragement of the state to take responsibility for a faster development of the IT society in the country and the region, in accordance with the EU initiatives – e-Europe 2002 and e-Europe 2005. This implies the recognition of a greater number of legal texts in accordance with the EU directives that regulate e-trade, e-contract and e-signature. Hence, Republic of Serbia has adopted the Law on e-Trade, the Law on e-Document, the Law on e-Communication and the Law on e-Signature. From the legislative viewpoint, Serbia has met virtually all normative preconditions for the establishment of the e-business in the country.

Apart from the European directives regarding e-business in Serbia, of the same importance is the Model Law on e-Trade created by UNCITRAL in 1996. This Law prescribes a set of internationally acknowledged rules with the purpose to provide assistance to countries that are striving to remove legal boundaries in the application of e-trade and to diminish differences between national legislations in this field. In 2002, the UNCITRAL Model Law on e-Signature and the instructions for its use were acknowledged. In the process of creation of the legal basis for e-business in Serbia, the aforementioned model law was taken as the starting point; however, a wider perspective for possible problems was taken into account with a special emphasis on the development priorities in Serbia and the traditional legal culture.

II. E-ADMINISTRATION CONCEPTUAL BASIS

E-administration is a term that has been very often used recently in different contexts. Rather frequently, it is presented as one of the more important preconditions for Serbia to enter Euro integrations. Also, it represents an inevitable condition for the provision of the greatest possible rights and freedom of Serbian citizens by state administration. Regardless the contexts that the term e-administration is used in, a great number of authors have tried to define the term and to provide a definition that would encompass everything that this term implies. Of course, the differences between the authors and aspects of their conceptual attitude towards the very notion have yielded a great variety of the notion's definitions.

One of the, so to say, general misapprehensions connected with the concept of e-administration is that it is made of the internet. In reality, it is completely different which means that e-administration does not consist solely of the Internet. It is undoubtedly true that the Internet is the most powerful mechanism used in performing tasks given to e-administration, but a similar effect can be achieved through use of other, mostly electronic devices, such as the simple telephone line, mobile and SMS technology, service providing centers or a combination of ITC and simple administrative procedures (when ordering

birth certificate by SMS with its postal delivery). This fact is of special importance and precious in countries where the concept of e-administration is in its beginning, the countries such as Serbia. It is an absurd expectation to transfer all the services and information provided by administration to the Internet immediately since this process is rather costly, complicated and time-consuming.

Apart from its great advantages, the concept of e-administration has the other side that is reflected in the numerous risks that follow it. Overly ambitious projects, lack of political initiative for the actual transformation of the way that the administration functions, insufficient capacity for the design and implementation of the solutions are some of the reasons that would cause the planned e-administration projects to fall trough. Still, what can be named the major threats to the survival of the e-administration project is the privacy terms violation and safety risks. The very thought that virtually entire database of someone's life (ranging form personal to financial data)would be available on the Internet, surely frightens even the greatest optimists in IT. In other words, the administration has to be in the position to guarantee and take responsibility for an immense quantity of information. Also, any kind of security error would seriously and up to a great extend question the trust of the citizens in the e-administration.

III. DEVELOPMENT OF E-ADMINISTRATION IN SERBIA

In October 2009, Serbian government published the "Strategy for the Development of e-Administration in Republic of Serbia for the Period of 2009-2013". The strategy entirely coordinates with the Basis of EU policy regarding e-administration for which there was an Action Plan approved by the EU Commission in 2006. As it is noted in the very beginning of the Action Plan, it is the integral part of the i2010 initiative as a framework of the EU policy regarding IT society and media.

Serbian government adopted this i2010 initiative as the general framework for development of the IT society by signing the eSEE Agenda+ for the development of South-East Europe IT society. The strategy starts form the state of regulations in this filed as well as from the accomplished results in the implementation of legal regulations. Of special importance is the implementation of the Law one-Signature. By registration of certified bodies that issue qualified electronic certificates in December 2008, it is possible to use a qualified e-signature for signing e-documents so as to provide their legal validity and make them a means of providing evidence in legal matters, administrative, court and other actions. By this, one of the basic preconditions for the further development of e-administration was met.

The regulations of the Law on Electronic Document will have a great impact on the processes of modernization, rationalization and the establishment of e-administration. In this, a special attention is paid to the basic legal regulation that states that the document that was originally created in the electronic form is perceived as the original and that represents one of the key conditions for reformation of the existing procedures and for the implementation of electronic public services for individuals and companies. Serbian government bases its strategy on the results of the ongoing projects such as introduction of electronic parliament sessions, electronic real estate register, the initial results of the introduced electronic services for certain business; also, of great importance for the development of e-administration are the regulations of the Law on the Personal Data Protection Law.

IV. INDIVIDUALS AND E-ADMINISTRATION

When speaking of the relationship between and the position of the individual and the e-administration, it is necessary to note that the e-administration is not an omnipotent database that could solve all the problems with one click. E-administration represents just one of the windows to the world in which there are numerous government bodies, organizations, services, starting form the level of republic to the level of the province and ending in the local level that represents thousands of administration clerks employed. In Republic of Serbia, the internet portal eUprava officially started working on June 11, 2010 and it represents a unique on-line window towards electronic services of the public administration instances provided to individuals and companies. Use of the infrastructure for the provision of electronic services is available for all instances of the public administration. Electronic administration makes it possible for the local administration to provide services for individuals and companies online easily. This implies cost cutting, optimal and efficient work and less time spent in front of desks.

By accepting United Nations and especially European Commission directives, it is assumed that the development of the e-administration will take the right course, whereas the pace of the implementation of the project depends directly on the political will. The level of legislative activity is on an exceptional level, especially if we take into account the fact that Serbia has adopted almost all the laws proposed by Euro Commission; at the moment, Serbia's greatest challenge is the implementation of legislative regulations and the best possible functioning of the e-administration.

An important step in creation of the e-administration , maybe even on the level of connecting Serbia and the EU , has been made by the Agency for Business Registers by it signing the Memorandum on the understanding with the German region North Rhine – Westphalia. Based upon this document, Serbia has entered a pilot project for creation of a platform for electronic exchange of data about registered companies. The goal of this project is to establish a common database of companies, their subsidiaries and financial reports for Serbia, Germany, Ireland, Austria, Switzerland and Macedonia. The project will serve as a pattern for the establishment of a universal system of registration and companies databases on the level of the entire EU; this is expected to be completed not later than by 2014.

V. OMBUDSMAN AND E-ADMINISTRATION

The factor that must undoubtedly be taken into account in the processes, the processes of the introduction of e-administration and creation of the universal office system that has not been used to the real extent yet, are the non-governmental specialized bodies organized for the purpose of the administration auditing. By this, we primarily mean the institution of the Ombudsman on the level of the state, province and the local level of government. A certain extent of influence can be attributed to the institutions of the Trustee for Information of Public Importance, the Trustee for the Protection of Equality and all other nongovernmental organizations, the representatives of relevant associations and organizations. All these organs, named by this term universally, have the goal to control the administration in a way and to help it in its communication with Serbian citizens. In this cooperation with the administration, there organs have a direct contact with the citizens as well as with the administration; hence they have a clear perspective of the problems without any other influence.

The primary task set for there organs, and especially for the institution of the Ombudsman is to , in the initial stage of this program's realization, represent the problems that have, up to now, been detected regarding the work of administration together with the reasons that brought them about. After this, it is necessary to present al the consequences following this way of work and practices, especially form the perspective of the provision of citizens' rights by administration and from the perspective of financial hazard of this way of work for the state budget. Of course, this analysis would enable us to reach the core of the problem and the ombudsman and all other independent institutions would be obliged to point them out as well as to actively propose solutions. If the exclusion of all the organs outside the state stricture is continued, the task will be ill-performed and it will be prevented form functioning in the way sufficient to meet standards set by all the parties involved in the process, i.e. both the citizens and the administration. This is the conclusion that can straightforwardly be made from the current practices of administration and realization of keratin projects that were left only as theory exactly for the lack of the "real perspective".

In this manner, the ombudsman's role in the e-administration is a very important one. On one hand, it is commonly believed that once the e-administration has been introduced, once the direct contact of citizens and administration has been established once the universal office has been made, the need for the ombudsman will cease to exist. This way of thinking is wrong since the very sense of the instruction and its task are not exploited by the number of administration organs and by improvement of the contact with citizens, but it is reflected in the assessment of legality and concordance with rules of the administration practices when it is to decide on concrete rights and freedom of the citizens. On the contrary, by establishing e-administration and a universal office, it will be possible for the ombudsman to access administration and its management more easily which in turn will result in a faster and more efficient performance of the ombudsman himself.

VI. POSSIBLE DIRRECTIONS IN FUTURE DEVELOPMENT

Not in a single segment has the e-administration reached- the level on which it can completely substitute the direct and written interaction between the state organs and citizens. In EU countries, on average, there are more than a half of services completely available online. Development of the status indicators (of the national portal user orientation) is in front of Serbia, since both these aspects are rated zero.

The ratings for e-administration in Serbia can be improved by adding new information and forms to the existing internet sites. However, for a significant development of e-administration to be achieved in Serbia, it is essential to implement back-office applications that would provide services for the users, realization of registers integration of information from databases and the inter-operability of applications that provide these services.

The existence of the e-administration portal with, for now, a modest capacity of state organs and local administrations participation can barely be the pillar for the further development of e-administration in Serbia. Namely, according to the latest surveys, the participation of local administration in the e-administration portal is about 30% of the total number, whereas only around 30 state institutions have posted their services on this portal. If seen from a critical distance and compared to the situation in the past, this is a rather good result because it represents a great improvement in the approximation of e-administration to citizens of Serbia. Until recently, e-administration was only debated about as a theory, whilst no actual legislative measures were taken. In the last couple of years, it can be said that there has been extensive activity in the attempt to increase the presence of IKT in the administration itself, but with the citizens as well, which surely leads toward creation of the universal e-administration. Legislative activity in this direction has been intensive and the largest portion of documents has been made(both legal and sublegal) so as to make this strategy implementation possible; On the other hand, the technical part of this work has taken a great intensity by setting up a website of the e-administration than provides citizens with services of state organs and local communities. Certainly, we all have a long way to achievement of the final goal, the creation of the universal office for citizens at which they will address the administration, but we have to state that Serbia is taking truly serious steps towards its accomplishment.

One of the important conditions that must be met in order to accomplish the goal is to attain the absolute political concordance in the necessity and the need for the universal e-administration; this is, to create a system and accomplishment of the idea of the universal desk for the citizens. The political will must be absolute in the sense that all relevant political factors support this project both

verbally and by concrete proposals and initiatives. The largest part of this project implementation is to be taken by the governing structure but it is also very important to note that those political factors that do not participate in the government are responsible for the success of the project as well. This project is the absolute benefit for all citizens and has to be the absolute priority and goal for all political structures.

The realization of this project, the project of the universal office implies a long and hard work. The work must be done by all social factors with a special contribution and engagement of the parties directly involved in the relationship. A special contribution is expected to be given by administrative organs (state, local and nongovernmental ones), especially for the reason they are directly and constantly connected with the citizens who expect and demand realization of their rights and protection of their interests. These organs are well familiar with the situation in its very structure where the problems are in organization, where they are in techniques and where there are problems regarding legislation and procedures. As a contribution form the other side, it is expected from the citizens to be active since they represent the other side in the process, the side that is eager to reach the best and the most quality solution possible. The citizens are rather familiar with the problems they encounter when it comes to "administration" and with the ways to overcome them. By giving their proposals and sharing their experiences they can help in making the system better organized and improved for the common benefit.

VII. CONCLUSION

E-administration is a segment that has been paid a lot of attention to in the recent years and that is expected to grow and expand more in the future. The awareness of the organized adjustment of the ancient administration to IT society in Serbia arose later than in European countries. Nevertheless, the goal to reach a modern e-administration can be achieved if examples of good practices in certain countries are followed.

In certain domains, Serbia can be proud of its good examples when it comes to application of all the principles and rules for e-administration. Of course, the examples are scarce but they should, nonetheless, be mentioned. Primarily, what needs to be mentioned are the activities performed in creation of the Central Register that can be accessed by all authorized officers form all Serbian cities. Next, what should also be mentioned is the Agency for Business Registers and its activities regarding registration of business subjects as well as its international cooperation in the attempt to create a universal database of companies on the EU level; Ministry of Internal Affairs and SMS service used for making appointments for issuing IDs and passports; the Tax Administration of Serbia, eUprava portal etc.

The conclusion that can be made after the entire situation analysis is that Serbia has been actively involved in creation of a favorable environment for the establishment of e-administration, as well as that measures have been taken for the purpose of realization of this project. It is obvious that we are in the beginning of the process but that we have a chance to progress rather quickly and to reach a significant level according to European criteria. Our advantage is reflected in the fact that we have a good legislative regulative, high motivation of the directly involved executives and participants of the project and the great enthusiasm of the IT specialists who are to complete the entire project in order for it to function well. The last link in the chain that is necessary to direct the project in the right way and at a satisfactory speed is the political will and its uncompromising attitude that the project must be realized for the good and the interest of the entire society.

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Business Rules Management In Distributed Information System - Risk Analysis

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Abstract - In order to remain competitive an enterprise needs a flexible business process, which can adapt to frequent changes that occur in the market, regulations or internal goals. The essence of adaptability of business process is applying and effective management of business rules. Large enterprises distributed information systems are used within operational and strategic processes. Complexity of distributed information systems structure and functionality brings risks of application business rules in common practice. The purpose of this paper is to present theoretical foundation as well as some software solutions for distributed business rules management, and a critical overview of risks of those systems.

I. INTRODUCTION

Business processes are changing according to market and regulatory impact, and therefore should be flexible and accurate according to those impacts. Changes should be adequate to required rules and needed performance measurements, but also should be done in appropriate time period. IT sector of an enterprise should provide flexible software support to effective and efficient business process at operational and strategical levels. Much research has been made in theoretical and experimental surveys about impact of IT to business processes performances. The conclusions are similar, and one of them is that impact of IT usage on organizational performance rests on the application of sophisticated IT tools in enterprise business processes. ([1])

Information system lifecycle depends on the lifecycle of an enterprise. The essence of information system development is model of an enterprise business domain – business process and business objects that are involved in those processes. Business design describes how that business works – the processes that it performs; the organizational structure of the people and finances within that business; the business' near-term and long-term goals and objectives; the economic and market influences that affect how that business achieves its goals; the rules and policies that condition how the business operates. By deriving the information system design from the business design you can more easily drive changes into the information system at the rate and pace of change in the business design. Furthermore, the information system can be used as a catalyst for change in the business design – the information system can be used to monitor the state of the business; it can report on how well the business is doing in meeting its goals; and can be used to suggest changes in the business design to improve its efficiency at achieving those goals.[2]

The critical part of business process modeling is formalization of business rules and its involvement in business processes which impacts software support to those processes. Business rules are statements that reflect policies, procedures, or other constraints on ways to satisfy the customers, make good use of resources, or conform to laws or industry regulations applications. Specification of business rules as well as enforcement and distribution of business rules in distributed environments are very important part of business rules management.[3]

The objectives of this paper are literature survey in the field of business rules, distributed information systems and risk analysis, as well as presentation of software support to business process management and its role in distributed information systems. Risk analysis of using business process management systems within distributed information system is contribution of this paper.

II. BUSINESS RULES

The basic research interest and results in the field of business rules come from several research and technology communities [4]:

- Artificial Intelligence community - knowledge based systems, inference engine, predicate logic, automated reasoning systems, expert systems [5]
- Databases research community – deductive databases, active databases (triggers, stored procedures), extensions of ERM (entity relationship model) for presenting events, actions and conditions
- Object oriented community – OCL (object constraint language) with UML, Z- formal language for specification, Active middleware
- Business rules projects – whole business rules lifecycle - discovery, analysis, modeling, classification, articulation, formalization and documentation, resulted in methodology, tools and technologies based on Business rules repository and Business rules engines
- Internet and e-Commerce - B2B communication and interoperability of heterogenic environments

[3], XML as a widely recognized technology, Web services, SOA, ontology, Semantic Web [6]

- Business rules engines technology and commercial software – some software companies focus on development of business rules engines as standalone software support that could be integrated in information systems of enterprises. The most popular commercial software are: QuickRules (http://www.yasutech.com), VisualRules (http://www.visual-rules.de), Jboss Rules (http://www.jboss.com). JBoss Rules and QuickRules are in the class of EXPERT SYSTEMS, and Visual Rules belongs to ACTIVE SYSTEMS. [7]

"A business rule is a statement that defines or constrains some aspect of the business. It is intended to assert business structure or to control or influence the behavior of the business.

From the business perspective, it pertains to any of the constraints that apply to the behavior of people in the enterprise. From the business perspective some of issue categories pertaining to the behavior of people in an organization include: capturing the rules that involve the use of human judgment, looking at the components of systems that are related to soft rules and seeing how they come together to support business rationale, showing workflows, processes etc. in terms of their relationships to business rules, the process of acquiring, maintaining and enforcing rules, other systems of classification such as mandates, policies, guidelines and corporate culture, industry rules and corporate rules, determining when rules are ineffective etc.

From the information system perspective, it pertains to the facts which are recorded as data and constraints on changes to the values of those facts. That is, the concern is what data may or may not be recorded in the information system. A business rule from information system perspective expresses specific constraints on the creation, updating, and removal of persistent data in an information system. The business rules described here control whether or not such data may be created or changed and the implications when this occurs." [8]

The complete definition and basic features of business rules are described in "Business Rules Manifesto – the principles of rule independence", by Business Rules Group in 2003. Some of the main characteristics are:

- Rules are the most important part of requirements, business models and technology models of an information system. Rules are a vital business asset. Rules are about business practice and guidance and are motivated by business goals and objectives. Rules should arise from knowledgeable business people – they describe part of the knowledge of a business process.
- Terms express business concepts, facts make assertions about these concepts and rules constrain and support these facts. Rules are explicit constraints on behavior and / or provide support to behavior. They are not process or a procedure and should not be contained in them. Rules apply across processes and procedures. Rules define the boundary between acceptable and unacceptable business activity. Rule violation should be handled with business activities.
- Rules should be expressed declaratively in natural language sentences for the business audience. Rules should be declarative, not procedural – they should consist only of terms that describe concepts from the problem domain and facts that are included in constraints applied in business domain over the facts.
- Rules should be expressed in the way that they can be validated for correctness by business people, verified against each other for consistency. Formal logics, such as predicate logic, are fundamental to well-formed expression of rules in business terms.
- Rules need to be nurtured, protected and managed. There should be cohesive and consistent body of rules that are enforced across all relevant areas of business activity. A rule is distinct from any enforcement defined for it, i.e. rules should be defined independently of responsibility of who, where, when and how of their enforcement. Business people should have tools available to help them formulate, validate and manage rules, to verify them against each other for consistency.
- Application of business rules is adapted to continuous change in business rules and software that runs those rules should support continuous change in business rules. Executing rules directly from a rules engine is a better implementation strategy than transcribing the rules into some procedural form. A business rule system should always be able to explain the reasoning by which it arrives at conclusions or takes action. Business rules should be organized and stored in such a way that they can be readily redeployed to new technology platform. Rules and the ability to change them effectively are fundamental to improving business adaptability. [9]

III. ENTERPRISE BUSINESS RULES ARHITECTURE

Enterprise architecture [2] is essentially the integration of business and technical architecture using a comprehensive methodology and shared repository.

Business architecture is comprised of: business strategy, security, business rules, enterprise decision management, business object model and/or data model, metadata, business process including workflow, orchestration and choreography, information architecture, application architecture, analysis and project management tools, business to technical alignment, organizational structure, performance management.

Technical architecture, including data and security architectures, consists of: infrastructure (network, operating systems, enterprise service buses etc), database, data-warehouse, programs, messages, design,

development and deployment tools and environments, integration tools and guidelines, standardization.

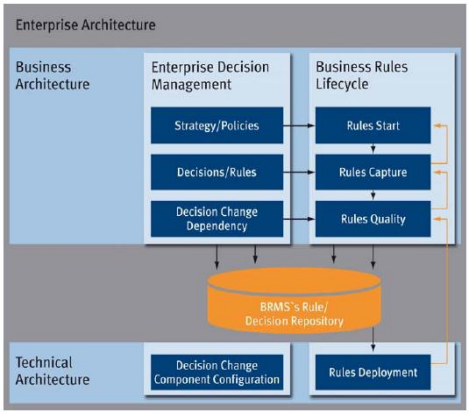

Figure 1. Enterprise architecture [1]

According to Enterprise Knowledge Development approach [4], an enterprise business rules architecture is structured through five sub-models:

- Business vision model: Describes an overall strategy of the business, focusing on goal structure and problems that must be solved in order to achieve those goals.
- Business process model: Describes the processes that are set to achieve the enterprise goals. The business process model describes how the enterprise processes interact, and clarifies the processes inputs and outputs.
- Business rule model: Describes and maintains explicitly formulated business rules as well as some of the rules that are implicit in other models.
- Business actors and resource model: Focuses on the structures of resources and their relationships with actors, processes, goals and other components of the enterprise model.
- Business concepts model: Establishes a common vocabulary for all the concepts that comprise the business environment (e.g. products, services, information resources, etc.). It helps to avoid misunderstandings and different interpretations of terms used in the business.

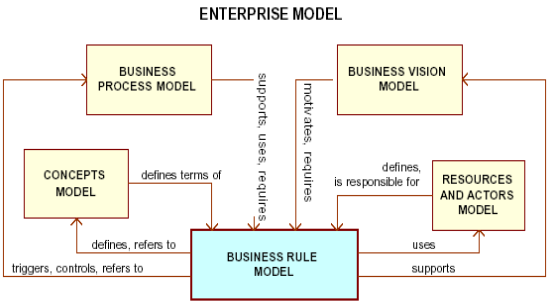

Figure 2. Enterprise model with business rules submodels [4]

IV. Distributed Information System

Distributed information system is collection of joined independent computer systems acting like a single coherent system [10]. Data processing in distributed database systems can be executed on all servers participating in this system. Information systems that support distributed data processing in the distributed database environment are Distributed Information Systems (DIS) [11]. Basic reason for starting DIS development is to provide better support for user requirements from organizations that are situated in wider geographical area. Comparing to the centralized IS (Information System), DIS offers more availability and better performance. Basic advantage of distributed databases is its architecture, which is suitable for modern decentralized organization of complex systems [11]. Each part of these systems has high level of local autonomy and requirement for local data storage. The unification of the system is achieved through collaboration of different parts of the system [12]. Concept of DIS is created as an answer to problems that often appear in phase of development and usage of integrated information systems with centralized database. Those problems may be very long development process, high expenses, management support, hard modifications in real time etc. DIS consists of subsystems that are feasible to develop and use independently, with previously designed communication interfaces. Decentralized database system enable high level of security and easier data control, better performances in data processing, better adaptability to local needs because equipment and database is physically closer to the users. DIS advantages are: higher fidelity and availability, better system performance and easier system maintenance and upgrade [12]. Disadvantages are that these systems eliminate duplication of data in file maintaining process, complicated coordination of processes and additional data exchange increasing network traffic [13]. Basic characteristics of DIS are [14]: resource sharing, openness, concurrency, scalability, fault tolerance, local autonomy of nodes, absence of a central node [12] and transparency.

According to the technological base of distributed database implementation there are homogenous and heterogeneous systems. Homogenous systems are based on the same DBMS type. Heterogeneous systems (multi-database systems) require portability and interoperability of DBMS of different types in a single functional unit, need integration of various data sources in a single unit developed in different technologies. There are several technology approaches for data integration. One of them is data warehousing, as a basis for OLAP (On Line Analytical processing). Data warehouse collects data from various physical sources [12]. Copying, extraction and correction, transformation, loading and updating of data create data collection. Software components, which integrate various source data, are called middleware application. The query is at first forwarded to the middleware application, after that the query is forwarded to the wrapper application for the appropriate data source in order to get the requested answer. Modern DIS are based on n-tier client-server architecture [12]; platforms for e-business are based on web technology that enables dynamic answers to user requests and ability to execute

tasks on client (Java applet, Java Script, ActiveX) or server side (Java Server Pages, Microsoft Active Server Pages, Java Servlet). XML gives opportunity for interoperability of heterogeneous data especially if they are used within middleware in web service applications.

V. Business Rules In Distributed Information Systems

To implement synergistic achievement between the business and IT domains we need to employ a number of capabilities:

- a formalism and language for capturing the business design;
- a methodology for translating the business design into a set of information system artifacts to implement that design;
- an infrastructure for hosting those implementation artifacts that is as flexible as the business itself needs to be to changes in its marketplace;
- a place for retaining the correlation between the business design and the information system that can be used to identify and fix failures in executing on the goals and constraints of the business design;
- a means by which we can manage the system to ensure those goals are met. [3]

The process of business rules implementation within a distributed information system could be modelled through steps, that deal with business rules (BR) as follows:

1. creation and definition – regulatory bodies /enterprise management create business rules
2. formulation – BR should be written (in a text form)
3. formalization – BR should be formalized to be more precise (predicate calculus, fuzzy rules...)
4. coding – BR should be coded for transfer (XML format or other)
5. transfer – via Internet or intranet (FTP transfer or other)
6. decoding - transformation of XML document to structured text or database items with formalized form of business rules – predicate calculus form, or fuzzy form of business rules
7. archive – archive of texts with business rules in file or database form
8. application – connection between software that supports business process and business rules that are in BR archive, so business rules can be enforced during software operation mode
9. check the application – comparing business rules requirements with data that are collected during software usage within some time frame (operational period)
10. application report – reporting about enforcement of business rules in using/reporting period, by examination on database where data should be stored according to business rules constraints
11. evaluation - measurement if business rules applications give appropriate business process performance measurements results, should business rules be changed to adopt to the acceptable level of business performance.

VI. XML For Business Rules Exchange

The actual standard in data/rules exchange is XML format. Communication between two business systems in a distributed information system is based on special XML format of business rule. XML formatted business rule presents a media for exchanging business rules among business systems. At the business system we have several modules:

- Enterprise organizational system database
- Business rules API for application in appropriate software support of information system
- Rule repository for rule storage
- Rule monitor as a software engine for checking if the data in a database is adequate to business rules from a repository, i.e. it is for enforcing business rules to be applied by checking the consistency of data with business rules
- Business rules generator – for presenting business rules in XML format
- Business rules parser – for getting the essence of XML format of business rule so it could be stored in BR repository and applied accordingly.

XML document has specific format for business rules with the structure as following tags/sections: Business_rules tag, Rule name, Rule version, Business action name, Start date, Retire date, Precedence, Success Action, Success Rule Name,Failure Action, Failure Rule name, Language (C), Database type (Oracle PLSQL), Digital signature. It is clear that it is important changes of rules are followed by versions, start date and retire date; business rules require business actions on successful accomplishment and on failure, and recognition of business rules responsible entity/person is provided by digital signature.

VII. Risk Analysis Of Business Rules Management in distributed information system

According to elements of risk analysis for IT sector [15], here we will present elements of risk analysis for distributed information systems and application of business rules management in distributed IT/IS environment.

System characterization

- results: distributed information system of an enterprise with decentralized databases and data processing, that has implemented module for

business rules acquisition, storage and application, as well as distribution to other client-server nodes...

- processes: development of distributed information system, business process, business rules management lifecycle, business rules distribution and application

Threat identification

- threat sources: - internal (results, process), external (users, other enterprises, viruses...)
- results: complexity of distributed information system, integration of business rules management system with legacy systems and client-server applications that are developed according to business process needs, formalization of business rules (fuzzy rules/predicate logic rules)
- process: IT process vs. Business process (parallelism of processes), accurate application of business rules

Vulnerability identification

- system environment vulnerabilities: technology changes and development, diversity of operational environments, computer viruses, unauthorized attempts to access the system...

Control analysis

- technology control: integration of heterogeneous operational systems, centralization of business rules dissemination
- organizational control: business organization and strict role / responsibility determination

Likelihood determination

- First priority and likelihood of threat: internal factors (business organization and technology)
- Second priority and likelihood of threat: external factors (technology development, virus, unauthorized access...)

Impact analysis

- Loss of Integrity – application of constraints to data entry according to business rules is needed to be enforced at each node of distributed information system. If any node don't use the same business rules, data integration from all nodes could be influenced and put on threat.
- Loss of Availability – business rules constraints include limited usage and functionality, and application of business rules could make the threat of loss of system functionality and operational effectiveness.
- Loss of Confidentiality - protection of information from unauthorized disclosure is needed because of need for centralized or controlled access to distribution of business rules to distributed nodes of distributed information system of an enterprise. If unauthorized access is under threat, functionality and confidence in proper business process software support is under risk.

Risk determination – the most important risk elements threat/vulnerabilities are:

- Complexity of distributed information system development and integration of business rules management module
- Organizational distributed / centralized roles / responsibilities
- External threats – unauthorized access, technology development...

Control recommendations

- Strong internal organizational role/responsibility determination
- The importance of IT sector and its integration to top management strategy plans
- Enterprise application integration tools and technologies, as well as reliable technology for integration of remote databases and operational systems in distributed environment
- User friendly tools for business rules management within all steps from business rules determination to business rules application evaluation.

VIII. CONCLUSION

Enterprise is changing in the dynamic environment. IT support is crucial for rapid adaptation to those changes and for enabling continual function of every business process. Business rules have the key role in the business process to be supported by software solutions. Separation of business rules from program code and database design and active components enable handling business rules by business staff, not by IT or other supporting staff at an enterprise.

Business rules management software support consists of software for rule capturing, formalization, distribution, application, enforcement, reporting and evaluation. In large companies that consist of many nodes of distributed information system, it is very important that business rules management module integrates within the functionality of existing client-server applications that support business processes.

Risk threat in distributed information systems is itself a challenge for IT sector of large companies, since the main feature if those systems are decentralization of database and data processing. Business rules that are distributed via special XML formatted documents give another vulnerability to the whole system, since business rules should all be applied at each node of distributed system at the same time and should not make constrains be limits to functionality of existing software practice.

Therefore risk management needs concrete activities that are planned controls for threats not to harm functionality and reaching an enterprises mission during everyday data processing. These activities are included in

business design through strong organizational role/responsibility determination, integrative technology for enterprise application integration and distributed information systems of heterogeneous operating systems integration, key role of IT sector together with management sector of an enterprise, user friendly tools for business rules management from business rules capturing to evaluation of its application during operational and strategic processes of an enterprise.

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AntNet-R: Ant Colony Optimization Based Routing Algorithm

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Abstract - In this paper we present AntNet-r, a new algorithm for routing in mobile ad hoc networks. Due to the ever changing topology and limited bandwidth it is very hard to establish and maintain good routes in such networks. Especially reliability and efficiency are important concerns. AntNet-r is based on ideas from Ant Colony Optimization. AntNet-r is even closer to real ants's behavior that inspired the development of the ACO met heuristic than ACO algorithms for N-P hard problems , Here we have also focus on the network routing problem and survey swarm intelligent approaches or its solution , and during the course of the communication session, ants proactively test existing paths and explore new ones. In simulation tests we show that AntNet-r can outperform AODV, one of the most important current state-of-the-art algorithms, both in terms of end-to-end delay and packet delivery ratio.

I. INTRODUCTION

In this work we describe AnNe-r, a routing algorithm for mobile ad hoc networks (MANETs) [3]. AntNet's design, which combines both proactive and reactive components, is based on the shortest path behavior observed in ant colonies and on the related optimization framework of Ant Colony Optimization (ACO) [1]. It has been experimentally observed that ants in a colony can converge on moving over the shortest among different paths connecting their nest to a source of food [2, 1]. The main catalyst of this colony-level shortest path behavior is the use of a volatile chemical substance called pheromone: ants moving between the nest and a food source deposit pheromone, and preferentially move in the direction of areas of higher pheromone intensity. Shorter paths can be completed quicker and more frequently by the ants, and will therefore be marked with higher pheromone intensity. These paths will therefore attract more ants, which will in turn increase the pheromone level, until there is convergence of the majority of the ants onto the shortest path. Local intensity of the pheromone field, which is the overall result of the repeated and concurrent path sampling experiences of the ants, encodes a spatially distributed measure of goodness associated with each possible move. This form of distributed control based on indirect communication among agents which locally modify the environment and react to these modifications is called stigmergy [4].

Here AntNet-r, the routing algorithm discussed, is extention of Ant Colony Optimization (ACO) In this paper we focus on the network routing problem . The aim of intelligent network routing is to detect dynamic traffic and topology events, thus identifying network bottlenecks, addressing them in an adaptive, intelligent manner.

II. ANTNET-R : INTRODUCTION

In the AntNet-r algorithm, routing is determined through complex interactions of network exploration agents, called ants. These agents are divided into two classes, the forward ants and the backward ants. Ants in each set possess the same structure, but they are differently situated in the environment, that is , they can sense different inputs and they can produce different , independent outputs. Ants communication in an indirect way, according to the stigmergy paradigm[[4], through the information they concurrently read and write on the network nodes they visit.

In AntNet-r, artificial ants move on the construction graph Gc = (C , L) with the constraint of never using the set of links that do not belong to the network graph. Like all ACO algorithms, AntNet-r exploits pheromone trails. These are maintained in an artificial pheromone matrix Ti associated with each node i of the data network. AntNet maintains at each node i a sample parametric statistical model Mi of the traffic situation over the network as see by node i. Here T and M , illustrated in fig 1 can be seen as memories local to nodes capturing different aspects of the network dynamics. The mode M maintains absolute distance/time estimates to all the nodes, while the pheromone matrix gives relative goodness measures for each link-destination pair under the current routing policy implemented over all the network . Here it is summarized as:

1. Each network node launches forward ants to all destinations at regular time intervals.
2. The ants find a path to the destination *randomly* based on the current routing tables.
3. The forward ants creates a *stack*, pushing in trip times for every node as that node is reached
4. When the destination is reached, the backward ants *inherit* the stack
5. The backward ants pop the stack entries and follow the path in reverse
6. The routing tables of each visited node are updated based on trip times

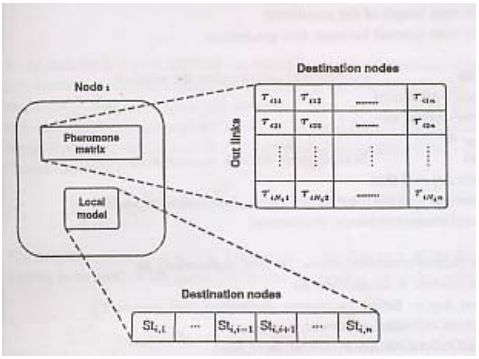

Figure 1. Data structure used by ants in AntNet for the case of a node I with Ni = | Ni | neighbors and a network with n nodes.

III. ANTNET : DATA STRUCTURE

In AntNet-r artificial ants move on the construction graph Gc = (C , L)

Here the AntNet-r algorithm, whose high-level description in pseudo-code is explained.

```
procedure AntNet-r(t, t_end, Δt)
    input t % current time
        input t_end % time length of the simulation
input Δt %time interval between ants generation
foreach Є C do
    M ⩽InitLocalTrafficModel
    T ⩽InitNodeRoutingTable
    While t ≤ t_end do
      In_parallel
        If (t mod Δt) = 0 then
Destination ⩽ SelectDestination (traffic_distribution_at_source)
    LaunchForwardAnt(source, destinat
          End-if

foreach(ActiveForwardAnt[Source,current,destination] )
do
   while(current # destination) do
next_hop ⩽ SelectLink (current,
destination,link_queues,T)
    PutAntOnLinkQueue(current, next_hop)
     WaitOnDataLinkQueue(current, next_hop)
       CrossLink(current, next_hop)
    Memorize(next_hop, elapsed_time)
      current ⩽ next_hop
  end-while
  LaunchBackwardAnt(destination, source,
                        memory_date)
End-foreach

foreach (ActiveBackwardAnt[source, current, destination] )
do
   while(current # destination) do
     next_hop⩽PopMemory
     WaitOnHighPriorityLinkQueue(current,
              next_hop)
     CrossLink(current, next_hop)
      from ⩽ current
      current ⩽ next_hop
     UpdateLocalTrafficModel(M, current_from,
          source_memory_data)
    r ⩽GetNewPheromone(M, current_from,
          source_memory_data)
     UpdateLocalRoutingTable(T, current, source, r)
 end-while
end-foreach
end-in_parallel
end-while
end-foreach
end-procedure
```

Informally, the AntNet-r algorithm and its main characteristics can be summarized as follows:

1) At regular intervals and concurrently with data traffics, from each network node artificial ants are asynchronous launched towards destination nodes selected according to the traffic distribution.
2) Artificial ants act concurrently and independently, and communicate in an indirect way through the pheromones they read and write locally on the nodes.
3) Each artificial ant searches for minimum cost path joining its source and destination node.
4) Each artificial ant moves step by step towards its destination node. At each intermediate a greedy stochastic policy is applied to choose the next node to move to. The policy makes use of (1) node-local artificial pheromones, (2) node-local problem-dependent heuristic information, and (3) the ant's memory.

5) While moving, the artificial ants collect information about the time length, the congestion status, and node identifiers of followed path.

6) Once they have arrived at the destination, the artificial ants go back to their source node by moving along the same path as before but opposite direction.

7) During this backward travel, node local models of the network status and the pheromones stored. On each visited node are modified by the artificial ants as a function of the path they followed and of its goodness.

8) Once they have returned to their source Node, the artificial ants are deleted from system.

IV. CONLUSION

We have described AntNet-r, an ACO algorithm for routing in MANETs. It is an algorithm, combining reactive route setup with proactive route probing and exploration. The algorithm seems to benefit a lot from situations in which there are some regularities and correlations which can be learned and exploited for data transport and path discovery. The algorithm also shows good scalability. In future work we will improve the exploratory working of proactive ants. By extending the concept of pheromone diffusion, more information about possible path improvements will be available in the nodes, and this information can guide proactive ants. This should lead to better results with less overhead. We also want to make the generation and forwarding of proactive ants adaptive to the Network situation.

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Machine Learning Algorithms for Business Decisions

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Abstract - This paper presents most often used machine learning algorithms for business decisions support. Machine Learning algorithms, particularly decision tree generating algorithms and reinforcement learning algorithms can be applied upon data stored using XML technologies, in order to support business decisions.

I. INTRODUCTION

The management and use of information, as an essential resource of a company, acquires new particularities deriving from its use in supporting decisions and from the continuous growth of the complexity of the decision process.

The decision process is a an assemble of activities driven by only one or several individuals facing an event that generates more than one acting direction, following the optimal direction, according to the value system of the decision makers.

This paper presents most often used machine learning algorithms that are used for business decision support.

II. DECISION TREES

Decision trees are an easy applicable for classification and prediction, the result being presented in a tree form with automatically set logic rules hierarchy by exploring a set of examples. The examples are similar to records with several attributes and the rules are being established by a detailed dividing of the assemble of examples, depending on the content of the attributes.

Building the decision tree begins from its root, which shows the available examples. The initial assemble is divided into intermediary nodes. Each node is being evaluated and is divided in other nodes if possible, until the terminal undividable nodes are found. When effectively processing data, the attributes are grouped in two categories: dependent and independent attributes. There is only one dependent attribute, also named *target* attribute, onto which we are searching for influences from the other attributes, the independent ones. From all the independent attributes we select the one that has the most powerful impact on the target field, the one that eventually supports the division of the record assembly into the most relevant sub-assemblies. For each of these subdivisions we re-perform the analysis, using the same target field but considering only the attributes that were left out in the previous steps, and seeking for new subdivisions.

After the tree construction, the new data can be included, at some amount of certainty, into one of the leaf nodes, depending on their attributes values, classifying them or being able to perform predictions regarding them.

III. DEVELOPMENT OF DECISION TREES

One of the most popular methods used in developing decision trees is CART (Classification and Regression Trees). This one starts with seeking out the independent variable which has values that allow the best division to take place. For this we move on to calculating a diversity index for the whole record assembly given an attribute. The procedure describes the parse of the independent attributes one by one and the evaluation of the diversity decrease obtained by the division one would make based on it. The variable that is retained as separation criteria is the one that produces the best results. We are actually looking for a binary tree. The attributes that have multiple values raise, in these conditions, a supplementary issue: regrouping the values as so the final division will lead to only two subdivisions.

IV. THE C4.5 ALGORITHM

A more recent algorithm is C4.5 proposed by the Australian professor Quinlan. Unlike CART, which generates only binary trees, a node can have here a variable number of branches. Another difference would derive from the treatment of nominal variables, which will now have one branch for each possible value. The precursor of this algorithm, the ID3, developed by the same author, enjoyed a vast popularity and was used in various computer products. This one uses for an evaluation criteria of divisions the information gain obtained, as well as the uncertainty degree removed, concept that derives from Shannon's information theorem.

Because its usage comes in favor of numerous branches to which a small number of records from the example set will correspond, C4.5 uses the ratio between the total information gain obtained by the corresponding division and the information gain that is only due to the sub-assemblies count it generates. The tree pruning is also made in a different manner that the one CART practices; the analysis is based also on the teaching data, without having to invoke the test or evaluation distinct data.

In its informatics representation, the C4.5 can automatically generate rules. Beginning with the complete set, generated directly based on the tree, the application follows a generalization chain meant to decrease the rules count. For this purpose we remove certain conditions for each given rule and we verify how this maneuver increases the error rate. A series of other transformations

can also be operated for this goal, as so, in the end, the rule count can be smaller than the leaf count.

Decision trees are a standard Data Mining tool and many of them are available in the C4.5 package. Decision trees are generally preferred due to the comprehensivity of their hypothesis and the efficiency of their learning and evaluation.

Decision trees are usually binary trees with simple classifiers associated to each internal node and with a classification associated to each leaf. In order to evaluate a *T* tree for an input *x*, the *x* attribute will be given to each classifier. The outputs of simple classifiers associated to the nodes determine a unique path from the root to a certain leaf of the decision tree.

Decision trees are generally understood through a descendant development procedure that begins with the root node and chooses a part of the data that maximize a cost function, usually a measurement of the subassemblies' "impurities" that is implicit defined in the moment of data partitioning. Afterwards the subassemblies are associated to two decision trees. The procedure is recursively applied to the child nodes and the tree is being enlarged until a stop condition is met.

The C4.5 algorithm only generates binary trees, a node having a variable number of branches. C4.5 is able to automatically generate rules. Starting with the complete set of rules, generated directly on the tree's basis, there will be a generalization part, in order to reduce the number of rules. This way, for each rule certain conditions are eliminated and the increase of the error rate must be verified. A lot of other transformations can also be made in order to decrease the number of rules.

The steps of the C4.5 algorithm are presented as follows:

1) selects the attributes that have proven the most quantity of gained information

2) given two classes P and N:

a) given a set of examples S that contain p elements from the P class and n elements from the N class

b) the information quantity required to decide if a random example from S belongs to the P or N class is defined in relation (1):

$$I(p,n) = -\frac{p}{p+n}\log_2\frac{p}{p+n} - \frac{n}{p+n}\log_2\frac{n}{p+n} \quad (1)$$

3) assuming that by using an attribute A, a set S will be partitioned in the following sets {S1, S2, ...,Sv}

a) if S_i contains p_i examples from P and n_i examples from N, then the entropy or the necessary information for the classification of all the objects from all the S_i trees is (2):

$$E(A) = \sum_{i=1}^{n}\frac{p_i + n_i}{p+n} I(p_i, n_i) \quad (2)$$

4) the codification information gained on the A branch would be:

Gain(A) = I(p, n) - E(A)

C4.5 is an algorithm for the induction of decision trees, being, as mentioned before, an extension of the ID3 algorithm which unlike C4.5 solves some problems such as data extra-matching, treating continuous attributes and attributes with missing values, increasing the computational efficiency. The C4.5 generates a decision tree by recursively partitioning the data amount, using a depth-first parsing strategy. The algorithm takes into consideration all the possible tests for partitioning the data and selects the tests that will lead to the best information gain.

Considering the entropy concept as the "impurity" of a set of training examples S, the efficiency of an attribute for classification of these examples can be estimated. The information gain measures the expected reducing of the entropy caused by partitioning the set according to the values of an attribute A (3).

$$IG(S,A) = H(S) - \sum_{v\in Val(A)}\frac{card(S_v)}{card(S)}H(S_v) \quad (3)$$

where *Val*(*A*) is the set of A attribute values, *Sv* is the subset of *S* for which the *A* attribute has the v value, and *H*(*S*) is the entropy of the set S with *n* classes, each with a *pi* appearance probability (4):

$$H(S) = \sum_{i=1}^{n} - p_i \log_2 p_i \quad (4)$$

Another important feature of the algorithm is the pruning of the decision tree, once the learning is done, meaning that the tests that are not really helpful for the decision problem are being eliminated. A later version of the C4.5 algorithms is the C5.0, used mostly in commercial systems.

V. REINFORCEMENT LEARNING ALGORITHM

Reinforcement Learning is a very interesting Machine Learning algorithm. The idea of Reinforcement Learning is very simple: an agent is exploring an environment and acting upon it, and in the end it receives a reward or a penalty. The agent will find out whether it acted correctly or not, without having the reasons explained.

In Reinforcement Learning, also called *learning with a critic* or *rewarded learning*, no hints are offered regarding the expectations; the only feedback is that the result will be categorized as correct or wrong. The situation is similar to the one of a critic that only claims that a certain thing is right or wrong, but doesn't explain it. Often the reward is being delayed.

The Reinforcement Learning algorithms are looking for a way of action in order to maximize the reward. The subject that has to learn isn't told the direction to action, as in most of Machine Learning techniques, instead it has to discover which action might bring the most efficient reward. In the most complex situations, the actions will not only affect the immediate rewards but also the future rewards.

The Reinforcement Learning technology is generally used for solving the so called Markov Decision Problems (MDP). The structure of a MDP consists in the following

elements: the system's state, the actions, the transition probability, the transition rewards, a policy and a performance measurement mode.

The system's state is a parameter or a set of parameters that are supposed to describe the system. If a system's state is modifying in time, it is called to be a dynamic system. A dynamic system can be considered the queue formed at the cashier in a store. In this conditions, the x state, represented by the number of individuals that form the queue, becomes x+1, if a new individual is joining the queue, and becomes x-1, when an individual has paid and leaves the queue.

Actions represent situations in which a system may or may not fulfill one of the options it has available. We consider an action *a* to be selected in the state *i*, and let *j* be the next state. The probability of transition is expressed by *p(i, a, j)* which depicts the probability of transitioning from the state *i* to state *j* through action *a*.

The system will usually be rewarded when a transition from one state to another is performed, reward described by *r(i, a, j)*.

The choice of the action in each state the system transitions through is established by a rule. In certain states no actions will be performed. The states in which decisions should be taken are naturally named *decision states*.

The rule for selecting an action must be designed as so it would be capable of selecting the optimal action, thus a means of measuring performance becomes available, means we shall define as the *medium reward for a rule*.

If we have a rule π then $\pi(i)$ will be the selected action by this rule for the state *i*. Let x_s identify system state before the *s*-th transition. The next formula (Gosavi, 2004) will describe the medium reward for the rule π starting with state *i*, considering $x_1=i$. The medium reward, ρ_i, expresses the sum of all immediate rewards divided to the number of transitions (*k*), calculated on a longer period of time.

$$\rho_i = \lim_{k\to\infty} \frac{E\left[\sum_{s=1}^{k} r(x_s, \pi(x_s), x_{s+1}) | x_1 = i\right]}{k} \qquad (5)$$

E – the medium value of the sum above
i – the initial system state
$\pi(x_s)$ – the action in state x_s

The limit in formula (5) is constant for any value of x_1 if the Markov problem satisfies certain conditions, thus we are going to have $\rho_i = \rho$ for any value of *i*. The goal of Markov's decision problem is finding a rule that will maximize the medium reward.

MDP can be solved through the dynamic programming method, which requires all the transition probabilities, *p(i, a, j)*, and the rewards *r(i, a, j)*.

The SMDP (Semi-Markov Decision Problem) variant requires an extra parameter that is the time span required for each transition. The duration of transition from state *i* to state *j* influenced by another state *x* will be expressed by *t(i, a, j)*. For SMDP the medium reward within the given conditions, using an initial state *i*, is defined through the next formula (6).

$$\rho_i = \lim_{k\to\infty} \frac{E\left[\sum_{s=1}^{k} r(x_s, \pi(x_s), x_{s+1}) | x_1 = i\right]}{E\left[\sum_{s=1}^{k} t(x_s, \pi(x_s), x_{s+1}) | x_1 = i\right]} \qquad (6)$$

VI. THE Q-LEARNING ALGORITHM

An example of Reinforcement Learning is the so-called Q-learning algorithm, an extension of the traditional dynamic, which allows an agent to learn some rules from an arbitrary environment.

Q-learning eliminates the need of considering the maximum in a set of integrals, succeeding to map values (Q-values) from state/action pairs. Rather than associating the value of a function, Q-learning will use the so-called Q-functions. In every state there is a Q-value associated with each action. This Q-value is the sum of rewards achieved for performing the associated actions and following the given rules. In the Q-learning context, the value of a state is defined as the maximum of a Q-value in the given state.

Having the estimated utility Q-function which describes how useful an actions is, given a certain state. *Q(s, a)* is the immediate reward achieved for performing an action that leads to a maximum usability of the resulting state.

The formal definition of the Q-function is the following:

$$Q(s,a) = r(s,a) + \gamma \max_{a'}(Q(s',a')) \qquad (7)$$

where:
r(s, a) is the immediate reward;
γ is the relative value of the delayed rewards versus the immediate rewards (*0* or *1*);
s' is the new state following after action *a*;
a, a' are the actions in states *s* and s'.

The selected actions are defined by the following function:

$$\pi(s) = \arg\max_a Q(s,a) \qquad (8)$$

Q-learning represents an algorithm without predefined learning rules. It can be demonstrated that for a sufficient amount of training under any rule ε-soft, the algorithm converges with a probability of 1 towards a small approximation of an action-value function for an random rule-target group. Q-learning teaches optimal rules even when the actions are selected from larger or even random rules.

VII. CONCLUSION

In conclusion, from the point of view of storing data for using it in a decision support system, the XML format remains as elegant in structure as well as in utilization, but it is not recommended for huge amount of data; storage is possible in this case, but further processing of these data becomes way to difficult compared to the

alternatives involving database systems. A problem in any given field of interest can be translated into a Markov decision process and solved using this technique. Reinforcement Learning is an extension of the classical dynamic programming and covers a set of problems it can solve. As opposed to the supervised learning, Reinforcement Learning does not require I/O data. It is foreseen that this kind of technology, combined with others, will be able to finally solve problems that could not be solved before.

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Technology Solutions to Support Implementation of the Serbian SME Development Strategy

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Abstract - The growth and sustainability of SMEs are crucial to Serbia's economic and employment growth. In recognition of this, the Serbian Ministry of Economy & Regional Development (MoERD) has developed and put in place an excellent policy framework to support them. Inevitably, due to the magnitude of the task, there have been some difficulties with its implementation. Serbian SMEs need solid practical support quickly but the MoERD's support framework will take time to realise its full potential.

This paper explores how the Serbian company Inteleksija, which is being formed by the author based on social enterprise principles, can rapidly adapt existing ready-made technological solutions to assist in the implementation of the MoERD policy within a very short timeframe. The paper will show how Inteleksija's partnership with three leading international service providers can deliver e-learning technologies to deliver entrepreneurship and best practice business training, managed service datacenters to provide technology support for SMEs and an hosted bureau service delivering Business Process Management training, consultancy and software tools adapted to meet the specific needs of Serbian SMEs.

Finally the paper shows how, with support from the Serbian Administration and academic community, these technology solutions can significantly accelerate implementation of the vital MoERD strategy.

I. Introduction

Over the last ten years, many excellent academic papers, government and industry white papers and EU reports have been written about the importance of supporting enterprises, especially SMEs, in order to create sustainable economic growth and more employment. Many of these papers address the need for governments and their associated agencies to provide a solid framework to support the development of SMEs.

A policy framework has been in place in Serbia for some time, and the most recent publication of it is the Strategy for Development of Competitive and Innovative Small and Medium-sized Enterprises 2008-2013, which was written by the Ministry of Economy and Regional Development (MoERD) and published in 2009. The excellent strategy document sets out a number of objectives to address this need.

This paper does not purport to be an academic paper. Its intended purpose is to supplement the excellent framework set out by showing how IT based services and best practice methodologies can provide practical solutions to some of the objectives of the Strategy.

The author, who lives and works in Serbia, draws on many years of hands-on experience creating and running a number of successful small and medium-size enterprises in a variety of industry sectors in the UK, Europe, the Middle East and India. He therefore has a practical view of how three key IT based services and best practices could quickly provide both the existing SME community, and potential entrepreneurs from the student population, with vital tools and competencies to build and manage sustainable and successful businesses for the lowest possible cost and in the shortest possible time.

II. Background to SMEs in Serbia

Although large enterprises are important to the Serbian economy, SMEs are the real giants, and it is clear that the Serbian administration has made substantial efforts over the years to encourage entrepreneurship and to support SMEs so that they can grow and thus create employment.

The 2009 EU SBA fact sheet reports that Serbian SMEs represent 99.4% of all registered businesses, 57.3% of employment, and 51.5% of value added.

TABLE I. SMEs In Serbia – Basic Figures

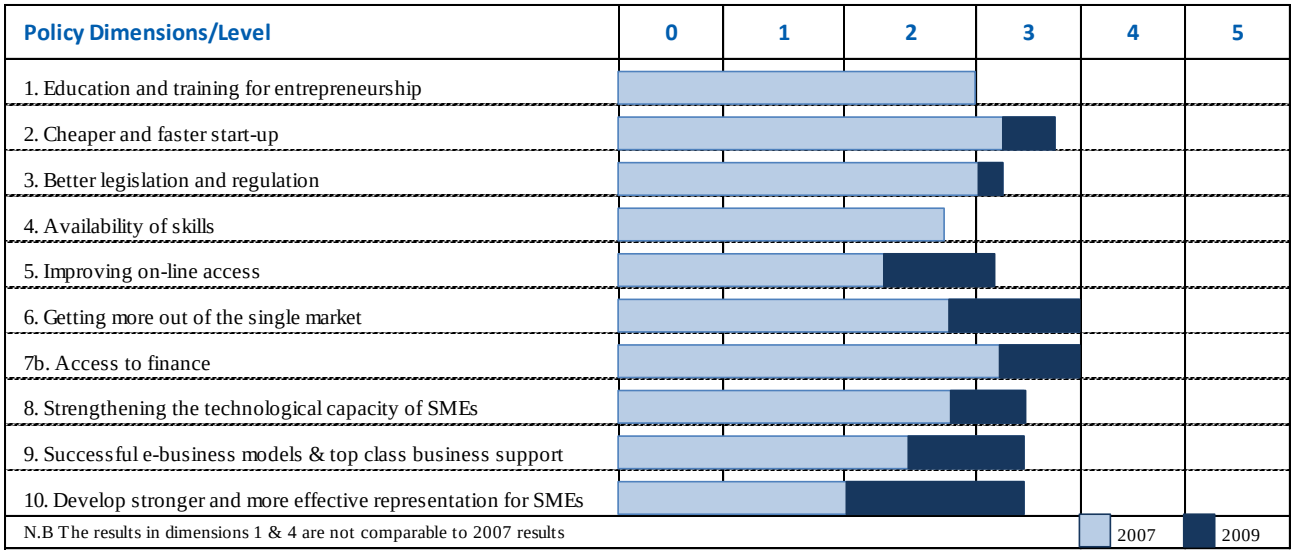
	Enterprises			Employment			Value added		
	Serbia		EU-27	Serbia		EU-27	Serbia		EU-27
	Number	Share	Share	Number	Share	Share	Billion €	Share	Share
Micro	69.235	84,9%	91,8%	135.899	13,9%	29,7%	2	11,4%	21,0%
Small	9.421	11,6%	6,9%	184.747	18,9%	20,7%	3	18,9%	18,9%
Medium-sized	2.350	2,9%	1,1%	240.413	24,5%	17,0%	3	21,1%	18,0%
SMEs	**81.006**	**99,4%**	**99,8%**	**561.059**	**57,3%**	**67,4%**	**7**	**51,5%**	**57,9%**
Large	523	0,6%	0,2%	418.794	42,7%	32,6%	7	48,5%	42,1%
Total	**81.529**	**100.0%**	**100.0%**	**979.853**	**100.0%**	**100.0%**	**14**	**100.0%**	**100.0%**

Data refer to the non-financial business economy (NACE C-I, K) and represent estimates for 2008.
Source: Eurostat, elaborated by EIM for EU27 figures; Institute of Economic Sciences, Serbia for country figures.

III. European Charter and SME Policy Index

The MoERD SME development strategy incorporates the European Charter for Small Enterprises and the associated framework takes into consideration the Small Business Act (SBA) and its related policy index. In June 2009, the OECD issued a report on the progress of the Charter's implementation in the Western Balkans in the form of the SME policy index, which is an analytical tool that uses collaborative benchmarking to measure progress in the ten dimensions of the charter listed in table 2 below. These provide a useful framework for the purposes of this paper and also relate back to the five pillars of the Serbian MoERD Strategy which incorporates the SBA.

TABLE II. OECD SME POLICY INDEX SCORES FOR SERBIA PER SBA CHARTER DIMENSIONS 2009



The indicators are structured around five levels of policy reform, with level 1 the weakest and level 5 the strongest. The policy development path for each indicator is typically structured as follows:

Level 1: There is no law or institution in place to cover the area concerned;

Level 2: There is a draft law or institution, and there are some signs of government activity to address the area concerned;

Level 3: A solid legal and/or institutional framework is in place for this specific policy area;

Level 4: Level 3 + some concrete indications of effective policy implementation of the law or institution;

Level 5: Level 3 + some significant record of concrete and effective policy implementation of the law or institution. This level comes closest to good practices identified as a result of the EU Charter process and the OECD Bologna Process.

Table 2 above shows that Serbia has made good progress in implementing the policy with significantly increased scores across many of the 10 dimensions. Each of these is a major undertaking and fully implementing them and extending the full range of benefits to the SME community is at best a medium to long-term exercise, particularly regarding education and training, skills availability and strengthening technological capacity.

In these highly competitive and challenging economic times, many small and medium size Serbian enterprises are struggling to survive, and there are many would-be entrepreneurs in state universities and vocational schools who lack the basic financial awareness, competencies and basic business skills to successfully start a business and put in place the strategy, IT infrastructure and business processes so vital for sustainable growth. Despite the progress made, entrepreneurial education for students and relevant and practical help for the SME businessman is still too far away.

There are practical solutions that can be implemented immediately to fill these gaps, and these are described below and are referenced to dimensions 1, 4 and 8 of the OECD policy index.

A. Policy Dimensions 1 – Education and Training For Entrepreneurship

The Serbian Government has an excellent and comprehensive strategy for the development of competitive and innovative Small and Medium-sized enterprises. The most recent publication of the strategy states that the five pillars of the strategy to support SME development is based on the following three elements:[1]

1) Concrete priorities for SME development;
2) The approach adopted in the EU regarding SME support policy and the "Small Business Act" (SBA) for Europe
3) Implementation of the principles of the European Charter for Small Enterprises.

The European Charter principles relating to education and training for entrepreneurship state that:[2]

- "Europe will nurture entrepreneurial spirit and new skills from an earlier age.
- General knowledge about business and entrepreneurship needs to be taught at all school levels.

- Specific business-related modules should be made an essential ingredient of education schemes at secondary level and at colleges and universities.
- We will encourage and promote youngsters' entrepreneurial endeavors, and develop appropriate training schemes for managers in small enterprises."

Implementing each of these principles is a monumental task and whilst the MoERD strategy document reports that Serbia has made significant progress in recent years in developing a functioning framework for SME support, it also states that: [1]

"Whilst the framework exists, implementing the framework has not been coherent or sufficiently integrated and has not been properly funded through budget support."

An analysis of Serbian education statistics confirms the MoERD view that there is not yet enough specific business related training, particularly in the State universities which accounted for 80% of university students in 2009.

TABLE III. ANALYSIS OF BUSINESS RELATED STUDIES IN SERBIAN UNIVERSITIES & VOCATIONAL SCHOOLS - 2009

Institution Type	No of Institutions	No of Faculties	[1] Business Related Faculties	% of Faculties	Number of Students	% of Total Student Population	Business Related Students	Business Students as % Total Students
State Universities	6	80	5	6%	148,181	63%	19,971	13%
Private Universities	13	45	19	42%	38,927	17%	18,891	49%
State Vocational Schools	46	46	9	20%	41,876	18%	15,570	37%
Private Vocational Schools	16	16	8	50%	5,046	2%	3,013	60%
Grand Total	**81**	**187**	**41**	**22%**	**234,030**	**100%**	**57,445**	**25%**

1 Business related students include those that are on economics, organisational science, business administration and all other management and finance related courses

The raw data for this table was extracted from the Statistical Yearbook of Serbia 2010 and imported into a dbase, coded and analysed for the purposes of this report

The Serbian state education system is excellent and provides first class economics, organisational science, business and business management courses. However, in common with most other European universities, these only provide some business related knowledge to a small percentage of total students. Developing a new full time course for all students is likely to be a long and drawn out process that may still only provide specific entrepreneurial knowledge to a small percentage of total students.

Both the MoERD strategy and the EU SME policy framework states that general business knowledge needs to be taught at all school levels. Specific business modules need to be an essential part of secondary and higher education. Entrepreneurial spirit and new skills must be nurtured from an early age.

There is a simple, practical, tried and tested and cost-effective solution available in the form of e-learning, which can supplement existing business-related education by delivering a generic extra-curricula and internationally recognised and certificated course to all secondary and higher education students.

The e-learning platform and course content are common to policy dimensions 1 and 4 and are described in detail in section C below.

B. Policy Dimensions 4 – Availability of Skills

The principles of the SBA Charter for policy dimension 4 covering availability of skills states that: [2]

"We shall endeavour to ensure that training institutions, complemented by in-house training schemes, deliver an adequate supply of skills adapted to the needs of small business, and provide lifetime training and consultancy."

The MoERD strategy document incorporates this principle within Pillar 4 of its strategy which recognises that in a knowledge-based economy, the performance of business organisations depends on ensuring that all categories of employees possess current and up-to-date knowledge and skills.

Therefore, the new global knowledge and information-based economic system implies a strategic role for the training function, and has significant implications for the identification of training needs and the delivery of training. [3]

Nowadays, businesses must analyse their training needs in greater depth and train a larger number of employees with different backgrounds in terms of knowledge and experience, and they have to do so more rapidly than in the past, while attempting to reduce training costs to remain competitive in a complex and changing environment. For their part, employees also must be constantly in a learning mode, in order to increase their knowledge and improve their skills. As a result, training habits have to change, for both organizations and their employees. Thus many large enterprises have turned to e-Learning as a "best practice" aimed at providing adequate training to their employees so they can remain up to date and competent in their jobs. [4]

The same is true of all enterprises including SMEs. "Best practice" e-Learning provides an ideal low-cost and fast-track solution to deliver business knowledge and skills training for SME managers and employees. Such training is vital in order to support growth and sustainability of SMEs and will also greatly improve long term SME survival rates.

C. Accelerating the Implemention of the MoERD Pillar 1 and Pillar 4 Strategies using e-learning courses

Some definitions of e-learning such as 'computer based training' or 'distance learning' are misleading in the context of this paper. A better definition is the use of computer network technology to deliver information and instruction to individuals. E-learning allows organisations to deliver training and education via the web, and provide relevant and targeted content anytime and anywhere, offering learners a customised and interactive experience.

A number of empirical studies concerning e-learning for SMEs show the following extensive benefits: [3]

- Flexibility – allowing the student and tutor to choose the course time and location
- Customisation – content can be adapted to suit groups' differing needs

- No time limit – each student can learn at his own pace
- Training material distribution – additional written materials are easily added
- Evaluation – real time progress evaluation and personalised tutor support
- Cost – no cost for transportation, meals, lodging, time away from work or additional tutors

Leading e-learning providers have developed hosted platforms with the capacity to deliver high quality content to many thousands of e-learning students concurrently. Their sophisticated Learning Management Systems (LMS) are easily integrated with any existing University SCORM based platforms - (Shareable Content Object Reference Model). Because they have been developed over time they can be offered at a very low cost. The business model for this service is high volume, low cost, and with a large enough volume commitment, these training courses can be offered for a very low unit cost per e-learning student without the need for any capital outlay.

There are a plethora of excellent e-learning courses available, but there are two initial course types most relevant to meeting the immediate needs of the entrepreneurial educational policy dimensions stated above. These are business basics and financial awareness courses for non-financial managers and the best practice PRINCE2 project management methodology.

1) Business Basics and Financial Awareness Courses

The Business Basics courses are relevant to all students as well as key non-financial employees in SMEs and covers key concepts of business basics. The training is aligned to business objectives and focuses on helping non-financial students, employees and managers understand the financial implications of their business decisions and actions on the organisations they work for.

The courses do not focus on providing accountancy training. They give a foundation in business and finance and provide the basic skills and knowledge of the dynamics of a business that entrepreneurs will need to develop their ideas into sustainable concepts.

These extra-curricular courses are already being used to great effect by students in other European business schools and institutions and by many thousands of SMEs, large enterprises and other organisations around the world.

2) Best Practice Training – PRINCE2 Project Management Methodology

The PRINCE2 project management methodology (as opposed to project analysis and scheduling tools) applies to the vast majority of business situations, and as such its importance cannot be over emphasised. Anyone who is involved in delivering a product or a service has either project managed, or been part of a team that manages service delivery or change. Project management skills are relevant to any future or present employee, and as around 60% of the student population will work with SMEs, the vast majority of SMEs would benefit from students learning at least the basic methodology, principles and language of effective project management, in the form of the PRINCE2 foundation course.

PRINCE2 is one of the leading internationally recognised best practice methodologies. It is a structured project management method developed by the UK Office of Government Commerce (OGC) over many years. The training focuses on the methodology of project management rather than project scheduling, delivery and analysis tools. Its popularity throughout the world is largely due to the fact that it is truly generic: it can be applied to any project regardless of scale, type, organisation or culture. It is available in two forms; the foundation course, which provides the basic knowledge and terminology of project management, and the higher level practitioner course, which gives the full range of skills required to successfully manage large projects.

As with the Financial Awareness courses, PRINCE2 courses can be delivered in an hosted e-learning environment, allowing student and SME users to learn in an enjoyable and inspired way in as little as 10 to 20 hours. Both courses are excellent due to their high quality, ease of use and low delivery cost and they provide the student with an internationally recognised certification. Many European businesses now insist that their employees and sub contractors are PRINCE2 qualified.

These two courses, delivered in volume from a solid e-learning platform, can provide a fast and low-cost solution to assist in meeting the requirements of dimension 1 and 4 of the policy framework.

D. Policy Dimension 8 – Strengthening the technological capacity of SMEs

The principles of the SBA Charter for policy dimension 8 covering the strengthening of SMEs technological capacity states that: [2]

- "We will strengthen existing programmes aimed at promoting technology dissemination towards small enterprises as well as the capacity of small business to identify, select and adapt technologies.
- We will foster technology co-operation and sharing among different company sizes and particularly between European small enterprises, develop more effective research programmes focused on the commercial application of knowledge and technology, and develop and adapt quality and certification systems to small enterprises. It is important to ensure that a Community patent is available and easily accessible to small enterprises.
- We will foster the involvement of small enterprises in inter-firm co-operation, at local, national, European and international levels as well as the co-operation between small enterprises and higher education and research institutions.
- Actions at national and regional levels aimed at developing inter-firm clusters and networks should therefore be supported, pan-European co-operation between small enterprises using information technologies enhanced, best practice

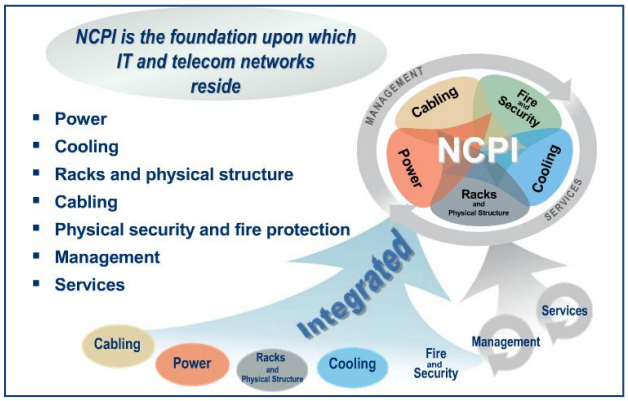
in co-operative agreements spread, and small enterprises co-operation supported to improve their capabilities to enter pan-European markets and to extend their activities in third country markets."

The majority of business start-ups that fail do so within their first year, and depending on their sector, between 45% and 62% will fail within their first four years. A major contributory factor to this is a lack of stable IT platforms and sustainable business processes, both of which are essential to SMEs from day one to support their start-up and expansion. Often these vital foundations are the last thing to be considered, either because of high set-up costs coupled with a limited cash flow or in the rush to take the companies products or services to market as quickly as possible.

To improve survival rates and support SME growth, practical help can be provided in the form of provision of specialist datacenters offering a subsidised managed service to SMEs and the creation of a bureau service to deliver business process management (BPM) tools and consultancy adapted to meet the needs of SMEs, particularly High Growth SMEs (HGSMEs).

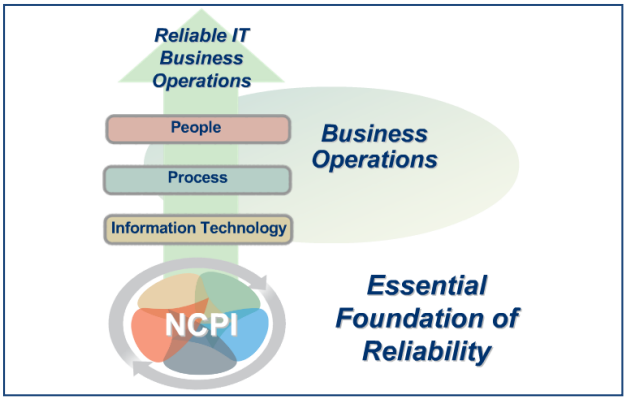
1) SME Datacenters

In today's technology driven world, SMEs depend on stable IT platforms, this is especially true of HGSMEs or SMEs with 10 or more employees. A modern business cannot function without IT, but crucially, this does not mean simply laptops and desktop computers but the network critical physical infrastructure (NCPI), which are the foundation upon which IT and telecom networks reside as depicted in the graphic below:



As the graphic shows, NCPI comprises of power, cooling, racks, security, fire protection, cabling, management and services. If any one of these elements fails (and they often do) the whole business is under threat, and yet it is often the last thing to be considered during the start-up or even the early expansion phases of a business.

NCPI is the essential foundation for reliable IT Business Operations, and once in place, the other three building blocks of Information Technology (IT), processes and people with the right level of skill and training to support the operation of these systems can be added to ensure reliable IT business operations are maintained.



Unfortunately, putting this vital infrastructure in place is usually cost prohibitive during the start-up and expansion phases as there are so many demands being made on very limited cash flow and working capital. The practical solution is not for SMEs to invest in more IT equipment that will require processes and skilled people to maintain, but rather to create specialist managed service datacenters designed specifically for SMEs, where the full NCPI, IT, software as a service (SaaS), processes and people are available on demand and at an affordable price.

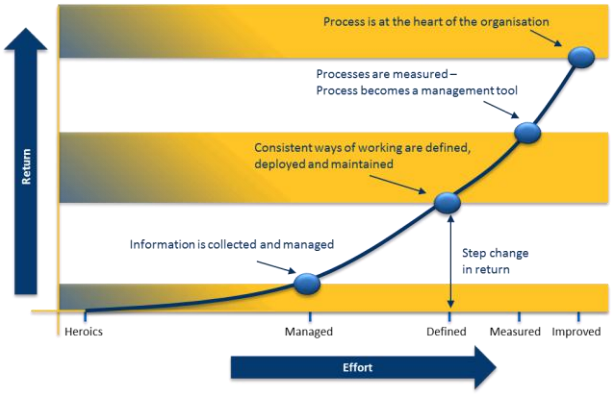
The pricing models for these datacenters and (internet) cloud based SaaS should reflect the extreme demands on cash flow and working capital for start-up and expanding SMEs and the author believes that part of the EU and government enterprise funding allocated to supporting SMEs should be directed towards subsidising this service.

2) Sustainable Business Process Management

Whatever an organisation's size, standardised processes must be at its heart if it is to prosper. They are an essential management tool to optimise efficiency, improve customer relations, lower operating costs and substantially increase working capital and cash flow – the life blood of any organisation..

Despite this, standardized processes are virtually non-existent in the early phases of most SMEs lives, and they are run haphazardly, with tasks being carried out as and when they need to be completed with little regard for process. Regretfully the majority of SMEs never get past the initial stage of "Heroics" depicted in the Process Maturity Journey graphic below and this is a major contributory factor to the very high SME failure rates during the first four years:-

The process maturity journey



In order to create these processes, information must be collected and proactively managed, and consistent ways of working need to be defined, deployed and maintained. Finally, when these basic elements are in place then processes can be measured and improved, turning them into one of an SMEs most valuable management tools.

This is where Business Process Management (BPM) is essential. BPM is a structured method of monitoring, analysing and improving end-to-end business processes and relevant resources using current software and technology. This methodology is used to great effect by large organisations, but many SME operators are not aware of the benefits of BPM and so remain attached to older functional ways of thinking and managing, to the detriment of their long term survival.

The solution is to encourage early adoption of BPM by SMEs. This can only be achieved through making them aware of its necessity and benefits, and by working closely with the best BPM solution providers, adapting their applications to focus on and meet the specific needs of SMEs from start-up to maturity.

There are three steps to this end;

- Developing and delivering a content rich short course on the principles and benefits of BPM to higher education students and SMEs, via the e-learning platform described above.
- Developing and offering an SME adapted version of a leading BPM application.
- Providing SMEs with a subsidised hosted managed bureau service that can offer on-demand advice, consultancy and technical support.

IV. CONCLUSION

Great progress has been made, both in the Serbian academic community and government administration, to put in place a comprehensive support framework for the development of SMEs.

SMEs have the capacity to lead the way in growing the emerging Serbian economy and in the drive for market share of what is an increasingly competitive and hostile global market. As shown in section 1 of this paper they are the real giants of the Serbian economy but it is clear that they need solid, practical support and they need it now.

In this paper the author has presented solutions for assisting the MoERD and academic community in implementing the excellent Strategy for Development of Competitive and Innovative Small and Medium-sized Enterprises by delivering quickly, efficiently and cost-effectively the competencies, skills, technologies and tools that are urgently needed by SMEs.

To that end he has approached and is contracting with three leading international service providers to deliver the solutions set out in this paper. Each partner company has responded with enthusiasm and optimism and are willing to put both their funding and substantial development resources behind the project against committed volumes.

These large, experienced and well established international service providers will bring their knowledge and expertise to the process of developing and delivering each of the disciplines discussed in this paper namely:

- Ready made e-learning platforms delivering entrepreneurial education for students and SME skills training courses in business basics, financial awareness and PRINCE2 project management methodology
- Business Process Management training, consultancy, applications and software tools adapted to meet the specific needs of Serbian SMEs and delivered via cloud technologies
- The design and build of SME specific datacenter managed services to provide the Network Critical Physical Infrastructure, Information Technology, cloud-based SaaS software applications, processes and people that are so vital to SMEs for reliable IT business operations.

The author is creating a Serbian company called Inteleksija. Inteleksija is based on social enterprise principles and is partnering with these leading international service providers. It is dedicated to delivering the urgently required supplementary education and training for entrepreneurship to students and to strengthening the competencies, skills, technological capacity and competitiveness of SMEs in Serbia.

There is much still to be done, but the essential ingredients are already in place. With the support of the Serbian academic community and the Serbian Ministry of Economic and Regional Development this vision can quickly be brought to life.

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On the Test Driven Development in the Small Development Teams

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Abstract: While traditional testing methods are based on testing of already existing code and functionality, First -Tests approach, or Test Driven Development (TDD) approach writes a test before implementation code is available. Small project teams are introducing different kind of challenges and most important are limited resources and time constraints. TDD methodology offers better resources utilization, and claims that quality is improved even a total time used for development is shorter. Results of rresearch projects on TDD differ significantly, what draws conclusion that involved IT professionals skills and experience could be a crucial factor. That what can be concluded is that TDD approach provides better test coverage of implementation code and introduces fewer software defects, and better software quality, than software delivered by traditional approach. However, this approach uses approximately more than 15% time for development.

INTRODUCTION

The test-first concept has been introduced in the Extreme Programming, an Agile development methodology created by Kent Beck. Extreme Programming development method originate from the experience that Kent Beck collected by working as project manager 1996 on the Chrysler C3 project. In 1999 he wrote a book "Extreme Programming Explained", where he presented this methodology that is combined from already known best practice principles. This methodology best fits to the small and mid-size teams.

Kent Beck is also known as designer of the automatic unit test driving framework known as xUnit framework, or today even better known as JUnit ,automatic unit test framework, used by Java programmers or NUnit, automatic unit test framework, used by .Microsoft, .NET programmers (C# programmers for example).

In 2003 Addison-Wesley published another Kent Beck book "Test Driven Development by Example", that attracts more attention to the test-first concept and replaced test-first programming concept name by today widely used Test Driven Development (TDD) name.

The basic idea behind the Test Driven Development is developing a test before implementation of requirement. The first Section, "Test Driven Development", describes this approach.

The next Section, "TDD and a Small Development Teams", discuss benefits and drawbacks of using TDD methodology, as well as pre-conditions and other tools that automate development tasks and improves team productivity and final product quality.

The Section "Conclusion" is a short discussion and conclusion.

I. TEST DRIVEN DEVELOPMENT

Test Driven Development (TDD) rules defined by Kent Beck are very simple:

1. Never write a single line of code unless you have a failing automated test,
2. Eliminate duplications.

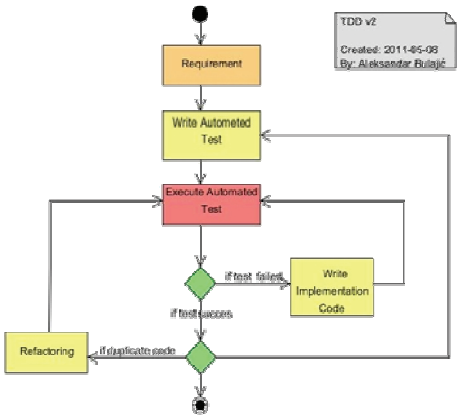
The first principle is fundamental for TDD approach because this principle introduces technique where a developer first writes a test and then implementation code.

Another important consequence of this rule is that test development is driving implementation. Implemented requirements are by default testable; otherwise, it will not be possible to develop a test case.

Second principle is today called a Refactoring, or improving a design of existing code. Refactoring also means implementing a modular design, encapsulation, and loose coupling, the most important principles of Object-Oriented Design, by continues code reorganization and without changing existing functionality.

A. Test Driven Development Work-flow

The following picture illustrates a Test Driven Development process:



Picture 1: TDD workflow diagram

1) Requirement

Requirements in case of the Extreme Programming and Agile development are managed differently than in a case of the traditional approach, where can be used a lot of time and huge communication overhead to specify requirements and requirements relations and interactions. Extreme programming splits development in the short iterations that can last from one to three or four weeks. Each iteration delivers fully functional software that adds new functionality or improves existing.

A short iteration requires that requirements complexity is reduced by dividing in the parts that can be completed in the short development time. A short iteration requires also that development starts very early, and there is no time to wait that whole requirement specification is completed.

Even many Agile and Extreme Programming sites are offering idealized pictures of the requirement management based on the user stories, the time necessary to understand requirement cannot be avoided. This means that even it is possible to start development from the short user story, communication overhead related to the understanding of the requirement details cannot be avoid. The differences are in the time used for specifying requirement and also in the requirement size and complexity. TDD requires less time and starts implementation as soon as some parts of requirements are known

2) Write Automated Test

This is implementation of the first TDD rule:

Never write a single line of code unless you have a failing automated test.

This means that before any line of the requirement implementation code is written, an automated test code is written. Automated test will fail because there is not existing implementation code.

Writing an automated test is not a spontaneous process. A test is chosen from a tests list that is already created during brainstorm sessions. This list contains a list of tests that "verifies requirement and describes the completion criteria". (Newkirk and Vorontsov 2004)

3) Execute Automated Test

Because implementation code is not yet written and there is existing only empty implementation method to avoid compiler errors, a test will always fail.

The automated testing tool is precondition to implement TDD. All tests or particular test shall be possible to execute automatically. This requirement is very important because developing small tests, step by step, can suddenly end by a test suite or test suites that contain hundreds of tests that shall be executed each time when implementation code is changed or new test is added to the test suite. This kind of testing is called Regression Test and this is very important step in the Quality Assurance process.

4) Write Implementation Code

If test fails then Write Implementation Code should provide implementation code that makes a corresponding test case to execute successfully. The TDD considers a passing test not useful and unnecessary. New test shall always fail and cause changes in the implementation code. These changes can introduce writing of new implementation code or changes in existing code.

5) Refactoring

"Although refactoring code has been done informally for years, William Opdyke's 1992 Ph.D. dissertation[15] is the first known paper to specifically examine refactoring,[16] although all the theory and machinery have long been available as program transformation systems." (Wikipedia_Code_Refactoring 2011)

Removing duplicate code today is better known as code refactoring. Code refactoring has been widely popular in recent years and very popular book written by Martin Fowler book "Refactoring Improving the Design of Existing Code" (Fowler 1999) still can be used as a reference book that contains a long list of refactoring techniques.

There are available different definitions and all agree that refactoring is improving design of existing code. Refactoring does not add new functionality or change old one. Refactoring eliminates duplicates, makes code more readable and improves code internal structure.

6) When to Stop TDD Iterations

If all tests are green (successfully executed) then on the Figure "Test Driven Development workflow diagram" are available three paths::

1. Refactoring.
2. Write Automated Test,
3. Stop Further Development.

The first two are described in previous Sections.

The third possibility means that application development is completed. Some authors are calling a Red, Green and Refactor sequence a TDD pattern.

A decision to stop further development can be made when all test cases from a test case list are implemented. This means that all requirements are implemented and there is no reason to use more time and resources.

II. TDD AND A SMALL DEVELOPMENT TEAMS

When IT professional hears about a small team, the first association is a project size. And then come to his mind other key words such as Agile development, Extreme Programming (XP), SCRUM, Lean Methodology and cutting development expenses too. The never-ending dream is to create more by spending less money and time, and in the same time improve quality of the final product.

A project size, is not decisive factor, even does not make sense to create huge team to accomplish a small project. Small in this case is measured by amount of money and required resources. Today are huge project divided to the small project teams where each team responsibility is development of the particular component or even component parts. That depends of the requirements and of the chosen architecture, and project or component complexity. This approach shifts complexity to the integration phase where some or all components are assembled and created an application.

A. Preconditions for Applying TDD

Clients and software companies hurry up to transform requirements to the implementation and to see application running, even it is already clear that requirements are obscure as well as benefits of such implementation.

Too many times, clients and software companies are, forgetting to implement proper Quality Assurance procedures. Too often that is discovered when it is already too late to correct it, without introducing delays and huge expenses, because application software is already running in production. Many times development is starting without a proper test strategy, and even more often without sufficient resources to test application properly from the very first beginning.

Why? An answer is not easy to find. The most of involved people would probably justify decisions by expenses and available resources. Doing more by using less becomes a motto that created many issues.

From managers point of view it is not an issue. It is just a question how to force people to do more in the same amount of time. All right, force is not very popular word. Motivation is preferable word. And manager is not more manager, but rather a coach. His main issue is motivating developers to work hard and deliver perfect software for a fraction of time that has been used yesterday? All right, perfect is too strong word. No one is expecting perfect solution. Today a perfect is replaced by good solution and even solution. Make something that works and then improve it in next iteration, if it is next iteration.

This philosophy is not in conflict by best practice. Software development is an iterative process and new iteration should deliver new functionality or improve existing. Delivery speed and shorten time to market become key words. Robustness and flexibility are also often used, but question is could it fit very well in case when speed is important and resources and time are very limited?

If you ask a question is it possible to deliver robust, flexible and good quality software quickly, you will today get a positive answer as quickly too. Agile development is an answer and too many people really believe that it is a right answer.

I would not say that it is not possible in a small project, where requirements are well understand, and implementation team works together for a while, and role and responsibilities inside of the team are well known. In case of complex projects that involves remote components, more layers, complex interfaces and complex data model and business logic, it is not possible. To make it possible, complex project shall be first divided to a number of a small and middle sized projects or components. But complexity in this case is moved from implementation to integration and it can be very irresponsible to expect that integration will be a piece of cake and works smoothly. In case of complex projects divided to small projects are involved too many people and too many small teams and very often these teams are spread all around a world or are a part of different organization or cultural environment.

In the small teams, there are not available sufficient resources for implementing proper QA, and resources for testing purpose are very limited too. In these teams, it becomes even more important to automate testing and ensure that by introducing new functionality the old one is not broken. This kind of testing is called Regression Testing. Regression testing has to be automated otherwise even in the less complex project it will not be possible manually execute all old tests and check all test results. In case of Agile development method and TDD, iterations are very short and can take just a few weeks.

Productivity and effectiveness of the small development team hardly depend of the available tools and frameworks, and process automation. Important advantage of the small development teams are fast communications. The huge development team introduces huge communication overhead. In the small teams, this communication overhead is set to a minimum. Disadvantage is limited resources, so the same team member has to execute more different roles, for example he act as developer and write a code and in the same time test application and write a test code. In this case there are basically two approaches, one called classic approach where implementation code is written first and then written a number of test cases to test implementation and TDD approach, where first is written a test case and then

implementation code In case of TDD the same person is writing test case and implementation code.

Successful implementation of TDD methodology is based on fulfillment of certain set of preconditions, and availability of additional components and tools, and frameworks for automate development process.

Preconditions can be summarized as:

1. Developers are able to act as testers
2. If there are testers available then testers should be able to write a code and simple programs (Beck 1996),
3. Project size is a small or middle-size project,
4. Requirements are known even it is not necessary that are fully completed,
5. Developers are familiar by tools and frameworks

Applying TDD in the small development teams cannot be effective without tools that automate development process. Without tools, applying this methodology would probably create ineffective and cumbersome development environment where benefits would be changed to pitfalls and affect a quality of final product.

Requirement for automate development process are:

1. Development Framework and Automated test framework that is able to execute test cases and easily collaborate with development framework,
2. Automatic build procedures,
3. Continues integration,
4. Development and Test environments for each developer – each developer should have own development environment where is executed his own test. When test and code are ready it is merged to main project branch. Otherwise team would introduce communication overhead to find which changes corrupted test environment and even more time to correct test cases.

In the small development teams time and resources are always most critical factors. This shall be always considered when existing framework or a tool want be replaced by new one.

B. TDD and Standards and Practices

The TDD development approach, as well as any other Agile development approach is based on short development iterations. Iteration can last just a week or two and usually no longer than 3-4 weeks. In the small development teams, where developer and tester and QA manager is the same person, it can be difficult to deliver good quality code on both sides. Short time constraints are introducing additional pressure on developers to deliver planned functionality and developers many times forget that testing is a first priority task too.

In such case it is important to have standards, procedures and supervision that ensures that every development team member respect and implement it. TDD promotes a Test-First approach and forces developers to write a test first, and then implementation code.

Continues refactoring and improving of code design removes duplicates and enforces modular design. These are two most important TDD premises

But how many test cases will be developed and how existing code will be refactored depends of a particular developer, project team or company where development process is completed. If company has well described procedures and implementation standards, as well as control mechanisms, then delivered code quality will probably satisfy quality requirements. If any of these not exists, or is a partially implemented, code quality will be unknown, and depend mostly of developer skills and experience, as well as of his personal motivation.

Processes and method purpose is to become independent from human beings behavior and even skills. Processes and methods are designed to provide standard quality despite differences in human beings skills and experiences. Of course, that this is only a theory. In praxes, delivered quality can depends of a person and his skills, and experiences and his personal motivation.

Tools and frameworks are important part of each development and good tools and frameworks can significantly increase developer productivity and effectiveness, as well as a quality of final product.

For TDD critical tool is automated testing framework. It is a mandatory tool, and this tool should be able easy

integrate to an Integrated Development Environment (IDE) framework. Today, this is not an issue, and on the market are available different automated testing frameworks known as xUnit family frameworks and these frameworks are open sources and can be used free of charge. There are also available different open-source IDEs where are automated testing frameworks already integrated or can be very easy integrated.

There are also available automatic build tools and continues integration tools that are able to execute build procedure in a predefined time intervals and execute automated tests (Unit Tests) and report any errors to developers by sending a mail notification.

A question is what is wrong and why delivered software quality still vary and introduces number of defects that are suppose to be discovered during development process?

An answer is that human beings are not machines and cannot be programmed to repeat exactly the same task again and again and keep motivation and hard work at highest level every time and still be able to think creatively. Even motivation is high, lack of knowledge and experience can

cause a software defect. Internal project organization, procedures, applied standards and processes management can be critical factor and affect significantly final product quality.

Different organizations developed standards that are specific to software products and customers often require that software product meet particularly standards as for example government organizations can require that software product meet ISO 9000 or CMMI standards. The most popular standards for software development are:

1. ISO 9000 standard family,
2. Capability Maturity Model Integration (CMMI),
3. IEEE 1298.

CMMI is very popular and many customers when ordering a software project require that Software Company is certified at least to CMMI level 3. The CMMI defines 5 different levels of maturity:

1. Level 1 Initial – poor process management, quality and schedule unpredictable,
2. Level 2 Managed - established process management based on experiences from previous projects and is by nature reactive ,
3. Level 3 Defined – project defines processes from existing standards and is able to track a progress, ; by nature is proactive and product quality is predictable,
4. Level 4 Quantitatively managed – processes are measured and quality goals are established and measured during project duration,,
5. Level 5 Optimized. – continues process improvement based on evaluation and measurements.

Each of these levels defines a set of documents and procedures and processes that are applied during software development process.

There is also important question what is testing purpose? Verify that software functionality is working as expected or try to break software and discover as many bugs as possible? Test cases written by using TDD are in the first category and usually further testing stops when all test cases are executed successfully. The simplest reason is that further testing can be expensive and reduce time for developing new features.

TDD is testing implementation code by using Unit Tests and this kind of testing is a white box testing approach, what means that tester, in this case the same person who developed implementation code, knows very well internal program structure. This is one of very often criticized TDD approach, because quality assurance standards recommend that developer and tester are different persons and that other person than developer who write a code should test that code.

Unit testing is just one of the tests that should be executed before software is deployed. There are also Integration Tests, System Tests, non-functional tests, such as stress and performance testing and also test of build procedures and deployment procedures, and these are not a part of the TDD..

Writing a test code, as well as writing implementation code, is error prone, and it takes time to design a test and write a code. Test case code can also contain errors and wrongly report test results. This can be caused by changing implementation code or even refactoring, as a side effect kind of error. The worst case scenario is when test case reports successful execution, but should fail. This can be caused by hard-coded values, for example.

Test maintenance can be daunting and time consuming tasks in case when hundred of tests should be corrected because requirement or design has been changed. Separating test case from test data in this case can help a lot and reduce test maintenance time significantly.

Even test tools are open source, that can be used free of charge, time to use it on the real IT project is not free and customers or IT company shall pay for it. Time spend on development of the test cases cannot be used on development of application functionality. These two, even close related processes, and even simultaneously executed, are executed in the separate time frames. This means that more time spent on test development is less time spent on application functionality implementation, and opposite.

Small development team means also a small number of human resources. A size of a small development team is from 3 to 5 people in average and one is a Project or Team Leader. If only one is dedicated to a test activity, it means in average 25% percentage fewer resources that can be used for other activities. If two of peoples are used only for testing activities it means that 50% less resources are used for development activities.

Another important precondition for successful testing implementation in the small development teams is availability of automatic testing tools. Even test development can be done by using simple test editor, test execution shall be automatic.

The simple reason is that manual testing, especially in case of full regression testing, is not possible to execute and successfully complete under time constraints that are defined as milestones for each software application.

Even many would advocate that software quality delivered by Agile development methodology, is better or the same quality as a quality of software developed by using traditional development methodology, I suggest to use common sense and estimate your chances in advance. Important parameters that should be considered are:

1. Project complexity,
2. Target platform (it is suppose that development and deployment under Windows will be easier

than under Unix or, for example under Mainframe computer),

3. Technology requirements (an old technology, emerging technology, mature technology, etc.),
4. Available tools (collaboration, development, build, continues integration tool, deployment and testing tools, frameworks, automatic testing tools, builds, deployment tools),
5. Team size,
6. Team competence (age, experience, are they already know each other or it is first time they work together)
7. Project management,(competence, experience, knowledge related to project requirements, knowledge and previous experience by using Agile development methodology, available procedures and methodologies, available tools).
8. Client (it is an old customer or brand new customer, how much support you can expect from such customer, competence of the people assigned as contact persons, testers and customer representatives),
9. Motivation of all above mentioned and dedication to project success. End user motivation and dedication can be crucial, but if it is not at good level, project management and project team has important task to increase it in positive direction.
10. Available time and resources,
11. Education and career development possibilities.

Even a TDD approach can deliver better software quality, it cannot be achieved only by using TDD, without implementing quality assurance and standards and procedures that ensures that TDD methodology is properly implemented.

C. TDD Benefits and Drawbacks

Wikipedia (Wikipedia_TDD 2011) provides a list of benefits and drawbacks that pretty well summarizes what different authors present as TDD benefits. Following is a short summary of benefits without long explanations (Wikipedia_TDD 2011):

- Writing more tests,
- Debugging is rarely used because development is using small steps and tests are developed before implementation,
- TDD affects implementation code design,
- Implementation code is by definition testable, because test is written before implementation,
- Even TDD requires more code to be written; total development time (test and implementation) is shorter,
- Automated test usually covers every code path,
- More modularized design and loose coupling,
- Number of defects is lower because of high number of tests,
- Improved maintainability and further development. Drawbacks of TDD are (Wikipedia_TDD 2011):
- TDD is difficult to use in case of User Inreface (UI) testing, database or service testing. In these cases Unit Tests are often replaced by Integration Tests,
- Management support is essential,
- There is not separation of duties, the same developer is writing a test cases and implementation code. This can affect both, test and implementation code quality,
- Maintenance of tests cases overhead,
- Test coverage during initial development and any next iteration can differ.

But to draw any conclusion about any kind of methodology, it is necessary first to apply methodology on real project and collect experience and then compare to previous experience where is used another methodology.

III. CONLUSION

The first principle of TDD, “never write a single line of code unless you have a failing automated test” is a fundamental for TDD approach, because this principle introduces technique where test is written before implementation is available and is driving implementation, and requirements are testable.

The second rule is requirement for continues code refactoring. Eliminating duplication of code requires continues source code inspection and changes that should improve internal code design. Developer learns about code internal structure and becomes confident to make changes. If changes are necessary, than developer impact analysis and estimations are in this case much more reliable.

Short development iterations discover requirements misunderstandings very early and reduce expenses for correcting these misunderstandings.

This approach raised very important question about final software product quality, especially because a TDD approach claims that total time used for development is shorter. This means that cutting of development expenses and shortening development time, would not affect final software product quality.

Test-first approach leads to development of a small portion of code and errors are discovered quickly without

using debugger. Implementations code has fewer defects what means that more time can be used for development of new features and functionalities.

Conclusion is that TDD approach provides better test coverage of implementation code and introduces fewer software defects, what means also that delivered software

has better quality, than software delivered by traditional approach.

Claim that TDD approach is using the same amount or less time for project development cannot be confirmed and according to research papers TDD approach uses approximately 15% more time for development

Claim that TDD improves internal software design and makes further changes and maintenance easier cannot be confirmed. It seems that design primary depends of developer skills and experience, as well as of implementation of best practice and internal standards.

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Computer Support Agency Operations for Freight Traffic

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Abstract. The package programs for modern working agency, Directorate for traffic communication "RTC Belgrade" realized buy Microsoft's database "Microsoft Access 2003". This package based on Direction for working Agencies, rules and tariff that apply on traffic communication in "RTC Belgrade". Including more 50 tables forms and reports which enable fast and efficient access for a data which necessary for work Agencies.

Introduction: Contemporary organization, technology and business are inconceivable without computer support. This paper presents a package of programs developed for the operation of basic organizational unit of the new forms of organization of the Directorate for freight traffic, freight transport agency. The package of programs is based on the Guidelines for the Agency, the existing regulations and tariffs. It is built using Microsoft's Access - perhaps the best program for the database. This created a local database. Interconnect them, as well as linking with other software packages that exist in the ZS-in order to achieve better organization and efficiency of the Agency and the Directorate, JZ

I. FORMATION OF THE AGENCY FOR FREIGHT TRAFFIC

In accordance with planned legislative changes, which are in the process of adoption in the Parliament of Serbia adopted in accordance with the objectives and policy of the Company for 2002. Year and the medium-term future, in order to define the position of Serbian Railways on market principles, in June months of 2002 in the Directorate for freight traffic of the Agency are organized on the ground in railway nodes Subotica, Novi Sad, Pancevo, Ruma, Belgrade, Pozarevac, Kraljevo, Zaječer, Nis, Uzice. The ultimate goal of this organization is a systematic approach rail users perform the following tasks:

- Contacting the economy to supply transportation;
- Consideration of the transport needs of the economy;
- Processing of applications for users of transportation services;
- Operationalization requires thee exploitation sector of the economy over the station, and other sectors and directorates,
- Preparing the elements of contracting activity in the area of transport agencies;
- Briefing and meeting service users with the regulations and documents on the railway;
- Monitoring the implementation of transport by the agreement;
- Addressing current problems in individual transport users of transport;
- Creation of conditions for establishing long term business relationship with users of transport services;
- Providing guidance department and station ticket offices;
- Monitoring the financial implementation of the contract of carriage with financial services in the field of transport and services revenue in Belgrade and Novi Sad, and creating conditions for the updated and correct payment of transportation costs in the station;
- Contacting the Revenue Commissioners, Revenue Control Department in Belgrade and Novi Sad to address customer demands reclamations transport services;
- Make a user to the relevant sectors and the Directorate for the completion of railway services, necessary for the conclusion of the contract, or to solve problems in the user -Railways.

Transport users were visibly pleased with the establishment of such services on the railway to the conclusion that it should have been done long before. Over time, the Agency accepted in the company or where the nodes are formed.

II. THE MAIN DUTIES AND TASKS OF THE AGENCY OF THE DIRECTORATE FOR FREIGHT TRAFFIC

A more detailed job description is processed Instructions on the Commodity Agency Traffic a decision in 2004. The business was transferred from the Department of the STP or STP Section of the Directorate and the Agency for freight traffic.

A. Instructions on goods transport agency

This Instruction prescribes the technological processes and operations in the collection, elaboration and definition of offer and sale of the transport market, the proceedings at the conclusion of the contract of carriage and other activities related to the execution of freight transport.

Instruction is done in accordance with applicable regulations governing the procedures prescribed in the transportation of goods.

Provisions of the Guidelines are binding for the employees of the agencies and apply to the commission of ordinary and extraordinary activities in the provision and execution of freight transport in the domestic and international traffic.

Activities and tasks that are performed in the Agency shall perform in accordance with legal regulations governing the area of execution of transportation of goods, tariffs and regulations governing the execution of freight transport, for consistent work organization and performance of the responsible agency head. Instruction provides that the :agencies perform the following tasks:

1. Technical and administrative activities;
2. Recording conditions and monitoring capacity;
3. Recording data on the seats and addresses of the users of transport, freight forwarding and customs offices;
4. Marketing jobs;
5. Sales manager;
6. Logistics jobs;
7. Monitoring activities of payment of transportation costs;
8. The preparation of monthly, quarterly and annual reports and performance analysis;
9. Coordinating the work between the stations, the Directorate's transport and other services in the node;

B. The decision on transfer of the Department of STP and STP in the first section of the Directorate and the Agency for freight traffic

In order to better organization and functioning of the transport process ordered by the Agency for freight traffic perform the following tasks which were formerly the responsibility of :the STP section 1 Monitoring statistics on the carriage of goods

2 The operational organization for resolution of disputed issues related to the repair of cargo, loading, interference in the issue;

3 Monitoring the management of the school car dispatcher, proposing priorities for the settlement of the obligations created;

4 Keeping records of the ensuing academic control if properly charged;

5 Minutes review and processing of irregularities Load over and run schools (K-162) and assess school damages (TK-37), as well as conducting safety investigation proceedings;

6 Tracking the cause of why there has been a not picked up waybills or invoices unpaid cell;

7 Monitoring expenditure and stock of seals by stations;

8 Condition monitoring scale (accuracy, calibration);

9 In cooperation with transport and credit controller will participate in a joint resolution of conflict situations in receiving, transporting and issuing package;

III. MAKING THE PROGRAM PACKAGE

A large number of requirements set Instruction are almost impossible to perform well in the traditional manner without the use of information systems. The cycle of making packages for the management of quality transport services can be divided into the following phases:

1) Strategic planning of developing ideas about the need for some software solution to making strategic decisions about the beginning of development;

2) Analysis of general conditions of business applications. It deals with the detailed analysis of operating in an environment that develops software;

3) Design the business system. Creates a model that involves all relevant processes, objects, or elements of the transportation system that includes applications;

4) the technical design. Creates the database;

5) Construction. Creates the program logic, defining the communication media and performs automatic generation of code in one of software language;

6) Transition. It includes the transfer application to real transportation system (chain or network), its implementation and testing in real environments;

7) Production. The active application and its maintenance, additions, alterations and improvements.

A. 1. Phase: Strategic Planning

The idea of creating packages for the Agency for freight traffic occurred when the instructions appeared on the work of agencies for freight traffic. From the viewpoint of strategic planning, despite the fact that such a package is needed ZS-in, with its interconnections with the existing software (e.g. to track cars) would allow much better operation Agency and the Directorate for freight traffic.

B. 2. Phase: Analysis of general business conditions apply

This phase was already done by professional staff of the Directorate for freight traffic, which made the work of User Agency and the design of a business system that is the next stage.

C. 3. Phase: Technical Design

Creates a database. Designing a database is carried out in seven steps:

- Design the basic structure of the system is to determine what to do in order to meet end user requirements;
- Project reports (output);
- Design of data structures (fields);
- Design tables and links between them. Normalizing database, grouping related information which helps eliminate duplicate data and provides better adaptability to future amendments;
- Designing fields (control accuracy of the data);
- Design patterns (data entry);
- Design menu (automate tasks).

IV. 4. THE BASIC STRUCTURE OF THE DATABASE TABLE

All the requirements for recording, reporting, and operation of the Agency should "pack" in a certain table. Imagine regular structure of the database and its tables are considered the most important step in developing an application that works with the database, it should be used with forms and reports that are prescribed or create them.

A. Technical and administrative work

1 The book of protocol form (prescribed form - ADM -1);

2 Reports on the OFFICIAL travel (prescribed form);

3 Statement of accounts (created account number, date, store, company, etc.., A total of dinars,:report data paid days notice);

4 Reports on the use of official old value of this counter, the new value of this:cars (created report, data counter, total mileage, total spent coupons, notice - the relation of transport);

5 Requisition (prescribed form);

6 The records of fixed assets (prescribed form);

7 List of regulations and tariffs (prescribed form, Rule 650);

8 Working time (prescribed form);

9 Data on staff (there are several forms that lead human resources department, but for the Agency created a form with data:

* personal data date and place of birth, telephone (post-office, mobile, e-mail), address and place of residence, names of family members, identity card numbers (cards, P-4, with a picture of the employee) and

* information on professional: career: starting date and place of employment on the railway, education, school ended and the place of school or university, jobs on the railway from the start and end dates of performing certain tasks);

10 Job classification (prescribed form);

11 Data for communication with:

- Agencies;

- Sections in the node;

- Departments in the directorate and ZS-in (created form - the form of contact for information regarding the name and surname, title, education, mobile telephone, postal, telephone, fax, e-mail, notes. This pattern was also used in the form of transport users, customs, logistics, stations, docks, workshops).

B. Recording and monitoring capacity of the state

1 Cells (created a contact form, with data from the directory SPT 33): Station Code, opened for transportation of passengers, baggage, merchandise packed in bales and parcels fast regular transport, consignments, live animals), as well as data related to the type of cells in terms of working with car, the data whether the station workshop, customs, disinfectants, credit, cargo depot station equipment, the home of station wagons, transitional, terminal, transparent), the prescribed form for the technical capacities of cells and form that refers to the siding as an integral part of the form cells.

2 Bars (pattern created on the basis of SPT 34, range finders for the transport of goods) include: information line number and axial length of the line pressure).

3 Trains (created based on forms from the booklet of the timetable, the Registry of trains per side) is just thrown AS column mode devices, and add the column maximum length of train with respect to the useful length of the track).

4 Kola (prescribed forms of the series of freight cars with pictures).

5 Locomotives (basic technical and operational characteristics)

6 Workshops (contact form);

7 Piers (contact form);

8 Disinfection stations (contact form).

C. Recording of data on the seats and addresses of the users of transport and freight forwarding customs offices - the internal address

1 Customs (contact form);

2 Freight Forwarder (contact form);

3 Transport users (the contact form registration number, VAT number, checking account, bank, customs, freight:data forwarding, JZ number of commercial benefits, contract number, contract number on the central calculation, note).

D. Marketing and Sales Jobs

1 Transportation (created form transport, the type and number of NHM:contains information about the user goods, transport route, the distance tariff, the amount of goods transported during the previous year expressed in the car and tons, the annual need for transportation, income generated in the previous year, whether the transport import, export, domestic,: common, permanent, seasonal, mass);

2 The classification of goods (a form created on the basis of SPT 32: NHM data on goods and commodities);

3 CONCESSIONS (prescribed form Guidelines for the agency);

4 Contracts (the form prescribed by the Guidelines for agency work);

5 Central billing (a form prescribed by the Guidelines for the work of the agency);

6 Road, River, ..., transport (include contact details of competitive modes, details of their capacity, the amount of transported goods, the price at which goods are transported, as well as data-defined pattern of transport);

7 Restriction (prescribed form);

8 Special items (a form prescribed by the Guidelines for agency work);

9 Military transports (prescribed form for the Agency's Guidelines).

E. Logistics Jobs

1 The scope of work (a form containing prescribed information for monthly reports) - 4 tables, report realized the commercial benefits and report on implemented contracts;

2 Log K-162 (Instruction 162 prescribes the form Bag);

3 School records (Form prescribed by the Directorate);

4 Expenditure and inventory records K-188 (a form prescribed by the Directorate);

5 School records of damage (a form prescribed by the Directorate);

6 The records of seals (a form prescribed by the Directorate);

7 Page circuits (a form prescribed by the Guidelines for agency work);

8 RID matter (a form prescribed by order of importance of constant 1 / 2000);

9 K - 212 Notebook Control objections (a form prescribed by Instruction 182);

10 K - 234 List waybills and invoices, (a form prescribed by Instruction 182);

11 List of outstanding advances and unpaid (prescribed form Instruction 182);

12 K - 308 the lack notebook (Instruction prescribed form 163);

13 K - 309 Main excess notebook (Instruction prescribed form 163);

14 A regulation box office records, etc. (created form);

15 Complaints of transport users (created form).

F. The preparation of monthly, quarterly and annual reports and performance analysis

Currently there are 14 monthly reports to be submitted to the Commodity traffic every month:

1 Table 1, Report on the overall scope of work loading and unloading school and command consignments;

2 Table 2, Report on the overall scope of work loading and unloading school and command shipments of goods by type of goods and types of traffic;

3 Table 3, report on the overall scope of work loading and unloading school and command shipments of goods sidings;

4 Table 4, Report on the overall scope of work loading and unloading school and command shipments of goods by type of goods and types of traffic on sidings;

5 Report on academic dangubnini;

6 Report on the commercial benefits realized;

7 Reports on the execution of contractual obligations transport of goods;

8 Report on the exposed K - 162;

9 Report on detention of foreign schools;

10 Report damage to cars by the users of transport;

11 Report on costs and bills signed by agency head;

12 Report on business trips;

13 Reports on the use of official cars;

14 Report on the working hours of employees in the agency.

V. 5 PHASES: CONSTRUCTION

Package for the construction of the Access 2003. This was done because of the opportunities it provides, as well as advantages over other similar tools.

Access 2003 is a system for database management. Access stores and loads the data, displays the requested data and automate repetitive tasks. With Access, can be developed for data entry forms that are easy to use. The data collected can be displayed in any form deemed suitable, and can be assembled complex reports. Access is a powerful Windows application for working with databases - probably the best product for the end user and the designer who has ever written. Can be used to transmit data, copy and insert between Access and any other Windows application. Most applications developed in Access works with multiple interrelated tables. Work with multiple related tables simplifies data entry and reporting by reducing the number of redundant data.

The package program (the "Agency") established the 53 tables, placed under the structure of the database. The basis of "agency" made the three queries that extracts information from a table in the "scope of work" for creating reports on the implementation of commercial concessions, contracts and the work of the sidings.

The package of "Agency" including five control panels. The first control panel opens when pressing the shortcut from the desktop and is the main display. Pressing the appropriate command button can be opened four dashboards. Pictures of command buttons and images on the patterns chosen to associate the table in which data are entered.

The basis of "agency" for each of 53 tables was made a separate data entry form. All data entry forms for the purpose and brings them to a table record.

These patterns are distributed over three switchboard:

1) Administrative information

2) Record review and updating of data

3) Operative data entry

4) Control panel Print report runs specially designed macro. "Monthly report ″, allows you to select report, his view and print.

The package declaring "the Agency" fifteen statutory reports, grouped by month, using specially made macros can be viewed or printed.

Given the huge amount of data can make a large number of reports. Access can not make any reports that come up.

The package of "Agency" made a line across the menu that can directly open the drop-down menu to a selected table, report or form.

VI. 6 PHASE: TRANSITIONS

Although Phase Communications is not completely finished, we have entered a phase of transition.

VII. INSTEAD OF A CONCLUSION

Finally, it should be noted that the developed set of programs that significantly simplifies and speeds up the work, providing greater safety and accuracy of data being processed in the agencies for freight traffic. In addition to linking with other existing computer programs and applications in the ZS-in, this package can serve as a basis for monitoring the performance of commodity traffic a much simpler, faster and more modern way. It is clear that the work program in this package is not completed, it is possible its extension, improvement, improvement. But the foundation is set, and if nothing else, traced the way for new computer applications in this field.

VIII. CONCLUSION

Work Program and the work it describes were made during 2003 and 2004. The paper was published in a scientific journal professional: "Railways", number: 7-8, 2004. In relation to this work, the base is increased over time: At first, made a number of reports that are in many ways represent the data from existing tables. Reports that show all the users of transport services that operate more than 50 cars a year, the relationship of transportation used to transport more than 50 cars a year, the type of goods being transported more than 50 cars a year. Especially interesting are reports that show the users' transportation on an annual basis, by month (table and graph) and cells with the same and so on.

Integral part of the database and could independently work a package of programs that specializes in calculating transportation costs, "RT 1", which was later made and that should be part of the "Transportation Accounting" which is under construction. Transportation Accounting contains tables: K-501, K505, K511 etc. The package of programs described in this paper shows the monthly processing of data as it is currently working on the "Serbian Railways JSC" Developed package is significantly easier and faster to work, providing greater security and accuracy of data processed in Section (OJ) for freight traffic. These amendments should be automated work stations. Data should be directly entered in the consignment note; school records, etc. would be reports: K-29 c, Business Diary transmission to the Treasury, K-119 Notebook mapping, etc. The following pictures show some "form" of these amendments. In the end I can only state that the program does not use the "Serbian Railways" (except of course in Lapovo) that the process of its completion is not such a big deal, but when does one man in all other environmental obligations, and when the outcome of implementation " unlikely "it is unfortunately our reality, such ... About the "Supplements" I hope to one day write another work. These things would certainly be a lot more to deal with people in the "Serbian Railways" for the good governance of such a large system is almost impossible without high-speed data processing using such programs, all in the context of developments in the railways of South East Europe.

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Internal control and auditing of accounting-information systems

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Abstract - Application of IT in business today is an undisputable fact, and means of controlling and auditing these technologies is a well known issue. Starting from the assumption that management of a business organization make their business decisions on the basis of information delivered by accounting sector, the subject of this paper is information accounting system, internal control and audit, aiming to achieve more dynamic and effective presentation of true and reliable financial statements, with adequate protection and control of the information in order to minimize the risk of financial problems, as well as manipulative and criminal actions. Accordingly, this paper gives an overview of information technology in modern business on the example of accounting information system with its subsystems, along with the role and significance of internal controls and auditing.

Keywords - Information, Information Technology, Information Systems, Business System, Accounting System, Internal Control, Auditing.

I. INTRODUCTION

Frequency and dynamics of changes that are manifested in today's modern business environment seem to be more numerous and faster than in any century of our civilization. They have spread to all spheres of human activities, including bookkeeping and accounting. In previous periods, all documentation was on paper, and now the job is done by accounting software. From the entries in bound books, with or without logs, with or without the documentation, we have witnessed the fact that significant segments of the accounting function have become virtual. More specifically, companies in today's dynamic and turbulent environment are likely to operate successfully in the gruelling race with competition only if they possess well developed information systems within which all business functions will operate. Information system is a subsystem of economic agents, thus its objective and functioning shall inductively be defined to support and improve the operation thereof. Accounting information system is a system of notes that the business system creates and preserves with the purpose of maintaining in-house accounting system. The purpose of accounting information system is to accumulate data, i.e. information that will help company management to identify significant opportunities (chances) and problems (threats).

II. APPLICATION OF INFORMATION TECHNOLOGIES IN MODERN BUSINESS

The most powerful technology in the world today is information technology. There is a proverb which has become more of a principle "Those who possess information are in possession of the world." And no matter how true this fact and confirmed throughout history, it can be described as such in modern business world.[1] Today's developed countries have passed from the stage of industrial and post-industrial society to the next phase of development, so called Information Society. Company managers use information technology to provide information on raw material orders, inventories, sales, payments, budget and other data necessary for decision making. Systems of support in supervision, control, decision making and planning, are also increasingly used. An important feature of electronic commerce is that it provides equal business opportunities for big and small countries, or companies.

The goal of an information system within business system is that all the employees have access to the information they need in business decision making, planning, execution and control. Today, there is an increasing need for efficient information system for managing all business system activities. The information system includes in its operations people (participants), data and information, software, hardware and procedures. These five basic components make up an information system. The first two components, hardware and software, are those directly related to computer technology, and they provide necessary equipment and tools for working with data and information. The third component of information systems, which is the subject of the information system operation, consists of data and information. The fourth component is the people who use information system, or those who are engaged around its development and administration. The fifth component is procedures, i.e. the established rules of conduct and work related to information system.

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III. ACCOUNTING INFORMATION SYSTEM

Quality of business policy management and business decision-making within an enterprise business system is conditioned by the existence and operation of an integrated business information system. Accounting information system, as a subsystem of integrated enterprise information system, is not only connected with, but also conditioned by other subsystems of information system, which together form an integrated system. Other subsystems of information system include: finance, market research, planning, structural and technological, operational - technical, checking, commercial, legal and analytical.

The information system is different from other types of systems, its purpose being to record and document the operation of another system. The second system is target system. An information system cannot exist without the target system.

The accounting information system is a permanent part of daily operations of a company. Each transaction must be marked to make the financial statements or any kind of unofficial reports that management can use for the purpose of business analysis.

All business transactions must be recorded in the accounting system. Management needs accounting information in order to make good business decisions. Given the fact that accounting is mandated to record all business changes within a single business entity, accounting information system must be connected to all other systems within the subject.

In conjunction with other sub-systems, accounting information system collects and processes data, then based on them performs analysis, control, automatically prepares financial reports, and performs financial planning. The introduction of information technology has improved analysis, monitoring and reporting to the largest extent.

Namely, they are parts of the accounting work that in addition to accuracy must be done timely, which means fast and automatic data processing, and this is what modern technologies provide for. A good accounting system allows the user to examine informal reports such as out-of-date accounts receivable or reports on inventory status. These systems can be created to provide information on a form and within the deadline which correspond to each individual user.

The purpose of implementing the accounting system is to improve efficiency. If the system does not save time or increase accuracy, it should be replaced.

Accounting affairs within an information system can be grouped into[2]:

1. chart of accounts;
2. processing of financial changes;
3. creating all the recapitulation;
4. recap posting;
5. control between general ledger and analytical records;
6. various reports.

All the above functions are maintained by accounting information system. System connections required to record these transactions can be very complex. There are main files from which information must be reviewed constantly and there are a lot of new data which are constantly being entered into the system and updated by the main files. At the end of the process, everything has to be sorted out accurately to provide precise and clear accounting reports.

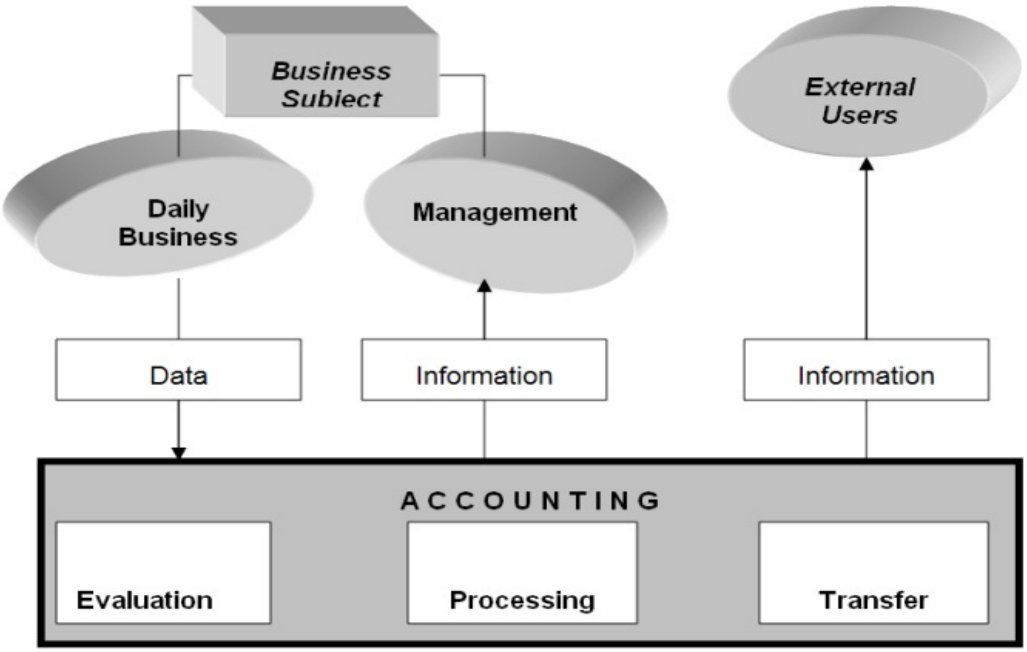
A. Accounting as a system

To understand accounting as an information system, it is necessary to define components of accounting in more details, as a general system:

1. Interconnectivity and Interdependence of the System Elements - indicates that there is an appropriate relationship between the elements. Sorting general ledger log, preparation of provisional and final balances, draft and operation of chart of accounts, etc.
2. Variety of Elements Contained within the System - means that each of the elements or sets thereof have their own performance. They can be divided or classified.
3. Holism of the System – means that the system consists of all its elements as a whole. It is not possible to see the system in a reliable way by reviewing its elements or one element. Lack of chart of accounts, general ledgers, documents, etc.
4. The Aim of the System - every system has a specific target or multiple targets. In accounting information system (RIS), primary goal is to produce quality information for business decisions.
5. Inputs and Outputs of the System - every system has input components based on which it produces output components. Incoming data on business events present inputs in RIS. Business information for business decision-making is the outputs.
6. Volatility of the System – the RIS is an emphatically changeable system. Regulations and internal regulations, as well as other segments are being constantly amended.
7. 7Feedback within the System – feedback is built into the RIS. There is a mechanism of permanent control of all activities undertaken. This way the system can be monitored and managed..

[2] Dr Rade Stankić, Dr Branko Krsmanović, Business IT with Practicum, Bijeljina Faculty of Foreign Trade, 2005, page. 123.

Figure 1 Accounting as an information system



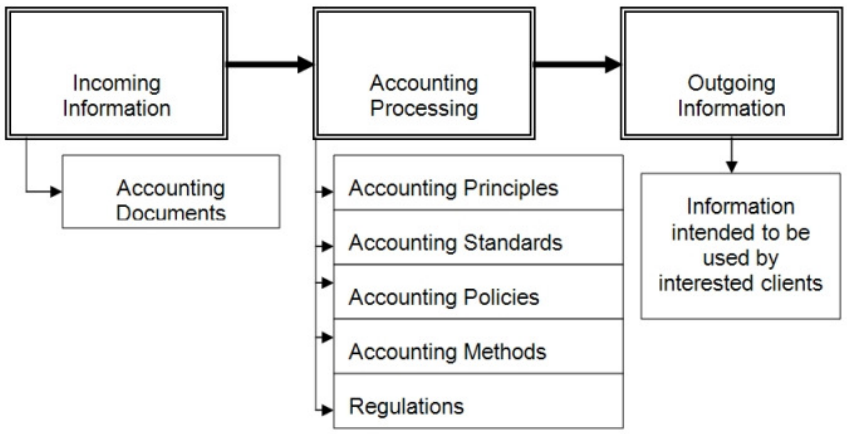
Source: Gray and Needles, 2001, Financial Accounting, Banja Luka, p. 4

B. Information subsystem as organizational structure of accounting

In the course of any organization of accounting functions and consideration of the role of information technology in it, it is necessary to point out that each of the accounting functions has the following main groups of accounting tasks and assignments, i.e. accounting activities:

1. bookkeeping;
2. accountancy planning;
3. accounting control;
4. accounting analysis;
5. accounting reporting.

Figure 2 Accounting Information System Functioning



1) Bookkeeping

Bookkeeping is an accounting activity whose function is to monitor all business events in the company at three levels. These three levels are:

1. analytical records;
2. synthetic records,
3. balance sheet and income statement.

The work technology is as follows: on the basis of basic analytical records, synthetic accountancy prepares the general ledger. Within the synthetic bookkeeping, business changes are recorded on those analytical accounts which are for practical reasons not kept in separate analytical records. Upon completion of synthetic bookkeeping, aggregate calculations such as balance sheet, income statement and additional accounting reports (annexes, report on capital change, etc.) are made.

2) Accountancy Planning

Main components of accounting plan are:

1. fund and fund sources plan;
2. gross and net revenue plan;
3. planned cost price calculation;
4. gross and net profit plan;
5. estimated amount of investment;
6. depreciation cost plan;
7. operation expenditure plan.

Each of these parts can be organized as separate sectors of planning. The entire planning process must be directly linked to other sectors within the accounting function, as well as to the sectors involved in planning being parts of other company functions such as manufacturing, procurement, sales, finance etc. When the accountancy planning has, in cooperation with all these functions, gathered the desired information, it starts processing the data in terms of making plans based on previous information and comparison of actual to planned values. The indicators obtained this way are used by company management in making their decisions. These decisions may be related to changes in product range, changes in product prices, changes in variable costs, changes in fixed costs and the like.

3) Accounting Control

Accounting control is a segment of overall control of a business entity. Four target groups of accounting control are:

1. incoming documents;
2. calculation control of performed posting and accounting;
3. outgoing accounting documents; and
4. planned accounting size and indicators, reports and information.

Accounting programs have a very important role in the process of controlling accounting functions. One of main accounting problems is finding errors in posting, simultaneous posting problem, the problem of accounting element integration, and update problem. These problems are solved through control functions in the books, but with the advent of information technology in accountancy, the amount of work in this capacity has been reduced significantly. This coverage is achieved with automated posting transfer, automated analytics and synthetics, automatic totals, automatic data comparison and the like. Now, the problem of error and control has been reduced to the original manual transaction entry into the computer.

4) Accounting Analysis

Analogous to the function of accounting control, the function of accounting analysis is a part of overall analysis carried out within a company. Accounting analysis deals with accounting data, with reproduction process as one of the main analysis subject. As shown in the scheme below, accounting analysis can include the following transactions:

1. analysis of costs and workload;
2. analysis of gross and net profit;
3. analysis of the accounted amount of investment;
4. analysis of costs;
5. analysis of assets and liabilities;
6. analysis of gross and net revenue.

Accounting analysis is a process of obtaining constructive suggestions and guidelines for business result improvement, through the process of studying data from various accounting estimates and calculations. This is a series of activities of analytical and comparative nature done upon the data and values enshrined in various reports.

The objectives of the analysis, in addition to determining the deficiencies of reproduction process, may be determination of financial situation and efficiency of businesses, the discrepancies between planned and established values, calculation of indicators, and proposing measures for improvement of operations. To obtain these results, all the data available to accounting information system are used. This data is modified into desired indicators in a special part of software which contains formulae for calculation and analysis, and some even provide written proposals with solutions to existing problems.

5) Accountancy Reporting (information)

Final part of the accounting process is financial reporting. Accountancy department uses these accounting statements to present state of company business operations to different users (other business functions, management, business bodies, social bodies and other external users). Since future business operations and success of the company depend on business results, preparation and presentation of financial statements is a very sensitive area. Furthermore, taking into consideration the obligation of financial statement publication, the significance and timeliness of presenting this information is even greater.

Account informing and reporting may be done as a whole or divided into segments. Whichever of these forms observed, their development is easier with the use of accounting software. Namely, it is about automatic sorting and printing of almost all forms of accounting reports based on daily entered data into the system.

IV. ACCOUNTING - INFORMATION SYSTEM INTERNAL CONTROL

Internal controls are the IT policies, procedures, plans and organizational structures designed to provide realistic security for business objectives to be achieved, and adverse events prevented, allocated and fixed.

Furthermore, internal controls create an organizational plan for coordinating methods adopted within the company to protect its assets, check accuracy and

reliability of accounting data, promote operational efficiency and encourage adherence to prescribed managerial policies. Each system and process within the company exists to satisfy certain business purposes. An auditor must seek existence of risk to these purposes, and ensure that internal controls are in the right place to minimize these risks.

Therefore, internal controls are groups of interconnected components whose properly coordinated effects jointly support implementation of predetermined goals of the information system. To achieve this, specific organizational, basic and applicable controls are implemented in all areas and levels of information system functioning. There are three fundamental types of internal controls, regardless of what type of auditing is in question[3]:

• Prevention / Protection Controls. The main task of prevention / protection controls is to identify problems or adverse events before they occur, predict them and using preventative measures try to stop them, along with constant monitoring of information system operations. Typical examples of preventive controls are recruitment of educated and skilled workers, establishing the organization of bodies used for information system monitoring (IT of the Steering Committee), establishing information system internal audit department, raising awareness of constant needs of audits and controls, assigning duties and responsibilities, and creation of a handbook on information system security policy.

• Detective Controls. Detective controls are those which identify and detect errors or problems in any part of the information system. Typical examples include various basic controls of information systems, incoming data controls, authorisation controls, physical and logistics control of access to information system, checking licenses for the systems, precision control, process control, data control and the like.

• Corrective / Reactive Controls. The aim of these controls is to minimize the effect of errors and problems that can compromise the information system. As soon as a threat to this control is noticed, special instructions are implemented, thus the detected errors or threats can be corrected. The procedures of copying and archiving the data, data transfer controls, and controls of key equipment are just some of common reactive controls.

Internal control of accounting information system is implemented so the organization can:

1. protect assets from excessive wear and tear, fraud and inefficient use;
2. ensure reliability of accounting information;
3. ensure compliance with management policies;
4. evaluate the work of organisation section managers.

The main objectives of information system internal control processes are[4]:

- to save property of the information system (security objectives);
- to ensure integrity of the information system and its immediate environment to the highest possible extent, including the work of system software, network management and operation of the system itself;
- to authorise entry;
- accuracy and completeness of transaction part of the system;
- reliability of all activities related to information processing;
- accuracy, completeness and security of the outgoing values;
- the highest possible integrity of the database;
- compliance with customer requirements, organizational procedure and objectives, legal and other regulations (harmonization goals);
- development of procedures and rules to implement in case of an incident, whose main task is to enable continuity of operations with minimal losses and expenses (business continuity), as soon as possible. Successful companies often prescribe additional requirements regarding business continuity goals.

Primary role of auditors, in addition to management of advisory services, is ensuring that all operational controls function and work efficiently, as well.

V. AUDIT OF ACCOUNTING INFORMATION SYSTEM

Information technology audit is a process of collecting and evaluating the evidence and data based on which performance of information system can be estimated. An audit of information technology and systems determines whether IT resources in use support current business objectives and what degree of future goals of business development they support efficiently, as well as maturity of management, and control of information systems at different hierarchy levels. This type of audit can be considered quite young "science" that has been developed as an increase of or support to financial audit.

An inevitable point in information system audit is also assessment of effectiveness of information system internal controls. Internal controls, in terms of information system auditing, represent a system that prevents, detects and corrects adverse effects and processes in the IT environment. Management of the company, along with information system management, is directly responsible for implementing and evaluating the effectiveness of internal controls within the information system.

A common mistake is to have special information systems, with isolated control environment separate from the system internal control. The reason leading to this

[3] www.itrevizija.ba

[4] www.itrevizija.ba

opinion and interpretation is misinterpretation of business risk (false, unauthorized and unreliable use of information systems), which the company may face. It is therefore very important to audit information systems as they often represent the relationship between information systems and overall business objectives.

Main concern and obligation in the course of auditing information systems are to check data integrity, as well as integrity of any system that processes, reports or maintains the data. The role of information technology auditors is to assess and evaluate stability of data and information generated by the computer, analyzing specific programs and their output. An audit of information technology will also be used to support financial statements and reports. Auditors observe abilities of controls in information systems and any related operations, in order to guarantee system reliability.

Information technology auditing covers various types of audit needs and different areas of activity[5]:

- Technical IT audit - which covers infrastructure, data transmission and communications data, as well as compute centres.
- Application IT Audit - which covers business and financial areas.
- Organizational IT audit - which covers management of information technology controls.
- Development and Implementation IT audit - covering specifications, requirements, design and development, and implementation.
- Legal IT audit - covering national and international standards.
- Information technology auditing is an assessment of the IT, practices and operations which ensure integrity of the entity's information. Such assessment may include evaluation of effectiveness, efficiency and cost effectiveness of the practices that are computer based. The audit assessment of systems, practices, and operations may include one or both of:
    1. assessment of internal controls within the information technology environment, to ensure validity, reliability and security of information;
    2. assessing the efficiency and effectiveness of information technology environment in economic terms;

An IT auditor is the person who needs to know characteristics of user roles in the information system, further on to work out assessment of the environment within the organization, at the same time evaluating successful performance of any system. Audit of information technology is an essential part of the audit because it, as such, supports auditor's decision on the quality of information processed by information technology and systems.

[5] www.itrevizija.ba

VI. CONCLUSION

Modern society is no longer called "industrial" or "consumer" but the "information society". Especially in the economic sphere, possession of information, possession and use of information technology, are becoming increasingly important.

Accounting process involves collection, processing and presentation of data. All these activities are now covered by relevant information and software packages that automatically perform recording, transmission, calculation, clustering, analysis, control plans, deviations from plans, and preparing financial statements. Introduction of this type of work in accountancy has led to multiple benefits that appear in the form of decreased workload, reduced percentage of problems, increased efficiency of data, better clarity and dynamics. This has raised the entire accounting sector to a lot higher level and made the job of mere recording the secondary one, whereas the creative and meaningful part of accountancy has become primary.

Internal controls are a set of procedures shaped by the administration, management and other employees with the purpose of obtaining a reasonable proof that organizational objectives will be achieved, risks foreseen, detected and minimized in time. Company management, in cooperation with information system management, is directly responsible for the design, implementation and evaluation of internal control system effectiveness within the information system.

Auditing and monitoring the systems that support business processes is imposed as an imperative of successful business and performance of business activities. The role of information technology audit and control has become a mechanism for ensuring the integrity of information systems and financial reporting in order to prevent financial problems promptly and minimize potential risks.

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CAN Based Embedded Systems for Vehicle Applications

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Abstract - The implementation of various electronic subsystems in different kind of on-road and off-road vehicles is constantly expanding. Accordingly the new vehicles, instead of being mechanical systems, become advanced mechatronics systems which development and testing call for a new approach. Possibility of using data available on vehicles network seems to be extremely powerful tool on it.

The paper deal with new approach for service load data measurement and acquisition as a helpful tool in development and testing of different mechatronics vehicles' systems. Based on complexity of the system and different communication protocols on the vehicles' networks it was found as extremely practical solution to make approach which will be based on standards which are widely accepted by the industry. The new approach is based on the hardware and software platform oriented to the main vehicle controllers with the task to acquire data which exist on the network and which are relevant to the transmission service load. The said hardware as well as software utilities have to enable computer based monitoring of the vehicle systems behaviour and in that way to be the tool for new vehicles development.

The new system was tested in real service. It was found that system can enable significantly less time of vehicle instrumentation before testing and accurate data acquisition.

I. INTRODUCTION

The one of the most important factor which impacts the new product development, including it's testing is duration of development activities. It is of great importance to reduce the time from the initial technical specification of the new product till the moment of lunching its' serial production. That task is mainly oriented to the development engineers which are under great pressure to satisfy market driven dements for fast and reliable new product design.

Many new designed vehicles' have to be in application with already installed advanced mechatronics systems. Simply speaking, if an existing vehicle would be placed in the service conditions which can be expected for the new vehicle then it can be used for service load measurement and acquisition which would be reference input for the new vehicle under development. It is of great importance to analyse possibility for controllers which are the parts of vehicle's mechatronics systems. Simply speaking, collecting the service load based on standard electronic enables faster and more reliable new product development and validation.

The system which was developed for service load data acquisition on vehicles fitted with CAN bus is presented in the following text.

II. CAN BASED SYSTEM FOR SERVICE LOAD DATA ACQUISITION

The concept of the system is based on common situation on nowadays vehicles already fitted with electronic networks which are in use for data interchanging among different vehicle's controllers and their instruments (Fig. 1 - top). In spite of the fact that there are a few protocols which are in use on vehicles' networks it is of importance to be noted that all of them are based, mainly, on the same physical layer which is, nowadays widely accepted by all producers. That is physical layer defined through ISO 11898 or frequently named as CAN 2.0B. As it is given in Fig. 1 - bottom, all data which has to be transferred through this layer have to be organized in frames which start with SOF (Start of Frame) character, followed by 29 bits CAN identifier, RTR character, Control Field, 0 to 8 byte Data Field, CRC Field, Acknowledge Field and EOF (End Of Frame) bits.

From the message format is clear that data of interest for service load would be placed in Data Field. But, to be in position to use those data a few problems have to be solved. Those problems are mainly related to the CAN identifier (ID).

As it is defined by ISO 11898 CAN ID has to be 29 bits long. But, different protocols use that identifier in different ways. For transmission load investigation it is of importance to be oriented to the protocols which are dominant for engine and transmission controllers. As per situation in the market those controllers are mainly based on SAE J 1939 protocol. SAE J 1939 is a protocol with all 7 layers, but for the first two layers (lower two layers) it takes definition from ISO 11898 i.e. CAN 2.0B bus. Before establishing data acquisition from CAN bus it has to be analysed in which way SAE J 1939 uses CAN's identifier (Fig. 2b). In brief, in J 1939 the first 3 bits of ISO 11898 Identifier (ID) are in use for priority (000 for

the highest priority and 1111 for the lowest priority). The next 18 bits are in use for PGN or Parameter Group Number.

The PGN is the key element for understanding possibilities for service data acquisition from the existing vehicle's network. Actually, all data which have to be sent to the CAN bus are organized in the groups. For example, all data relevant for the electrical transmission controller would be placed in the data message (according to the SAE J 1939 terminology: PDU i.e. Protocol Data Unit) in which PGN would be 61442 and 61445. Data available in messages (i.e. messages Data Fields) with stated PGN(s) would be: transmission selected gear, transmission actual gear ratio, percent of clutch slip, transmission input shaft speed, etc. It is clear that lot of data significant for transmission service load are already available on the vehicle bus in the messages with appropriate PGN's.

Out of data messages with PGN(s) related to the transmission controllers, there are other messages of the interest. Those are mainly the messages from engine electronic controller, retarder controller, axle controller, etc.

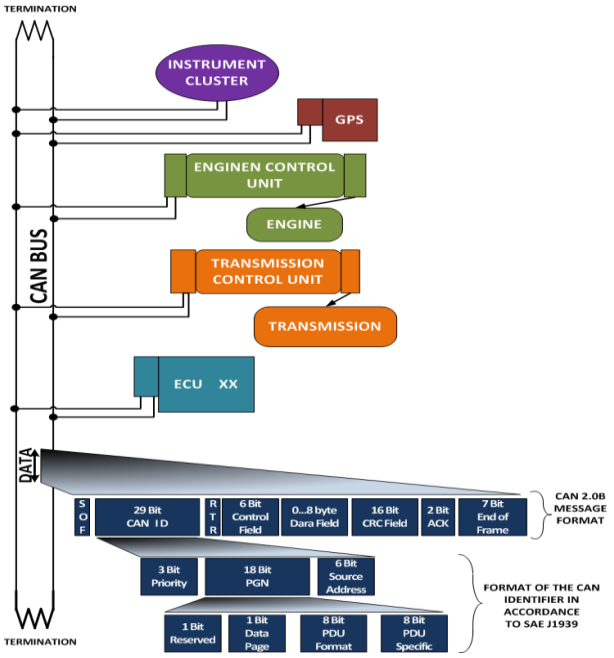


Fig. 1.: Common configuration of the vehicle's CAN bus (top) and the message format (bottom).

It is clear that for the concept of service load data acquiring is essential to be familiar with the PGN concept. Unfortunately, the concept of PGN and establishing CAN identifier is not as simple as said above. Strictly speaking, PGN has 4 parts: Reserved bit, Data Page bit, PDU Format - 8 bits and PDU Specific - 8 bits. Also, it has to be recognized that PDU Specific can be defined in two different ways based on the value of PDU Format: as the Destination Address (for PDU Format values 0 to 239) or as Group Extension (For PDU Format values 240 to 255). All of this makes approach to the messages on the CAN bus (PDU) very complicated and can cause a lot of problems.

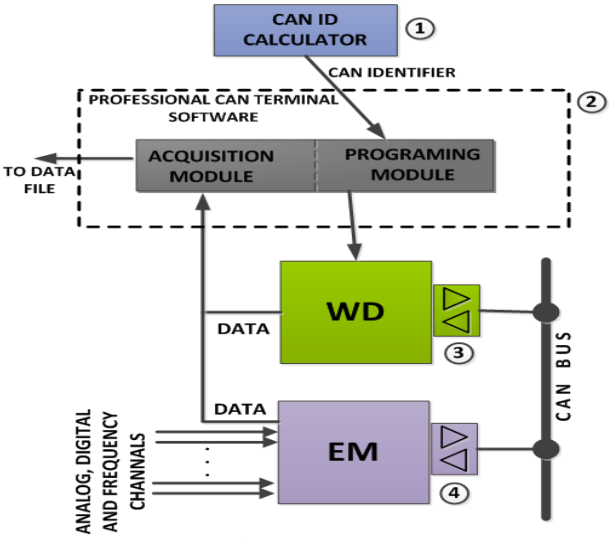


Fig. 2.: Hardware and software components developed through the project (meaning of numbers and abbreviations are given in the text).

As it was explained, defining the proper PGN is not sufficient for successful data acquisition i.e. acquiring of data of interest from the CAN bus. It is also important to know the position of the value of interest in Data Field. The Data Field is 8 bytes long and encloses different data. Their allocation in Data Field must be known for proper data extraction.

Based on explained concept of data flow through CAN bus it is obvious that first interest in establishing the system for data acquisition has to be oriented to providing of adequate software tools for PGN, CAN Identifier (ID) and Data Field evaluation.

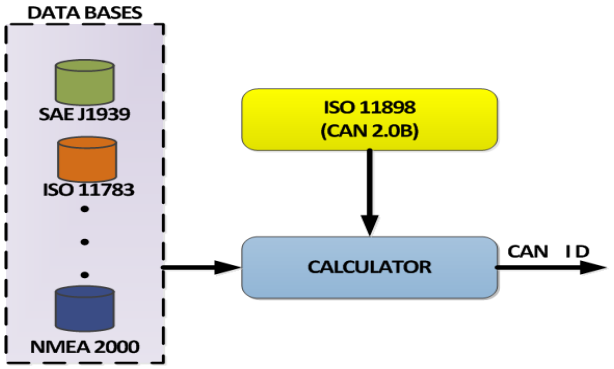
To reduce problems i.e. to enable easier service data acquisition through CAN bus the project which results are given in this paper considered development of a few software and hardware components which are listed below.

1. CAN Identifier (ID) Calculator – software component,
2. Professional CAN Terminal – software component,
3. Watch Dog (WD) – hardware component,
4. Extension Module (EM) – hardware component.

The scheme of functional interdependence of the developed components are given in the Fig. 2 where components are marked with appropriate numbers as given above.

The first of developed components is "CAN identifier (ID) Calculator", with the structure as in the Fig. 3. Through varies data bases it provides support in defining CAN identifier from different standards including SAE J 1939. The user has to approach to the date base trough Excel (Fig. 3, path mark with 1). The data base can be searched in different ways including searching based on data of interest such as engine torque, engine rpm, etc. In that way user can find out the value

which he is interested in to monitor or to acquire from the bus. Once when the value of interest is defined the software defines PGN and other parts of 29 bit identifier (Fig. 3, path mark with 3) in accordance to the previously explained rules. In that way the user is in position to know which message has to be grabbed from the communication on the CAN bus and to be in position to extract appropriate value(s) from the data field in that message (i.e. from PDU).



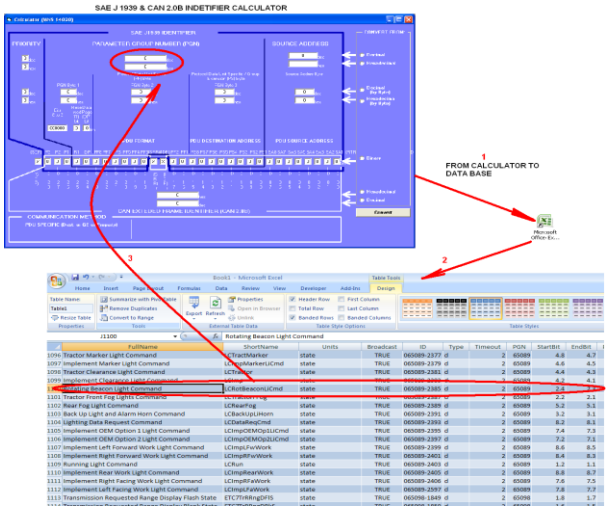


Fig. 3.: CAN Calculator; top – the software structure; bottom – the monitor page which provide support to the user to calculate CAN ID based on SAE J 1939 protocol.

Since data are organize in 8 bytes Data Field, for successful monitoring, it is essential to be known the position of the data of interest within Data Field. Last two columns in the data base (see Fig. 4, columns marked with "StartBit" and "EndBit"). In this way the first software component which is developed in this project enable to user the full support related to the messages on the CAN bus even without his deep knowledge of the protocols.

The next part of the data acquisition system developed for the project was dedicated hardware (see Fig. 4 - top), named WD. Actually that is Watch Dog type hardware with the following basic specification:

- Microprocessor based mother board
- 128 dedicated memory slots,
- Two CAN based gates,
- One Ethernet gate,
- Memory block for application programs, etc. (see Fig. 4 - top).

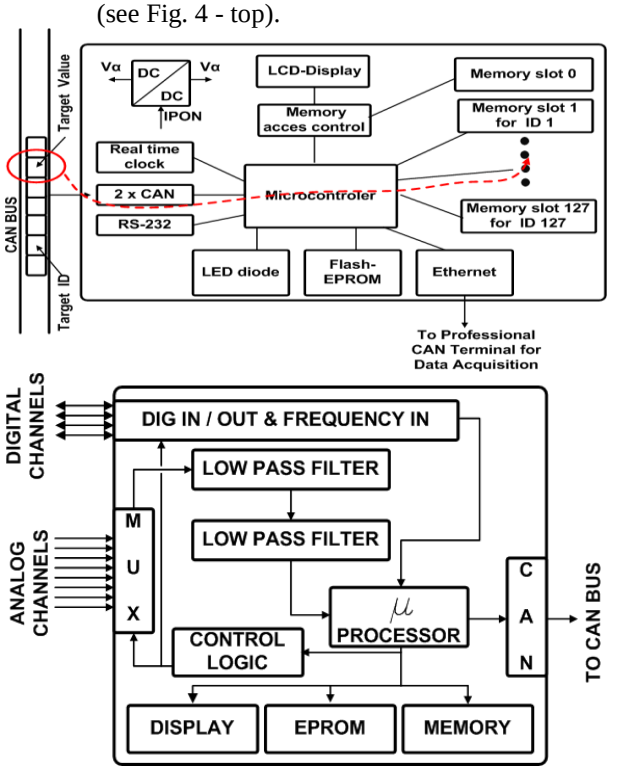


Fig. 4.: Configuration of the hardware components: top – WD (Watch Dog); bottom- EM (Extension Module).

The WD hardware was initially programmed with parameter free software developed in this project. The software drives WD to continuously listen the traffic on the CAN bus. Once when WD starts it work it asks for the values for parameters. Those values have to enable WD to know CAN identifier(s) of interest, part of the data field which has to be extracted from the message with defined identifiers as well as to enable to WD to know in which memory slot the extracted value has to be downloaded. This process is visualized with red lines in Fig. 4 (top) and explained with more details and trough example related to the transmission related data, later in the text (see Fig. 7 and text in the chapter 3).

Once when user defines all parameters WD performs operation of grabbing data of interest from the CAN bus and places values of interest in the memory slots. The on line monitoring and data acquisition of the values are available through the Ethernet gate.

The third part of the developed system is software which enables WD programming, on line data flow monitoring and data storage for post acquisition evaluation. That software product, named "Professional CAN Terminal" (main user page of the software given in Fig. 5) has specification as follows:

- Automatic allocation of WD within local network,
- Definition of parameters which defines data of interest from CAN bus,

- Monitoring of ongoing communication in real time and data storage,
- Possibility for sending messages to the CAN bus.

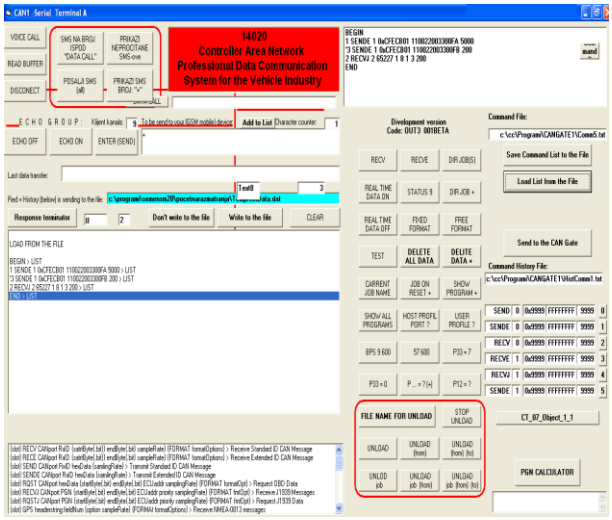


Fig. 5.: "Professional CAN Terminal" software – the main monitor page.

The second hardware component which was developed in this project was "Extension Module" or EM (the configuration given in Fig. 4 – bottom). The EM, among others, performs two essential services:

- Analog to digital conversion of the analog values and
- Broadcasting CAN based messages with converted values.

The necessity for development of the module comes from the circumstance that not all values of interest were available on the CAN bus. It is common situation that there are some values of interest for acquisition which are broadcasting by no one electronic control unit connected to the vehicle's bus. In such cases there are two possibilities for acquiring data of interest: *(i)* to use separate (additional) data acquisition system or *(ii)* to provide the system which will measure the value(s) of interest and make up the PDU(s) with Data Field in which data of interest (measured values) would be incorporated. The second noted way has some advantage. It enables utilization of the already existing data acquisition system which is oriented to the CAN bus, for acquisition of all needed data and makes needless any additional measurement and acquisition unit.

In this project the second of two stated approaches was used.

III. CAN BASED SYSTEM APPLICATION

As it is noted in the introduction, one of the important advantage of data acquisition through CAN bus is to provide accurate service load data for the system which has to be developed, by using data from already existing systems. This chapter deals with that kind of the new data acquisition system application i.e. its application in designing a tractor transmission.

For the purpose of designing the new agricultural tractor transmission it was necessary to make in detail investigation of gear box input power (actual input rpm and torque) as well as front and rear axle input toque and rpm. All those data was needed as the input for precise design calculation of the new tractor transmission.

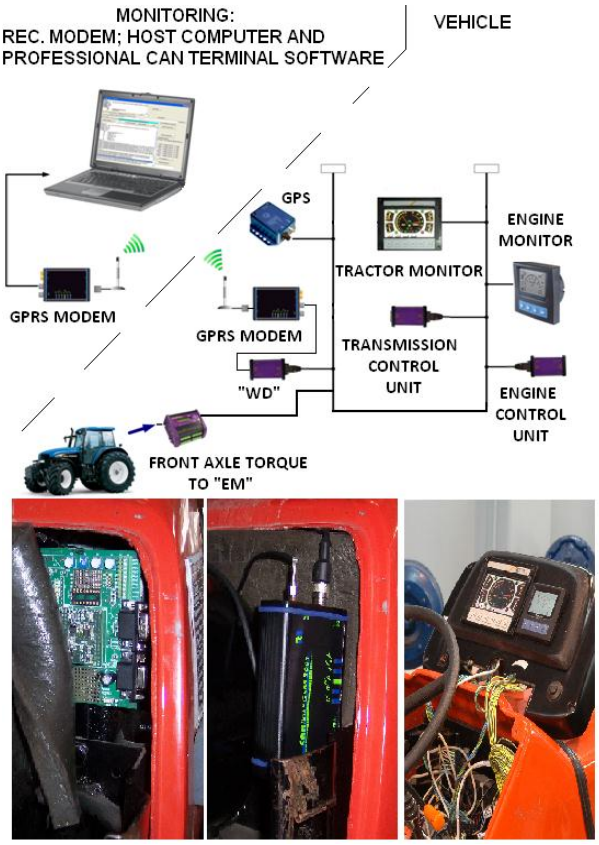


Fig.6: System for service load data acquisition trough CAN bus: top – configuration of the system, bottom left – EM built in the tractor; bottom middle – GPRS modem built in the tractor, bottom left – installation of the WD unit.

It was found that tractor with close the same specification as the new tractor which had to be developed existed on the market. Based that the existing tractor was "CAN based" it was found as cost and time effective to provide transmission service load data by utilization of CAN based data acquisition system on existing tractor. Consequently, it was brought out as possible to avoid making of the prototype of the new tractor for the purpose of service data investigation.

The existing tractor was instrumented in the way that WD was installed on its CAN bus (see Fig. 6). For real time data monitoring WD's Ethernet port was connected to Ethernet port of GPRS modem i.e. it was establish data channel from CAN bus to GPRS network. Monitoring station was fitted on the local computer with Professional CAN Terminal software and with another GPRS modem (receiver).

For acquiring data which were of interest for this investigation and which were found as missing in CAN bus traffic (broadcasted by no one ECU on the network) the Extension Module (ED) was connected to the bus.

Since the front axle input torque was not-broadcasted value of interest the additional front axle torque measurement line was established on tractor's propeller shaft and the analog signal from the toque conditioning unit was directed to the EM.

Before data acquisition, it was necessary to find out appropriate PGN(s) part of Data Field in PDU(s) and ID for the values of interest. That was done with previously developed CAN Calculator software. The following text gives in detail explanation of that process. Given explanation is of general importance since it provides guidance for other researcher and facilitates their work on data acquisition htrough CAN bus.

For the engine speed which is (when the vehicle's clutch is engaged i.e. while the transmission is loaded) equal to the transmission input speed, the relevant PGN is 61444 and 2 bytes long data of engine rpm starts in 4th byte in Data Field. It was found that engine control unit on the tractor had address 0. Based on SAE J 1939 i.e. with help of CAN Calculator software it was found that corresponding CAN identifier which of interest as ID = $00DE0400_{hex}$. The whole process can be visualized as it was given in Fig. 7 and represented in symbolic way as follows:

Engine speed:
Priority Level: 3 >>> ID = 011xxxxxxxxxxxxxxxxxxxxxxxxxx$_{bin}$
PGN: 61444_{dec} $00F004_{hex}$= xxx00111100000000100xxxxxxxx$_{bin}$
Source: 0_{dec} = 0_{hex}= xxxxxxxxxxxxxxxxxxxxx00000000$_{bin}$
Result ID = 217056256_{dec} = $00DE0400_{hex}$
Start position in Data Field: 4th byte
Length: 2 byte
Note: "x" replaces 0 or 1 i.e. bit can be set or reset.

The next value of interest is engine torque or transmission input torque which is broadcasted by the engine electronic controller, with the same PGN. The calculated output torque of the engine is transmitted as indicated torque in percentage of reference engine torque. Consequently, from CAN calculator software it was found that the ID of the message which contents data relevant for torque was 217056256_{dec} or given in-deal:

Engine torque
Priority Level: 3 >>> ID = 011xxxxxxxxxxxxxxxxxxxxxxxxxx$_{bin}$
PGN: 61444_{dec} $00F004_{hex}$ = xxx00111100000000100xxxxxxxx$_{bin}$
Source: 0_{dec} = 0_{hex}= xxxxxxxxxxxxxxxxxxxxx00000000$_{bin}$
Result ID = 217056256_{dec} = $00DE0400_{hex}$
Start position in Data Field: 2nd byte
Length: 1 byte

Even the torque level is transmitted in percentage of reference engine torque one can easily find out the actual torque. That is possible based on the engine characteristic which is always defined in ECU memory as rpm/torque matrix. The matrix can be given in one of three modes. Mode 1 provides a complete curve of speed and torque points while modes 2 and 3 provide a partial curve of speed and torque points and a separate end speed governor characteristic. Data from the matrix loaded in ECU can be asked by sending the request with PGN 65251.

Here, we have to recall the part in which the Professional CAN Terminal software was described. As one can recognize in given specification of that software it's main purpose is to help in WD programming, to enable monitoring of the traffic on the CAN bus and to support data acquisition. But, as it was given in the software specification, it also has capability to send messages to the CAN bus. Here it is clear the purpose of that (sending request with PGN 65251).

Before starting data acquisition it is essential to send request with PGN 65251 to CAN bus. That request would be served by engine control unit. The ECU will replay with message with multi-data field (total length 39 bytes) which will be matrix data. Only in that way one will be in position to find out torque value (in Nm). The actual torque level would be find based on torque value in percentage which would be transmitted with ID $00DE0400_{hex}$ as explained above and from the data which would be enabled trough request with PGN 65251.

The next values of interest were actual or engaged gear ratio and actual transmission range. Taking together, those two values give information of overall transmission ratio. Both are defend in data field of the messages with the PGN 61445, as follows:

Transmission actual gear ratio:
Priority Level: 6 >>> ID = 110xxxxxxxxxxxxxxxxxxxxxxxxxx$_{bin}$
PGN: 61445_{dec} $00F005_{hex}$= xxx00111100000000101xxxxxxxx$_{bin}$
Source: 2_{dec} = 2_{hex}= xxxxxxxxxxxxxxxxxxxxx00000010$_{bin}$
Result ID = 418383106_{dec} = $18F00502_{hex}$
Start position in Data Field: 2th byte
Length: 2 byte

Transmission current range:
Priority Level: 6 >>> ID = 110xxxxxxxxxxxxxxxxxxxxxxxxxx$_{bin}$
PGN: 61445_{dec} $00F005_{hex}$= xxx00111100000000101xxxxxxxx$_{bin}$
Source: 2_{dec} =2_{hex}= xxxxxxxxxxxxxxxxxxxxx00000010$_{bin}$
Result ID= 418383106_{dec} = $18F00502_{hex}$
Result ID= 418383106_{dec} = $18F00502_{hex}$
Start position in Data Field: 7th byte
Length: 2 byte

In, addition, it was needful to provide data for real tractor speed. That is extremely important since there is no other way to find out wheel slip (and to give input do design time for development of differential locks) out of measuring the real vehicle speed and each wheel rpm.

Real vehicle speed value, in nowadays tractors, is provided based on GPS based Doppler transducer which broadcast measured value to CAN bus with PGN 65256 in according to concept as given bellow. The priority and position of the data in data field are:

Navigation-Based Vehicle Speed (real tractor speed):
Priority Level: 6
ID=110xxxxxxxxxxxxxxxxxxxxxxxxxx$_{bin}$
PGN:65256_{dec} = $00FEE8_{hex}$=xxx00111111011101000xxxxxxxx$_{bin}$
Source: 10_{dec} A_{hex}= xxxxxxxxxxxxxxxxxxxxx00001010$_{bin}$
Result ID = 419358730_{dec} = $18FEE80A_{hex}$
Start position in Data Field: 3rd byte
Length: 2 byte

A few other values of PGN are also taken in consideration during the development but we will not discuss them here.

IV. VERIFICATION OF THE SYSTEM

This section deals with verification of the system results of measurement conducted with the previously explained system.

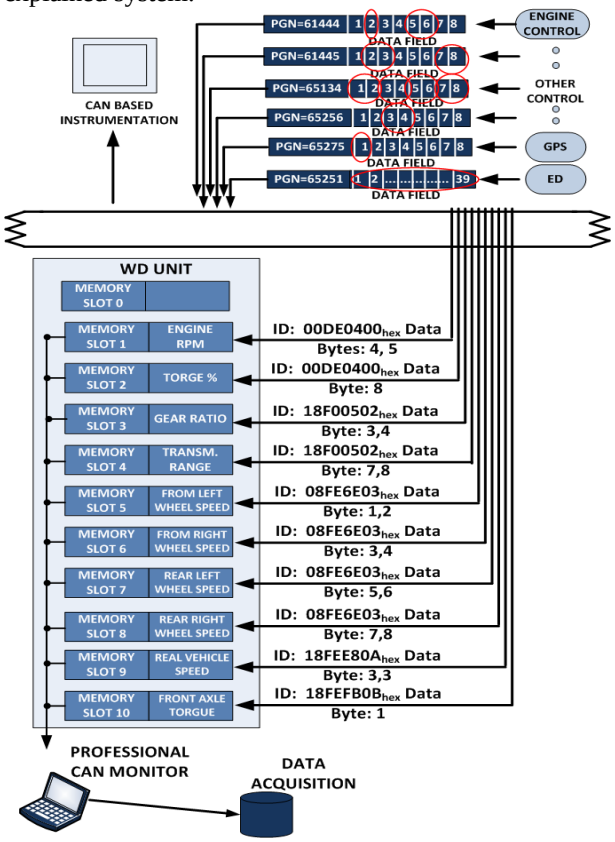


Fig.7: Concept of the measurement.

The agricultural tractor with service mass of 2850 kg, mass distribution front : 1250kg, rear: 2600 kg, rated engine power of 66 kW at 2250 rpm with transmission concept 6x2 gear ratio forward, 4 WD and with it's own CAN bus was fitted with Watch Dog (WD) hardware, Extension Module (EM) hardware and GPRS modem as given in the Fig 6. On the "receiving" side it was establish server with installed "Professional CAN Terminal" software and receiving GPRS modem.

The vehicle was submitted to the two types of tests:

- Regular service application (haulage, in field operation, etc.) as per predefined scenario and
- Non regular service application i.e. special tests created for in detail investigation of CAN based acquisition system's capability.

To enable verification of the new data acquisition system the conventional measurement (taken as a reference) of gearbox input torque and rpm was conducted simultaneously with measurement done with the new system. The reference measurement was done by implementation of full bridge strain gauge arrangement for toque measurement (at the output gearbox shaft and propeller shaft for front axle) and inductive transducers for rpm measurement (at the input gearbox shaft) as well as multichannel signals conditioning unit (HBM's Quantum). The position of the transducers installation was selected based on available space for their installation.

The testing according to the first service condition (regular service application) was conducted with the purpose of defining the transmission input torque service load distribution. Actually, it was necessary to provide to design team information related to the percentage of particular torque level in total service life of the transmission.

It was found that the system is capable to enable accurate measurement with close to no preparation of the tractor. Thanks to GPRS connection it was possible to make no limitation on area where the tractor will operate as long as GPRS network is available.

It was found that suggested concept is extremely powerful. Without implementation of suggested concept (software and hardware developed in this project) the preparation time of the tractor was 2 weeks (because of complexity of torque measurement in the gearbox). In addition, disassembling of equipment and assembling transmission after measurement regularly took one week. With implementation of CAN based hardware and software for data acquisition the preparation time was a few hours, only.

V. CONCLUSION

The CAN based approach in monitoring of the vehicles' mechatronics systems can significantly reduce time for vehicle instrumentation and enable to development engineer to make whole testing in the already existing vehicle before making the prototype of the new vehicle or system under development.

The concept is accomplished by building up dedicated hardware and software. Totally two hardware and two software components were developed. The results of initial testing of all developed components indicate their good performances.

Trough initial testing of the development platform it was accomplished accurate monitoring.

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ERP : Myth or Fact?

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The main idea for this presentation comes from the rumors about benefits of ERP. Usually companies are not concentrating on the real needs, and try cutting the costs no matter of results. Even ERP is a "cost" for most of them.

Necessitate of ERP is to implement complete control over the company, having processes and data availability, integrity and confidentiality at any time. Having this implemented, reduce of the costs is essential result.

I. INTRODUCTION

ERP stands for Enterprise Resource Planning. ERP is a way to integrate the data and processes of an organization into one single system. Usually ERP systems will have many components including hardware and software. In order to achieve integration, most ERP systems use a unified database to store data for various functions found throughout the organization. Enterprise resource planning (ERP) is a company-wide computer software system used to manage and coordinate all the resources, information, and functions of a business from shared data stores. An ERP system has a service-oriented architecture with modular hardware and software units or "services" that communicate on a local area network. The modular design allows a business to add or reconfigure modules (perhaps from different vendors) while preserving data integrity in one shared database that may be centralized or distributed. The term ERP originally referred to how a large organization planned to use organizational wide resources. In the past, ERP systems were used in larger more industrial types of companies. However, the use of ERP has changed and is extremely comprehensive, today the term can refer to any type of company, no matter what industry it falls in. In fact, ERP systems are used in almost any type of organization - large or small. Today's ERP systems can cover a wide range of functions and integrate them into one unified database. For instance, functions such as Human Resources, Supply Chain Management, Customer Relations Management, Financials, Manufacturing functions and Warehouse Management functions were all once stand alone software applications, usually housed with their own database and network. Today, they can all fit under one umbrella - the ERP system.

II. MYTHS AND FACTS

The biggest myth of ERP is that it is no more than an upgraded version of old systems. Most of the SMEs think like this. But it is not true. Some of the common myths vis-à-vis integration of the software is easy job, transfer of data is unidirectional, copying data in software integration, it can increase the efficiency of the business, it has magic box- can generate any type of report or can take any decision.

Latest ERP is good for your organization, it will reduce the IT staff - but in actual things are totally different which is discussed below.

MYTH**:** "Our project is not progressing as planned because it lacks management commitment"

FACT: Progress is often not achieved because of management burn-out. People involved can be cynical by promises made and expectations that were built-up by overzealous vendor reps, consultants who collect very expensive fees as the project lingers and IT personnel who were looking for big budgets and the opportunity to rub shoulders with the "big boys." When management is made aware of the process, and understands that there are no silver bullets in ERP or quick fixes, then expectations don't run amok and progress can be measured in a real and meaningful manner. A successful ERP implementation can provide a realistic ROI.

MYTH**:** "Our system went live in just a few months"

FACT: It is more likely that the financial part of the ERP went live in a few months rather than the whole system. Corporate financials are fairly straight forward to implement. Also, in most organizations the financials are already "under control." An ERP system's biggest added value is not in the financial area, but rather in other parts of the operation and perhaps in tying those other parts into the financials. Modeling and effectively managing operations in an integrated ERP system may take years to implement. In fact, it is an ongoing process. Ultimately, the system must be flexible enough to accommodate operational changes indefinitely.

MYTH: "Once we finished getting our ERP system up and running, our expenses went down drastically."

FACT: Outside consulting fees may have been reduced and the initial costs for setting up the system are paid off, but companies often fail to take ongoing internal implementation investment into consideration. In the words of one CIO, "we planned for $600,000 and a 6 months project; we reached both and then stopped counting." An ERP implementation extends over long

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periods of time, and any worth its salt will take years, not months.

MYTH: "Consultants are professionals who can guide the selection process and manage the project while maintaining an objective stance."

FACT: We believe that anyone reading this already knows the facts.

MYTH: "Comparing ERP functionality lists is a good practice for initial screening of vendors for your project."

FACT: Functionality lists are of marginal value in the selection of potential ERP systems. A single line in a list may represent a world of functionality in one software packages and very little in another. Even if the desired functionality is fully supported in the software, actually making it work for your specific needs may make implementation complex and cost prohibitive. Referrals in your industry are a much better yardstick. As the implementation team is just as important as the software in terms of successful projects, referrals from industry representatives regarding the implementation team are the second most valuable indicator.

Many industry leaders have believed on the evasive nature of ERP benefits. But how real is the issue of ERP benefits realization? To find out, it helps to look into some key statistics from ERP benchmark study. The study, which focuses on companies across the globe that have implemented or are in the process of implementing various ERP packages, reveals some interesting points:

- 30% of those surveyed did not realize any sort of staff reductions after go-live
- 18% did not measure benefits after go-live
- 28% had some type of problem or operational stoppage after go-live

Surprisingly, only 18% of companies did not measure post-go-live benefits (in other words, 82% did indeed measure). Besides almost 100% of the companies that have implemented ERP, does not measure post-implementation benefits. Second, the fact that 28% experienced stoppages seems somewhat alarming. It does highlight that at least 1 in 4 companies have operational problems and/or stoppages because of the disruptions caused by ERP. So what does this all mean? First, the results show that ERP benefits are by no means guaranteed. Second, the risk of ERP disrupting an organization's core operations is a significant business risk. These factors are clearly areas that will affect the ROI of the investment in ERP and should be carefully managed as part of an overall ERP Benefits Realization plan.

III. ADVANTAGES & DISADVANTAGES

There are a number of powerful advantages to Enterprise Resource Planning. It has been used to solve a number of problems that have plagued large organizations in the past. At the same time, it is not without a number of disadvantages. Being able to weigh the two will allow a company to decide if this solution will properly meet their needs.

Advantages of ERP:

In the absence of an ERP system, a large manufacturer may find itself with many software applications that do not talk to each other and do not effectively interface. Tasks that need to interface with one another may involve:

- design engineering (how to best make the product)
- order tracking from acceptance through fulfillment
- the revenue cycle from invoice through cash receipt
- managing interdependencies of complex Bill of Materials
- tracking the 3-way match between Purchase orders (what was ordered), Inventory receipts (what arrived), and costing(what the vendor invoiced)
- the Accounting for all of these tasks, tracking the Revenue, Cost and Profit on a granular level.

Change how a product is made, in the engineering details, and that is how it will now be made. Effective dates can be used to control when the switch over will occur from an old version to the next one, both the date that some ingredients go into effect, and date that some are discontinued. Part of the change can include labeling to identify version numbers. Computer security is included within an ERP to protect against both outsider crime, such as industrial espionage, and insider crime, such as embezzlement.

Disadvantages of ERP:

Any problems organizations have with ERP systems are due to inadequate investment in ongoing training for involved personnel, including those implementing and testing changes, as well as a lack of corporate policy protecting the integrity of the data in the ERP systems and how it is used. Limitations of ERP include:

- Personnel turnover; companies can employ new managers lacking education in the company's ERP system, proposing changes in business practices that are out of synchronization with the best utilization of the company's selected ERP.
- Customization of the ERP software is limited. Some customization may involve changing of the ERP software structure which is usually not allowed.
- Re-engineering of business processes to fit the "industry standard" prescribed by the ERP system may lead to a loss of competitive advantage.
- ERP systems can be very expensive to install often ranging from 30,000 to 500,000,000 for multinational companies.

- ERP vendors can charge sums of money for annual license renewal that is unrelated to the size of the company using the ERP or its profitability.
- ERPs are often seen as too rigid and too difficult to adapt to the specific workflow and business process of some companies—this is cited as one of the main causes of their failure.
- Systems can be difficult to use.
- Systems are too restrictive and do not allow much flexibility in implementation and usage.
- The system can suffer from the "weakest link" problem—an inefficiency in one department or at one of the partners may affect other participants.
- Many of the integrated links need high accuracy in other applications to work effectively. A company can achieve minimum standards, then over time "dirty data" will reduce the reliability of some applications.
- Once a system is established, switching costs are very high for any one of the partners (reducing flexibility and strategic control at the corporate level).
- Resistance in sharing sensitive internal information between departments can reduce the effectiveness of the software.
- There are frequent compatibility problems with the various legacy systems of the partners.
- The system may be over-engineered relative to the actual needs of the customer.

Conclusion:

The success of the system is fully dependent on how the workers utilize it. This means they must be properly trained, and a number of companies have attempted to save money by reducing the cost of training. Even if a company has enough money to implement ERP, they may not be able to successfully use it if they do not have enough money to train their workers on the process of using it. One of the biggest problems with ERP is that it is hard to customize. Very few companies can effectively use ERP right out of the box. It must be modified to suit their needs, and this process can be both expensive and tedious. Even when a company does begin changing the system, they are limited in what they can do.

IV. ROI

ERP covers a multitude of topics, all integral parts of a very expansive and comprehensive process. In learning what it's about and how it works, there are some central features one must understand.

Business process reengineering: ERP is about leveraging a company's information, as well as the information resources of partner companies, in the pursuit of more efficient ways of doing business. In general, a company's business processes already leverage existing resources and information availability optimally in order to achieve the most efficient operation possible. But by reconfiguring information resources, combining and extending applications, and partnering with other companies in the sharing of information, new possibilities emerge in terms of how business processes (such as manufacturing, order processing, and inventory control) may be implemented. Making business systems better is a central ERP objective.

Database integration: Most traditional businesses store information by business function. Financial information is in an accounting database, customer data is in a customer database, and so on. ERP calls for the integration of databases into a super-database that enables logical links between records that traditional applications would not require but that process-oriented ERP applications do require. Often, ERP platform software simply creates convenient and easily maintained bridges between existing databases rather than requiring the awkward generation of new databases from old.

Enhanced user interfaces: ERP applications, in general, cease to be stand-alone and become steps in a process. Often, a user interface will initiate down-line processes, in addition to its primary function, in highly efficient ways (such as the triggering of updates in down-line databases when a record is changed in the database the user interface is using). It is also often the case that ERP-integrated databases offer wider reporting options via application interfaces than conventional systems do. It is important to learn what options are useful and how this extended reporting may be enabled.

Data transport between companies: As the Internet continues to blossom, the sharing of strategic information between partner companies and logistical data between companies partnered in supply chains is increasingly important. The enhanced databases and interfaces of an ERP-based company are made all the more valuable if partner companies are invited to the party. So a broad and detailed knowledge of the various data communication options is essential to an ERP designer.

Extended and distributed applications: What exactly does it mean to extend an application or to share in a distributed application? Basically, a conventional information system is much like a farm covered with ponds: you go to a particular pond and scoop out a bucket of water in order to water your plants. In an ERP environment, the ponds are all converted into an irrigation system: the water is routed to the section of the farm where it's needed. And this includes sharing water with neighboring farms. An extended application has ancillary functions; a distributed application accommodates many users—even if the users have different needs and are all making use of different portions of database records. It is essential to understand how to facilitate this varied use of common data and to familiarize yourself with how a particular development environment can enable it.

V. SMALL BUSINESS

Despite aggressive cost cutting, middle-market enterprises still consider pressure to reduce operating costs as key to their business strategies. Yet these businesses are in the market for new technology — specifically customer

relationship management (CRM), an area in which either slight increases or significant investment over the next two years is most often designated.

ERP for small business calls for voluminous investments. The amount was fairly affordable to small business entities. There is no doubt or two say about its benefits. But the question that kept ringing in the market was can everyone afford it. The answer was a stubborn no initially but not anymore. ERP outsourcing, Open Source ERP's and ERP applications designed for S.M.E.'s (Small and medium Enterprises) have successfully overcome the above said limitations.

Enterprise Resource planning was a term restricted purely to elite class. This scene was witnessed in the IT market for some long time ever since ERP was introduced. The large organizations went ahead with ERP process unmindful of negative consequences, not to forget mentioning the fact that they took every proactive measure to curb the same. Needles to say firms were interested in serving such large players. So the fate of Small and Medium enterprises remained unanswered. ERP for S.M.E's remained a mere dream. It so happened that the number of larger companies without ERP turned out to be nil. Thanks to the awareness created by vendors and IT researchers. No doubt companies were initially hesitant lot and apprehensive on just hearing the word ERP. However the industry proved them otherwise. Then came a stage where a company could not exist but without ERP. Even if their performance was satisfactory they were not able to gain any competitive advantages. This explanation of how goliaths adapted to ERP has lot of significance in studying their intervention with S.M.E. These bigger companies were not providing the required business to ERP vendors. Even though there are many big companies the number of vendors was always greater in multiples. This means only the best could strike deals and there was no possibility for mediocre or average vendors (in terms of performance).The best players also found that they had none to serve after a point of time because almost every company in the market successfully established ERP (whether on the first or further attempts).

So they had to naturally look for greener and fresher pastures. S.M.E.'S was the only answer. The next question was how to provide best services at an affordable cost and still make profit. In this case the vendors had to be worried only about the number of sales they could make and not the quantum of profits because the number of vendors was few and far between when compared with the number of S.M.E.'S choosing to go for ERP. As the saying goes "necessity is the mother of Invention" vendors had to devise cost effective applications to meet the demands of the Small and Medium enterprises. This was the origin of ERP for S.M.E.'S. This benefited them in terms of business .On the other hand the firms enjoyed greater benefits by making use of this application. Hence ERP and S.M.E. was weighed on the same scale.

The key things driving small businesses to ERP seems to be 1) growth of the small business sector, and 2) more focus on the small business market from ERP software vendors. Most of our small business clients are considering or implementing ERP because of their rapid growth and the corresponding strain it puts on their legacy systems. In addition, large ERP vendors that typically focused solely on the Fortune 500 market are now developing lower-cost solutions with more appropriate functionality for smaller businesses.

A third and final possible reason is because many niche ERP players have entered the marketplace to provide functional solutions for specific industries. Open technologies such as .net have reduced barriers to entry into the ERP market, so many smaller, industry-specific niche players are able to fill the voids left by the big ERP companies at a lower cost.

Although this increasing focus on small business is good for companies with limited capital budgets, it also poses additional risks. Now, there are more choices than ever, and some vendors' products are much more proven than others. So small businesses should be especially thorough when evaluating and selecting an ERP package. They should engage in a vendor selection process that ensures they choose a solid software package that provides a strong ROI to the company.

S.M.E.'s are becoming the popular choice of ERP vendors. There is an increasing awareness of ERP in S.M.E. market. It has practically helped to unravel the myth that ERP is exclusively meant to business empires. ERP and S.M.E have become important part of enterprise studies.

VI. EFFECT & ESSENCE

ERP (Enterprise Resource Planning) systems are used in the organizations for information integration and aligning & streamlining their processes for delivering high value to the customers. Through its very use, it influences manager's jobs and the organization structure as well.

ERP has significant impact on the organizations and has tremendously changed the way of manager's job and organization structures. ERP implementation on five dimensions of Manager's job (autonomy, use of power, delegation, people skills and privileged information), five dimensions of organizational structure (specialization, formalization, centralization, standardization and complexity of work flow) and on the flexibility of organization has been effected by the use of ERP in organisations of all levels.

ERP is an outcome of 40 years of trial and error. It has evolved as a strategic tool because of continuous improvement in the available techniques to manage business and the fast growth of information technology. Prior to 1960s, the business had to rely on the traditional ways of inventory management to ensure smooth functioning of organisation. The most popularly known amongst them is EOQ (Economic Order Quantity). In this method, each item in the stock is analysed for its ordering cost and the inventory carrying cost. A trade off is established on a phased out expected demand of one year, and this way the most economic ordering quantity can be decided. This technique in principle is a reactive way of managing inventory.

How does an ERP system make it all happen? The essence of it is the fundamental premise that the whole

being greater than the sum of its parts. The traditional application systems, which the organisations generally employ, treat each transaction separately. They are built around the strong boundaries of specific functions that a specific application is meant to cater. For an ERP, it stops treating these transactions separately as stand-alone activities and considers them to be the part of the inter-linked processes that make up the business.

VII. IMPORTANCE

ERP is a Rising Need of Enterprises. It is a strategic tool helping an organization to gain and edge over its competitors by helping in successfully integrating its key business operations, synchronizing, planning and optimizing the resources available in the existing extremely competitive environment.

Its use has a much broader scope in today's world rather than of just planning the use of the enterprise resources.
Organizations (especially those which are borderless) face many difficulties in quickly making out the information required. The integration of the business processes improves coordination between bodies, streamlines, workflows and processes and benefits them in terms of retaining and satisfying customers by delivering their orders "just-in-time" and keeping them well informed about their orders' current status rather than keeping them waiting for just a small piece of information. ERP has the effect of making an enterprise more time-sensitive. Another benefit is of better marketing opportunities. ERP penetrates one segment after the other and addresses solutions to many debacles existing in an enterprise.

VIII. PLANNING & IMPACT

The success rate for implementing not just MRP and ERP systems but all large software packages has never been very good. In survey after survey, in the USA, Europe and elsewhere, less than one third meet the basic criteria set out at the start of the implementation. Too many software engineers know how the software works but do not know how to integrate it into the business in a way that delivers real business benefits. With enterprise resource planning (ERP) packages costing hundreds of thousands, many costing millions, this failure rate is frightening.

The question is - how can you minimise the chance of failure or, more difficult, rescue a package that is not delivering sufficient business benefits to justify the cost of implementation? The good news is that, when properly implemented, an ERP package can be the most cost effective project a company has ever seen.

ERP failure cannot be tolerated by organizations as it involves great money. On the contrary ERP success makes great money. Selecting a new ERP system can be time-consuming and risky — but with the right strategy and tools, the selection can be turned into a positive change. Here are some steps to help identify the best solution for a company. The following elements acting in combination or individually results in good planning and choosing the best posssible ERP solution:

ERP implementation can positively affect the process capital of a company: process capital can positively affect customer capital and customer capital ultimately affects business performance. Companies implementing ERP can build process capital to meet the challenges of the competitive market environment.

ERP'S impact on its stakeholders: Impact of ERP on the role of managers or organization or stakeholders can be best studied and understood if the subject is analyzed right from the implementation stage. Nevertheless it has a strong influence on the business process itself as soon as it is gripped and decides major issues for employees, customers and other stake holders. It is better to analyze it in this context rather than debating on "How will ERP impact the accounting Profession?"

*Impact during the Implementation Process***:** ERP has a significant impact right from the time it is conceived in the organization. Firstly it facilitates the members in the organization to arrive at a consensus though after a detailed and deliberate discussion. It paves way for restructuring which would not have otherwise happened in organizations sticking to traditional and conventional values. ERP is an eye-opener for such organizations because they get to realize the nuances and edge involved in modifying the business process. This would not have happened but for the intervention of ERP. Organizations disclose vital information in the public domain which was otherwise considered confidential and not meant for dissemination. All this happens in the implementation process as this it is the time the seeds sown (FOR ERP Intervention) gets shaped in this phase. Nevertheless the impact of ERP on managers is noteworthy.

Impact on Departments: It brings about interactions and tends to nurture healthy relationships among departments in organizations which would have otherwise remained isolated. The problems of coordinations faced by each department are made known to the company. They can arrive at a better means of doing things on such group discussions. It is therefore necessary to study the impact of ERP on all departments rather than restrict it to issues like "How will ERP impact the accounting profession"?

Impact on the organization as a whole: The ERP consultant will able to identify the flaws and guide the organization in devising better procedures. It helps organizations to adapt and adjust to change right from the implementation process.

Impact on Employment: It throws job opportunities to many individuals, whom the organizations hire at the implementation process. They even realize the need to retain them on permanent rolls once ERP goes full-fledged in the organization. The good news is that it gives another room of employment for the existing IT professionals in the country. They were able to update themselves on ERP modules and continue serving the organization in terms of enhancing user interface with ERP applications.

Impact on the nature of Job and information access: ERP has directly and indirectly helped to redefine functions in the organization. Anything that people

wanted to know about the company was available by a click of the mouse. There was no more relying on the department of internal communications even for single information. Outsiders don't have the hassle of obtaining permission and following stringent procedures to access information. IT has helped vastly and so it is not necessary to ask exclusive questions like "How will ERP impact the accounting Profession"?

Impact on the individual employees: ERP provided more freedom, authority and responsibility to the individual employees which were mutually beneficial to the management. Each employee became more aware of his/her function while ERP has given the confidence to execute it individually and successfully. Above all it resulted in transparency and accountability. The tasks of employees became totally independent as ERP succeeded in doing away the need of exclusive interdepartmental dependence in order to elicit information. This has resulted in easing the process of handling and answering customer queries and undertaking clientele orders.

Conclusion: A one phrase explanation for the impact of ERP would be "Simplifying Complex Process". One has to have an idea of the above issues which will help in understanding the impact of ERP on the role of managers.

IX. Reasons & Benefits

Many people say that ERP is the future, that it is completely necessary nowadays. The following are the reasons to implement an ERP software system in an organization.

Enhance productivity, flexibility and customer responsiveness: From quote to cash, an integrated business system helps you get product out the door faster. ERP gives you the tools to maximize the efficiency of business processes across the entire enterprise. Forecast demand to suppliers. Increase on-time delivery. Automate the shop floor. Decrease lead times. Increase order capacity. Make commitments you know you can keep.

*Enable new business and growth strategies:*Undertaking new business strategies requires an infrastructure that can handle the demands of an industry that is increasingly dependent on technology. Updating and integrating your business processes with an enterprise system enables you to take on more business and grow in new directions. Connect multiple plants. Take advantage of the Internet and wireless technology to connect to customers and partners. Introduce new product lines. Mobilize your sales force.

*Eliminate costs and inefficiencies***:** Using an enterprise system to standardize your business processes can dramatically improve your company's bottom line. Better resource management results in more inventory turns. Management of your vendor relationships reduces costs for purchased items. More efficient scheduling on the shop floor reduces downtime and overtime. Improved customer service leads to repeat business.

Expand your knowledge of key business data **:** An ERP system integrates all business management functions, eliminating contradictory information from disparate systems. Reports, graphs and charts on key business data can be automatically generated to provide a higher level of business performance visibility, with the drill-down capability into details behind the data that you've always dreamed of.

*Extend your business using the Internet:*Taking your business onto the Internet can give your company a competitive edge. Web-enabled technology allows you to access information, sell product, run business processes, and communicate with your customers and partners at any time and from anywhere in the world.

Help reduce operating costs: ERP software attempts to integrate business processes across departments onto a single enterprise-wide information system. The major benefits of ERP are improved coordination across functinal departments and increased efficiencies of doing business. The immediate benefit from implementing ERP systems we can expect is reduced operating costs, such as lower inventory control cost, lower production costs, lower marketing costs and lower help desk support costs.

Facilitate Day-to-Day Management: ERP programs are being developed and updated all the time. With so many different types on the market, companies should make sure they do due diligence and try out different packages before choosing one to use. Some of the programs even offer mobile capabilities so that you can always have a finger on the pulse of your business activities from your pda. With real time capabilities and the ability to be able to see what is going on with your company as it happens, ERP systems are handy when you deal with high volume. With an ERP system, your company will never have inventory shortages or wasted time spent transferring files. You can test out an ERP system before buying it and see how it will work with your business.

Support Strategic Planning: Strategic Planning is "a deliberate set of steps that assess needs and resources; define a target audience and a set of goals and objectives; plan and design coordinated strategies with evidence of success; logically connect these strategies to needs, assets, and desired outcomes; and measure and evaluate the process and outcomes." Part of ERP software systems is designed to support resource planning portion of strategic planning. In reality, resource planning has been the weakest link in ERP practice due to the complexity of strategic planning and lack of adequate integration with Decision Support Systems (DSS).

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Implementation of Electronic Customer Relationship Management in Banking

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Abstract - The Internet as a locomotive of the modern economy directly affects the work and operations of financial institutions. Thanks to the revolution of information and telecommunication technologies from the early nineties up until now, Web technologies as tools enable better implementation of the Customer Relationship Management (CRM) concept as a business strategy and they improve communication with customers aimed at collecting information about customers to increase their satisfaction and loyalty, making the relationship with them better, longer and more profitable.

The scope and purpose of this paper is the development of Electronic Customer Relationship Management (e-CRM) of banks based on the classical concept of CRM in banking operations, which are viewed through the prism of the key generators that affect the development of the concept. To be more exact, the research effort of this paper is focused on defining the architecture of CRM concept in general, the development from CRM to e-CRM, the analysis of conditions for the application of e-CRM, the benefits that are realized by applying this concept and implementation stages of e- CRM.

The results **confirm the positive impact of two factors, experience with computers and web technologies, which affect the implementation of e-CRM concept as a strategy in banking. In addition, the results confirm the role of digital points of contact and engagement of clients as a condition of e-CRM concept.**

I. INTRODUCTION

The main goal of any company's marketing activities is satisfaction of its end consumers' and business clients' needs. Whether it is a traditional business or e-business, companies should always take into account this fact. This distinctive feature of marketing is especially prominent in modern day business environment, where one of the basic parameters of successful business is the quality of the relationship with clients, whether they are buyers, suppliers or other participants in business procedures. Companies have to know the needs of their customers, their habits, desires, in order to increase their loyalty in dynamic market competition. There are various studies about the need to create customer loyalty and to retain existing customers, and almost all of them refer to the fact that it is necessary to spend much more time, effort and money to acquire a new customer than it is necessary to retain relationship with the existing one. The convergence of computer and telecommunication technologies improves the development of electronic networks and web sites. These web technologies help overcome many traditional problems connected with marketing services especially when the banks are concerned. Many authors examine websites in the context of integrated marketing that allows a greater understanding of the web as a commercial medium. In their research they (1) suggest that the advertising, sales and customer services over the web are main activities of e-commerce directed at consumers. In their research, they also (2) identified five points where companies can use the web as: market awareness, customer support, sales, advertising and electronic information service. There was also one more model of analysis and classification of e-business strategies proposed, (3) the one from a seller's perspective .The model describes four virtual business spaces: virtual information space, virtual communication space, virtual distribution space and virtual transaction space. I was also suggested (4) that the success of e-commerce will depend on site design, its modeling as an e-customer relationship management. CRM (Customer Relationship Management-CRM) is a business and communication strategy aimed at gathering information used to increase customers' satisfaction and loyalty, making the relationship with them better, longer and more profitable.

The knowledge of strategic marketing and internet technology is necessary for its successful implementation and the ultimate goal is to identify opportunities for establishing profitable relationships with clients, to form relationships and maintain profitable relationship with customers. As the banking industry and related markets inevitably come to the stage of maturity, clients have wider choice and are less loyal to one and the same bank. In order to avoid a price war, banks are left with only one option and that is to improve the level of their services, personalize them, so that the cost of switching to another bank would be unprofitable. CRM represents a key lever in the process of reorientation of the bank from organization -centric into customer-centric, and in that process, the most important part is the organization and analysis of the data and information through the Data Warehouse (Data Warehousing - DW), Data Mining (Data Mining - DM), Online Analytical Processing (On - Line Analytic Processing - OLAP) and Clickstream Analysis. The above mentioned methods are the main development directions of business intelligence. These

methods in interaction with appropriate internet marketing strategies and some other web technologies lead to constant improvements of bank websites through which it is possible to electronically manage client relationship.

II. DATA AND VARIABLES

A. *Research objectives*

The scope and purpose of this paper is the development of electronic customer relationship management (e-CRM) of banks based on the classical concept of CRM. Many authors suggest that the attitudes and motivations of consumers are the key factors which influence the acceptance of new technologies based on internet as a global service. Therefore, the objectives of this study focus on the research of:

- Engagement of clients as the basic precondition of e-CRM concept using web technology;
- The impact of demographic, psychographic and behavioral characteristics which affect the adaptation of e-business in the spirit of implementing e-CRM concept;

The methodology and research approach are based on qualitative and quantitative research. Qualitative research was conducted by surveying 128 people in four cities in Bosnia and Herzegovina from November 2009 to March 2011. The respondents were asked to answer the questions about the use of electronic banking. The questions in the survey are based on the use, attitudes and adaptation of citizens to e-banking and mobile banking as part of e-business activities which develop through the web and digital points of contact with customers through which e-CRM can develop. The comparison of attitudes of users and non-users of electronic and mobile banking relying on factors such as technology, safety, convenience, experience with online transactions, the possession of credit and debit cards are the digital points of contact with customers, and through them it is possible to implement the complete architecture of CRM and e-CRM concept. Guided by the architecture of customer relationship management Fig.1. main points for the development of e-CRM were analyzed through the following questions:

- Convenience of electronic banking;
- Simplicity of use of internet transactions;
- Access to the website of the bank;
- Location of internet access;
- The security of internet transactions;
- The use of debit / credit card;
- Experience with computers;
- Experience on the world wide web;
- Personal banking experience;
- Influence of reference groups

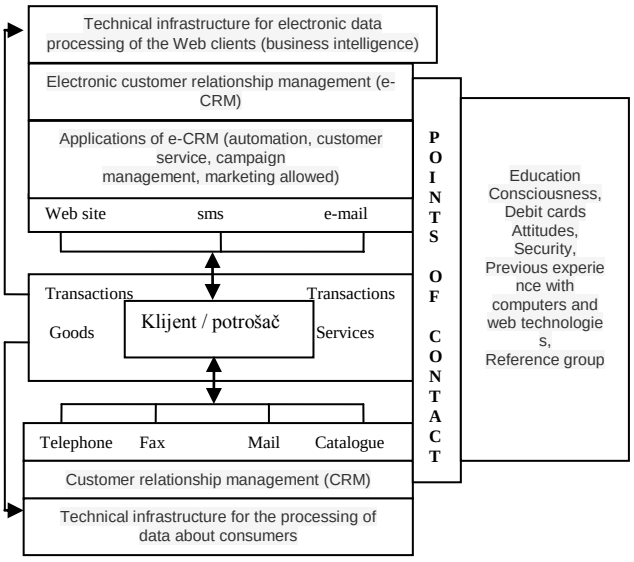

Figure.1. The architecture of customer relationship management

Source: Author's interpretation

The responses in the survey were evaluated by five points of Likert scale from Fully agree to Totally disagree. Data were collected by statistical random sampling technique and by analyzing the degree of interdependence of one and several factors - regression and correlation, t-test, using statistical software STATISTICA7.

The proportion of male and female subjects was approximately the same in this poll, with 53% male and 47% female respondents. Most responses were collected in the age group of 25-34 (participation in the survey, 57%) with secondary education (as employees 65%), age group 35-44 (participation in the survey, 20%) higher education (managers and senior managers 94%). The survey shows that a high rate of younger population has shown willingness to use the electronic banking services in comparison to older population who answered the same questions. One third of respondents are users of electronic banking (33%) of which 71% are male and belong to the age group of 25-34 years (71%). Factors and the current attitudes that affect the use of electronic banking as part of e-business are emphasized according to the basic issues that constitute the survey.

Education. The results have shown that education as a category does not significantly affect the use of electronic banking and the attitude on electronic commerce.

Consciousness. The Results of the survey pointed out confirmed differences between users and non-users of electronic banking in terms of their level of awareness about this banking service. The results have shown that people who do not use electronic banking, are not aware of what this service can provide. So, one third of respondents were aware of the benefits of electronic banking, while two thirds were not aware of the benefits that electronic banking can offer.

Owning credit / debit cards. The results have also shown and proven the difference between users and non users of electronic banking in terms of possession and use of debit / credit cards. Debit / credit cars are elements

which lead to use of more advanced electronic services such as Internet banking and Mobile banking.

Views of users and non-users of electronic banking. The views of users and non-users of electronic banking were compared on the basis of attributes that were identified in the literature as convenience, simplicity of use, service access from any place and at any time, trust, security and hacker attacks. Judging from the t-test, there were no significant differences, except in the categories of confidence and security. These factors have confirmed a significant difference between users and non-users of online banking.

Security. Hackers and fraud were a major obstacle in using electronic banking and online banking products.

Previous experience with web technologies and personal banking. Literature suggests that the previous experience with computers and new technologies preceded the positive banking experience which led to adaptation of online and mobile banking. The results have confirmed two factors, experience with computers and web technologies. T-test has showed and confirmed the differences between online banking users and non-users in terms of results that were based on previous experience with computers and web technologies.

The influence of reference groups. Respondents in one part of the survey were asked to evaluate the degree of the importance of reference groups, with five-points of Likert scale. The results showed that the reference groups did not have a major impact on the adaptation and use of online banking products as e-banking segments.

III. RELATIONSHIP OF CRM CONCEPT WITH OTHER MARKETING APPROACHES

A. Marketing and CRM concept

Building a long term relationship with customers is essential for sustainability of any business and the same is true for online business. During the last decades, the direct marketing, relationship marketing, one to one marketing and database marketing were combined to create a powerful new marketing paradigm. This paradigm is often called customer relationship management - Customer Relationship Management (CRM). Direct marketing provides marketing tactics for the delivery of marketing communications and sometimes the product itself to individual consumers. Relationship marketing theory is the concept about market sharing on the level of the individual. One to one marketing is a unique dialogue between companies and individual customers or customer groups with similar needs. Approach known as one to one marketing, in theory, is regarded as management on individual basis. But due to the cost of management relations at the individual level, many companies will apply CRM using approaches that automate services, develop relationships with specific clients or groups rather than with individuals. Today, adapted messages can be sent via e-mail, recommendations and promotions through the website. Delivering relevant messages includes companies in the development of long-term relationship with each client in order to understand better the customers' needs and then provide services that meet these individual needs. The interactive nature of the internet, together with e-mail communication provides an ideal environment in which relationships with clients can be developed.

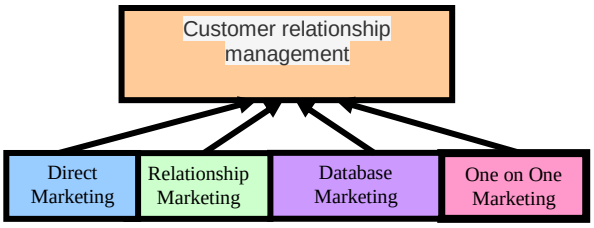

Figure 2 Relations between CRM and other approaches of marketing relationships.

Source: Dave Chaffey, Fiona Ellis-Chadwick, Richard Johnston, (2009), *Internet Marketing*, fourth edition Prentice Hall, pp. 330.

Marketing database predicts technological solutions, allowing access to the vast amount of data related to customers that enhance the strategic and tactical marketing opportunities. Databases provide the basis for storing information about the relationship and provide information for improvement of personalized services. This online approach to CRM is often known as electronic customer relationship management e-CRM. Customer relationship management (CRM) is an approach in building and maintaining long-term business contacts with clients.

IV. CHARATERISTICS, TECHNICAL INFRSTRUCTURE AND APPLICATIONS OF E-CRM

A. Basic features of e-CRM

E-CRM is based on the use of digital communication technologies to increase sales to existing customers and encourage further use of online services. Electronic customer relationship management involves plans on how digital technology and digital data can support the management of customer relationship management. Some authors argue that those engaged in e-commerce should follow this concept as the basis of their work because it provides adequate benefits. From the perspective of banks, benefits of e-CRM are reflected in, at least, three aspects, and those are:

- achieving greater cost efficiency,
- achieving wide customization of marketing messages
- improving and increasing the depth and wideness of relations with clients.

Achieving cost-effectiveness is evident in accessing client's address. Traditionally, targeting customers through the mail is often based on the mailing list which is prepared in accordance with the appropriate criteria, but that means that all clients are contacted in the target market. For example, companies that want to acquire new customers can use zip codes to target the area with the appropriate demographic structure, but population can vary within one postal district. The result of such targeting can be poor response rate, perhaps even lower than 1%. Internet has the advantage that the contact list can be created on its own through bank website visits where customers express interest in the products and

services. During the process, customers can register and leave their name and address. The website visit and content search indicate target customers. Thus, the concept of gaining new clients and establishing relationships is essentially different from the traditional concept of CRM because it involves attracting customers to the web sites, where the bank offers registration and it continues to maintain relationships with those clients.

Mass customization of marketing messages is achieved through technology that allows you to send customized e-mails at a much lower cost than direct mail and personalization, customization of web pages can be done to meet customers' requirements.

Improving and increasing the depth and wideness of relations with clients is based on additional information supplied when needed. For example, through their websites, banks may provide more information on financial trends in future periods, on investments both local and global. The nature of the relationship with clients may be changed through frequency of contact.

It is important to emphasize that e-CRM can not be separated from the traditional CRM, the two need to be seamlessly integrated. The CRM and e-CRM are not just about the technology and database, it is not just a process or a way to order some parts, they require a complete analysis of the client's culture throughout his life. Based on the variables which were examined in this study, we have come to conclude that three basic types of customer data should be considered and those are:

- Information on personal profile. This data include contact details and characteristics for profiling customers, such as age and gender (B2C), industry sector and individual roles in the purchase (B2B).
- Details of transactions. These data represent a record of each purchase-transaction, including purchases of specific products, quantity, category, location, date, time and channel where it was purchased.
- Data about communications. These data represent a record of customers who were targeted by the campaign.

B. Technical infrastructure and applications e-CRM

For e-CRM architecture, electronic technical infrastructure integrates requirements for customer relationship management through the use of bank website, quality management of e-mail lists, data mining, quality control and management of online customer service experience.

Using the site increases the number of bank clients and manages relationships with clients through the conversion from offline to online customers. Quality Management of e-mail list refers to the coverage of e-mail address and the integration of customer profile information from other databases, which allows targeting. Data Mining improves targeting and customizes the online services which are intended for the customers. Quality Management of Online Services Clients who make a certain transaction for the first time, should have a good experience in order to repeat it. Managing multi-channeled customer experience involves the use of different media as part of the transaction process in certain points of customer's life cycle. Basic e-CRM applications in banking are based on: sales force automatization (application of tools for organizing and recording site visits by clients), management of customer service (the representative in the contact center responds to customer requests based on internet accessed information data base, products and services, interests and previous queries), campaign management (management of advertising, direct mail, e-mail and other campaigns) Fig.1. Taking into account the record of site visits to banks by their customers, track of all transactions via electronic cards, result in one more key element of e-CRM concept, and that is customer engagement. Taking into account the rapid increase in fragmentation of online media, customer engagement in the implementation of online services or transactions is one of the leading elements in the implementation of e-CRM concept. To engage customers in an online context, it would be wrong to limit the understanding of engagement in the context of how much one spends time on the internet or turns into some other activity. An engagement represents a repeated customer interaction that fosters emotional, psychological or physical investment of a client in the product or the service. Client engagement has three parts that can be measured in online and offline form, such as participation, interaction and influence.

Participation is reflected in the visit to a particular website, time spent on the website, number of web pages visited etc. In our study participation as the first phase of client engagement is mirrored through the contact points with customers achieved on the basis of previous experience with web technologies, personal banking and attitudes of banking customers.

The interaction is formed by commenting on blogs, the frequency of reviews written on the website about a product or a service, comments about the service based on previous experience. In our study, the interaction has been confirmed as the second phase of the customer engagement through the use of web technology for online transactions.

The influence relates to measures which provide recommendations, content forwarded to friends, etc. In this study, the influence of reference groups is the third address, which is used to enhance customer engagement.

Permission marketing is a concept that supports e-CRM throughout customer's life cycle and as such, represents an application of e-CRM.

Permission marketing is a concept of marketing in which customers agree to be involved in the marketing activities of the bank, usually as a result of incentive. Consumers are usually bombarded with an average of 500 marketing messages per day, with occurrence of the internet and digital TV systems, this number has grown to over 3000 per day. From the point of marketing organization, this leads to dilution of effectiveness of messages which are sent by the company. Therefore customers pay less attention to the supply of companies, they lose patience and expect a

reward for their attention, time and information. In practical situations, we imagine that users / potential customers want to connect to the company via internet technology and to agree to accept further communication with the company, this approach is called an opt-in. Access to opt-in is a legal requirement in many countries. When customers / potential customers do not want to share information with companies and do not want to be part of the marketing activities of the company, such an approach is known as an opt-out. Selection of an opt-in communication is based on the client, because:

- the client selects content (news, information about products and services, events, etc.)
- the client determines the intensity of information received (daily, weekly, monthly, quarterly, annually),
- the client determines the channel through which to receive information (e-mail, direct mail, telephone, SMS),
- the client sets the text format (HTML or plain text).

V. CONCLUSION

E-business offers much more possibilities than the traditional business, as well as opportunities to create relationships with customers using the concept of CRM. It is true that this concept has its own uniqueness reflected in certain prejudices and a certain amount of uncertainty. The paper presented an example of just one segment of the customer relationship to CRM concept in the field of electronic banking which is also the most fertile ground for the development of e-business. The current electronic market in B&H is relatively small. The research shows that even in urban population use of e-banking is 33%. The findings from the survey show that the awareness of end consumers and business consumers in B&H about e-commerce is extremely small, viewed through the prism of financial industry. The finding also shows big difference in development of electronic commerce between B&H and EU. Consumers regard the use of e-business as risky, they fear hackers in particular, and frauds. There are also the questions of trust, use of plastic cards, awareness, experience with computers and experience with web technologies. In line with these findings, e-business in B&H must be developed in the spirit of applying standard and electronic CRM. The use of customer relationship management - CRM model using web technologies represents a fundamental advantage. CRM and e-CRM integration in the architecture of long-term business strategies of the company should give visible results in low costs, repeated transactions, the transition from offline to online visitors and becoming loyal customers of the company's online products or services. A key activity for the implementation of CRM model is to enhance client engagement through points of contact, both offline and online. Banks can influence the awareness about products and services and other elements that will improve retention of clients which is one of the main bases of efficient business.

In the future, the concept of CRM will be much broader and more comprehensive in order to keep pace with increasingly sophisticated clients, and clients who are willing to participate in creation of final products and services. This concept will be extended to manage relationships with consumer communities, suppliers, state, business partners and other organizations. Banks will have to consider options and strategies that will sustain in the market and be competitive at the same time, to achieve satisfaction of all parties in the relationship.

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Application of technical analysis on the Forex online trading (Case study)

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Abstract - Forex market (Foreign Exchange Market or FX) is the on-line market with a set of operations related to the purchase of one foreign currency for another. On the currency market pricing has a global character, as investors from around the world at the same time enter into on-line contracts primarily through brokerage platforms. Forex, unlike conventional stock market, has no particular limitations, so the trading of the currencies takes place on-line, literally in all places and at all times. Technical analysis (T.A.) is a form of market analysis of securities based on the study of price and trading volume in the past, with the aim of formulating a view on future developments. Using appropriate methods, the aim of technical analysis is to identify pricing trends in the stock market, futures or currencies.
The aim of this study was to analyze the real example, through a case study, and test the applicability of different methods of TA. Also, the aim was to analyze the effects of various methods measured through financial result – profit in the process of trading.

I. INTRODUCTION

Forex market (Foreign Exchange Market or FX) is an online stock exchange, where supply and demand for foreign currencies is met, i.e. where foreign currencies are sold to participants [1]. Forex is characterized by a large number of participants, a lot of different types of currency trading and non stop working hours during working days. Large number of participants and continuous operating hours provide high liquidity of the market. Participants in this market are large commercial banks, investment funds, insurance and pension funds, individual investors. Due to the size of individual transactions and high financial requirements, until recently, the currency market was not available to "small" investors, so the trade was made between banks, dealers, and occasionally large speculators. Today, with the help of leverage, one can enter into the large positions with a relatively small amount of capital, so this market has become more liquid than ever and available to large numbers of participants [1, 2]. The Forex market currencies are traded in pairs, each pair consisting of two different foreign currencies. The dollar is the most traded currency. Regardless of whether buying or selling, the dollar participates in the 89% of all transactions in the foreign exchange market. The euro is the second most traded currency with 37%, while the yen is in the third place with 20% [3, 4].

There are different types of analysis of market trends [5, 6, 7]. In this paper, the technical analysis is applied to Forex market data.

The aim of this study was to test the specific examples of all methods of technical analysis, and the comparative analysis in the real trading. Special emphasis in this paper is placed on an active approach to Forex, in the long run, and with no discontinuity. The effect of all types of the results to individual decisions will be explained in detail in the paper.

This paper is organized as follows: After introduction, in second section is explained purpose of technical analysis and shown five methods that we used the most in our case study for the recognition and use of price formation. In this section we analyzed the basic terms for trading in the Forex market, such as time of trading, the calculation of rates and types of orders. Third section brings our journal of trading, where is demonstrated difference between used methods and realized profit based on it. We presented daily trading, in which the practical knowledge of technical analysis is applied to trading in Forex. We offered our opinion concerning electronic trading on the stock markets and technical analysis in general. The forth section is reserved for conclusion and future research.

II. TECHNICAL ANALYSIS

Technical Analysis (TA) is a form of market analysis of securities based on the study of price and trading volume [7]. Using appropriate methods, the aim of technical analysis is to identify pricing trends of the stocks, futures or currencies [8]. TA analysis is a process based on the past prices of stocks, futures and currencies, with the aim of formulating a view on future developments. Technical analysis is based on the assumption that all the information from the previous period is relevant to the behavior of the participants, and can be used in the present and future. TA concludes that the future behavior of market participants can be drawn from their behavior in the past [9, 10].

Although there are many technical analysis tools used in the Forex market, this paper describes those who are considered "important" and are commonly used in TA. It is very important that the analysis of the market is reduced to a small number of important tools, because their excessive number may offer misleading, giving a large number of false signals. The aim of TA is to give a

clear picture of price movements in short time, avoiding the use of complicated and complex methods based on mathematics. The reason for this approach is that financial markets are very dynamic, changes occur in short periods of time, and speed decision-making is of great importance.

Technical analysis is quite subjective and open to different interpretations. Although the interpretation of the charts is a standard, if two different technical analysts are watching the same chart, they will often see different shapes and draw different conclusions. They will, in their own way, have a logical explanation for everything that is happening, but they will make their conclusions in different way [1, 6, 9].

The main disadvantage of technical analysis is that it is often delayed, because while we analyze a trend there is a possibility that its greater part has already passed, thus changing the relation between risk and earnings. The other thing is the reliability of indicators, which in different range of currency pairs and different time periods do not show the same results. What is the most important is to track market trends with the use of standard indicators. This is used by most retailers, and it allows to predict in which direction the market is going and to facilitate decision making [5, 7].

In this work, the following formations and methods were used. Firstly, we used formations of trend changes and formations of trend extension. Formations of trend changes that were used are: Head and shoulders, Jump start strategy, two-peak formation, double bottom, triple peak and triple bottom, rounded top and rounded bottom. The used formations of trend extension were: Symmetrical triangle, Ascending triangle, Descending triangle, Flag formation, Pennant formation, Signal 1-2-3 formation. Than, the Gaps were analyzed. Afterwards, we used Japanese candlesticks formations: Japanese candlesticks, Long day, Short candle, Marubozzu, Spinning Tops, Doji, Hammer and Hanging Man, Engulfing formations, Harami, Morning Star, Evening Star, Three White Soldiers [11, 12].

Fibonacci method was used, as well as Elliott wave analysis. Indicators of future price movement that were used in the study are: Moving Average, Exponential Moving Average - EMA, Bollinger Bands, MACD, Relative Strength Index (RSI), Parabolic SAR, The Average Directional Index ADX and Stochastic Indicator [11, 12].

2.1. The most used TA methods

In our research we used more than ten different TA methods, but the next five are the most used. These methods are explained in short:

a) Head and Shoulders

Head and shoulders formation is very famous one. It can be recognized by the following movements in the market: "The primary trend" - it is very important to define the primary trend in its growing. If this first trend is not recognized, we should not expect the formation of the contours of the head and shoulders. “Head and shoulder” formation in real trading of the currency pair EUR / USD is shown in the Figure 1.

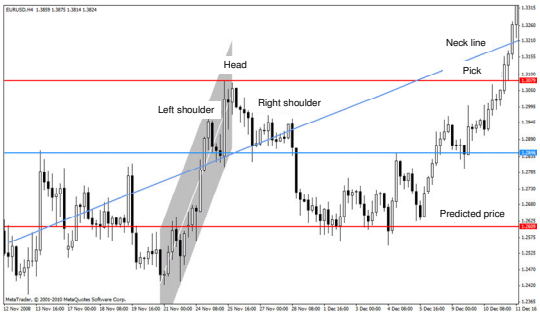

Figure 1. Head and shoulders formation, shown in real trading EUR / USD

“Left Shoulder" - during the uptrend, the price reaches the peak at one point and then begins to fall, forming a left shoulder contours. However, the fall in prices during this period does not jeopardize the primary trend. "Head" – from the lowest point of "left shoulder" a sharp rise begins, to the highest point where the performance of the primary trend breaks: this is top "head". After reaching the peak, the price suddenly drops breaking through trend channel, to the lowest point, which is in the bottom level of "shoulders". That point also represents the starting point of the "right shoulder" and it can often dramatically threaten the primary trend.

"Right Shoulder" - is another cost recovery, but its peak is lower than the top of the "head," and most often can be found at the top level of the “left shoulder."

"The neck line" - a line in the graph drawn by connecting the two lowest points of the break between the shoulder and the head. This line can have a positive or negative slope, or it may be horizontal.

”Scope” – is a mandatory part of this outline. It can be measured using indicators or one can only analyze the amount of volume; ”Break of the neckline” - the "head and shoulders" formation can not be considered complete, up to the moment of completion of a declining trend while the right shoulder does not break the neck line. The support line transforms into the resistance line - and that happens after the “break of the neckline".

”Price target” - after breaking support line ("neckline") the planned price decline will be revealed by measuring the distance between the "neckline" and top "head". This distance is then subtracted from the "neckline" in order to obtain the lowest expected price.

b) Pivot line

Pivot lines are used to identify important support and resistance levels. Pivot line and its levels of support / resistance are areas where the changes in the direction of prices can happen. They are particularly useful for "short-term” traders who wish to take advantage of small changes in price. Pivot lines can be very useful, since many currency pairs generally vary between these levels. Pivot line is used by traders who trade in the range-bound, as well as retailers who are waiting for breakout of the market. When trading in a range, a trader uses

pivot line to identify sharp trade points, and then places an order for purchase near the line of support, as well as an order for sale near the line of resistance.

Every day, the market has an opening price, closing, highest price and lowest price for the day. These are the basic information needed to calculate the pivot levels, Figure 2. Since many traders follow pivot levels, the market often reacts to them. This gives us the opportunity for successful trading.

Figure 2. Trading with Pivot line

Advices for trading using the Pivot lines are as follows:

- If the cost is at PP, expect a move to R1 or S1
- If the price is at R1, expect movement to R2 or back towards PP,
- If the price is at S1, expect movement in S2 or back towards PP,
- If the price is at R2, expect movement on the R3 or back towards R1,
- If the price is at S2, expect to move back to S3 or S1,
- If there is no significant impact of news on the market, the price will usually move from PP to S1 or R1,
- If there is a significant impact on the market news, prices will go through the R1 or S1, and will reach or R2 or S2, and even R3 or S3,
- R3 and S3 are a good indicator for the highest achievement during the volatile days but can occasionally be exceeded,
- Pivot lines work well on the "sideways" markets because prices will be most likely in the range between the R1 and S1 line.

In addition to a strong trend, prices will fly through the pivot line and will continue to move forward.

c) Channel

Forex trading in a channel occurs when the price over time oscillates between two parallel lines that are formed around the trend, Figure 3.

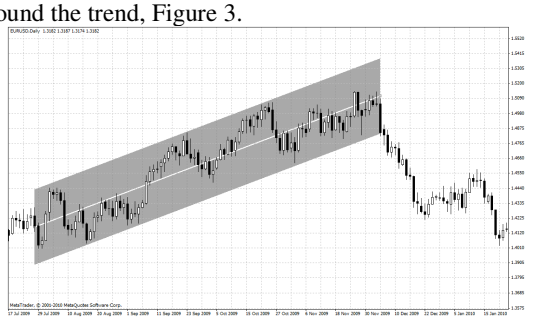

Figure 3. The formation of channels and the movement of prices in the channel.

When the price touches the line of resistance (upper line of the channel), it can be used to enter into the short position, ie. selling. Otherwise, if the price touches the support line one should enter into the long position, i.e. purchase because we expect that the price will grow.

d) Gap

Gap is an empty space between two neighboring candles. The upper gap occurs when the highest price in one period (High) is lower than the lowest price in the next period (Low), while the lower gap occurs when the lowest price of the first period is higher than the highest price in the next period.

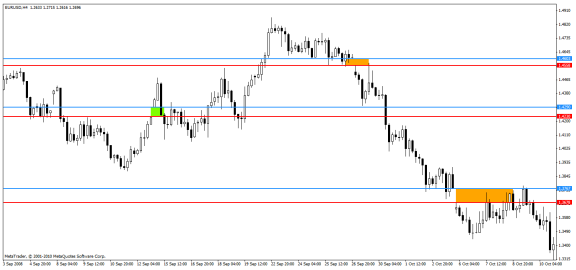

Figure 4. The gap in real trading

It should be noted that one of the rules for trading currencies is that each gap tends to close with a probability of 80%. In Figure 4, examples are shown for the upper and lower gap, and its complete "closing" in the future, in two of the three cases, for the currency pair EUR / USD.

e) Fibonaci

Italian mathematician Fibonacci became famous when he discovered a simple series of numbers that create indicators for describing the natural proportions of the Universe. These indicators derive from the following sequence of numbers: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89,144… Each number represents the sum of the two preceding numbers: 1 +1 = 2, 1 +2 = 3, 2 +3 = 5, 3 +5 = 8 and so on. Properties that we observe in Fibonacci numbers are as follows:

• If we divide any number from that row with the following number, we will get the result of a number of 0.618. For example, if we divide 34 by 55, we get the result 0.618.

• If we divide every second number, we will get the result 0.382. For example, if we divide 34 with 89 = 0.382. These indicators are called the "golden mean".

Exactly these indicators are important when using Fibonacci levels:

- Fibonacci Retracement levels: 0.236, 0.382, 0.500, 0.618, 0.764
- Fibonacci Extension Levels: 0, 0.382, 0.618, 1.000, 1.382, 1.618.

Fibonacci Retracement levels are used by traders as a place where their position will be opened for trading. Retracement Fibonacci levels act as support and

resistance levels, depending on whether the main trend is increasing or decreasing, Figure 5.

Figure 5. Rejection rates from one of the Retracement levels

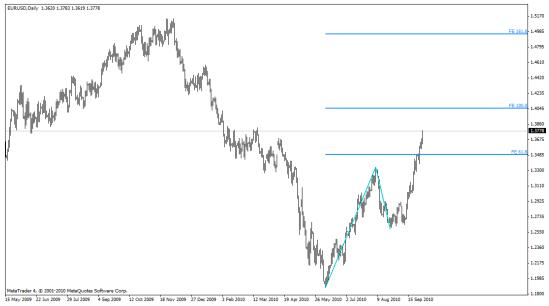

Figure 6. Assessment of Extension level of reached price

Fibonacci Extension levels are used to define levels for gaining a profit, or as a place where the trend is expected to stop, Figure 6. Extension levels are equal in their importance with Retracement levels, because if the trader fails to close the position in time, it risks losing the gain that came from a well-chosen Retracement levels.

III. JOURNAL OF TRADING

The practical application of knowledge of TA is shown in the following Journal of Trading. The diary was made between 1.11.2010. and 02.12.2010. and is mostly linked to the currency pair EUR / USD. After initial growth, which is a logical continuation of the upward trend in October, a large depreciation of the euro followed against the U.S. dollar (about 1200 pip) with a slight consolidation of the market during the mid-month. During trading it was observed that the price movement often does not follow the given pattern. Price was often stopped on the pip or two of taking profits or immediately after the opening position and then changed direction, making less profit or even a loss. Afterwards, the line is strongly pushing its way to taking profits and went far beyond the level that we set forth. Tables I-VI show data from the above mentioned currency trading based on different TA methods.

TABLE I. TRADING WITH PIVOT LINES – PIVOT LEVELS, CHART: 5 MIN, TYPE: BUY LIMIT.

Opening		S / L	Closing	
Time:	9.11.2010 9:50	1,3890	Time:	9.11.2010 10:09
Price:	1,3900	T / P	Price:	1,3918
Volume:	1 lot	1,3918	Profit:	18 pips

The trading platform used in on-line trading was MetaTrader 4. The total number of orders was 38. Currency pairs for trading were mostly EUR/USD, and AUD/USD. In the following section, we will show some of the trading orders, technical analysis applied to those orders, and profit/loss statements, Tables I-VI.

TABLE II. TRADING WITH FIBONACCI LAVELS – CHART: 5 MIN, TYPE: BUY.

Opening		S / L	Closing	
Time:	9.11.2010 12:02	1,3947	Time:	9.11.2010 13:07
Price:	1,3961	T / P	Price:	1,3947
Volume:	1 lot	1,3973	Profit:	14 pips

The market experienced a sharp jump after which a mild fall appeared, and then rise again. By using Fibonacci levels we determined the price growth and its stopping at 1.3976. As a profit point we put the level of 1.3973. Price has reached 1.3972 and came back, activating the S / L, Table II.

TABLE III. TRADING WITH MACD – CHART: 5 MIN, TYPE: SELL.

Opening		S / L	Closing	
Time:	4.11.2010 23:18	1,4221	Time:	4.11.2010 0:02
Price:	1,4213	T / P	Price:	1,4221
Volume:	1 lot	1,4207	Loss:	8 pips

We observed downward 1-2-3 formation, confirming with the MACD and ADX indicator, where the sellers are predominant. The price was, in a few moments, very close to T/P line, but it was not touched. This was followed by a sudden rise in the price by about 40 pips at 1.4250, which led to the loss, Table III.

TABLE IV. TRADING WITH HEAD AND SHOULDERS – CHART: 15 MIN, TYPE: SELL.

Opening		S / L	Closing	
Time:	24.11.2010 22:41	1,4221	Time:	2.12.2010 14:59
Price:	0,9816	T / P	Price:	0,9706
Volume:	0,1 lot	0,9525	Profit:	110 pips

For trading was used the currency pair AUD / USD. On hourly chart formations were observed head and shoulders, while the 15minuts chart formed symmetrical triangle. We have waited for the breakout of the triangle on the bottom of the confirmation of a downward trend. After breaking the bottom line, there is a strong trend of continuation, and the S / L moved to 0.9706. In a period of several days, price has reached a level of 0.9538 (only 13 pips from the T / P) and the price has then returned in a different direction and at the level of the new S / L the account was closed, Table IV.

TABLE V. TRADING WITH DOUBLE TOP FORMATION , CHART: 5 MIN, TYPE: SELL.

Opening		S / L	Closing	
Time:	24.11.2010 16:25	1,3367	Time:	24.11.2010 16:50
Price:	1,3367	T / P	Price:	1,3352
Volume:	2x 0,5 lot	1,3335	Profit:	15+13 pips

Double top formation, the account was opened on the size of one lot. At the level of 1.3352 half of the orders were executed, and half have been left to possible activation by T/P. Price has failed to achieve projected value, so the account was closed at 1.3355, Table V.

TABLE VI. TRADING WITH MACD – CHART: 5 MIN, TYPE: BUY.

Opening		S / L	Closing	
Time:	1.11.2010 1:49	1,3962	Time:	1.11.2010 1:49
Price:	1,3972	T / P	Price:	1,3978
Volume:	1 lot	1,3978	Profit:	6 pips

MACD line crossed the slow signal line, joining the Long position. S / L set to the previous five-minute minimum. T/ P below the R2 pivot line, Table VI.

The overall results are shown in Table VII-IX, and in Figure 7. In Table VII, the data from the online trading on Forex is shown; while in Table VIII the success rate is shown. Taking the total number of 38 orders, maximum loss and profit per unit of trading is shown in Table IX. Of 38 positions, the 32 completed as positive with a gain of 622 pips, the other 6 positions have brought a loss of 70 pips. Profit at the end of monthly trading was 552 pips.

TABLE VII. THE TOTAL NUMBER OF TRADING OPERATIONS.

The total number of positive tradings:	32	622 pips
The total number of negative tradings:	6	70 pips
Sum:	38	552 pips

TABLE VIII. SUCCESS RATE.

Position Type	Number	Success rate
Long positions:	14	71,42%
Short positions:	24	91,66%
Total:	38	84,21%

TABLE IX. MAXIMUM LOSS AND PROFIT PER UNIT OF TRADING.

The maximum loss on a single trading:	-18 pips
The maximum gain on a single trading:	110 pips
Average trading:	14,53 pips

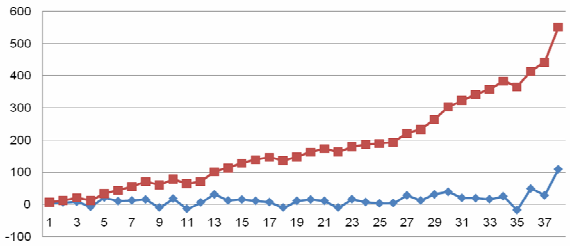

Figure 7. Journal of Trading; Blue line - number of pips per trading; Red line - total number of pips.

In Figure 7, the course of trading is graphically presented, with parallel changes in the number of earned / lost pips, for summary and individual trading (number of pips per trading and the total number of pips).

IV. CONLUSION

In this paper is presented implementation of the several Technical analysis methods, based on real environments. All trading was realized on Forex online trading, during one month.

The journal of trading was made between 1.11.2010. and 2.12.2010. and its mostly related to the currency pair EUR / USD. After initial growth, which is a logical continuation of the upward trend in October 2010, a decline in the value of the euro against the U.S. dollar happened (about 1200 pips) with a mild consolidation of the market during the mid-month. During trading it was observed that the price movement often takes place with the specified pattern. Price sometimes stopped for a pip or two of taking profit, or soon after the opening position, and then changed direction, making less profit than expected or even a loss, while others put a strong line break to take profits and went far beyond the traced level.

In the opening of positions, the most attention was given to recognize the formation and continuation of a trend change formations, pivot lines, gaps, Fibonacci levels and the use of standard indicators, and a choice between market and entry orders. When closing the position, depending on the situation, a combination of Stop Loss and Take Profit orders is made, and in some situations where an estimated price movements could increase in the expected direction, we set Trailing Stop (of the size in the most appropriate time). The profit at the end of monthly trading of 552 pips shows that TA can be very useful for making decisions on the Forex online trading.

Our future work will be addressed to more intensive research based on some new methods, and comparison between different methods from the point of efficiency.

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Information Technology Adoption and Implementation in Small and Medium Enterprises

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Abstract - Small and medium enterprises (SMEs) have great impact on economy of every country and small business sector is one of the fastest growing sectors of the economy. SMEs are becoming more dependent on information technologies (IT) for their operations. IT is a form of organizational resources that can be transformed into a valuable, rare and not easily imitable asset. The asset then makes the base of competitive advantage and high business performance. Researches in IT implementation have primarily focused on large corporations, but results of the researches may not be fully applicable in small and medium enterprises and there is a need to investigate specificity of IT adoption and implementation in SMEs. Therefore, this paper researches the most important issues and challenges in adoption and implementation of information technologies in small and medium enterprises. Also, the paper treats problems of adoption, implementation and use of groupware technology.

I. INTRODUCTION

Small and medium enterprises (SMEs) make a great part of economy in every country. For example, in the United States, SMEs make 99.7 percent of all firms and employ 60-80 percent of new employees annually, over the last decade. Also, in the USA about 600,000 new SMEs are established each year, although more than 500,000 existing SMEs are closed. The crucial question for SMEs is how to survive in today turbulent environment and competition. [1]

In comparison with large companies, SMEs have limited resources and little influence on the market. Their survival depends on their ability to take full potential of the resources and adapt quickly to market changes. IT is a driver of operational flexibility and competitive advantage, and may help SMEs to be more flexible, to survive and succeed. Also, information and communication technology (ICT) infrastructure is deemed important in supporting operational, tactical and strategic goals of enterprises.

However, many studies showing the positive effect of IT resources engagement on enterprise performance have been conducted in large US-based firms. Small number of researches have been focused on use of information and communication technologies in SMEs and the issues related to IT adoption and implementation in SMEs. IS (Information Systems) theories and practices developed for large organizations may not be fully applicable in small and medium enterprises. Challenges, opportunities, and management issues of IT implementation in SMEs are unique and deserve special attention of research community.

Considering the need for new researches in that specific field of IS, the paper has a focus on adoption and implementation of IT in SMEs with brief view to groupware technology. The paper is organized in five sections. In the second section, prior researches on IT implementation in SMEs are briefly presented. In the third section, a model of IT adoption and implementation in SMEs with factors influencing on the adoption and implementation are described. In the fourth section, the main issues in implementation and use of groupware technology in SMEs are analyzed. The final section is dedicated to concluding remarks.

II. PRIOR RESEARCHES ON IT IMPLEMENTATION IN SMES – A BRIEF REVIEW

Information technologies can improve enterprise business performance and competitive advantage. This is particularly a fact if enterprises use IT on innovative way to compete with their rivals. However, adoption and application of the new technologies is a very complex and difficult task. As we previously mentioned, a great number of studies and researches is dedicated to IT adoption and implementation in large enterprises, but studies of IT implementation in small and medium enterprises are very rare. In addition, small and medium enterprises have specific attributes influencing process of IT implementation that requires special attention and investigation.

SMEs differ from large enterprises in many aspects. For example, large firms have greater scope of operation and compete in diverse markets, have a better ability to allocate IS development costs on larger units of production, and have internal IS development technical staff. All the aspects and attributes typically are not related to SMEs.

On the other hand, SMEs have their own specific attributes. For example, in small enterprises, decision making is centralized in one or two persons, bureaucratic procedures are minimal, standard operation procedures are not well established, long-term planning is limited, and there is greater dependence on external services for IS operations. Therefore, the problems and opportunities in SMEs considering IS implementation are unique and require a special focus.

Traditionally, SMEs have been the slowest in adopting modern information technologies. Large enterprises make high level of investment in hardware, software, hiring and training IT professionals. SMEs usually lag behind large firms considering adoption and implementation of advanced IT products. However, the decreasing cost of storage and processing hardware and the increasing number of software applications designed for SMEs eliminate barriers that prevent SMEs from adoption of new IT. In recent years, SMEs invested a significant amount of resources in IT implementation.

A recent survey [2] shows that IT environments of SMEs are no longer based only on desktop PCs. Over 75% of SMEs have more than one server and the majority of SMEs have distributed IT infrastructures. Also, the literature on SMEs suggests that the enterprises can make benefit from using IT. For example, IT enables SMEs to manage better their customer bases, keep information about customers in a more organized manner and also share knowledge within the organization more efficiently. Other benefits of IT that SMEs can achieve include: cost reduction, improved profitability, better customer service, enlarged market scope, and tighter interorganizational relationships with trading partners. Information communication has become an important factor of success in the Internet age. Communication technologies such as e-mail, the Web, interorganizational systems (IOS), and electronic data interchange have dramatically changed business processes.

A common theme in many studies about IT implementation in SMEs is the importance of contextual and organizational factors in achievement of business success. The studies try to find answers to following questions: What kinds of organizational, contextual, and other factors influence IT success in SMEs? What makes one enterprise more innovative compared with other enterprises? For example, there is some evidence that the organizational size is just one important factor in making a firm innovate and adopt new IT. [3]

There are several investigations that explore the factors influencing the adoption of communication technologies in SMEs. One investigation [4] evaluates the impact of six factors (perceived usefulness, cost, compatibility, top management support, competitive advantage, and size) on the adoption of communication technologies. Data is collected from 207 firms and the results of data analysis reveal that competitive advantage, top management support, and size are important determinants of adoption of communication technologies.

A study [5] of drivers of IT adoption in 188 small retail businesses reveals that owner's perceived relative advantage and firm's willingness to innovate have an impact on potential IT adoption in SMEs. In another study [6], authors investigated factors that affect IT success in SMEs. Examination of 150 SMEs have showed that respondent's awareness of IT and attitude toward IT are critical factors in their use of new IT.

Mentioned research [3] analyses factors that determine conditions for Electronic Data Interchange (EDI) implementation. Research question in the research is: Under what conditions SMEs are likely candidates for the information technology implementation? The four distinct factors influencing on the conditions are: internal/external business and technological environment, organizational readiness and trading partner support, financial impact, workflow productivity. Although the research is related to the specific IT, the four factors are clearly robust and could potentially be applicable to any information technology implementation in the small firm context.

In next section, we try to define a comprehensive and integral model of IT adoption and implementation in SMEs. The model shows the four major domains or layers with all important factors influencing IT adoption and implementation.

III. A MODEL OF IT ADOPTION AND IMPLEMENTATION IN SMES

The four major domains or different layers influencing adoption, design and use of information technology are: individual domain, technology domain, organizational domain and environmental domain [7]. The main goal of information technology adoption and implementation in an organization is to enable employees to complete various work tasks. Primary elements in the domain are the individuals and the tasks that need to be completed. The technology domain at the next layer provides the tools and information for the individuals in order to do their work tasks. The information technology is implemented in the specific organizational context. Thus, various characteristics of the organization influence IT adoption and implementation. The organizational context is deemed a domain separate from individual domain. Organizations are described as a collection of individuals working to accomplish a business objective with a common set of rules, procedures, and value systems. Collective vision and belief regarding information systems of organization may not be the same as that of the individuals within the organization. Because of that, there is a need to differentiate the organizational domain from the individual domain influencing adoption and implementation of IT. The final domain in IT adoption and implementation model is external environment. Organizations react to the environment by innovations in data processing and analyzing in order to compete in the marketplace. Model of IT adoption and implementation with four domains and all factors influencing the adoption and implementation in SMEs is shown on figure 1.

Individual Domain. It is difficult to describe clearly the effect of individual characteristics on IT implementation because the technology is implemented across multiple individuals. Individual factors such as demographics are useful in studying individual-level IT implementation. There are many various demographic factors such as education, job tenure, cognitive style, and IS expertise and experience that influence IT adoption and implementation. Also many studies have researched user involvement and user training as factors of IT implementation success. Some studies considered these factors as an individual variables while others considered the factors at the organizational level. The context of the study determines which approach (individual or organizational) will be accepted [8].

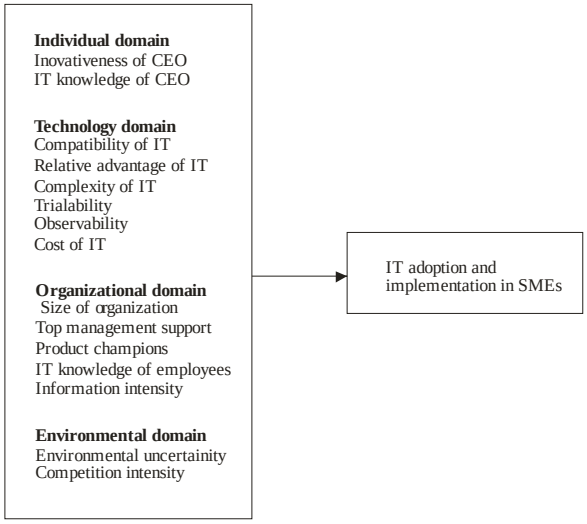

Figure 1. Model of IT adoption and implementation in SMEs

In a small and medium organization, CEO (Chief Executive Officer) is usually the owner of the organization and the main decision maker. Therefore, characteristics of CEO are essential in decision making on adoption and implementation of IT. Technological innovations and changes depend not only on factors such as business size or market forces, but also on the abilities and preferences of CEO. CEO can belong to two groups of managers: adaptors and innovators. Adaptor searches for solutions that have been already tried and understood, while innovator seeks solutions that have not been tried and that are risky. CEO willingness to innovate in IT domain impacts on the other members of organization to adopt easily new technological innovation (for example, new software application, new hardware device, new procedure in data processing etc.)

Second characteristic of SME's CEO influencing IT adoption is his or her technical knowledge. The lack of necessary skills and technical knowledge can be a serious obstacle to IT adoption and implementation. Overcoming of the obstacles will lead to greater likelihood of the innovation adoption. CEOs in SMEs often lack basic knowledge of IT and consequently they are not aware of IT potentials. Education of these CEOs about the benefits of IT will lead to greater readiness for IT adoption.

Technology Domain. Innovation/technology characteristics are very important factors influencing IT adoption/diffusion in an organization. An individual forms an opinion toward the innovation on basis of the characteristics. The opinion leads to adoption or rejection of innovation and, if the decision is to adopt, the implementation of innovation will be done. The perception of the potential adopter toward an IT is the main determinant of the IT adoption.

Tornatzky and Klein [9] identified three variables that are related to IT adoption: compatibility, complexity, and relative advantage. Other studies [10] have also included other variables such as cost, trialability, and observability *Compatibility is* positively related to adoption of an innovation. Compatibility is the degree to which an innovation is consistent with the existing values, past experiences, and needs of the receivers. Compatibility has organizational and technical aspect. Organizational compatibility means that the innovation should be compatible with the organization's values and beliefs, while technical compatibility is related to work practices and system interfaces. If the IT is compatible with existing work practices and existing software/hardware products, the SME is more likely to adopt it. *Complexity* is the degree to which an innovation is perceived as relatively difficult to understand and use. Ease of use of computer systems is positively related to adoption of innovation, while the perceived complexity of the IT has negative effect on decision to adopt the IT. Technology acceptance model (TAM) is often used in studies of the impact of ease of use (or complexity) and perceived usefulness (or relative advantage) on IT adoption and usage. *Relative advantage* is the degree to which an innovation is perceived as better than previous solution. This factor from technology domain is positively related to IT adoption. The positive perceptions of the benefits of IT make an incentive for a SME to adopt the innovation. *Trialability* is the degree to which an innovation may be experimented, while *observability* is the degree to which the results of an innovation are visible to others. However, trialability and observability are factors that are hard to measure. Finally, the *cost* effectiveness of the innovation is a significant variable in analyzing IT adoption and implementation.

Organizational Domain. The impact of various organizational factors on IS implementation is obvious because most of information systems are implemented in an organizational context. The organizational factors that are important to study are: degree of top management support, existence of a product champion, organizational size, IT knowledge of employees, information intensity and communication channels. We have already mentioned user training and user involvement which can be individual factors and organizational factors as well.

Top management support and commitment sends strong signals within the organization, reduces or eliminates political barriers in IT adoption and provides resources for IT implementation. *Product champions* play a critical role in propagation of the innovation to the decision makers, developing an implementation plan, facilitating resource allocation, and removing barriers to implementation. Considering the impact of *organizational size* on IT implementation there is a threshold level beyond which size is not an important factor. Larger organizations have more resources and technical expertise to facilitate IT implementation. However, they have more bureaucratic practices and resistance to change that smaller organizations may not have. Small businesses have scarce of resources because they operate in following conditions: a highly competitive environment, financial constraints, lack of professional expertise and high pressure of external forces. These unique conditions cause constraints on financial resources, a lack of internal technical expertise and a short-range management perspective. Consequently, SMEs face more obstacles to adoption of IT than large organizations. Even among SMEs, if an enterprise is larger, it is more able to hire people with specialized skills, such as knowledge of IT. In

addition, larger enterprises have more potential to use IT than smaller enterprises, because of their larger scale of operations

IT knowledge of employees in a SME has positive effect on IT adoption and implementation, but SMEs usually have lack of specialized IT knowledge and technical skills. Problems with developing the necessary skills and technical knowledge may cause that SMEs postpone adoption of the innovation until they provide sufficient internal expertise. Thus, if employees of SMEs have IT knowledge and skills, the enterprises are more willing to adopt IT. The degree to which information is present in the product or service of enterprise reflects the level of *information intensity* of that product or service. Similarly, we can measure information intensity of business processes by determination of degree to which information is present in business processes of an enterprise. SMEs in more information-intensive sectors are more likely to adopt IT than those in less information-intensive sectors. For example, financial organizations like banks and insurance companies are more information-intensive, because their main functions are related to processing of financial information. Greater information intensity can make CEO of a small enterprise to think of IT as the main competitive weapon and that increases probability of IT adoption. Finally, the use of various *communication channels* to get information for adoption is a significant factor that impacts on IT adoption/diffusion.

Environmental Domain. Environmental factors have emphasized the use of IT to gain competitive advantage. The growth of interorganisation information systems (IOS) extending organizational boundaries draw attention on the impact of environmental factors on IT implementation. Users of IS are not only internal staff audience, but also organization's customers, suppliers, and other trading partners. Hence, many studies have examined the impact of competitive advantage in initiating the implementation of IOS, the role of interorganizational dependence and power on adoption of these systems. In most cases, the powerful trading partner influences IT implementation. Researchers have also examined the role of incentives and the transaction climate between the trading partners in facilitating the implementation of IOS [11].

Generally speaking, competition increases probability of innovation adoption, because strong rivalry between enterprises pushes the enterprises to be innovative. Intense competition leads to environmental uncertainty and increases need for innovation and rate of innovation adoption. By adopting IT, enterprises will be able to compete in three ways. *First*, IT can change industry structure and thus changes the rules of competition. *Second*, IT can give enterprises new ways to outperform their rivals and thus creates competitive advantage. *Finally*, enterprise can create new business from existing IT operations. Small or medium enterprises in more competitive environment have greater need to adopt and use IT in gaining of competitive advantage. On the other hand, a small enterprise in less competitive environment is not pushed to be innovative.

IV. IMPLEMENTATION AND USE OF GROUPWARE IN SMES

Groupware technology supports group of users working on common tasks, processes and projects. Groupware has some specific attributes which make it different from traditional IT. *First*, groupware technology is not so expensive. There are low cost solutions and even free technologies (e-mail, repositories, etc.). *Second*, groupware technology is complementary and has a supportive role because groupware adoption is parallel to the normal work flows. These two attributes make groupware affordable for SMEs. *Third*, groupware technology is versatile, because implementation and use of the technology depend on the meaning that users give to it and its characteristics which they emphasize and use.

Groupware is collaborative technology that plays a key role in knowledge management. Table 1 shows a classification of groupware technologies that categorizes the technologies in two types: systems supporting information exchange (ECS - electronic communication systems) and systems that support group of users constituting a team (teamwork systems). The aim of the first category of systems is to make the relationship between individuals or organizations easier. The aim of the second category of systems is to integrate information in work processes that have been previously defined. The systems make automation of defined work flows [12].

TABLE I. CLASSIFICATION OF GROUPWARE

Category of groupware	**Electronic Communications Systems**	**Teamwork Systems**
Concept	It allows the exchange of information, documents and opinions	Work is done through the system
Aim	Relation	Integration
Applications	Email, discussion forums, repositories, yellow pages	Workflow, project management, shared databases, group decision systems

The main characteristic of ECSs is the versatility since they affect the communication processes. In the process, there are various levels of interest of users in sharing their information or knowledge and the levels of exploitation of the possibilities offered by these systems. The flexibility of groupware (especially of ECS) means that the group finally defines its use. For example, ECS can be used exclusively in information exchange, but also can be used to support group working in processes and joint decision-making.

Potential benefits of groupware can be viewed through the perceived usefulness and the relative advantage of the technology. However, the so-called productivity paradox of IT can be connected to groupware technology. The real problem related to productivity paradox of groupware technology is the lack of understanding of tacit knowledge and its relationship with the technology. Investments in traditional IT have limited consequences on competitiveness, but investments in knowledge management technologies like groupware have great impact on gaining competitive advantage. In addition, if groupware supports management of tacit knowledge,

enterprise can expect more benefits. Tacit knowledge represents the most valuable resource for knowledge management, especially in innovation processes. However, if groupware is used in the coding of existing knowledge in explicit forms and sharing this knowledge through the whole organization, benefits are low. Tacit knowledge is not easily formulated or modified into explicit forms due to personal and contextual nature of the knowledge. Process of modification and conversion of tacit knowledge into an explicit form is known as externalization. The communication of tacit knowledge needs a shared system of meaning for its understanding and application. Groupware should support the communication in order to gain greater benefits and competitiveness.

The benefits derived from groupware (particularly Electronic Communication Systems) depend on its use. Technology is socially built. Users give the different meanings to it and emphasize its various characteristics and uses. Therefore, organizational context that encourages employees' participation and creativity must be created. In the context, groupware is the ideal tool to channel the potential of participants, allowing them to share and develop their individual knowledge. Autonomy is a significant dimension of learning and knowledge exchange that facilitates learning among individuals or groups of individuals. The employees' autonomy allows employees to experiment with their knowledge thus improving organizational knowledge assets.

Consequently, the organizational context influences adoption and implementation of groupware technology. The organizational variables that should be considered are: CEO's innovativeness, knowledge externalization and employees' autonomy. However, the simple adoption of groupware does not lead always to better business performance. This is the case particularly in adoption of Electronic Communication Systems, due to versatility of the systems. The reason for that is in the fact that SMEs often adopt low-cost and low sophisticated technologies with no intention to change business processes and practices. For example, they can adopt document management systems which are just document warehouses without associated search technologies.

V. CONLUSION

IT is a significant driver of every enterprise effectiveness and competitiveness. However, there are conflicting opinions about the role of IT on a SME performance. Many owners of SMEs view IT as a cost, as opposed to having the potential for enabling them to grow. In addition, adoption and implementation of IT in a SME mainly depends on individual characteristics, technical knowledge, and innovativeness of the SME owner which often plays role of CEO. Except individual domain, technological, organizational and environmental domains impact adoption and implementation of IT in SMEs. Considering groupware, we can conclude that the technology is affordable for SMEs, but certain adoption and implementation guidelines are needed. Groupware should allow the exchange and creation of tacit knowledge in any environment featured by innovation and autonomy.

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Application of information technologies in the process of researching the market and planning future offer of service enterprises

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Abstract - We are currently witnesses to a rapid development of "information society" and intensive implementation of highly sophisticated information technologies in many areas of people life and work. Because of the fact that the service sector in recent years experiencing expansive growth, information technologies can provide a huge contribution to the maintenance of this trend in the future as well as to adapting the services to the needs and desires of modern users. Small and medium enterprises are often present in a service sector and they intensively induce his further development. If one service enterprise wants to retain existing, attract potential and encourage undecided consumers he must focus all his power on the implementation of market research and planning the future offer. The aim of this paper is to emphasize the importance of taking the process of market research by using a "desk" analysis of secondary data in order to reduce the degree of exposure service enterprise to market risks. The purpose of this paper-work is reflected in the confirmation of the fact that the modern information technologies give support to accelerate the process of gathering, processing and analyzing before mentioned data that are easily accessible and available for immediate usage. Through concrete examples of implementation of the "desk" methods we will point to the significance of information systems as sources of secondary data as well as to their many advantages in analyzing the market environment, improving service quality and constituting individual offers of service enterprises.

I. INTRODUCTION

Intensive use of information technologies and their constant improvement produce many positive effects and led to major changes in the ways of doing business. All types of businesses both large and small are using information systems networks and internet technology to conduct more of their business electronically, achieving new levels of efficiency and competitiveness [1]. Today, it is hard to imagine that many complex and demanding business activities are performed without support of information systems. That is impossible in this moment. However, conflicting opinions are still presented and tell us about whether every business activity should be automated and whether it really always leads to positive and high-quality results. Exactly mentioned question is often asked when we talking about market research and process of collecting necessary data for begin a new or improve existing business process. The importance of disposal relevant and credible data is fully expressed especially when we talk about service companies whose survival depends on understanding the needs and desires of current and potential customers, adequate design of services, quality of service implementation process as well as establishing and cherishing lasting relationships with consumer. Does the service company in the process of market research should rely on intensive use of information technology or by direct contact with consumers coming to the necessary information? That question has individual character. The nature and size of service companies will play a crucial role in finding the right answer. Motivated by the intensive development of the service sector in Serbia, the government implementing various measures to encourage SME to become the driving force of the service industry and thus contribute to accelerating economic development of Serbia. Currently in our country, SME provides jobs for almost 67% of employed workers, contributes to approximately 60% of the total gross value and about two-third of total turnover. In further work we will through a concrete example confirm the fact that small businesses can rely on the use of information technology in carrying out the process of market research for beginning business activities as well as in their future business. Proper use of Internet will enable access to many useful data that will serve the company for the implementation of high-quality market analysis, seeing the current and future trends, identify the characteristics of competitors and the needs and desires of service consumers. The Internet is certainly a disruptive technology that has eliminated geographical and location barriers [2]. Particularly, we will point out the advantages of small service companies which are realized by using the Internet as a secondary source and which are primarily manifested in reaching high-quality, easily accessible and multi-usable data.

II. THE ADVANTAGES OF USING SECONDARY DATA SOURCES IN SERVICE COMPANIES

For a long time we are witnesses of an in intensive development of the service sector and its enormous contribution to gross domestic product of the world economy. A multitude of diverse and individualized consumer needs and a growing degree of specificity of their requirements are additional stimulants for the future rapid development of the service industry. The above-

mentioned events can be easily detected in the service market of our country where among participants appear many SME that by constant striving for improvement of their services and providing target consumers contribute to establishing sharper competitive relations. We have previously mentioned the positive contributions of SME to development of Serbian economy; however we can not neglect the presence of specific development problems in this area. Very slow payment of claims, difficult process of obtaining necessary permits, inadequate tax policy; various obstacles of an administrative nature are just some of the sources of discontent of numerous small entrepreneurs. As the main obstacles for the development of the SME in the domestic market emerging a lack of financial resources, lack of knowledge, lack of market and lack of adequate institutional infrastructure [3]. SME are often meeting with the problem of financial resources lack at the beginning of their business when it is necessary to implement the process of researching the target market and thus identify the current position and future actions of their competitors as well as key characteristics of potential service users. The solution of this problem is looming in the use of secondary data sources primarily because of their cost-effectiveness, speed and ease of finding target data. Secondary sources refer to data that already exist somewhere and that has been collected for another purpose, regardless of the exploration we conduct in this case [4] In the case of small service company that want to appear on the target market and create appropriate offer of services, mentioned data sources provide quality, cost effective and reliable basis for the implementation of market analysis. Mostly, these companies choose to use external secondary sources and thereby come to a number of data that are out of the scope of the research activity holders. Access to the right data at the right time is particularly important for current operations as well as to increase the competitive advantage of companies because of making possible to do something better or faster than the competition [5]. A little service company his research activity will begin by searching the Internet, collecting, selecting and analyzing relevant data which are adequate for the nature of its service orientation and that will often be sufficient and suitable basis for entry into the target market and start business.

III. MARKET RESEARCH BY USING "DESK" METHOD FOR COLLECTING SECONDARY DATA

In order to reduce the uncertainty of future business and formulate high-quality, consumers adapted service offer, small service company before starting her business activities inevitably carrying out targeted market research. Each company operates in an environment that shaped by the impact of general economics, demography, social values and lifestyles, government laws and regulations, technological factors and, in a narrower sense, influences of industrial and competitive area in which it doing a business [6]. In this sense, for small companies, first of all, it is very difficult to enter and survive at the market in the since they must with theirs modest capabilities adapt to all the aforementioned influences and in the same time they must obey the required regulations. Due to the scarcity of financial resources mentioned companies are frequently decide to carry out a market analysis by using the „desk" method and secondary data collected in this way are mostly sufficient for the recognize a level of competition, meet the key characteristics of potential consumers and formulate the initial service offers. Applying this method, small companies use pre-existing, easily accessible and available data which are created for certain other purposes but in the same time very useful for implementation of each individual market analysis. Most massive and most intensely used an external secondary data source is the Internet. More than 500 million people working in science, education, government and business use the Internet to exchange information or perform business transactions with other organizations around the globe [1]. The aforementioned trend is also present in Serbia and we confirm the researches of the Statistical Office of the Republic of Serbia which show us that during 2010 about 97% of active SME owned computers and used them in its usual business. The most intensive use of computers is recorded on the territory of Belgrade even 98.7%, then 98.3% in Vojvodina and in Central Serbia 96.5% of these companies. Especially important information relevant to our further analysis tells us that 96.8% of enterprises in Serbia in 2010 were owned internet connection and that is 2.3% more than in the previous year. In further work we will focus on the implementation of the market research process in service sector with support of external secondary data sources since only knowledge of the market and knowing your consumers as well as your competition creates the conditions for achieving results [7].

IV. IMPLEMENTATION OF MARKET RESEARCH PROCESS BY THE SERVICE COMPANY THAT OPERATE IN THE SME SECTOR

One small service company makes a decision about the selection of the target market by taking into consideration the intensity and direction of the impact of various factors. In current circumstances, owning your building or lease it under favorable conditions are powerful motives which lead the service company into a choosing the business location. Even though we accept above mentioned as a correct first step, anyway it is necessary to examine the justification of starting business on that location by research the market. We mentioned that the scarce financial resources and high costs of starting service activities are often a limiting factor for small companies and as a very convenient way to research the market imposes "desk" method of collecting and analyzing secondary data. The emergence of the Internet as the most important resource which makes possible collection of secondary information has contributed to lowering the cost of market research in the markets of developed economies as well in our market [8]. We will analyze the market of the Central Banat and municipality Zrenjanin, which with nearly 130 thousands inhabitants, favorable development characteristics and attractive location is very challenging market for service companies. We will take into consideration future entrepreneur who in order to start its service activities of renting wedding dresses carrying out the research of target market by using secondary data that are available by the Internet. Market is unpredictable and one of many purposes of looking at your market is to uncover opportunities and threats that

result in alternative strategies and ultimately to comparative advantage [9]. We will prove that in the case of small companies it is completely enough to carry out analyze of external secondary data without further analyze of primary data and we also point out the enormous benefits of the Internet and its versatility in business purposes.

Company looming a potential possibilities of a successful future business as well as achieve competitive advantage in the branch of renting wedding dresses because interest in this kind of service intensively grow as well needs, wishes and requirement of potential consumers are becoming more diverse. Also, to before mention should be add that centuries-old tradition of the Serbian people in organizing weddings and psychological characteristics of people in this region directly affect the emergence of the need for weddings dress. On the other hand, modern lifestyles and often the insufficiency of financial resources have caused that buying of weeding dress today become a short-term rental. To produce want-satisfying products and services, you must know what your customers wanted, where they can find what they want, and how to communicate to them that you are able to meet their needs and solve their problems [9]. By using „desk" method of collection and analysis secondary data which are accessible through the web sites on Internet the company exploring hers competition and potential service users.

TABLE I. COMPETITORS ON THE TARGET MARKET

Basic information	***Salon „Tina"***	***Salon „Sreća"***	***Salon „Vuletaš Tanja"***	***Salon „Bajolika"***
Date of starting a business	19.06.2006	15.05.2007	01.05.2005	21.12.2007
Individual number	60201269	60658188	56845933	60984085
Tax number	104451852	104964975	100648918	105334891
Number of activity profile	1413	1413	7729	4778

http://pretraga.apr.gov.rs

We note that the competition is not so intense and a small number of participants are present, according to the market proportion, all of that leads us to the conclusion that potential possibilities for entry of new company at target market are presented. Also, direct competitors are providing these services relatively for short time so their tradition and experience can not be competitive advantages for them. Since 2005 onward, there has been a constant entry of companies in this market that might tempt us to conclude that the number of potential consumers as well as the demand for analyzed services was increased by the same intensity as company's entrances.

By the further analysis and application of „desk" method we will come to the large number of reliable data that tell us about the characteristics of potential users of renting wedding dresses and we will also can conclude in which direction their possible behaviors will go. Assess the demographic, psychographic and other descriptive aspects of your customers, including age, income level and education [9]. Fundamentally, it is necessary to consider the age and sex structure of population on the target market as well as to make their selection by age periods in which there are the biggest real possibilities for the marriage as direct causes of the need for renting a wedding dress.

TABLE II. THE ESTIMATION OF THE POPULATION BY SEX AND BELONGING TO DIFFERENT AGE GROUPS IN THE PERIOD SINCE 2002 BY 2010 ON THE TARGET MARKET

Age group / Region	**20 to 24**	**25 to 29**	**30 to 34**	**35 to 39**	**40 to 44**
Central Banat					
Women	6035	5810	5923	5839	6602
Men	6744	6573	6783	6261	6808
Vojvodina					
Women	65079	67398	67274	63399	66240
Men	69143	71879	71383	65327	65953

http://webrzsu.stat.gov.rs

Examination of consumer needs should be established from the standpoint of the character of needs as well as of their sensitivity to external influences [10]. Since the marriage occurs as a product of natural instincts we note that the presence of approximately equal number of male and female population in critical age periods there is a real possibility that the need for analyzed service will appeared and continue its upward trend in the future. It is clear that the potential direct consumers will be women but we can not exclude from further consideration members of the male population because they influence the probability of appearing needs for mentioned service. We will confirming before mentioned claims using data which coming next and we also prove that exactly at the presented age periods the largest number of male and female population getting married in our region.

TABLE III. THE NUMBER OF MARRIAGES CONCLUDED IN VOJVODINA IN 2010 ACCORDING TO THE AFFILIATION OF BRIDE AND GROOM TO CERTAIN AGE GROUP

Age group	**VOJVODINA**	
	Groom	***Bride***
20 to 24	1197	2434
25 to 29	3260	3241
30 to 34	2455	1585
35 to 39	924	560
40 to 44	416	281

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The number of marriages concluded in the age periods which precede of follow the presented is not considered a relevant for this analysis because it is negligibly low. It is expected that key users of the service will be members of the female populations aged 20 to 35 years because of the largest intensity of marriage conclusions in that age period. Although we must not forget members of other age groups even though it is obvious that after mentioned years there is a significant reduction in the number of concluded marriages. Further analysis we will focus on the territory of the town Zrenjanin and the surrounding municipalities from which we expect arrival of potential consumers because they can not settle the need for analyzed services in their own place of residence.

TABLE IV. THE NUMBER OF CONCLUDED MARRIAGES ON THE TARGET MARKET AND SURROUNDING MUNICIPALITIES IN 2010

Region	Total number of concluded marriages	Number of concluded marriages on 1000 residents
Zrenjanin – town	572	4,59
Žitište	67	3,78
Nova Crnja	55	5,24
Novi Bečej	100	4,09
Sečanj	57	4,10
Central Banat	851	4,45
Vojvodina	9387	4,80

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We mention that in previous years the number of concluded marriages in this area does not fluctuated significantly and because of gender and age composition of the population we expect that this trend will be continued in the future. In proportion to the size of municipality and number of residents we note that in each municipality approximately equal number of marriages was concluded and in this way we confirming the fact that Central Banat is a very challenging market for the analyzed company because about 9% of all marriages in Vojvodina are concluded exactly in this area. Considering the before mentioned circumstances as well as the number of entrepreneurs who provide the services of renting wedding dress in the Zrenjanin we can assume that there is a real possibility for expanding the market, entry of new competitors and their successful future business.

A very interesting fact that speaks about the growing trend of the phenomenon which early is not happened so frequently but otherwise can directly cause intensification of analyzed services as well as to encourage the company to enter the target market is the conclusion of the second, third or any subsequent marriage. It is indisputable fact that the largest numbers of concluded marriages are the first in a row for both spouses but certainly for the purposes of our research we can not neglect the other situations that happened especially in recent years. For example, during the previous year 1667 marriages that were concluded were the second in the row for at least one of the spouses and that makes almost 18% of all concluded marriages in Vojvodina. In the same period, brides as potential users of renting wedding dress service have concluded even 1134 „second“ and 136 „third“ or some subsequent marriage. When we compare these data with those of previous years we notice that the concluding of the second, third and some subsequent marriages growing intensively and that in the future we can expect a raise of the demand for service of renting wedding dress because of this phenomenon.

The crucial factor that directly affects the possibility of renting a wedding dress is the level of monthly income as well as the working engagement of the intending spouses. In almost 45% of all concluded marriages both spouses were actively performed their jobs and previously were employed.

TABLE V. AVERAGE NET INCOME PER EMPLOYEE AND WORKING INVOLVEMENT OF POPULATION ON THE TARGET MARKET AND SURROUNDING MUNICIPALITIES IN 2010

Region	Average net income per month expressed at Serbian currency	Total number of employees
Zrenjanin - town	34299	29095
Žitište	27744	2583
Nova Crnja	28186	1115
Novi Bečej	26586	3683
Sečanj	26562	2260
Central Banat	32358	38734
Vojvodina	33392	472441

http://webrzsu.stat.gov.rs

For more detailed consideration of the present influential factor we need considerably more space because many studies show that for the purpose of organizing wedding future spouses using other sources of funding in addition to regular income. In order to increase the quality of market analysis as well as to additionally confirm validity of formed conclusions, our future work certainly can be expanded by taking into consideration the other factors such as the price of renting wedding service, cultural environment, attitudes and perceptions of people who lived at the target market, seasonal character of this service etc. but in that case we can move away from the basic purpose of our paper-work.

V. CONCLUSION

Merits for the intensive development of the service sector in Serbia certainly can be attributed to the SME because they are his driving force. In the future period it is expected that the state continues to inducing further development of SME as well as to encouraging competition in order to improve quality and innovativeness of the process of giving services. Small service company is often hesitant to make the decision on starting own business primarily because of the lack of financial resources on the one hand and the existence of the real need to research the target market on the other. An efficient way for solution of this problem we find in using secondary data sources and applying „desk“ method for collecting and analyzing data during the implementation of research process. SME in service sector of Serbia intensively exploit the many benefits which provide usage of information technologies, they also possess computers and use them in their usual business and have internet connection. In the specific case of small service company we have shown that the market research can be carried out successfully by using the Internet as one of the external secondary data sources. With this, perhaps the most massive media now, we have access to a variety of useful, relevant and usable data and in the same time we satisfy cost-effectiveness. The market analysis which is carried out helped us in reaching knowledge about the current situation in the target market, competition intensity, the characteristics of potential service users, trends in the movement of future demand and the basis for designing the most appropriate service offer. We also can noticed, on the basis of the presented characteristics of the target audience, the certain regularities as well as innovations in their behavior and made conclusion about the viability of

start a business and entry into the target market. Once again it was proven that information technology, particularly Internet, in addition to affect performance of usual, everyday activities of people it especially exerts influence on the change of current methods in doing business of economic subjects and entrepreneurs in the direction of their faster, better, more efficient and successful implementation.

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ON – LINE IS OPERATIONAL TRACKING AND MANAGEMENT OF RAILWAY TRAFFIC

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Abstract: Project solution of software tools presents an interface between graphical and numerical representation of data concerning navigation of trains in space and time. It is possible to apply software tools for constructing and creation of railway time-table in traditional technology, as well as for dynamic variant of development of railway time-table. Software tool of this type is indispensable for simulation model of train management in cases of offset from determinate time-table.

I. INTRODUCTION

Operational monitoring and management of trains in move with a classical methodology based on continuous telephone collecting data on the movement of trains (time of arrival, departure time, deviations from the projected schedule ...). These data are manually registered, and then presented in graphical form on a printed chart in advance, adapted to a particular part of railway (the actual chart of train traffic).

Plotting the actual route of movement of trains is carried out manually by different color pen with great care and a lot of time. Certain time intervals (work situations) are performed by cumulative and individual processing of data on the movement and work of trains (labor effect) for each Area of operational department. This processed data is forwarded to the Central operating department, where the data is processed and systematize the level of the entire territory of joint stock company "Serbian Railways".

All these activities are done manually and take so much of the time for dispatchers. This has the consequence that dispatchers are often not in a position to do their primary job (train traffic management, optimization of train transport, the optimization of material use and human resources, operational planning...)

We came to the idea ,with full participation and suggestions of **DIZS (Society of Engineers of RAILWAY TRANSPORT)** that this job should be transferred to the informational system.

II. GENERAL INFORMATION SYSTEM FEATURES

Information subsystem is based on continuous and uninterrupted data collection and processing (24 hours, 365 days a year) about the origin of the train, train composition, movement of the train, graphical representation train in movement (real - the dynamic traffic chart of trains), the simulation of further movement of trains (including logical controls that can detect the conflict situation), change of the train status, telegrams and dispatching orders relating to the relevant train, the end of the train drive (train dissolution), as well as insight into the archival data.

At any time system provides information on current location and status of all trains on all parts of the track covered by the informational system. The train formation and creation of the route becomes visible to all official locations that are on the driving course.

At each change of data on train movement correction is performed on the full route of the train route, and prediction of deviations from the planned timetable.

- subsystem for real-time
- data is collected at source and stored in local and central tandem server with data replication
- data are available at any time to authorized administrative authorities (management company), dispatch centers (operational departments), the staff members who is directly involved in regulation and execution of railway transport, as well as users of railway services (in the form adapted to their authorities and needs)
- subsystem is directly linked to and coordinated with other informational subsystems on the railway (schedules, tracking of wagons ....) which function as an integrated informational system for monitoring and management of traffic.

Subsystem is directly connected to the Internet application to track information about current location and the delay of trains, wagons location, schedule and WAP service via mobile phone for information about the timetable and location of wagons.

III. TECHNICAL – TECHNOLOGICAL TERMS

Informational system covers about 1,500 kilometers of track (including a complete "Corridor X" and "Bar line"). The informational subsystem includes the following lines: Belgrade - Novi Sad - Subotica (01/03/06), Belgrade - Ruma - Sid (19/04/06), Belgrade - Pozega - Vrbnica (12/07/06), Belgrade - M. Krishna - Lapovo (12/07/06), Belgrade - Lion - Lapovo (12/07/06) Pozega - Kraljevo - Lapovo (12/07/06), Nis - Lapovo (01/10/06), Niš - Dimitrovgrad (01/10/06), Nis - Presevo (01/10/06), Nis - Zaječar (01/10/06), Ruma - Sabac - Brasina (2009) Belgrade - Pancevo - Vrsac (2009).

For the purposes of the Informational System was installed and configured the appropriate computer and communication equipment (connected to a single intranet joint stock company "Serbian Railways") at over 140 locations, of which: 55 in the offices of train dispatcher, 30 in Head of sections and Head of stations, 20 in Dispatching centers (including Tele command centers: Belgrade Marshalling, Pozega, Nis (the Department Lapovo).

It has been trained over 500 users, who directly participate in work or use the services of informational system (TK dispatchers, senior dispatchers, train dispatchers, the authorized station workers).

COMPUTER AND COMMUNICATION EQUIPMENT

Specifications of equipment of INTRANET network of Serbian Railway

Computer and communication equipment	*The level of communication nodes*					
	1a	*1*	*2*			*Total*
Database server	*5*	*3*				*8*
Intranet access server	*1*					*1*
Router to connect to a companion Intranet nodes	*1*	*3*	*25*			*29*
Router to connect to the Internet	*1*					*1*
Central switch	*1*	*3*				*4*
Firewall	*1*					*1*
Switch for the local network	*22*	*12*	*20*			*54*
Surveillance equipment and network management	*1*					*1*
Domain controllers	*2*	*3*	*20*			*25*

1.

2.

3. The level of communication nodes

Level 1:	*Belgrade*
Level1a:	*Novi Sad, Niš, Požega ili Kraljevo*
Level 2:	*Subotica,Belgrade shunting, Belgrade centre, Užice, Lapovo, Lapovo shunting, Zaječar, Bor lugagge engine , Požarevac, Pančevo, Ruma and Zrenjanin*

Servers in the hall Nemanjina 6

Local servers

No.	Location	Purpose
1	Makiš	Domain Controller
2	Zdravka Čelara	Domain Controller
3	Novi Sad	Domain Controller
4	Novi Sad	SQL
5	Subotica	Domain Controller
6	Subotica	SQL
7	Ruma	Domain Controller
8	Šid	Domain Controller
9	Lapovo	Domain Controller

No.	Purpose of server
1	Domain Controller
2	CISCO Management
3	Antivirus – slave server
4	ORACLE
5	File and print server
6	SQL
Blade servers	
1	SQL 1
2	E-mail
3	DNS, mail relay
4	ORACLE 1
5	Proxy
6	External web, Cristal report
7	Antivirus – master server
8	SQL 2
9	ORACLE 2
10	Linux – internal mail
11	The primary domain controller
12	MQ
Dell server	
1	ORACLE, DELL
IBM Mainframe	
1	DB2, application and file servers, ftp

3.2 APPLICATION SOFTWARE

3.2.1. Application software has entirely done and the developed **Project team for the IT Department of Informational Systems and Informational Technology JSC "Serbian Railways" in cooperation with experts from the Department of the timetable and Operative Division of Department for Transport jobs.**

3.2.2 Application software has been done in two layer client - server architecture, designed for **On - Line work** to the central database,

10	Niš	Domain Controller
11	Niš	SQL
12	Kraljevo	Domain Controller
13	Kraljevo	File server
14	Dimitrovgrad	Domain Controller
15	Prijepolje	Domain Controller
16	Požega	Domain Controller
17	Ristovac	Domain Controller
18	Zrenjanin	Domain Controller
19	Zaječar	Domain Controller
20	Požarevac	Domain Controller
21	Kikinda	Domain Controller
22	Vršac	Domain Controller
23	Sombor	Domain Controller
24	Pančevo	Domain Controller

3.2.3 Software package as the base uses software tools for graphic interpretation of space-time data on the movement of trains **"ŽELMET"**

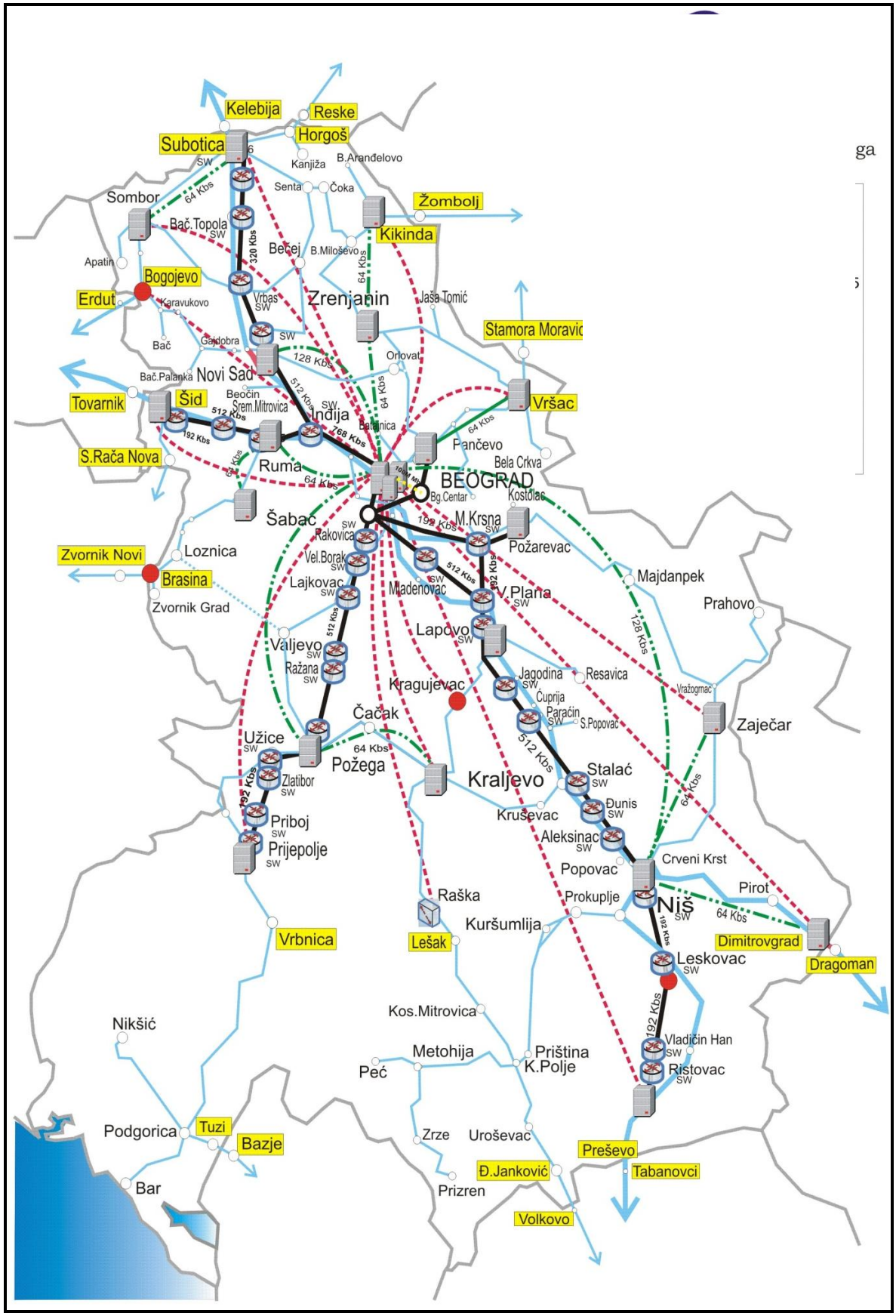
(Decisionof the Commission for findings and technical improvements of Public Institution "Serbian Railways" No. 5442/04-59 from 20/07/04 was recognized as a Technical promotion)

3.2.4 The database has been created **in SQL - Server 2000**, as part of an integrated **database for monitoring traffic joint stock company** Serbian Railway "Ž IIS"

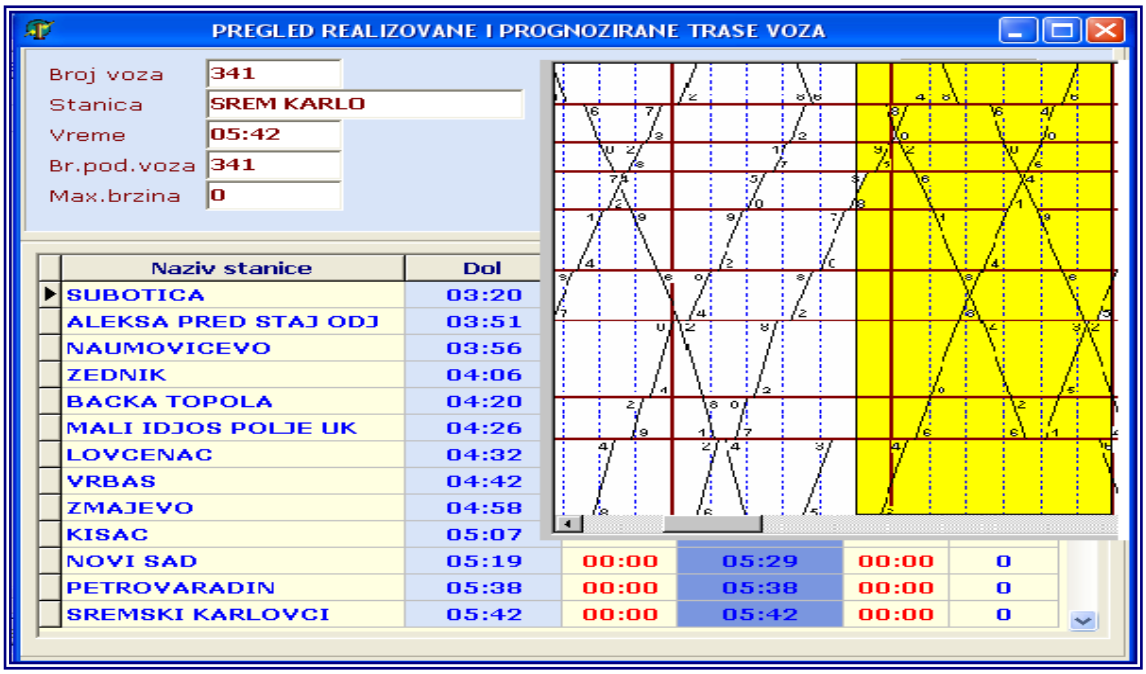
3.2.5 The user interface is organized into four complex and functional units as it follows:

- **Software package for Chargé trains**
- **Software package for Transportation Dispatcher**
- **Software package for TK - Dispatcher**
- **Software package designed for Management**

Intranet network with the network of railway lines of joint stock company"Serbian Railways"


Kelebija
Reske
Horgoš
Subotica
Kanjiža
B.Aranđelovo
Sombor
Senta
Čoka
Žombolj
Bač.Topola
Kikinda
Bečej
B.Miloševo
Apatin
Bogojevo
Erdut
Karavukovo
Vrbas
Zrenjanin
Jaša Tomić
Stamora Moravic
Bač
Gardobra
Orlovat
Bač.Palanka
Novi Sad
Tovarnik
Šid
Beočin
Srem.Mitrovica
Indija
Vršac
Petrovaradin
Pančevo
S.Rača Nova
Ruma
Bela Crkva
BEOGRAD
Bg.Centar
Kostolac
Šabac
M.Krsna
Rakovica
Požarevac
Zvornik Novi
Loznica
Vel.Borak
Majdanpek
Brasina
Lajkovac
Madenovac
V.Plana
Prahovo
Zvornik Grad
Lapovo
Valjevo
Ražana
Jagodina
Resavica
Kragujevac
Čuprija
Vražogrnac
Čačak
Paraćin
S.Popovac
Zaječar
Užice
Požega
Kraljevo
Stalać
Zlatibor
Đunis
Kruševac
Priboj
Aleksinac
Prijepolje
Crveni Krst
Popovac
Pirot
Raška
Prokuplje
Niš
Kuršumlija
Vrbnica
Lešak
Dimitrovgrad
Leskovac
Dragoman
Nikšić
Kos.Mitrovica
Vladičin Han
Metohija
Priština
K.Polje
Peć
Ristovac
Podgorica
Tuzi
Bazje
Zrze
Uroševac
Preševo
Đ.Janković
Tabanovci
Bar
Prizren
Volkovo
64 Kbs
128 Kbs
192 Kbs
320 Kbs
512 Kbs
768 Kbs
1024 Kbs
SW

Picture of menu to display charts Real traffic trains



3. CONCLUSION

In the opinion of the expert team **DISZ (Society engineers of RAILWAY TRANSPORT)** , this information system is fully possible to apply to smaller systems such as urban and suburban railways, subway, operators (lessees of railways) in cargo and passenger traffic.

The implementation of informational system **ŽIIS** achieved the following effects:

• Modernization and humanization work of operational service with the full support of computer science and technology
• Monitoring the traffic of trains in real time
• Simulation of the traffic situation for a certain period of time
• Avoiding and overcoming conflicting traffic situations
• Minimize the deviation of the projected timetable that arising from traffic reason
• Realistic and operational planning of train working appliances and the operation of train and train staff
• Making operational decisions based on real data
• Elimination of multiple recording and processing of data relating to the same phenomenon
• The ability to access and exchange data with other information systems within the joint stock company "Serbian Railways", as well as with neighboring railway administrations
• Significant financial savings resulting from reducing train delays and reduce the cost of consumable materials (charts, forms, pencils ...)

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The Importance of E-business in Supply Chain

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Abstract - In order to meet the needs and requirements of final customers, market participants will work together, setting up various co-operative partnerships. They invest all their energy in the process of creating customer value to their buyers. As the result, they establish supply chains, through which synergy can be achieved. There are many processes directed towards the planning, organization and control of the smooth, continuous flow of products and services from suppliers to end customers. Among them, procurement, manufacturing and logistics activities take very important role. All these processes have been influenced by Information revolution, followed by the development and implementation of Internet technology. Internet technology is also available to end-customers, which enables the firms to directly communicate with them and to get the required information. By implementing these systems companies can optimize their activities, in addition to increase operational and cost efficiency. Also, it enables better information connections between participants, which improves the coordination of all processes in the chain. The aim of this paper is to indicate the benefits and the importance of the Internet and e-business in supply chain.

I. INTRODUCTION

Today, many companies establish special business chains to achieve their common objectives. Manufactures, distributors, transporters, retailers and other participants, cooperate in order to satisfy the final customer, by offering appropriate product, or service with acceptable conditions. They form supply chains, through which they try to create the best mix of responsiveness and efficiency for the market being served. Their work and results depend on many factors, among which technology has a very important role. It enables process automation, standardization, and simplification, therefore enhancing process efficiency, organizational productivity, and effectiveness.

Computer technology and modern communication systems create a special environment for e-business. The spread of e-business has allowed many companies to build supply chains that have a competitive advantage in their markets. These companies are much more capable to react quickly to changes in market demand. Also, their business efficiency, which is becoming a central fact in many markets, is on a higher level.

To develop these advantages, individual companies and entire supply chains need to learn new behaviors and they need to enable these new behaviors with the use of e-business technology. Very important role in this process belongs to Internet technology, that has became one of the most cost effective mean of driving supply chain integration. There are various forms of e-Business applications, among which three categories have a special place – e-Commerce, e-Procurement, and e-Collaboration. e-Commerce helps a network of supply chain partners to identify and respond quickly to changing customer demand captured over the Internet. e-Procurement allows companies to use the Internet for procuring direct or indirect materials, as well as handling value-added services like transportation, warehousing, customs clearing, payment, quality validation, and documentation. e- Collaboration facilitates coordination of various decisions and activities beyond transactions among the supply chain partners over the Internet. With a use of these technologies, companies in their supply chains, not only can achieve higher process efficiency, but also can increase responsiveness, and therefore revenue-enhancing, opportunities.

II. THE CONCEPT OF SUPPLY CHAIN MANAGEMENT

The term “supply chain management” arose in the late 1980s and came into widespread use in the 1990s. To that time, words as “logistics” and “operations management” were used instead. There are various definitions for supply chain, that change with the industry vertical and the context. Some of them are represented in the following table.

A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. It encompass the companies and the business activities needed to design, make, deliver, and use a product or service. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. They all participate in activities from purchasing basic commodities to selling the final product to the end-customer, and also in recycling the used product. Material flows from a basic commodity (such as a bauxite mine as a source of aluminium ore) to the finished product (such as a can of cola) (Harrison A., Van Hoek R, 2008., p.6.).

Table 1.: Definitions of supply chain

Definitions	***Source***
"A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers."	Ganeshan and Harrison: "*An Introduction to Supply Chain Management"*, Penn State University, 1995.
"A supply chain is the alignment of firms that bring products or services to market."	Lambert, Stock, and Ellram: "*Fundamentals of Logistics Management* ", McGraw-Hill, 1998.
"The systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole."	Mentzer, DeWitt, Deebler, Min, Nix, Smith, and Zacharia: "*Defining Supply Chain Management"*, Journal of Business Logistics, 2001.
"Supply chain management is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served."	Hugos M.: "Essentials of Supply Chain Management", John Wiley & Sons, 2003.
"A supply chain encompasses all activities associated with the flow and transformation of goods from the raw material stage (extraction), through to the end user, as well as the associated information flows."	Chopra, S., Meindl, P.: "*Supply chain management: Strategy, Planning, and Operation"*, New Jersey: Pearson Education, 2004.
"A supply chain is a networ of partners who collectively convert basic commodity (upstream) into a finished product (downstream) that is valued by end-customer, and who manage returns at each stage."	Harrison A., Van Hoek R.: "Logistics Management and Strategy: Competing through the supply chain", Prentice Hall, 2008.

On this flow, there are two ends, the demand end and the supply end. The demand end of the supply chain models elements of the supply chain where the demand originates. Examples of the demand end are stores, a Web-storefront, or customers. This end can be also called the downstream. The supply end of a supply chain represents the sources of supply, such as suppliers' warehouses or a factory. These represent the supply chain elements that provide supplies to address the demand generated at the other end of the supply chain. This end is called the upstream (Sehgal V. 2009.)

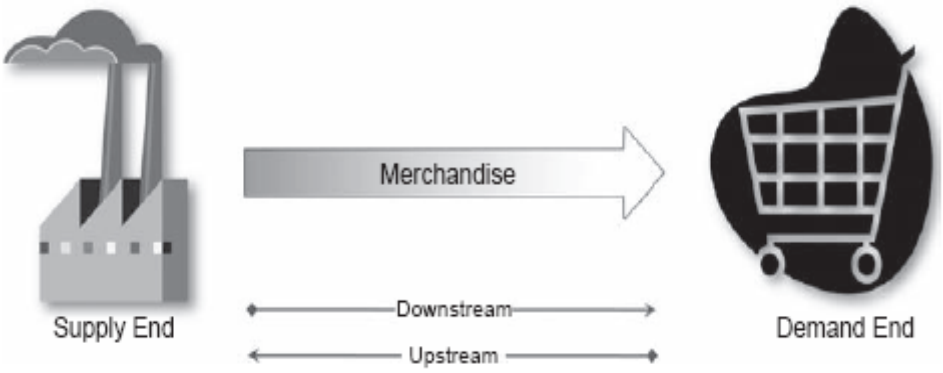

Figure 1.: Demand and Supply Ends of a Supply Chain (Sehgal V. 2009., p.7.)

Demand flows from downstream nodes to the upstream nodes in a supply chain network, while the supplies flow from the upstream nodes to the downstream nodes. The core problem in almost every supply chain is to balance the balancing the demand and the supply end. In order to solve his problem, companies in any supply chain must make decisions individually and collectively regarding their actions in five areas: (Hugos M ., 2003.)

- production - this activity includes the creation of master production schedules that take into account plant capacities, workload balancing, quality control, and equipment maintenance; it refers to the capacity of a supply chain to make and store products; the fundamental decision that managers face when making production decisions is how to resolve the trade-off between responsiveness and efficiency, by managing capacity, the more excess capacity that exists, the less efficient the operation becomes.
- inventory - the primary purpose of inventory is to act as a buffer against uncertainty in the supply chain; It enables a company to support its customer service, logistic or manufacturing activities in situations where purchase or manufacture of the items is not able to satisfy demand; lack of satisfaction could arise either because the speed of purchasing or manufacturing is too protracted, or because the appropriate quantities cannot be provided without stocks; inventory management is the the activity which organizes the availability of items to the customers;
- location - it refers to the geographical sitting of supply chain facilities and includes the decisions related to which activities should be performed in each facility; when making location decisions, managers need to consider a range of factors that relate to a given location including the cost of facilities, the cost of labor, skills available in the workforce, infrastructure conditions, taxes and tariffs, and proximity to suppliers and customers; once these decisions are made they determine the possible paths available for product to flow through for delivery to the final consumer.
- transportation - material distribution is a core supply chain function in most business operations; in the manufacturing industry, it is the movement of raw materials from the vendors' warehouses to factories, and of the finished goods from the factories to the distribution warehouses; in retail, such movements extend from vendors to the retailer's warehouses, and then to the stores.
- information - timely and accurate information holds the promise of better coordination and better decision making; with good information, people can make effective decisions about what to produce and how much, about where to locate inventory and how best to transport it.

The sum of these decisions will define the overall supply chain value. The value a supply chain generates is the difference between what the final product is worth to the customer and the effort the supply chain expends in filling the customers request (Chopra S, Meindl P., 2004.). In order to maximize that value, all participants together try to make improvements in both customer service levels and the internal operating efficient. Customer service at its most basic level means consistently high order fill rates, high on-time delivery rates, and a very low rate of products returned by customers for whatever reason. Internal efficiency for organizations in a supply chain means that these organizations get an attractive rate of return on their investments in inventory and other assets and that they find ways to lower their operating and sales expenses (Hugos M., 2003.). If they work and cooperate together, they will achieve these goals much easier. So, it is very important for companies to be aware and to understand the roles that they play in their supply chains.

III. SUPPLY CHAIN INTEGRATION OVER THE INTERNET

Supply chain management (SCM) shifts the unit of analysis from a plant, a warehouse or a company to the entire supply chain (Pardalos P., Hearn D., 2005.p8). Since a supply chain typically spans over multiple companies, SCM particularly highlights the importance of cross-enterprise coordination – in the name of supply chain integration using Internet. It incudes not only companies that produce goods, but also their suppliers, and their suppliers' suppliers. Chain management means relationship among partenrs and the processes that conect them. The number of primary and secondary suppliers could be large. Together, this extended multi-tier supply chain (the chain of primary, secondary and tertiary suppliers) contitutes a crucial aspect of the industrial infrastructure of the economy (Laudon, Traver, 2010. p. 12-11). Supply chain management refers to wide variety of actitvities combined with Internet technology that is used to coordinate partners in procurement metod.

e-Business applications in supply chain management for SME is divided in three classes – e-Commerce, e-Procurement and e-Collaboration (Pardalos P., Hearn D., 2005.p8). e-Commerce goes beyond the Business-to-Consumer (B-to-C) interface to include the backend processing of transactions in the supply chain as well. Indeed, the Internet provides a natural setting to link supply chain partners for delivering a product or service in tight coordination. On the other hand, e-Procurement is the set of Internet applications by which buyers and sellers find each other and transact according to some pre-specified protocols, and involves private or/and public marketplaces. Since a typical manufacturing company needs to procure thousands of products from hundreds of suppliers, the Internet can help such a company manage the complexity of the procurement process.

e-Collaboration is the use of the Internet among business partners beyond transactions. Unlike e-Commerce or e-Procurement, whose functions are well defined, e-Collaboration exists in a variety of functions. Examples are different models of information sharing, collaborative decision-making, and product change management. Differenet models of eCollaboration is for information sharing, Collaborative planing and development of new product. *Information Sharing* as a part of eCollaboration in supply chain management that exist to share information to supply chain partners. On the other hand, *Collaborative Planning* use Internet for system arhitecrture to implement collaborative decision making in cost effective way. Collaboration in developing of new product is used to deliver efficient and speed

demended in new product development and product change management.

These implemented activities in supply chain management improve capacities of all partners in a chain. In this way supply chain management becomes a system of partners concted with Internet techology. Supply chain management as a system functions as a link of activities of buying, making, and moving products from suplliers to purchasing firms, as well as integrating the demand side off the business equation by including the order entry system in the process. For example, Hewlett-Packard has a Web-based order-driven chain management system either a customer placing an order online or the receipt of an oreder form a dealer (Laudon, Traver, 2010. p. 12-11). e-Collaboration uses digital Internet technology to permit partners to collaboratively design, develop, build, and manage products trought supply chain.

IV. IMPACT OF E-BUSINESS ON SUPPLY CHAIN

The Internet plays a significant role in many supply chains and companies are using Internet to conduct a wide variety of supply chain transactions. Supply chain transactions that involve e-business include the flow of information, product, and funds. With Internet, companies can provide product information across supply chain, place orders with suppliers, fill and deliver orders to customers and allow them to place and track orders. The Internet is an electronic link that ties different entities, but it is neither the first nor the only electronic link. For example, EDI (Electronic Data Interchange) on VAN (Value Added Network) is another electronic link that preceded the Internet age. But the Internet has many more advantages. It is based on open standards and grants universal access to a wide audience (anytime, anyplace, anyone, almost) at a lower cost. Also, the Internet is much more efficient than a traditional three-tier distribution system in which finished goods flow from the plant to the manufacturer's warehouse, then to the distributor's warehouse, the wholesaler's warehouse, the retailer's warehouse, and finally to its stores. In the process, logistics cost accumulates due to additional handling, multiple handoffs, document processing, transportation, warehousing, and excessive inventories throughout the supply chain. So, inefficiency in information flow can result many costs, measured by millions of dollars, in material flows. In the case of the grocery industry, for example, this inefficiency previously resulted in over 120 days' supply of inventory and $30 billion of unnecessary cost (Pardalos P., Hearn D., 2005.).

E-business influences supply chain operations in many ways. It has great impacts on responsiveness, which primarily affects a company's ability to grow and protect revenue, and on efficiency, which primarily affects a company's costs. An e-business allows a firm or supply chain to exploit the following responsiveness, and therefore revenue-enhancing, opportunities (Chopra S, Meindl P., 2004.p.529.):

- direct sales to customers – an e-business allows manufactures and other members of the supply chain that do not have direct contact with customers in traditional channels to enhance revenues by bypassing intermediares and selling directly to customers, thereby collecting the intermediaries incremental revenue;
- twenty- four-hour access from any location – an e-business can attract customers who may not be able to place orders during regular business hours because an e-business is always open; for example the order at Dell Computers can be placed anytime;
- wider product portfolio and information aggregation – with e-business firms can offer a very large selection of products that would be unrealistic in a brick-and-mortar store;
- personalization/customization – the internet offers an e-business the ability to use personal information to intelligently guide each customers baying experience and increase sales; for example, some e-business use information on birthdays and other events provided by customers to send reminders and purchase recommendations;
- faster time to market – new products can be introduced much faster with Internet than with a use of physical channels;
- price and service discrimination – an e-business can price discriminate, meaning they can alter prices based on the characteristics of individual customers to enhance their own revenues; the ability to ask different customer segments to pay different prices allows a firm to increase revenues compared to a situation where a firm charges a single price to all customers;
- efficient funds transfer – an e-business can enhance revenues by speeding up collection;
- lower stock out levels – e-business can greatly increase the speed with which information on customer demand is disseminated throughout the supply chain, giving rise to more accurate forecasts and significantly decreasing the negative aspects of the bullwhip effect;
- convinced/automated processes – e-business can increase the ease with which one does business.

Beside the increase of responsiveness, e-business has great impact on costs. It can lower inventory levels and inventory cost by improving supply chain coordination and creating a better match between supply and demand. E-business can aggregate inventories far from customer because most customers are willing to wait for delivery of on-line orders. It also influences the facility, transportation and information costs. An e-business can reduce network facility costs by centralizing operations, thereby decreasing the number of facility required. The transportation costs will be increased if a firm can put its product in a form that can be downloaded. An e-business can share information throughout the supply chain to improve coordination. It also may be used to share planning and forecasting information within the supply chain, further improving coordination. Supply chain

management refers to wide variety of actitvities combined with Internet technology that is used to coordinate partners in procurement metod.

V. CONCLUSION

Synonimes for supply chain management in privious years were logistics and operation management. But supply chain management is far more than that, it contains more complex operations and concepts. Supply chain management contains an cooperations between manufacturer, supplier , transporeter, warehouses, retailers, and consumer. E-business aplication for supply chain management can be devided in three classes eCommerce, eProcurement and eCollaboration. Importance of eCommerce in supply chain management means using Internet to provide coordination in delivery of products and services to consumer. Supply chain transactions that involve e-business include the flow of information, product, and funds. E-business influences supply chain operation by having impacts on responsiveness, which primarily affects a company's ability to grow and protect revenue, and on efficiency, which primarily affects a company's costs. Beside the increase of responsiveness, e-business lower inventory levels and inventory cost by improving supply chain coordination and creating a better match between supply and demand.

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Supply Chain Management as a Key Factor for Improving Macedonian SMEs' Competitiveness

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Abstract - In recent years, effective logistics and supply chain management have been recognized as key opportunities for improving the profitability and the competitive performance of the companies. Also in the last few years, a significant progress in the field of small and medium enterprise development in Macedonia has been seen. The supply chain management is seen as a catalyst for unleashing economic growth in Macedonia and throughout the region of Southeastern Europe. Supply chain performance will be a key indicator of overall corporate success in the upcoming period and core advantage when entering foreign markets and compete with low cost countries. Small and medium enterprises (SMEs) with efficient logistics and SCM will be able to maximize their profitability and improve their competitiveness. That is why this paper elaborates the supply chain management as a key factor for improving the competitiveness of the Macedonian SMEs.

I. INTRODUCTION

The reason for the existence of the supply chains is that there are very few companies that can produce end products for end-customers from raw materials on their own, without the assistance of other organizations. The company that produces the raw material is often not the same company that sells the end products to the end-customer. In order to provide end products to the end-customers, a network of actors is involved in activities (as purchasing, transforming and distribution) to produce products and/or services. All of these actors add value to the end product. The series of companies that interact to produce end products, and to contribute to the value of end products, is actually the supply chain. [1]

Consequently, the competition is no longer between companies but between supply chains. The goals of the entire supply chain become the common objective of each company. Cost and service improvements that were not achievable by individual companies will now be attained by cooperating companies. [2]

The large companies in Macedonia, although they exist in small number, have developed logistics and SCM system. This is especially the case with the companies that were privatized during the transition period and where a foreign investor is a dominant shareholder. Usually in these companies the main advantage is that they use the experience, the know-how and the benefits from the already well established logistics and SCM system in the parent company, located in some foreign country.

The successes achieved by organizations that implement the strategic supply chain management approach will certainly have a positive impact on the popularity of the approach and a trend towards implementing the supply chain management approach by increasingly more organizations is to be expected. This trend will undoubtedly influence small and medium-sized businesses (SMEs). Many SMEs are already supplying materials, products and services to large organizations. Hence, the adoption of the strategic supply chain management approach by large organizations in supply chains will have a definite impact on them (SMEs). [3]

It is obvious that the position of the SMEs regarding the SCM is not as favorable as for the large companies. If we have in mind the fact the SMEs dominate in the Macedonian economy, we can say that the development of the Macedonian economy is based on the development of the Macedonian SMEs.

II. DEVELOPMENT OF SMES IN MACEDONIA

According to the data of the State Statistical Office the number of active business entities in the Republic of Macedonia in 2010 was 75497. The sectors with the highest share in the structure of business entities were: Wholesale and retail trade; repair of motor vehicles and motorcycles with 28326 entities or 37.5% and Manufacturing with 8263 entities or 11.0%, whereas the least represented were the sectors Electricity, gas, steam and air conditioning supply with 107 entities or 0.1% and Mining and quarrying with 164 entities or 0.2%.

The data on the structure of active business entities according to the number of persons employed show that the highest share of 78.5% belongs to business entities with 1-9 persons employed, followed by business entities with no persons employed (or the entities did not provide information about persons employed) with 14.2%, and entities with 10-19 persons employed with 3.3%. The share of entities with 20-49 persons employed was 2.1%, those with 50-249 persons employed participated with 1.6%, while entities with 250 or more persons employed had a share of only 0.3%. [4]

Nearly 99% of the companies in Macedonia are registered as small enterprises, employing nearly 55% of the employees in the private sector. According to the main activity registered, the majority of businesses are in the wholesale and retail trade sector (47%), manufacturing sector (13.1%), and the transportation, storage, and communications sectors (approximately 10%). The largest

employer is the manufacturing sector, with 35.6% of the total number of employees in the private sector.

The Macedonian Government puts a high priority on the development of the SME sector, focusing on measures and activities to support the development and competitiveness of SMEs, and to improve the business environment in general.

The strategic framework for support of SME development is defined by the following documents: the Small Business Development Strategy, Program on measures and activities for the promotion of entrepreneurship and creation of competitiveness of the SMEs in the Republic of Macedonia, the European Charter for Small Enterprises, the Law on Realization of Handicraft Activities, and the Law on the Agency for Promotion of Entrepreneurship of the Republic of Macedonia (APERM).

In order to achieve a higher degree of coordination among the relevant factors, the National Council for Competitiveness and Entrepreneurship was established as an advisory body to the Government, linking the private and public sector to improve the climate for entrepreneurship development.

The Agency for Promotion of Entrepreneurship of the Republic of Macedonia is the major player on the national level for the implementation and coordination of national and international support to the small businesses. The Agency works in cooperation with various foundations, development centers, centers for technology transfer, Euro Info centers, as well as private consultants. [5]

From the aspect of its size and flexibility the SMEs represent the most dynamic but in the same time and the most vulnerable segment in the global economic structure of the country. That's why, the policy makers responsible for SME development, necessarily need a reliable mechanism for systematic follow up and assessment of the condition of the sector. It will further on, help them to select and carry out adequate measures providing the desired level of SMEs development. [6]

Already in 2002 the Ministry of Economy has published an SME Strategy paper covering a ten year period (2002 to 2013), together with an action plan for implementation of the strategy for the period 2003 to 2006. The overall approach to the development and support for the SME sector that has been outlined in this Strategy paper remains valid. However, a number of developments have made it necessary to revise the SME Strategy and Programme:

- A new Government was elected in July 2006 with an election manifesto and programme which places strong emphasis on increasing the competitiveness of the economy, and on promoting domestic and foreign investment; the Government moreover recognises the important role that the SME sector must play in achieving these objectives.

- With attaining Candidate Country status for accession to the European Union (EU) in late 2005, the harmonization of the National legislation and regulatory framework with EU norms and standards has become a priority. This pertains in particular to numerous laws and regulations affecting the SME sector. Candidate Country status also requires that the Government implement the EU Charter for Small Enterprises, and pursues the goals of the Lisbon Agenda.

- New EU initiatives such as the EU Commission's Instruments for PreAccession Assistance (IPA) and the Competitiveness and Innovation Framework Programme (CIP) present new challenges, in particular in relation to Science, Technology and Innovation (STI) and Information and Communications Technology (ICT) as a means of enhancing the competitiveness of SMEs. The Government must respond proactively to these challenges, in order to create a business environment in which SMEs not just survive, but thrive and are enabled to compete within the EU markets.

Therefore, the SME Department undertook a major revision of the existing strategy paper in the course of 2006, leading to the revised SME Strategy 2007 – 2013. This document has identified the following key areas for policy improvements in relation to the SME sector:

- ♦ The legal, regulatory and institutional environment;
- ♦ The business climate;
- ♦ Support to small businesses;
- ♦ Access to finance;
- ♦ Taxation for SMEs. [7]

III. ADVANTAGES OF SUPPLY CHAIN MANAGEMENT STRATEGIES FOR SMES

Chapman, Lawrence and Helms believe that SMEs can take advantage of the supply chain management strategy for various reasons: [8]

- SMEs are critical links in many supply chains.

- SMEs are very flexible. Many SMEs are still young and developing and it is therefore easier for them to re-engineer existing business processes and adopt a supply chain management approach than for large organisations with a long-standing organisational structure and culture. The integrated approach is inherently part and parcel of SMEs.

- SMEs follow an integrated approach by nature. Various business functions are usually performed by one or a few persons working together.

- Computer software programmes are more SME friendly. IBM, for example, started the service Smart Start, which allows SMEs to use IBM's expertise with information systems along with their own business expertise to find and implement ERP system solutions that work for their business.

- SMEs can also benefit from global competition. Supply chain management provides a method of addressing the competitive challenges facing business today.

Small businesses are therefore already vital links in the supply chains in which they participate. By virtue of their size, flexibility and expertise they possess advantages that

they can use to benefit their supply chain and strengthen their own businesses.

Technology is increasingly affordable and available to help SMEs take advantage of supply chain strategies. Because of the competitive pressures facing small businesses it is critical for them to use supply chain perspectives and associated strategies to create synergies with supply chain partners in order to succeed in the global competitive environment [7]. Despite the optimism of Chapman, Lawrence and Helms there is reason to doubt the general implementation of the supply chain management approach and willingness and ability to implement the approach by small businesses. [3]

IV. SURVEY'S RESULTS

Supply chain performance will definitely be a key indicator of overall corporate success in the upcoming period and core advantage when entering foreign markets and compete with low cost countries. Small and medium enterprises (SMEs) with efficient logistics and SCM will be able to maximize their profitability and improve their competitiveness. That is why a survey has been accomplished in order to see how Macedonian SMEs are managing their supply chains and what should be done in order to make SCM a critical factor for increasing their competitiveness. The research about SCM in Macedonian SMEs was made through a web based questionnaire, which was sent to 68 managers of small and medium enterprises from various industries in the Republic of Macedonia. The questionnaire was answered by 55 managers and only those answers are included in the analysis.

Out of the 55 interviewed managers, 28% are form SMEs from the manufacturing sector, 44% from the service sector, and 28% are offering both products and services.

It is disappointing that only 37% of the SMEs have a separate logistics department and 63% do not have. From the companies that do not have a separate logistics department, 77% plan to establish one in near future, 13% do not know if they will and 10% do not plan at all. Of course this is an encouraging fact. 54% of the interviewed managers think that there is a need for organizational change for SCM adoption in the company, 33% think that there is no need for organizational change and 13% do not have opinion about this issue.

Regarding the current public policy towards SCM, 34% of the interviewed managers are not satisfied, 27% are satisfied and 19% are very satisfied.

On the question How do you manage your supply chain?, we got the following answers: 34% have close partnership with suppliers, 39% have close partnership with customers, 25% use outsourcing, 23% are holding safety stock, 21% use subcontracting, 14% use Supply Chain Benchmarking, and 12% use Vertical integration. These are the most popular methods among the Macedonian SMEs, while we got negligible percentage (i.e. almost no one) for using other sophisticated methods, such as: Electronic Data Interchange (EDI), e-procurement, Just-in-Time (JIT) supply, Third Party Logistics Providers (3PL), Fourth-party logistics provider (4PL) and similar.

13% of the interviewed managers think that their company is not successful at all in managing its supply chain in general, 34% think that they are just not successful, 28% think they are somewhat successful, 17% think they are successful and only 8% think that they are very successful. These figures are disappointing, but the managers are aware of the fact that there is a need of implementing different systems in the companies for supporting the Supply Chain Management. More of the half of the interviewed managers believe that the Supply Chain Management in the company will be supported strategically by the implementation of the following systems: Material Requirements Planning (MRP), Manufacturing Resources Planning (MRPII), Enterprise Resource Planning (ERP), Warehouse Management System (WMS), Customer Relationships Management (CRM), Supplier Relationships Management (SRM), E-commerce, Radio Frequency Identification (RFID), Bar coding and Electronic Data Interchange (EDI). Nearly three-fourths of the interviewed managers strongly believe that the companies will achieve great benefits with the implementation of those systems, such as: better quality and quantity of information, reduced lead-time in production, reduced inventory level, better operational efficiency, increased coordination with suppliers and customers and flexibility. But, they are of course aware that the implementation of these systems is very expensive and a long-run project, probably as SMEs they will not be able to implement most of these sophisticated systems, so as a solution for overcoming the unfavourable level of logistics and SCM development in the SMEs, they are planning to implement the following future measures for supporting the company effort in logistics and SCM by raising the awareness of the importance of these topics: More funding and financial support (73%), More formal education (65%), Easier access to vocational training (62%), Better infrastructure (61%), Increased regional cooperation between institutions (59%), Closer cooperation between companies and governments (57%) and Improved information provision (54%).

V. CONLUSION

Success in integrating global supply chains starts with the ability of companies to move goods across borders rapidly, reliably and cheaply. In order to connect the Macedonian economy to the world trends and processes and connect the Macedonian market to the European and the world market, the highest priority should be given to the development of logistics and supply chain management in Macedonia. It is obvious that for the large companies it is easier to reap up the benefits of the well established logistics and SCM division. The position of the Macedonian SMEs regarding the SCM is not as favorable as for the large companies. If we have in mind the fact the SMEs dominate in the Macedonian economy, we can say that the development of the Macedonian economy is based on the development of the Macedonian SMEs. That is why this paper is focused on research about the level of development of logistics and SCM in the Macedonian SMEs. Macedonian SMEs must fully

understand the supply chain management approach and their role. Large organizations, however must realize that, despite their size, SME suppliers are important partners who can contribute substantially to savings in the supply chain. Only in this way they can increase their profitability and competitiveness and become integral parts of the global supply chains.

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DIGITAL MULTIMEDIA TECHNOLOGY TO SUPPORT SERBIAN SME's

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Abstract - Digital multimedia technology is an emerging new communication technology. It is expected to play an important role in communication today and to provide timely information, with reducing costs in relation to traditional media. The main target of this paper is the implementation, and evaluation of a digital multimedia technologies based on a computers to display contents on digital displays located at one or more locations, also each display has an attached processor and local storage containing both the information which will be displayed and the local playlist of what should be displayed. Additionally, the design allows content to be customized to specific local viewers, i.e., the displayed information can be adapted to the user or users currently in front of the display. The granularity of the schedule is much shorter in digital multimedia technology – leading to a more visually dynamic experience for viewers. The paper also investigates how the installation of proven digital multimedia technology into many places could provide a valuable and relatively low-cost marketing platform for any large or small enterprise/organisation to communicate and promote their respective products and services. Finally, such a system could be an important ICT support of Serbian SME's development.

I. INTRODUCTION

Digital multimedia is the most compelling platform to effectively reach employees, students, customers, and partners. This digital media is used to convey important information and messages such as news, training material, and information about upcoming or current events. Digital media is effective because it brings familiarity and closeness to modern communications. In today's dynamic world digital media has an important role; especially for organizations who wish to spread their business throughout the world. For educational organizations digital media plays an important role in informing target audience about the events, such as: seminars, lectures, meetings, registration deadlines, schedule changes, exams, and sports activities. Digital multimedia represents an emerging new communication technology; in particular digital signage is rapidly gaining popularity today.

The main challenge today for many organizations is the successful deployment and integration of a digital network system. In large organizations, such as business, educational, and research organizations, lots of events are taking place each day. Thus there is a constant need to inform people about what activities are taking place, where they are taking place, and how to get from where the sign is to this place. Informing the potential audience in these organizations through conventional media has many disadvantages. Some of these drawbacks and disadvantages are the great financial costs of printing, broadcasting, distributing, etc.

An important aspect in the digital multimedia industry is educating the end-user firstly about what digital multimedia technological systems are and secondly about its benefits, why are they need it and what is it bring to them. If one still believes out-of-home advertising is for large organisations or advertising agencies only, a reality-check is needed. By becoming more affordable digital multimedia technologies allow SMEs to take advantage of engaging with their customers cost-effectively and even make a profit out of this.

II. BASICS OF MEDIA AND NEW DIGITAL MULTIMEDIA TECHNOLOGIES

Media is essentially the routes by which messages are passed on, for a limited period of time, from a sender to a recipient. A broad view of it is to consider businesses or people as units of energy or material known in communication terms as intermediaries. They convey information to each other and so forge links between them. In marketing terms, information is the primary objects of market exchange, and media plays a crucial role in any communication process.

Media is divided into the following categories:

- **Print media** - daily newspapers and periodicals, post, etc.
- **Electronic media** - radio, television, computers, radio stations for advertising, etc.;
- **Media posted in public places** - posters, boards, billboards, illuminated signage, etc.;
- **Media in a space** - shop windows, exhibitions , fairs, theaters and similar media;
- **Media on the move** - public transportation vehicles, as well as all other means of transport;
- **Multimedia** - uses multiple different types of media integrated into a whole.

The term digital multimedia technologies implies any combination of two or more media in digital form, which are so integrated that they can be presented through a unified interface, using a computer program, which broadcasts the content from one central place to multiple remote locations, according „Digital Signage" networks, see Figure 1, as in [1].

Possibilities of digital multimedia technologies:

1. **Multi-zone** – divide the screen into multiple zones,
2. **Multi-layer** – layered presentation,
3. **Multi-source** – content that is displayed may come from a large number of external sources,
4. **Multi-channel** - the management of multiple displays over a single computers,
5. **Multi-display** - connecting multiple displays or projectors into a single image. as in [2]

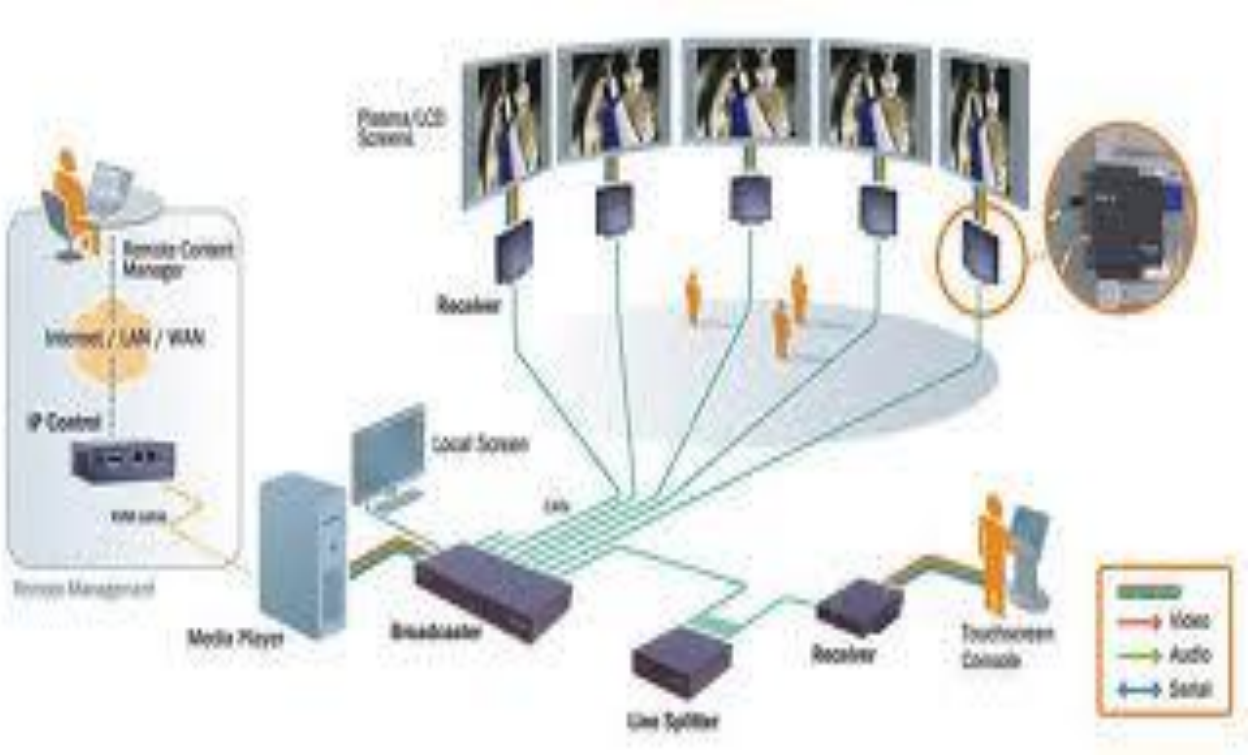

Figure 1. Basic components of „Digital Signage" networks

Computers and the Internet are an integral part of multimedia technology. Specialised software means that information can now be transmitted as text, images, graphics, movies, video clips, music and sound effects, which can be further processed and manipulated. Interactivity is one of the most important features of digital multimedia technology, and it represents a change from one-way communication through traditional media, towards diffuse communication where every person and device become both emitters and receivers (Bluetooth, touch-screen displays etc).

These systems are already used by different industries, including: commercial, sports, entertainment, hospitality, corporate business, transportation, education, healthcare, public sector and banking, as in [3]. Digital multimedia technology is used for many different purposes and there is no definitive list.

Below are some of the most common applications:

- Public information – news, weather and local information, such as fire exits and traveler information,
- Internal information – corporate messages, health and safety, news, etc.,
- Advertising – either in related to the location the digital multimedia technological system is in or just using the audience reach of the screens for general advertising,

- Brand building – in-store digital multimedia technological system to promote the brand and build a brand identity,
- Influencing customer behavior – directing customers to different areas, increasing the dwell time on the store premises,
- Enhancing customer experience – applications include the reduction of perceived wait time in restaurant waiting areas, bank queues, etc., as well as recipe demonstrations in food stores,
- Enhancing the environment – with interactive screens or with dynamic way finding.

The main features of „Digital Signage" network:

- **Adaptability** – it can cover broadly what people care about and adapt to most of the existing implementation with little change,
- **Manageability** – it can be used as the key information in managing,
- **Extensibility** – it allows future expansion for various digital multimedia applications,
- **Scalability** – its existence does not provide a hardship when the network scales large,
- **Easy to implement** – the effort to generate such log and any value-added services (e.g. reporting, analytics) are reasonable**.,** as in [4]

III. ASSUMPTIONS OF EFFECTS ON USE OF ALTERNATIVE MEDIA FOR MARKETING COMMUNICATIONS AND BUSINESS IN GENERAL

The communication effects of traditional media have been declining in recent years.There are currently several methods for the measurement of range, frequency and impact of media. In the United States results using CPM methods (Cost per thousand impressions) show that there is smaller investment required in advertising through digital multimedia technologies in public places than in other media, as in [5], as seen in Table 1 below. Other measurements show that digital multimedia technologies increase awareness of the brand by 48%, increase the consumption of customers by 30%, increase sales by 32% and increase in the number of visitors into retail areas by 33%, as in [6].

TABLE 1. The results of some analysis carried out in the U.S. According to the Cost per thousand impressions (CPM) method

TYPE OF MEDIA	PRICE PER ONE VIEWER
Digital multimedia systems (outdoor)	In the range from $1.5 to $5
Television network	≈ $25

Digital Multimedia technology offers companies a fast, cost-effective way to roll out user-centric Unified Communications with extensive mobility support. By putting users at the centre of communications, the new technology enables them to keep in touch wherever they are, using their preferred available device and network.

The Digital Multimedia technologies is a business communications solution that provides user-centric Unified Communications which does fully adhere to the Protocol standards: no proprietary signaling is used to secure interoperability with other network components. It gives business users a single point of contact for any form of communications, Presence, preference management and real-time monitoring are available for all users on all devices, as shown in Figure 1.

Battlefield for advertisers has been extended! Traditionally, brand managers contest TV channels in living rooms. Nowadays, more and more of them are trying to reach their target audiences with timely information right at points of purchase, where customers can enter into the immediate action to buy.

They also try to convey corporate image and up-to-date information of new products and promotional activities to target customers in train stations, airports, bus stops, hospitals, banks, and other places where people have to wait, also in public transport vehicles. Moreover, those commercials in the out-of-home media network cannot be skipped or changed by viewers.

Digital multimedia technology can thus play a very important role because it can help SMEs both create business opportunities and combat pressures from competition. Appropriate Digital multimedia technology can help SMEs cut costs by improving their internal processes, improving their product through faster communication with their customers, and better promoting and distributing their products through constantly presence. In fact, Digital multimedia technology has the potential to improve the core business of SMEs in every step of the business process.

Given the focus of SME performance and productivity, to this paper, there is a research which did not quite give answer on the relative costs and benefits of Digital multimedia technology. A key issue is that whereas many of the costs of adoption are tangible and quantifiable, the benefits may be often either speculative, intangible or difficult to quantify. However, many research has shown that companies who have accepted Digital multimedia technology believe that it contributes to improved performance in four main ways:

- The development of new products and services;
- The generation of new customers;
- Reductions in costs; and
- Improved productivity.

IV. STRATEGY MEDIA SUPPORT TO SME SECTOR

SMEs are often the main driver for a country's economic growth. However, as the number of SMEs increases, competition increases, which then results in a decrease in prices, customer base, or both. This in turn will erode existing profits, creating less incentive for people to start SMEs. This dynamic is captured by balancing feedback loops where the greater the number of SMEs, the greater the competition, resulting in a slower rate of growth for SMEs . To counter the increasing competition, firms can lower prices, increase promotion of their product, improve their product, add new distribution channels, and/or improve their internal processes. The challenge is to counter competition when the firm still has the financial resources to do so. Otherwise, once the pressure of competition sufficiently decreases the SME's profits, it will no longer have resources to counter the competition and will have to exit the market.

Recent government statistics report that SMEs represent a key factor of economic development in Serbia and make up 98.8 % of total registered enterprises. They also make up 65.5 % of the total number of employees in Serbia, as in [7]. As such, SMEs are important agents of economic growth. They raise the living standards and create conditions for a better trade balance. During the last decade, much has been said and done about supporting the development of the SME sector. Almost all previous Serbian governments have issued and implemented a Strategy for SME's development and growth statistics show that the country has achieved considerable benefits from this. Among other elements of the development strategy, one of the most important is the promotion of activities to support SMEs' development through a continuous media campaign, as well as to promote SMEs themselves and their products and services. Most SMEs do not have the ability to allocate funds for media campaigns using traditional media because prices for advertising services are generally cost-prohibitive. SMEs in general, and in particular start-up and immature enterprises have so many demands on their working capital that there is insufficient means to invest in expensive marketing campaigns. In such a situation, by introducing digital multimedia technologies for marketing communications, can create more SME media centers providing practical and even subsidised support for SMEs to promote their goods and services which is entirely consistent with the stated aims of the Serbian Government development strategy.

Digital products and information services are an increasingly significant part of economic activity and they offer important opportunities to small firms. Government and the private sector have key roles in facilitating content availability across all platforms and encouraging local development of new content, including content from public sources.

Potential partners for this initiative include:

- Relevant ministries and other state bodies governing development in the Republic of Serbia;
- Local governments, who in most cases would be able to use the resource to advertise local developments, tourism, cultural and historical content, agriculture and products;
- A wide range of manufacturing and non manufacturing organizations, which could include: travel, sports, commercial, marketing, logistics and others, as well as all transport providers who could benefit from a multi-modal communication platform being available on the Serbian transportation system., as in [8]

Small firms may lack objective information regarding the benefits and costs of adoption of Digital multimedia technologies. The private sector (e.g. business associations) and government have a role, and can provide information about services available and when necessary improve coordination of government information on the benefits of adoption and use of Digital multimedia technologies, for example case studies and good-practice.

It is commonplace for governments to have policies to encourage the growth of SMEs as they can help to directly alleviate poverty by increasing income levels and creating jobs. However, as the global economy becomes increasingly reliant on information and communications technology to receive, process, and send out information, the small businesses in Serbia, which form a significant portion of their developing economies, have yet to gain the benefit of these benefits evenly. This is because obtaining such opportunities rests largely upon the ability of SMEs to engage in the regional and global economic business networks which, in turn, demand provision of a prerequisite level of access to and use of ICT. Unless these prerequisites are in place, these SMEs are set to lose out on opportunities to integrate into the global supply chain, bid for outsourcing businesses, and increase their internal productivity and efficiency. SMEs can benefit either as producers of ICT or as users of ICT for purposes such as increased productivity, faster communications and reaching new clients.

While ICT can benefit SMEs in multiple ways, SMEs in Serbia have been slow to adopt ICT as they face major constraints such as poor communications infrastructure, limited ICT knowledge, inability to integrate ICT into business processes, high costs of ICT equipment, incomplete government regulations for e-commerce, and a poor understanding of the dynamics of the knowledge economy. To remove these constraints, government need to do more than merely improving ICT national policy and promoting SMEs in the ICT sector. Instead, government should embed ICT components (in this paper, components digital multimedia technology) into overall SME policy in a comprehensive manner. However, this does not mean that SME policy should be the same for all industries. SMEs in different sectors use ICT differently and will adopt them at a different pace. Additionally, SMEs need help in translating the benefits of ICT to their core business.

The willingness of SMEs to integrate multi-modal communication business practices depends on how much it can directly improve their core business and how much the potential benefits outweigh the definite costs. This can have wider impact on national economies since SMEs are the engines of economic growth.

V. CONCLUSION

Serbian government and economy have not explicitly focused on Digital multimedia technology adoption by SMEs. They have either focused on growing the ICT sector or supporting the growth of SMEs, but they have not focused on integrating the more media in digital form, which are today used all around the world.

The author of paper recognised that there is a substantial opportunity for Serbian economy to create a very sophisticated marketing communications platform to deliver emotionally intelligent content to highly segmented and predictable target audiences. From this, Serbian SMEs will be able to realise considerable benefits together with the potential for a very healthy financial return on investment (ROI) on a long-term and ongoing basis.

The author believe that a more important output of this paper is the recognition that the implementation of such a platform could also play a significant role in helping to grow the emerging Serbian economy by using at least some of the financial surpluses from this initiative to provide SMEs with a subsidised means to promote their products and services to their selected target audiences.

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Bricolage approach for the software development in SMEs -Case study of simulator manufacture

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Abstract -. Bricolage approach, based on the idea that new product should be result of innovative assembly and adaptation of available technologies and tools in order to make them work in practice, may effectively be applied in software design in SMEs.

This paper presents a longitudinal case study of using bricolage approach in a SME producing flight simulators. The focus is on parts of the software for simulation of airplane flight, including development, testing and validation. The software is built from few commercially available tools, some free components, and in house developed specialized and integrating modules.

I. INTRODUCTION

Modern ICT has enabled the Small and Medium Enterprises' (SMEs) to become more integrated, more effective across longer distances, and to operate with more efficiency.

However, SMEs can experience difficulties in adopting Information Systems (IS) and aligning them with their strategic development [1]. Introducing standard IS and Enterprise Resource Planning may impose a rigid structure on a company, requiring that a SME behaves like a large company with long-term strategic planning and lots of in-house experts for IS – two requirements that are typically not fulfilled for a SME [2].

SMEs possess abilities to innovate fast, to respond rapidly to changing environments and to satisfy customers' emerging and evolving requirements, that can give them a competitive edge over larger organisations. However, these attributes are rarely exploited when SMEs implement IS.

A useful concept is bricolage, as it deals with the need for SMEs to learn about the possibilities of IS in situ, simultaneously exploiting the can-do approach that is usually found in SMEs [1,2]. The bricolage is based on the assembly and integration of various existing technologies and devices in order to make them work in a novel product. In addition, IS may be implemented piece by piece, stretching IS to support administrative and other functions that were outside of the application's intended scope.

This paper presents the results of several years of development IT solutions in one SME - French flight simulator manufacturer [3]. Starting at late nineties in the field of hi-tech IT technology, and promoting low cost technology products on market, the enterprise succeed to install their Flight Simulator Training Devices (FSTD) worldwide. One of its FSTD is installed in JAT Flight Academy in Vrsac.

The role of adopted strategy, combining existing commercial and free software components with in-house IS development, was significant factor for the enterprise success. Full control of the customer-tailored parts of the software makes it possible to remain flexible and dynamic, and to conform to the need of the customers at any time.

This experience may be useful for other SMEs, at least those working in the fields of innovative technological solutions.

II. BRICOLAGE APPROACH AT SME

Bricolage (the term is borrowed from French meaning "do it yourself") is used in several disciplines, to refer to the construction or creation of a novel product from a diverse range of things that happen to be available. By strict definition the bricoleurs 'universe of instruments' is closed and he will make use of whatever is at hand [1].

For example, in education bricolage is described as a way to learn and solve problems by trying, testing, and playing around, very much like a constructivist approach to learning [16], contrary to the analytical style of solving problems.

The concept of bricolage has been adopted, among others, by information systems developers [2]. When considering IS bricolage 'materials at hand' are usually considered to be information technology hardware and software artefacts.

There is an increasing race in the IT business environment which requires faster and more efficient software development methodologies. Thus, many alternatives to classical waterfall development process model are suggested [17,18]. For example, rapid application development (RAD) and eXtreme Programming (XP) have in some cases allowed small teams to develop systems quickly in rapidly evolving requirements. In addition, outsourcing software development and combination of bought, in house

developed and open sourced software, which often happens in SMEs' practice, make scenarios not well addressed by formal software development methodologies.

In fact, improvisation is frequently a chosen business model of SMEs. It enables them for a fast reaction on immediate pressure, as they can adapt and change to suit market conditions with no long term direction or strategic planning. Sometimes this flexibility is giving them a competitive edge over large companies.

Bricolage approach formalizes and systematizes this process of IT systems development.

III. IT APPROACH AT SIMULATOR MANUFACTURER

Aeronautical industry is usually related to cutting edge technology products, large systems, large investments, very systematic approach and rigorous standards. The solutions are often exclusive and expensive. Flight simulation industry is not an exception.

In many branches of industry, flexible low-cost products, adaptable to current market demands are produced by SMEs. This might be expected in the flight industry, too, but that seldom happens. Namely, practice, standards, experience and development methodology in aeronautical industry leave little or no room for small firms with limited resources, unless they find their way to produce high-tech low-cost solutions.

Although "high-tech low-cost" seems to be an oxymoron, it may not be the case if a SME succeeds to find a way outside well known schemes and procedures. A conceptual approach of bricolage is not only ideological but just practical framework to find new innovative solutions.

ALSIM [3] is French simulator manufacturer started to build Flight Simulation Training Devices (FSTDs) for pilots' initial training [4] in late 90'ies. Independent firm with 25 to 30 employees including management, finance, sales and marketing, development and production, succeeded to develop its own products and its own methodology. What happened just corresponds to what is meant by the concept of bricolage.

The text to follow will highlight an aspect of the IT development usually considered as hi-tech in simulator technology. Its major components are:

- airplane flight modelling;
- collecting of representative data;
- implementing the flight model on FSTD;
- validation of the flight model;
- qualification of the flight model and FSTD.

It will be explained how the company under study has integrated all these components into a successful marketable product, combining off-the-shelf parts with in-house developed components, thus successfully implementing bricolage development process in practice.

IV. SOFTWARE CONCEPT FOR FLIGHT MODEL DEVELOPMENT

The development concept in the company under study in this paper is centered around real time (RT) simulation software implemented on the training devices.

A. Real time IT support

Only few commercially available tools are used on PC Windows platform:

- Visual C++ 6.0 for real time programming;
- PC anywhere, for access of distant computer
- Adobe Illustrator, Corel Draw, 3D Studio Max for graphical content (assets) of synthetic instruments and indicators in the cockpit and visual system creating computer generated imagery of outside world;
- Microsoft Word and Excel for documentation.

This completes RT informatics support.

A distributed system architecture shown in Fig. 1 (autonomous processes interact with each other by message passing) is adopted for RT software on FSTD.

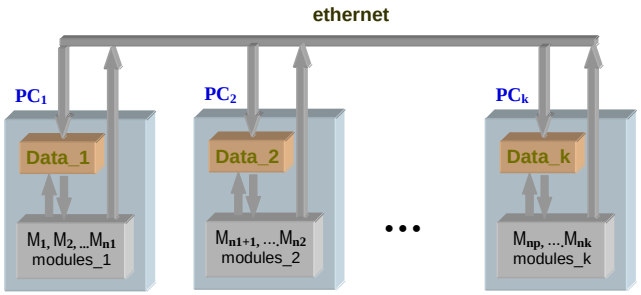

Fig 1 Distributed computing architecture

The processes are running either on the same physical computer or different computers.

Peer-to-peer architecture is exploited where there is no special machine or machines that provide a service or manage the network resources. Instead all responsibilities are uniformly divided among all machines, known as peers. Peers can serve both as clients and servers. This is in fact application of the concepts of DIS (Distributed Interactive Simulation) i HLA (High Level Architecture) [5,6,7] which offer high level of modularity and flexibility.

Thus, FSTD are built primarily from low-cost massive production components and common basic software tools are used.

B. Non-real time IT support

Software for Flight Model Development (SFMD – running in non-real time) is composed from in house developed modules or third party products. The latter is either free software (e.g. Octave – Matlab clone, or GCC compiler), or bought for a fee of the book with the software attached (e.g. Sidpac [8], Stdaer [9] etc.).

Each of these modules has been tested and validated prior to its integration in the SFMD package.

The integration of third party software was not simple due to variety of programming languages, input-output formats, and a mixture of source and executive code. Generaly, none of these modules has been compatible with others.

The principle of distributed computing is exploited, because data-centric architecture enables computing without any form of direct inter-process communication.

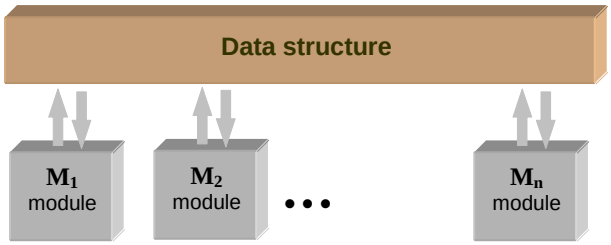

Fig 2 Data centric Architecture

Again, the ideas from HLA are exploited. All modules of SFMD are independent but it is asumed that comunicate with rest of the system trhough comunication interface (which corresponds to midleware in HLA terminology).

In howse developed modules are already built compatible, and third party modules are wrapped by an auxiliary software layer to obtain FSMD compatibility (see Fig 3).

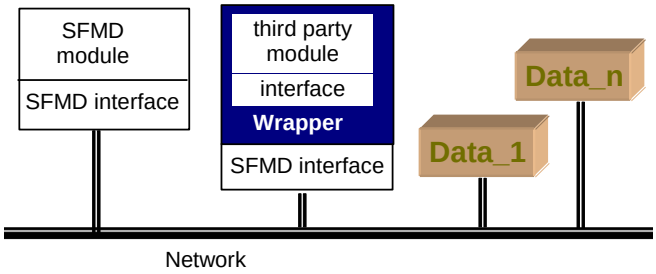

fig3 integrating third party modules into SFMD

The following sections give more details on particular tasks, methods and modules in SFMD.

V. Flight Modelling and Simulation Module

Flight model or mathematical model of airplane motion is commonly adopted system of differential equations representing rigid body with six degrees of freedom in quasistationary aerodynamic flow field [10-12]. Solution of this system may be represented in the form

$$Ch = f(p) \qquad (1)$$

where ***Ch*** is set of airplane characteristics (fixed values as airplane maximal speed, ceiling, or functions like motion time histories e.g. flight altitude versus time), ***p*** is set of airplane parameters (fixed values as weight, wing area or functions like engine thrust vs. airspeed and height) and ***f*** is function .

Parameters ***p*** are input data to the flight simulation model while characteristics ***Ch*** are output data, i.e. results from the simulation model due to eq. (1).

The set of parameters ***p*** (known as data package) is sold by airplane manufacturer, since these data are normally predicted as a part of the airplane design. For some simulated airplanes there is no data package to buy, so simulator manufacturer has to build it. The practice at ALSIM was to build its own data for simulated airplanes.

Thus, the task to be solved by use of SFMD is: a) Build the set of representative parameters ***p*** for a simulated airplane, b) Obtain the set of airplane characteristics ***Ch***, both of them validated and conform to the standards [4].

A. Data collection

Primary sources for the airplane flight model definition are: certification data sheet, Airplane Flight Manual and Airplane Operating Manual as officially approved documents. Additional data may often be found in some of textbooks [8-14], and in various technical reports.

The next level of data collection concerns the similar airplanes (i.e. those having similar or same purpose, certification category, propulsion, weight and size). Using principle of aerodynamic similarity and model equations [8-14], this data may be used to predict parameters of the target airplane.

B. Data consistency check and flight model parameter prediction

Data collected from various sources may be more or less reliable and should be checked for consistency.

For data consistency checking, the following simple statistic principle is often exploited. The values of the same parameter coming from various sources are compared. If some value is outside the pre-set level (which may be defined in terms of standard deviation σ), its source may be eliminated from further considerations, or taken into account with the confidence level depending on deviation of parameter mean value.

Flight model parameters are predicted using standard techniques for airplane design, available in the textbooks [8-14] and technical reports. Often the books are accompanied by software ready to use.

The principal software packages exploited in the airplane flight modelling are the following:

- DATCOM. The U.S. Air Force Digital Datcom is a computer program that uses flight conditions and aircraft geometry to estimate the aerodynamic stability and control characteristics of aircraft. Digital Datcom follows the methods in the U.S. Air Force Stability and Control Datcom [13]
- Smetana codes is a software accompanying the book [9], permitting to estimate aerodynamic parameters of a light airplane – just corresponding

to the class of airplanes used in the initial pilot training and simulated on the low-cost FSTD.

- Lowry codes [14] represent Excel sheet implementing simple techniques for predicting light airplane performances. It is used in inverse fashion: parameters are tuned until predicted performances fit the real airplane performances.

VI. FLIGHT MEASUREMENT MODULE

Demonstration of the simulator fidelity, i.e. that simulated airplane behaviour is sufficiently close to real airplane behaviour require flight measurement records done at specified test conditions by standards [4]. Flight records may be bought from airplane manufacturer (if available) or done in house. The latter is the option adopted by ALSIM.

The equipment developed in house, dedicated to the flight measurement for the airplane model development is based on the following principal low-cost components [15]:

- Laptop computer (Sony Vaio PCG-141C notebook)
- PCMCIA data acquisition card (National Instruments DAQ Card AI-16E-4) collecting up to eight analog input signals and eight digital IO signals.
- Attitude and Heading Reference System (Crossbow AHRS400CA-100)
- Video and voice recording camera
- Accessories, position and force sensors completes the system hardware.

The software is written in C++ (hardware communication routines) and Matlab.

VII. FLIGHT MODEL VALIDATION AND TESTING MODULE

At a first stage the flight model is validated in non-real time context. It consists of validation of model equations which are common to all airplanes in a simulated class and validation of model parameters, specific to simulated airplane.

Model equations are implemented in software modules and they are validated prior to use in SFMD as well as during each flight model development. Namely, they may be considered as source of the of model parameters and data consistency check described in last section also attributes the confidence level to the module.

The simplified principle of the consistency check may be stated as: "If the results of two different modules are identical or sufficiently close, then both of them are correct. In opposite case they are both considered not correct and further validation is necessary".

In Fig 4. a simulation results are compared with flight records. Although match is relatively good, the deviations may be noted.

One may not a priory state that neither simulation results are correct (comprising equations, parameters and simulation algorithm) nor the flight records are correct (since they suffer from measurement and data processing errors).

Flight model parameters and equations are considered

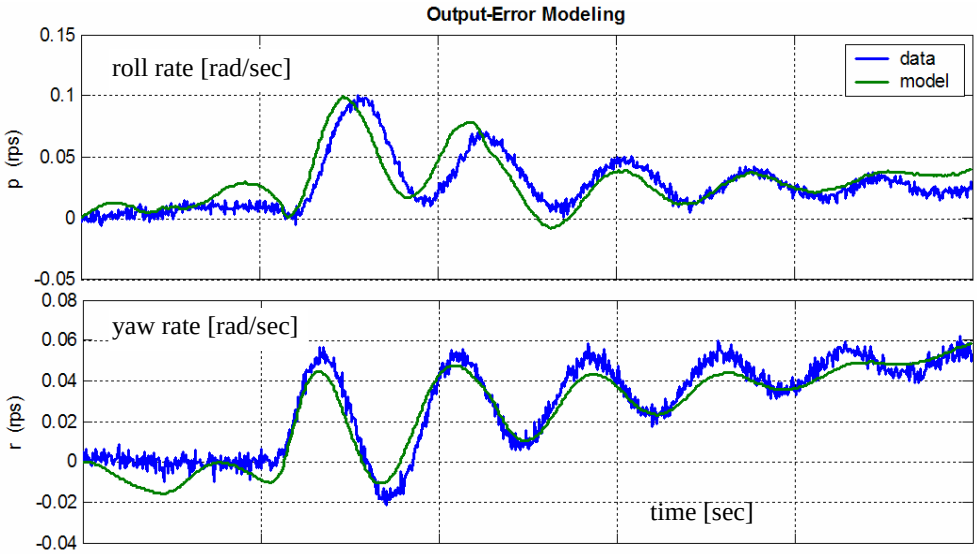

Fig 4. Comparison of simulation results with flight records

validated after achieving acceptable confidence levels.

By model based testing approach, a real time simulation model is validated using standard unit and integration test techniques and driver-stub arrangement.

Finally a series of automated tests is executed on the simulator and compared with the data collected during model development. The test results together validation data are delivered with device.

Each of FSTD in use is subject to periodic evaluation (called FSTD qualification according to standards [4]) by flight and technical inspectors which run the tests and compare with validation data.

VIII. CONLUSION

The standard IS development approach tailored primarily for policy and operation of large companies might not be

olways the best solution for SMEs which usually operate with limited resources, but are typically more flexible and adaptable.

Introducing IS piece by piece from already available products, combined with in house development, may result in IS better adapted to SME company needs. This approach is formally called bricolage. Experience and IS solution described in this paper indicate that bicolage approach of combining technologies at hand may result in successful products developed by SMEs, although those products are usually considered to be hi-tech and exclusive for large companies..

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Stigmergy processes in the function of Web information system management and their importance in the development of small and medium-sized enterprises

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Abstract: Stigmergy processes are a key factor in the development of information systems for small and medium size enterprises, they represent an efficient, applicable, cost-effective and reliable solution, their future implementation will be crucial in the progress and survival of the Web based enterprises. Development of the company which offers software supports to their clients, use this type of software for autonomous development, systems based community support, grouping and dedicated to the development of such type of products, plays a crucial part in products development. Enthusiasm of the community oriented members has a crucial part in the open source software processes, where members take active take part in the development, improvement of functionality, mechanisms of coordination, stability, efficiency, and the software security. Stigmergy is a term taken from biology, presents a mechanism for controlling and coordinating the work of individual and the environment, members and the environment as an enclosed system, for the benefit of community and all their individuals. Many processes on the Internet are stigmergy oriented and based, and its understanding is crucial for the future processes of Internet development.

1. INTRODUCTION

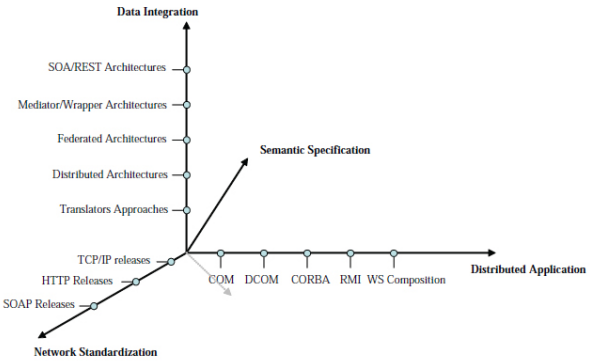
Stigmergy processes are a key factor in the development of information systems for small and medium size enterprises, they represent an efficient, applicable, cost-effective and reliable solution, their future implementation will be crucial in the progress and survival of the Web based enterprises. Development of the company which offers software supports to their clients, use this type of software for autonomous development, systems based community support, grouping and dedicated to the development of such type of products, plays a crucial part in products development. Enthusiasm of the community oriented members has a crucial part in the open source software processes, where members take active take part in the development, improvement of functionality, mechanisms of coordination, stability, efficiency, and the software security. Stigmergy is a term taken from biology, presents a mechanism for controlling and coordinating the work of individual and the environment, cooperation of members and the environment as an enclosed system, for the benefit of community and all their individuals. Many processes on the Internet are stigmergy oriented and based, and its understanding is crucial for the future processes of Internet development.

Complex software applications, web sites, magazines, encyclopedias, social sites are result of stigmergy processes, where members without fees of restrictions, use complete software code or part of it, modify it, commercial monopoly is excluded and is not constrain factor in continuous software developing. Stigmergy process paradigm, with "work in progress" as the slogan, represents an essential factor, where the modification of the environment serves as external systems memory, encompasses work groups or individuals into a continuous chain of upgrades and improvements.

In this study of stigmergy processes, special attention will be focused to the Drupal development, the CMS open source software, as a practical application realized on than one million Web sites and applications, its development is supported by hundreds thousands of active users, who in their own and benefit and goodness of community, working in active modules development, the software implementation which its strength exceeds all community together, and whose adaptability and creativity, system resources, wide theoretic and practice area, economic feasibility, presents a challenge for all competing products. Applicability of the Drupal CMS system in the following areas: electronic commerce, web information systems of small and medium enterprises, on-line magazines, travel agencies, media web sites, systems of education, scientific research projects, etc. In the practical part of the paper we show Drupal system and its implementation in the distance learning system, as a real-time effective solution for on-line education system.

2. SYSTEM, INFORMATION SYSTEM, WEB INFORMATION SYSTEM

In the analysis of information systems in modern interpretation has far greater significance, we start from the system that is commonly defined as a set of entities, at least two, organized to perform a particular function, while interaction of parts creates a whole. That is a set of interrelated dependent parts which together form a whole so that this set has a specific purpose, goal and changes in any part leads to changes in another part to. [1]
Information system is an integrated system of human activities and technologies that support the operations, management and decision making. Today's information system show is multidimensional, presented three axes with its elements in the way of data integration, of network standardization and distributed applications.



[2]

3. OPEN SOURCE SOFTWARE AND STIGMERGIC PROCESSES IMPORTANCE

The open source processes are almost identical to the termites colony building, process known as stigmergy. There is no centralized leader, no hierarchical project layout designs termite colonies. Stigmergy is simultaneous process between the communes-associations and its members, the work coordinating process for the systems impruvments, in the benifit of the individuals and community development.

Basic stigmergic processes features are :

- individuals do not respond to centralized instructions
- each individual does in his own way
- mode of communication is via the environment (site, forum, blog, comercial support)
- system feedback, benifit of an individual from the community and the community of individual
- errors are discovered by accident but they prevail abundance of the commune and its willingness to help
- stability and persistence of components depends on the environment and each individual
- all structures lead to the improvement, simplification, the applicability of the product around which the community operates and works
- stable states of the system are mulitple.

Stigmergy processes are based on the belief that hierarchy is extremely inefficient, where all personal is rely on the head person who manages all aspects of the activity, creativity and intuitiveness, inventiveness are completely ignore.

Open source software is those whose source code is publicly and available for elementary rules of usage, the code can be changed, adapted and improve. Such products are: Firefox, Joomla, Drupal, LINUX, MediaViki, Wikipedia etc.

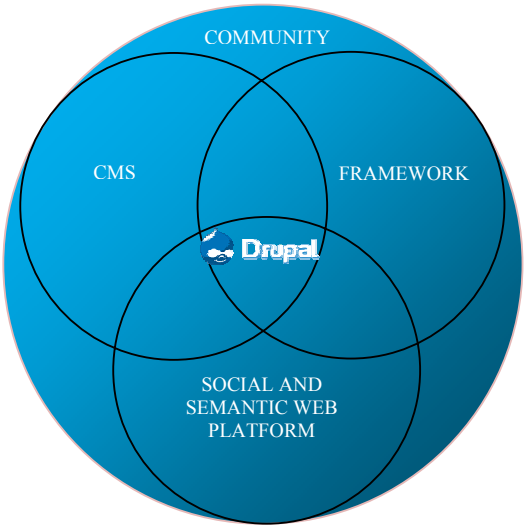
The GNU General Public License (GNU GPL or simply GPL) is the most widely used free software license, originally written by Richard Stallman for the GNU project. The GPL is the first copyleft license for general use, which means that derived works can only be distributed under the same license terms. Under this philosophy, the GPL grants the recipients of a computer program the rights of the free software definition and uses copyleft to ensure the freedoms are preserved, even when the work is changed or added to. This is in distinction to permissive free software licenses, of which the BSD licenses are the standard examples. [3]
The classical economics model holds that people are intrinsically selfish, and will not do anything to help others—such as providing information products—without remuneration. Traditional economics is based on the assumption that private property rights are needed as an incentive for production. Only when you have full control over your production can you ask remuneration for it to the people who would like to use it. Moreover, the free market model assumes that competition is needed to optimize production: if people do not buy your products because they prefer the one of your competitors, you will be forced to improve your products or lower their price. When the major producers all cooperate, as in a cartel, competition is eroded and prices can increase freely without corresponding increase in quality. [4]

If small and medium enterprises are often showed as organizations including the qualities of flexibility and resistance, the auto-organization seems, on the other hand, very rarely held in reticular organizations. It is here that swarm intelligence, which include the phenomena of auto-organization of social insects, brings us elements of reflection in the light of the four main mechanisms that constitute the auto-organization phenomena :

- The existence of multiple interactions,
- Development by the positive feedback,
- End by Negative feedback,
- The amplification of fluctuations. [5]

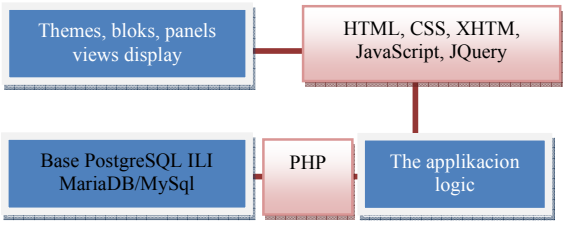
Using models of social insects allowed us, at first, to consider otherwise the mechanisms of coordination and control in a peculiar reticular organization, a grouping of small and medium-sized firms working on shared projects. [6]

4. DRUPAL APPLICATIONS LAYERS



[7]

Drupal is written in the PHP programming language, Java Script and Query libraries represent the standard programming tools, while the database is based on PostgreSQL or MariaDB/MySQL. Application layers of which was built Drupal application are:



With the slogan Come for the software**,** stay for the community, 656,444 people in 228 countries speaking 181 languages power Drupal. Drupal is an inevitable force of progress and continuous improvement. At the main Drupal Web sites: http://drupal.org/ you can find information for the beginners and advanced user, conference theatres information, security patches, information about new modules and themes details installation instructions, diverse community, software and hardware system requirements. The Drupal is supported by community oriented individuals, diverse groups which are paid for the modules and specific code developments. On the various Web sites you can find books and video instructions, tutorials for the specific system functions. [8]

Drupal is highly modular, open source, Web CMS (Content Management System), its strength is based on great support and cooperation hundreds of thousands of passionate people and teams, working on powering improvement and upgrade of the system. As expandable, encompassed with advanced administrative interface, supported by teams of highly qualified programmers, the code are continually updated and improved, the security system is based on multiple Drupal layers.

The possibility of separation and the system maintenance organization is integrated into the very essence of the system architecture, hereby the presentation part is fully separated from the system code and maintenance parts, and is enforced by the system authorization and modularization. Drupal is constantly being improved by drupal.org associations through the permanent forums, blogs and conferences. “73 Sessions and 87 BoFs later it's all over and we can emerge from the DrupalCon bubble. DrupalCon London has been an amazing success with a final attendance of 1751. We're delighted to announce that as well as being the biggest European DrupalCon in terms of attendees, DrupalCon London was also a profitable event - investing over £38,000 back into the Drupal Community.”

[9]

Many profitable organizations, small and medium size enterprises, contracts Drupal teams in the code improving and the module developments for the business requirements specifications. Drupal is used as a web portal, on-line journals, electronic commerce systems, photo galleries and systems of distance learning. Drupal is fully modular, new designee styles added via modules

and themes, that are integrated in the Drupal core or added as contributed themes or modules.

5. PRACTICAL DRUPAL SYSTEM IMPLEMENTATION

Drupal is practical web application used for everything from personal blogs to enterprise applications. Used for the different web sites, blogs, academic journals and conferences, electronic commerce systems, tourism organizations advertisements, the system of the distance learning, Drupal is used for the biggest Web sites.

A. Scientific conferences

Web site EDASOL scintific conference. Basic site information: Drupal versions 6.22, defined content types with CCK , View models used to present the various content types, theme Orange, adminstration theme Garland, languages: bilingual (serbina and english), 65 built in modules, search engine optimization is done with Drupal SEO modules. [10]

Web site scintific conference ICASUS.
Basic site information: Drupal versions 6.22, defined content types with CCK , View models used to present various content types, theme BlueMaster, adminstration theme Garland, site is bilingual (serbina and english), 75 built in modules, search engine optimization is done with Drupal SEO modules, Gmap optimization.[11]

B. Scientific journals

Basic site Emc-review and Gfpn scientific journals. Sites inforamtion: Drupal versions 7.7, defined content types with CCK , View models used to present various content types, theme Ellington7 and Desk02, adminstration theme Garland, 40 built in modules, search engine optimization is done with Drupal SEO modules.

[12]

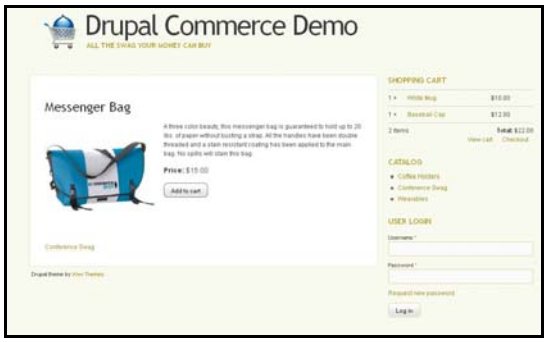
[13]

C. Tourisam advertising sites

Basic site inforamtion: Drupal versions 7.7, defined content types with CCK , View models used to present various content types, theme Marinelli, 65 built in modules, languages (English, Croatia, Italian), built in content managment system, search engine optimization is done with Drupal SEO modules. [14]

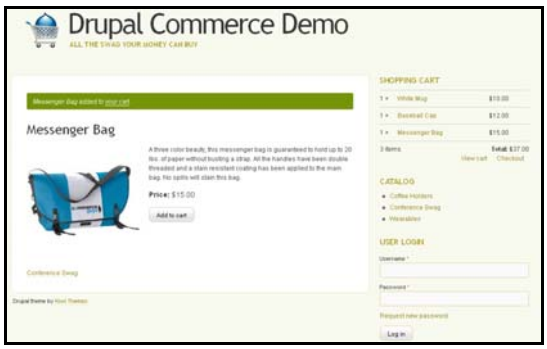
D. Eelectronic commerce

Demo Drupal pages with sa E-commerce soultions and merchandise details.



[15]

„Messenger bag“ is added and shoping chart as it is followed. Site is built with E-commerce Drupal moules.

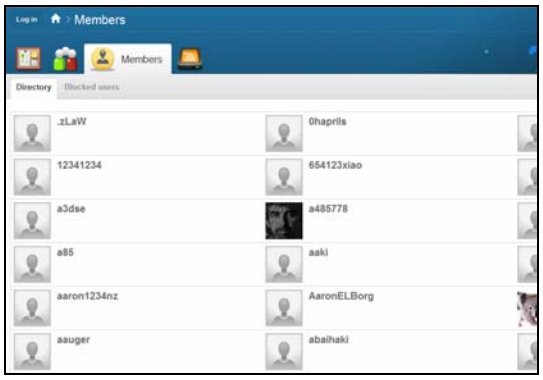


[16]

E. Social networks

[17]

Organic group: enables usere to operate and maintane specific social group. Every group is organized their own memebers and social groups. Each group can have subscribers, and maintains a group home page where subscribers communicate amongst themselves. Groups may be selective or not. Selective groups require approval in order to become a member, or even invitation -only groups. There are lots of preferences to configure groups as you need. [18]

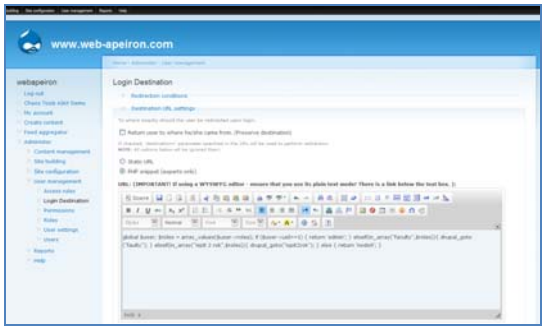


6. THE DISTANCE LEARNING SYSTEM *DRUPAL CMS*

A. Logging destination [19]

Login sessions implemented through PHP code:

```
global $user;
$roles = array_values($user->roles);
if ($user->uid==1) { return 'admin'; }
elseif(in_array("faculty",$roles)){ drupal_goto("faulty");
elseif(in_array("ispit 2 rok",$roles)){
drupal_goto("ispit2rok");
 else { return 'node9'; }
```



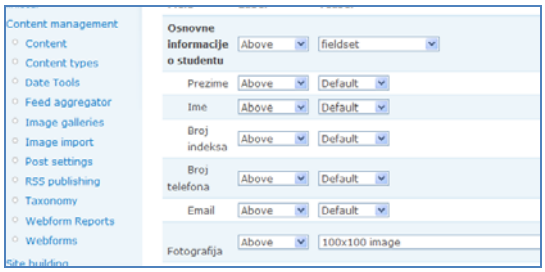
Sessions redirects users to the specific site pages according to the previously defined roles of the system administrator conceptual design. It is possible to specify certain conditions like referring pages or user roles and make the destination depend upon them.

B. List of users, rights and filtering users by groups

Access rights are enabled through the checkmark of the individual fields and users groups of within the system permissions. The users are divided into precisely defined groups according to incoming subject or the exams period. Upon completion of the pre-preparation obligations users are moved to the examination group, finishing the testing duties most of the right are blocked, except checking the result of the examination, polls overviews. Users are required to fulfill different polls “POLL” and leaves comments on the blog so that the whole process is improved are modified.

C. CCK – content construkcion kit [20]

CCK and View modules are the crucial part of Drupal system, due to its powers and extended functionality, special attention is focused on their practical value. CCK modules allows user to define content in accordance their own needs, content can be grouped to fulfilled conceptual and technical Web system designee. The key factor is to create the middle level of presentations as connection between raw database contents and node implementations. Hundreds of add-on are available for download for this modules to extends to create the most complex content system
Defined content types for the content Bijeljina students as basic category information about student are: name, surname, telephone number, E-mail, etc.

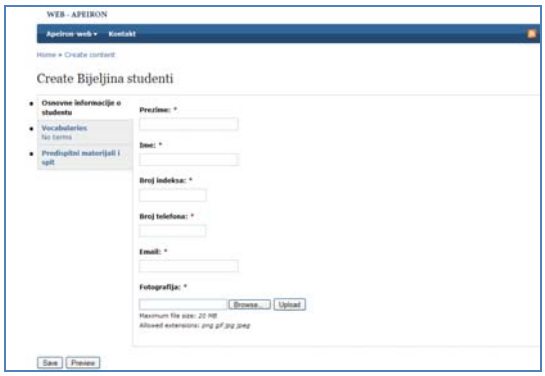


Bijeljina student content system organizations: The basic information are grouped into category as followed: student's information, preparation's materials, exercises, exams, while adapting modular system implementation is powered by Drupal API system.

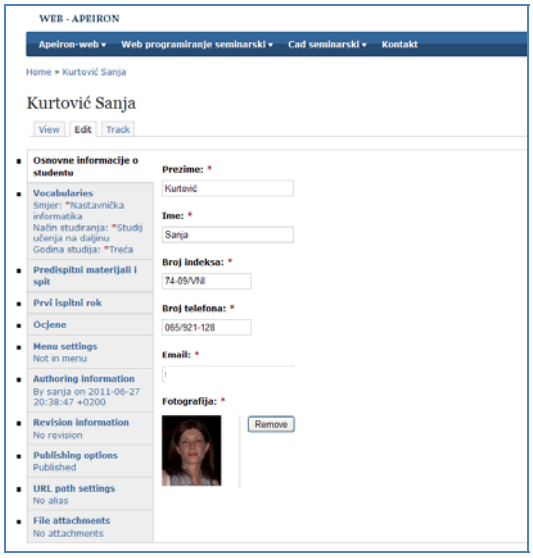
Individual content presentation is student content type that has exactly the fields I need in accordance with the system requirements and presentation practical goals.
Photos preparing for the presenting format:
Defining "Preset - pre-defined elements" using the "Image cache" module to adapt the photo in a format requested, rendered through the Image cache actions. We previously defined the pictures formats (.jpg, .png, .gif) precisely defined size (100 x 100 px) and frame of 2px, frame color, using the "Define the canvas" presets. The implementation is shown in the CCK, photograph is presented on the rendered Web page.

D. CCK menu implementation

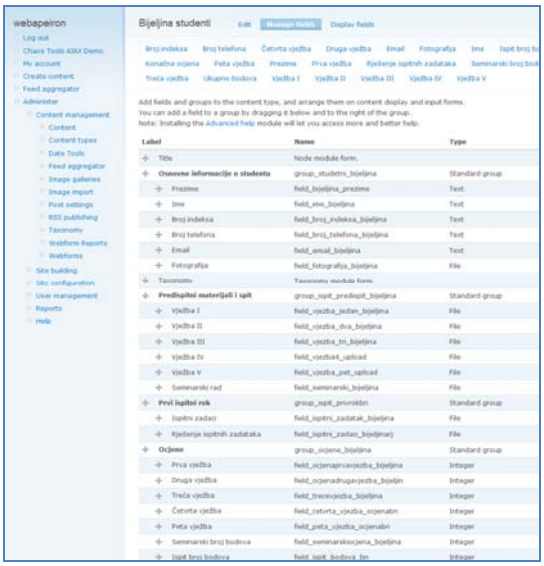
Student creates content in order to log onto the system, collect pre-exam materials and gain information which for exams preparations. Student uploads pre-exam solved homework and questionnaires. Information are available for students to edit or delete.



Information available for administrator or professor for defined subjects:

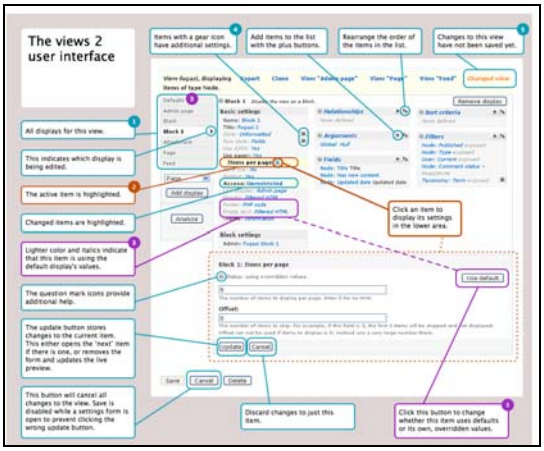


Field editing methods in construction phase:



E. Content presentation using view module

Drupal is a stable platform based on relational databases (MySQL usually also have other types supported) while View modules is used to filter information out of the box and preset them on site pages. Drupal Help advance modules is integrated into View modules, shows how administrator can configures and present the above information in accordance with parsing and the system modularity.



Views interface interpretation (basic concepts):

- All displays in view: Every view has a number of displays which represent where output will be placed (Number 1)
- The active items is highlighted: When you click on the link for an item, a form will open up (Number 2)
- Lighter color and italic indicate that this item is using the default display's values. (Number 3)
- Items with a gear icon have additional settings - Some items, particularly styles, have additional settings. (Number 4)
- Changes to this view have not been saved yet - You can safely leave a view page to go and do other things. If you come back, the view will still be there, stored in a cache. (Number 5)

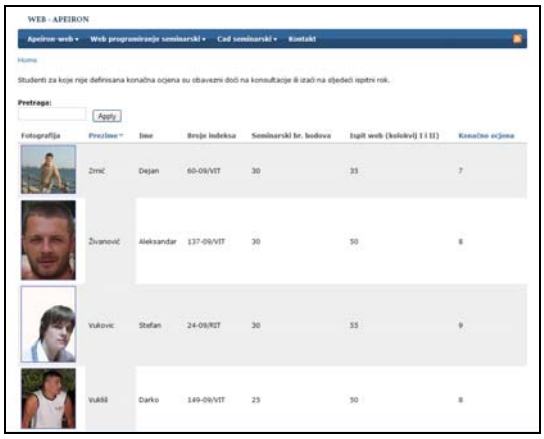
Views interface basic displays

- Fields are the individual pieces of data being displayed.
- Relationships allow you to expand the query to include objects other than the base query. This is actually made more difficult to understand by the fact that Views actually includes a few relationships by default, and doesn't tell you they're there.
- Arguments are input. While they often come from the URL, they don't always so please don't be shocked when they don't
- Filters are used to reduce the data set that Views provides. That is to say, without any filters applied, Views will return all of your content. You don't want that, so at least some filters must be used.
- Displays tell Views where the output should go. By adding a display to a View, you can have your view appear as a page, or as a block, or even as an attachment to a different display on the view.
- Sort criteria determine what order the records are retrieved from the database and displayed in.

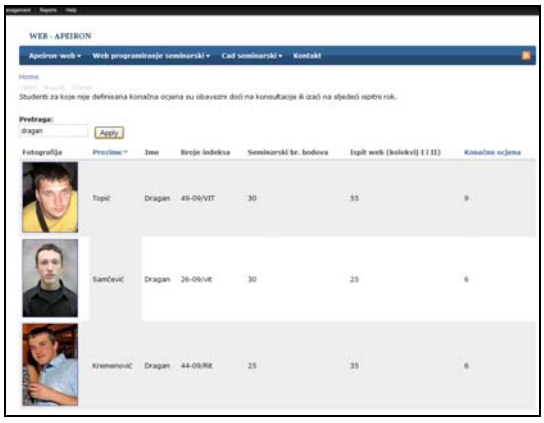
During Drupal View installations process, other models are required to be installed to enable View integral tool modules fully functions. It is mandatory to install CTool as additional module to implement .inc files, AJAX responder, object caching, models dialogs.

F. *Views in www.web-aperion.com system* [21]

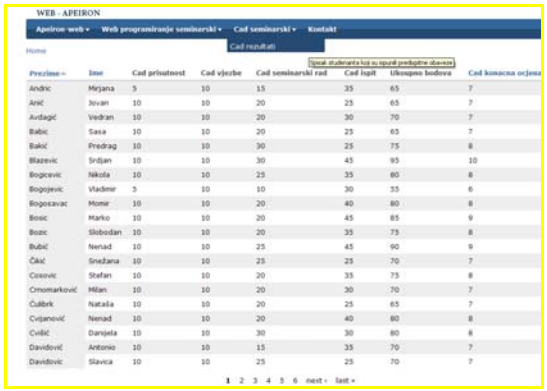
Web programing exams results are filtred from raw database, defined by CCK with special desigen of every data as construction field, View modules with database query represents results, and API does page finally rendereing.



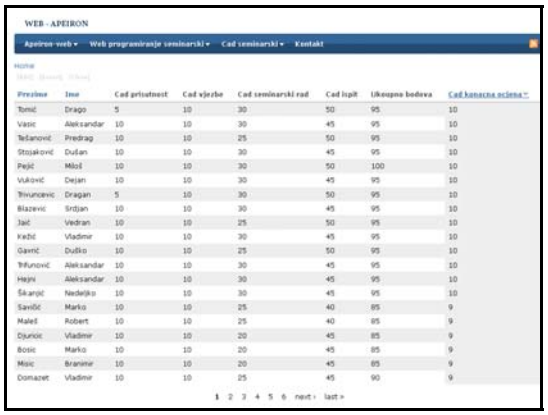
Search result of Dragan as a name, results are presented in the in the below specified web pages. Photograph selections enables student to edit profile details, and leave comments inside specific Drupal nodes.



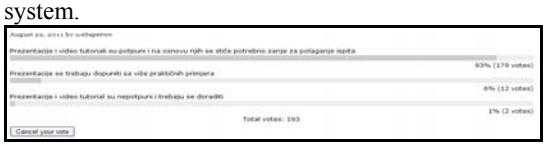
Exam results CAD-CAM-CIM presented in tabular View:



Sorting criteria is a final exams score:

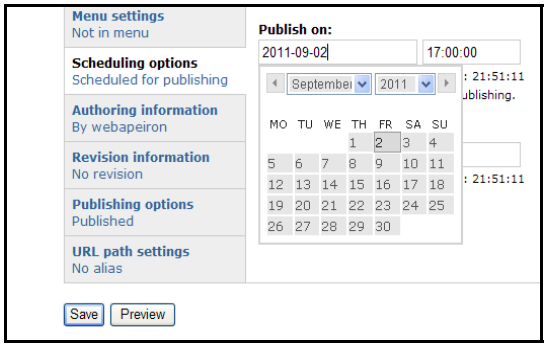


During the work process user permissions are control by system administrator, total time spent on systems, time spent exploring certain content and video presentation, different system's session, filling the questionnaires, are recorded accurately, illustrating the student's system or subject activity. Polls filled by students are the feedback system.

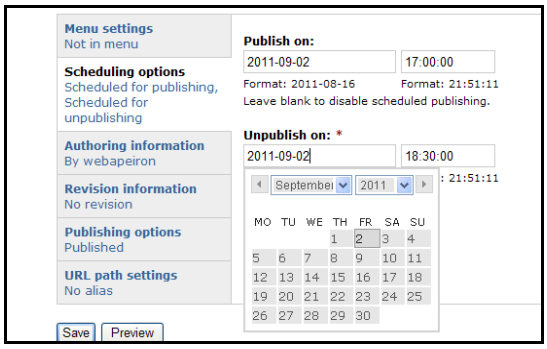


Session and login time are controlled for every system user:

Test time trigger in a time interval X using Scheduler modules:



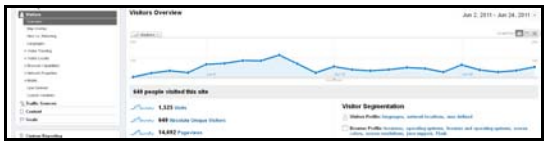
Closing the session in a given time interval Y:



Modules used for this session are "Data", "Scheduler" and C-Tool modules. [22]

G. Google analitic

Google analytic module as final system feedback [23]



7. CONCLUSION

Open source web based system with community support, integration of members to build stronger associations, will be one of the key factor to enter into new stage, choosing highly modulated web solutions for small and medium sized enterprises. Adaptability, code adjustment, numerous modular solution will be competitive factor that will emphasize integrity and adaptability with huge knowledge bank and alternative module options (Drupal system has 8458 modular solutions, August 2011.). Commercial support, the ability of management to notice importance of stuff education, to create the software in the fast and efective way, cost effectiveness and implementation simplicity, IT teams preparation to applying those systems and adopt to our needs is continuous and endless competitive factor and it should be our long term strategy. Based on our innovation desire, response to the constantly changing environment, our flexibility, analitic system understanding in the space of continous upgrading and changes, stigmergic processes with open source software solutions in the incoming decades will be the key factor in the web information systems development.

8. REFERENCE

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[12] http://www.emc-review.com/
[13] http://www.gfpn-au.com/
[14] http://www.lazagara-vlasic.net/
[15] http://demo.commerceguys.com/dc/catalog/
[16] http://www.drupalcommerce.org/
[17] http://www.popsugar.com/community/groups
[18] http://drupal.org/project/og
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[21] http://www.web- apeiron.com/admin/build/
[22] http://drupal.org/project/ctools\
[23] https://www.google.com/analytics/

Tools for Generating Web Site Traffic

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Abstract. Internet is very powerful tool for creating marketing image of the company. Internet marketing connects the creative and technical aspects of internet including design, development, advertising and selling.

The opportunities that electronic marketing tools provide for the comp anies today are discussed by many distinguished marketing and communication experts for the purpose of seeing in what way the companies can connect products and customers, how companies can create loyal customers, image, identity and its own story that customers will spread and how companies can increase traffic on their web sites.

At online marketplace, Macedonia is still far behind the other countries in the world, so the goal and subject of this paperwork are electronic marketing tools for generating traffic on the web sites, with hope to help Macedonian firms to become both more present on the internet and more familiar with advantages of using the electronic marketing tools in their everyday work and communication with the customers.

The research is based on this methodology: literature from domestic and world known authors, domestic and foreign web sites, comparative analysis, qualitative and quantitative analysis.

I. INTRODUCTION

In today's modern society, innovations and new technologies have very important place in people's every day life. One of the most significant technological achievements in the world is information technology. Nowadays, the internet is available everywhere and facilitates people's lives. With the internet people can do different businesses such as sell products and services, communicate with customers, or advertise themselves. Electronic business has swept the world and with his help the most ordinary people that are not in the business world but have enterpreneurial skills, can work, earn a lot of money and can extend the business all over the world.

Internet has dominant importance in the formation of the company's market image. By using different electronic marketing tools company promotes itself, presents its products and services to the global market, communicates with customers, creates trust and loyalty between the company and the customers, creates brand and habit of buying. Based on this, every company should make a right choice between traditional and new media, taking into account the important role of the internet in establishing the company's image. Internet is more efficient and cheaper than television or radio, because the potencial market is global, not local and the number of publications or broadcasts is unlimited. This means that if the product is published on the web, it is presented at the world market, to a very big number of customers, in any time of the day, twenty four hours, seven days a week, whether at work or at home, customers can analyse the suppled products via different technological solutions, specifications, pictures and videos.

Internet marketing refers to all activites for achieving marketing goals by using digital technologies: search engines, public relations, e-mail marketing, banner advertising, web 2.0 strategies. Thanks to the big number of internet users, internet marketing becomes the most suitable tool which enables companies from different industries get closer to the target clients.

Despite the fact that there is a huge interest in electronic commerce and internet marketing in Macedonia, it has not still reached the desired level. In the developed countries everything can be purchased via the internet: books, clothes, pills, software solutions, music, the bills can be electronically paid, parking place can be booked. In Macedonia, only the big companies implement digital solutions in their business processes, while small companies implement partial solutions in their work, by which they digitize only the parts of the operations they perform. Because of this, it is very important for small and medium enterprises to be involved in electronic commerce and internet marketing in order to become more competitive on the global market.

II. TOOLS FOR GENERATING WEB SITE TRAFFIC

Generally, traffic on the web site is very important for achiving electronic marketing goals, whether they concern sell, serve, speak, save or sizzle. There are three aspects for generating web traffic: [1]

a) Specific goals for generating traffic that refers to tactics for achieving bigger electronic marketing goals. Typical traffic goals are focused on quantity, which means number of web visitors, quality of the web site, its content and services and costs for attracting visitors on the site.

b) Combination of on-line digital media channels and traditional offline communication technics for promoting the web site and stimulating the visits.

1Dave Chaffey and PR Smith " eMarketing eXcellence: Planning and optimizing your digital marketing " 3th edition, Oxford, 2008, p:278

c) The time when it is the most appropriate to generate traffic on the web site

Most widely used tools for generating web site traffic are:

A. Search Engine Marketing

Search engine marketing is the most important digital marketing channel for customer acquisition. All customers when seeking for new product, service or entertainment naturally turn to a search engine. If the customer knows the company or the product he is looking for, search engines are used for typing the web address of the company into the search box. Search engines give opportunities to web sites' owner to offer its products, services or brands to a big number of customers at the time they are looking for them. The main focus of search engines is on providing quick, relevant and on time search results for the users. Search engine marketing consists of two parts: search engine optimization and pay per click.

Search engine optimization (SEO) involves achieving the highest position or ranking practical in the natural or organic listings on the search engine results' pages after a specific combination of keywords (or keyphrase) has been typed in. 2 In search engines such as Google, Yahoo! and MSN Search, the natural listings are on the left side of result page, although there may also be sponsored links above these. The position or ranking is dependent on an algorithm used by each search engine to match relevant site page content with the keyphrase entered. There is no charge for these listings to be displayed. The most important here is which company will have first positions on the search engine result page. This depends on key words and phrases that web sites have, popularity of different links set on the web sites and large selection of products and services that web sites offer. Search engines to give qualitative and on time results to the users must include indexing and crawling in the work. Crawling is the spider (boot) job, the spider goes to website and crawls it in pretty similar way like users would have done. The spider reads the page and follows the links on the page. Indexing is entirely different process that supposes to gather information about the webpage. For successful search engine optimization of the web site some rules must be respected such as key phrase research, page optimization and content development, link building. Keyword phrase research involves identifying a group of keyword phrases that will be used in optimization. This step is critical and requires a considerable amount of time to find a good set of phrases that offer a balanced combination of two important factors: high usage by searchers and relatively low competition within the search engines. Page optimization and content development are critical to search engine success. Content is king in search engine optimization. The search engines love text with high volume and high-quality content related to the business that company does.

Paid search marketing or Pay Per Click (PPC) is similar to conventional advertising. Here a relevant text ad with a link to a company page is displayed when the user of a search engine types in a specific phrase. A series of text ads usually labelled as sponsored links are displayed to the right of the natural listings. Although many searchers prefer to click on the natural listings, a sufficient number do click on the paid listings (typically around a quarter or a third of all clicks) so that they are highly profitable for companies such as Google and a well designed paid search campaign can drive a significant amount of business for the search companies. Advantages of using pay per click are: 3

a) With the right tracking system, the return on investment for individual keywords can be calculated.

b) Traffic, rankings and results are generally stable and predictable. This contrasts with search engine optimization.

c) Technically simpler than search engine optimization. Position is based on a combination of bid amount and quality score, whereas search engine optimization requires long-term, technically complex work on page optimization, site restructuring and link-building.

d) Pay per click listings get posted quickly, usually in a few days. Search engine optimization results can take weeks or months to be achieved.

e) When a website is revised for search engine optimization, rankings will initially drop while the site is reindexed by the search engines.

f) Tests have shown that there is a branding effect with pay per click, even if users do not click on the ad. This can be useful for the launch of products or major campaigns.

B. Online Public Relations

Today consumers are choosing how, when and where they get news and information that is important to them. And, if the company needs to reach out to a younger demographic, or a global marketplace, target audience will only see the message online, so the best way to communicate is directly to that target market using the web. Successful public relations today means moving beyond media relations and into direct to customer relations. Online, public relation practitioners need to begin to think like word of mouth marketers. This can be frightening at first—but it is absolutely necessary that company's public relation department or public relation agency have the skills to reach individuals on the web and to engage them, without the comforting cushion of mediators they have relied on in print, radio and TV.

Consumers increasingly turned away from traditional media because of the following reasons: [4]

2Kristopher B. Jones " Search engine optimization " 2nd edition, Indiana, 2010, p:18

3Damian Ryan and Calvin Jones, " Understanding Digital Marketing: Marketing strategies for engaging the digital generation" 1st edition, USA, 2009, p: 72

4David Phillips and Philip Young " Online public relations: a practical guide to developing an online strategy in the world of social media " 2nd edition, USA, 2009, p: 3

a) Convenience. Consumers can get news and information on any screen at any time they want, on multiple platforms, such as an iPod, mobile phone or text pager.

b) Relevance. Consumers can choose the news that is most interesting to them during any time of the day; they no longer have to wait a morning newspaper . Customer can sign up for email alerts for a particular industry, and surf the web to shop on a lunch hour.

c) Depth. Consumers can drill down to the level of detail they want on a particular topic. Using search, it's possible to amass quantities of information; links and tags on news stories allow skimming related stories with a single click.

There are four key differences between online public relations and traditional public relations: [5]

a) The audience is connected to organizations. Previously, there was detachment – public relations people issued press releases which were distributed over the newswires, picked up by the media and then published in their outlets.

b) The members of the audience are connected to each other. Through publishing their own web sites or through e-mail, information can be rapidly distributed from person to person and group to group. Today, a company 's activity can be discussed and debated over the internet, with or without the knowledge of that organization. In the new environment everybody is a communicator, and the institution is just part of the network.

c) The audience has access to other information. Often in the past, the communicator was able to make a statement that it would be difficult for the average audience member to challenge the Internet facilitates rapid comparison of statements. It takes a matter of minutes to access multiple sources of information over the Internet. Any statement made can be dissected, analyzed, discussed and challenged within hours by interested individuals. In the connected world, information does not exist in a vacuum.

d) Audiences pull information. This point is similar to the last one. Previously there were limited channels in terms of television and press. Today there are many sources and channels of information. This makes it more difficult for the message to be seen.

Web site in many ways presents online face of every company and it is the most important thing for creating online relationships. Web site should even be mostly focused on public relations besides the fact that there are so many other ways in which a company can create internet relationships with the costumers such as e-mail, social network or blog.

E-mail marketing is cost-effective communication with market in a way that it is immediate and relevant. 6 E-mail is more editorial than advertising, and it is powerful because it can support and even drive a sales process. However, like any other medium, it has its challenges. Business people get hundreds of emails each day, so the company needs to get the message past spam filters and give them a reason to read. Company also needs a strong offer, valuable editorial content, appropriate design and a good fulfillment and measurement process. It should think of e-mail as a one-to-one communication – personalized, relevant, timely – not a blast.

Social networks are built around site platforms that enable members to develop identity profiles, interact with other members, and participate in various site activities. [7] Although interactions with others can seemingly approximate synchronous real time communication, the messaging structure is static rather than dynamic. Networks can be thought of as utility based tools. They are an elegant but fun way to organize content, socialize, and promote one's self-identity. Despite this, social networks have grown in popularity from their ability to provide a platform for information sharing, communication, and relationship development and maintenance. In a world where individuals may have reduced physical contact and heightened time spent interacting with electronic devices, social networks have evolved to provide an online platform for personal, intimate, informal neighborhood and office chatter. They offer a sense of contact comfort in a society where many of us spend less time with actual people than we do with machines. Contact comfort helps to meet individual needs for affiliation and socialization. Social networks meet customer's need for contact comfort while also providing entertainment and information sharing. Social networks are above all else communication hubs. While they all offer the core product of networking capabilities, networks do find ways to differentiate themselves. MySpace and Facebook support relationship building and maintenance. YouTube offers a venue for sharing and promoting videos and related opinions. Flickr enables photo sharing and reviewing. LinkedIn provides a form of self promotion and career networking. There are niche sites as well focused on any number of hobbies and personal interests. Catster, for example, offers tips and information on caring for one's feline companion with the added benefit of being able to talk with others who define themselves in part by the pets they love.

Blogs provide a window to the world of individuals. For some, like artists or innercity youth who tag buildings and vehicles with graffiti to make their mark and get noticed, a personal blog represents an escape from anonymity.

5Alison Theaker " The public relations handbook " 2nd edition, USA, 2004, p:18

6Rob Stokes " eMarketing: the essential guide to online marketing ", 2nd edition, USA, 2008, p: 7

For others, a blog is their private journal, open to the world. By posting their innermost thoughts and concerns, they are per-haps hoping that others with similar thoughts and struggles will connect with them. Naturally, bloggers with perspicacity and a clear voice have emerged and obtained a following. Some of these have become a new breed of citizen journalist who wields as much power as any major newspaper columnist.

There are several advantages to creating and maintaining a blog. Provide unfiltered information that are directly available to the audience. There are no mediators interpreting, or misinterpreting the information. The salient points get through. Enjoy direct access to consumers' focus. By allowing readers to post feedback, or comments to the blog entries, company will invariably gain valuable insight into the likes and dislikes of the consumers. Company can learn how they relate to its product, and what modifications they would most like to see. A blog helps to position the company as experts in the field. Increase ranking in the world of search engines. One metric search engines measure when determining the relevance of a particular site is the number of inbound links to that site. The more inbound links, the higher the site ranks on the search engine. Blogs create links to the site by others linking to and referencing a blog, and by creating links to company's site within company's blog. 8

C. Affiliate Marketing

Affiliate marketing is an internet based marketing practice in which a business rewards one or more affiliates for each visitor or customer brought about by the affiliate's marketing efforts. [9] Affiliate marketing is also the name of the industry where a number of different types of companies and individuals are performing this form of internet marketing, including affiliate networks, affiliate management companies, and in-house affiliate managers, specialized third party vendors, and various types of affiliates/publishers who promote the products and services of their partners. Affiliate marketing overlaps with other internet marketing methods to some degree, because affiliates often use regular advertising methods. Those methods include organic search engine optimization, e-mail marketing, and in some sense display advertising. On the other hand, affiliates sometimes use less orthodox techniques, such as publishing reviews of products or services offered by a partner. Affiliate marketing using one website to drive traffic to another—is a form of online marketing, which is frequently overlooked by advertisers. While e-mail, and website syndication capture much of the attention of online retailers, affiliate marketing carries a much lower revenue. Still, affiliates continue to play a significant role in e-retailers' marketing strategies.

D. Viral Marketing

Viral marketing describes any strategy that encourages individuals to pass on a marketing message to others, creating the potential for exponential growth in the message's exposure and influence. [10] Like viruses, such strategies take advantage of rapid multiplication to explode the message to thousands, to millions. Consumers are also more involved than ever before in controlling communications and message delivery at a global level, thanks to the aforementioned rise of digital media, such as blogs and forums. Consequently, advertisers are finding it more and more difficult to reach marketing-shy, fragmented audiences, let alone engage with them. Unlike traditional 'top-down', marketer-to-consumer techniques, viral marketing focuses on personal experience of the brand and taps into the new power of the consumer. One of the reasons consumers find viral marketing campaigns appealing is because the campaigns tend to be non-interruptive, so they enable consumers to choose to interact proactively with a communication (and the brand behind it), or not, other than be passively dictated to. This 'bottom-up' approach respects that the consumer is in control; viral marketing campaigns are ultimately driven (or derailed) by consumers themselves. The result of this user-driven process is ultimately very valuable exponential brand endorsement by influencers and consumers – if the campaign is successful. The difference between one campaign succeeding and another failing is dependent on the campaign's ability to connect with consumers and inspire them to engage and interact with the advertising material, the brand and ultimately the product or service. Viral marketing is being used for two main purposes: to maintain or boost a cost-effective level of brand awareness during mainstream media spend 'downtime', usually by releasing Web-exclusive viral material that retains brand and campaign themes and to kick-start consumer-driven interest in new marketing communications activity – which often means pre-launching a mainstream advirally (perhaps using a Web-exclusive edit) before it hits TV, in order to create buzz and exploit exclusivity. Other purposes and benefits specific to each campaign may include: reach well beyond a business's core target market, create buzz around products and brands that have no compelling, 'wow' factor (so the agent itself must have the 'wow' factor), accelerate and amplify natural buzz and viral ability for products that do have a 'wow' factor, reinforce existing advertising and branding messages, extend other marketing communications activities, provide accountability when tracked, thereby measuring and proving return on investment and help add to the bottom line in terms of response and/or increasing recommendation rates.

III. INTERNET MARKETING IN MACEDONIA

When we are talking about Macedonia, the greater part of internet marketing includes banners. On many macedonian portals the only option in marketing menu is booking advertising space for banner.

7Tharon W. Howard " Design to thrive: creating social networks and online communities that last " 1st edition, USA, 2010, p: 29 8Susan Sweeney, C. A " 101 ways to promote your real estate web site " 1st edition, Canada, 2008, p: 89

9Jeremy Palmer " High performance affiliate marketing " ebook edition, UK, 2006, p:10

10Justin Kirby and Paul Marsden " Connected marketing: the viral, buzz and word of mouth revolution " 1st edtion, UK, 2006, p:87

For now, there are several companies in Macedonia specialized for offering profesional services for internet marketing, such as: pretpriemac.com, seebiznis.com.mk, httpool.com.mk, emarketing.com.mk, ideaplus.com.mk. Internet marketing as advertising option is offered along the way, as part of big campaigns that include advertising on billboard, in magazines, on television or radio.

Regular clients of internet advertising in Macedonia are telecommunication firms or distributors of new cars, probably because of standards imposed from abroad within their firms or groups od franchisees. Their campaigns are mainly focused on banner advertising at local portals.

Macedonian companies have recently started advertising on social networks. In Macedonia there are 793 640 or 38,30% users of Facebook, that stimulates Macedonian companies to use Facebook as promotional tool and Avon is favorite brand on Facebook, with 30 692 fans in Macedonia. 11 Based on a research about advertisements of macedonian companies on Facebook and the users clicking on them, the conclusions are: 27% of the respondents responded that they never note the advertisements on Facebook, 6% responded that they deliberately do not click on advertisements, 37% rarely click on advertisiments, 25,3% sometimes click on advertisements and 4,4% often click on advertisements on Facebook. 12

Based on the other research made in February 2010 about Macedonian users of search engines, the conclusions are: 78% of respondents use search engines more than 4 times a day, 73% responded that rarely or never use Macedonian search engines, 97,4% responded that use Google as favorite search engine on internet. The most used Macedonian search engines are najdi.org.mk, pogodok.com.mk, nabu.com.mk and borg.mk. 13

According to the Macedonian institute for media, online newspapers in Macedonia operate exclusively as a copy of traditional newspapers. Today, web presentations of television in Macedonia is with bigger dinamics than before and the most influential are A1 TV, Sitel and Kanal5 with the greatest visits. 14

About the blogging in Macedonia, the most famous are komunikacii.net, razvigor, blog.com.mk. Blogers thing that social networks killed the blogs in Macedonia and because of that in the country there are a few qualitative blogs. 15

Unlike Facebook, Twitter in Macedonia has lower number of users, but it is noticeable that highly educated and intense intellectual structure of people use Twitter. This group of people are characterized by critical and sarcastic attitude towards society.

11www.socialbakers.com/facebook-statistic/macedonia

12www.novamakedonija.com.mk

13www.newmedia.mk/download/

14Emilija Petreska- Kamenjarova, Zoran Ricliev, Snezana Trpevska " Sostojbata na onlajn mediumi I onlajn novinarstvo vo Makedonija " Skopje, dekemvri 2010, str:23

15Emilija Petreska- Kamenjarova, Zoran Ricliev, Snezana Trpevska " Sostojbata na onlajn mediumi I onlajn novinarstvo vo Makedonija " Skopje, dekemvri 2010, str:26

I. CONCLUSION

Considering the fact that on the global network we are all equal and there are no physical or political limitations,

every company should find a solution for presenting its products and services to a big audience, specially suited to their needs. On the other hand, relatively expensive classic marketing that big number of companies cannot afford, contribute towards increasing the positive effects that electronic marketing is offering.

Regarding the fact that new changes are occuring in the digital world and diverse developments also occur in technology, it is good to know that if companies do not keep pace with changes they cannot hope for successful operation.

Limited use of electronic marketing and electronic commerce in Macedonia is due to a lack of expertise and capability of staff in the companies, specially in small and medium-sized firms. The most of the companies still have not reorganized and digitalized their processes according the world trends and standards of electronic commerce. Only through electronic marketing companies can present themselves on their own to the global market and to the million of customers, an that will enable them to promote their results, to share their experiences and to gather foreign experiences relevant for their work.

The best companies in the world despite traditional marketing, big part of their budget invest in electronic marketing. Electronic marketing helps them to create loyal customers, to connect customers with company's products, to create emotional benefits for the customers and sense that the right choice is made, security in terms of quality, services and features that are hard to forget. All these things can be achieved with electronic marketing tools: search engines, public relations, viral marketing, affiliate marketing. Therefore, Macedonian companies must include strategies for winning the online market and becoming recognizable all over the world.

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Introducing Innovative Features to the IPTV Environment

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Abstract – The Innbox Media Centre, presented in this paper, represents a new-generation, multimedia experience by supporting a variety of television-distribution platforms. It provides a rich set of IPTV services and supports popular internet content through plug-ins and a fully featured web browser for a variety of Web 2.0 services.

The Innbox Media Centre acts as a framework for special plug-ins by which additional features can be provided. As such, Innbox enables the rapid application, development and deployment of new, innovative services, such as home/office automation control, energy-resource-consumption monitoring, home-alarm control, health telemonitoring, real-time communication support, etc.

One of the main challenges during the Innbox Media Centre's development was the design of the graphical user interface. Our goal was to create a product with an excellent user experience and a graphical user interface that will be intuitive and easy to use for different user groups, and without any previous training. In order to evaluate the usability and user experience of the Innbox Media Centre, several usability and user-experience studies were conducted and are discussed in this paper.

I. INTRODUCTION

The television industry is now in the midst of profound changes [1]. Digital television has been evolving for several years and television services are becoming increasingly interactive. Because of the advances in video-compression technology and improved media-coding algorithms, bandwidth requirements are being reduced. At the same time, the network-access bandwidth of many available end-user services is increasing. All these changes have resulted in an increasing interest in the delivery of TV services via Internet Protocol (IP) networks, widely known as Internet Protocol Television (IPTV). The distribution over an IP network provides an easy delivery of various modern features and functionalities, which includes services, applications and content. IPTV includes television services provided by telecommunications companies, operators and other service providers. The television programmes are transmitted to set-top or net-top boxes through dedicated networks or Over-The-Top (OTT) via a standard internet connection [2].

In the sections that follow we present the Innbox Media centre, a product that offers numerous innovative features to the IPTV environment.

II. INNBOX MEDIA CENTRE SYSTEM

Most currently deployed IPTV systems rely on set-top-boxes (STBs). A STB is usually a custom device, dedicated to audio-video decoding with relatively little capabilities for the execution of services and applications. It is connected to a television set and has an external source of signal. The STB device turns the signal into content, which is then displayed on the television screen or another display [3]. Adding additional services to the STB platform is difficult and usually in the domain of STB manufacturers and IPTV platform developers [4]. That was one of the main reasons we chose a net-top-box (NTB) instead of a STB as the hardware for the Innbox Media Centre solution. A NTB is a very-small-form-factor, inexpensive, medium-power, desktop computer designed for basic tasks such as surfing the internet, accessing web-based applications, document processing, and audio/video playback. It is installed in the user's environment and is connected directly to the TV set [5].

The Innbox Media Centre is a complete NTB solution, which represents a new generation multimedia experience by supporting a variety of TV distribution platforms such as IPTV and internet TV. Additionally, it integrates the facility for personal multimedia entertainment by offering videos, pictures, music, news, etc. As a complete package, the Innbox Media Centre includes a rich set of services, including: Live TV, personal video recorder, electronic program guide, plug-ins to Web 2.0 services (e.g., YouTube, Picasa and Facebook), access to significant online media-techs and the management (network access, storage, and viewer) of personal content (e.g., photographs, videos and music) [6].

The introduction of more powerful processors in the NTB chipsets has brought a shift in the architecture of the latest generation of IPTV and interactive TV solutions. The thin-client approach used in the past was replaced with a fat-client approach. As a result, the necessary meta-data is cached in the background. The user interface can therefore provide a fast and pleasant user experience [7].

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III. STANDARD INNBOX MEDIA CENTRE FEATURES

Some of the standard features included in the Innbox Media Center are:

- *Electronic program guide (EPG)*, used for presenting the program guide on the TV screen. It provides users with fast and customized searching for favourite TV and radio programs.
- *Personal video recorder* (PVR), which stores the content on a local hard disk. Users are able to schedule video recording from the EPG user interface.
- *Pause TV* enables users to pause Live TV during some other activities, e.g., answering a call.
- *Restricted access*, used for blocking the access to content, that is, for example, not suitable for minors. It is used when age-related information for content is provided by the operator.
- *Video on demand*, where users can select among a wide range of movies. Different presentation modes of the video library are available to the end user, who is able to customize the user interface according to personal preferences.
- *Local content.* The Innbox Media Centre combines audio and video players in a single device. It enables users to consume audio, video and photo content, which can be stored and played from the internet, local network, USB storage or DVD disc.
- *Social networking.* Users are able to access social networking tools such as YouTube, Flicker, Twitter and Facebook directly from their TV screen.
- *Internet browser* for browsing the internet on the TV screen via remote control and an additional keyboard.

Other advanced features included in the Innbox Media Centre are presented in the following sections.

IV. TELEMEDICINE SOLUTIONS IN THE IPTV ENVIRONMENT

Since the 1990s the interest in telemedicine has increased dramatically. Telemedicine is generally defined as the use of telecommunications and information technologies to provide a remote delivery and exchange of medical information and services [8]. Unfortunately, many people from different user groups have problems or are afraid to use modern technologies. On the other hand, statistics from various studies have shown that people spend a large part of their time watching TV [9]. Hence, TV can be used as a medium for delivering complex telemedicine and other e-Health services to users, since this is the device they are most familiar with. The presentation on the TV screen and management relying on a remote control provides a potential to bring the telemedicine services to users in a new, accessible and user-friendly form.

Telemedicine ad e-Health services were introduced to the Innbox Media Centre through the applications MyHealth and MedReminder, which are presented below.

A. *My Health – an IPTV-based health-telemonitoring system*

My Health (**Figure 1**) is a personal health application, which is completely integrated into the domestic IPTV environment. Optionally, My Health can be connected to a back-end system, which is responsible for advanced health monitoring and other e-Health features and services [4].

Figure 1: My Health, an IPTV-based health telemonitoring system

The current My Health implementation enables blood-pressure and weight measurements with common sensors and weight scales that have built-in communication interfaces. The measurement results are automatically read from the measuring device and stored in the NTB. A notification about each measurement is available on the TV screen. Depending on the user's preferences, the measurement history is presented in a tabular or graphical form, where users are able to review, edit or delete the existing measurements (Figure 2). The simultaneous uploading of measurement values and other corresponding meta-information to the back-end system is assured by a background communication system.

Figure 2: Measurement history for a specific user

The My Health application provides multi-user support. Users are authenticated by a PIN number or a smart card. This authentication can be bypassed when the system is used by only one user.

To determine the users' subjective assessments of the My Health application's usability, a user-evaluation study was conducted. The results from the study showed that users find the application acceptable and good in terms of usability aspects.

B. MedReminder- an interactive multimedia application

MedReminder is another medical application that is integrated into the IPTV environment. This client-server application is implemented within the XBMC multimedia platform. MedReminder is used to remind people to take their medications as prescribed, and to call relatives or medical personnel in an emergency situation. Whenever a user is supposed to take the prescribed medicine, a medicine reminder accompanied by a sound notification appears on the television screen (
Figure 3**).**

The MedReminder window contains short and clear instruction about the medication's usage. Additional information about the medicine is available in a video that is played on the user's demand. In emergency cases, users are able to call a relative or authorized medical personnel by pressing a key on the TV remote control. When there is no user feedback after a preset time interval (1-10 min), the back-end systems triggers a voice call (on a mobile or fixed-line telephone), SMS message or an e-mail notification [10] .

Figure 3: MedReminder notification on the TV screen

The MedReminder application was also evaluated by a group of study participants. During the three weeks of MedReminder usage in their homes, twelve study participants were carrying out different tasks and rating the tasks' difficulty. Afterwards they all completed a standard usability questionnaire and were interviewed by a usability expert.

The results obtained from the conducted user-evaluation study showed that MedReminder has a good potential for a high adoption rate among users. The study participants evaluated MedReminder as logical, useful and easy to use and operate. From the study results it can be concluded that MedReminder's greatest advantages for users are recorded video clips with medical instructions and the possibility to make a call using only the TV remote control.

Even though study participants evaluated MedReminder as acceptable, they gave suggestions for further improvements. Their suggestions and some additional features are going to be added to the existing version and an enhanced MedReminder will be available in the near future.

V. CONNECTED HOME IN THE IPTV ENVIRONMENT

The connected home solution is an innovative and transparent network solution that expands the use of an existing individual end-user connection. The solution enables users to expand the usability of the conventional desktop phone using the TV as the primary communication device for voice, video and messaging [11].

Connected home combines multiple communication devices that are connected via local area networks, a wireless home network, mobile networks and/or with the internet. Such devices include media centre (TV set, TV remote control NTB, gaming consoles), wireless IP cameras, mobile phones and/or fixed-line phones, print server, wireless broadband router, and other compatible devices (**Figure 4**). By using all these various communication devices offered by Connected Home the users gain a rich portfolio of innovative services, such as:

- Web browsing on a TV set
- Voice calls with a click on the remote control
- Video calls via the TV set
- Presence status overview and text messaging on the TV set
- Home/office automation control
- Energy resource consumption monitoring
- Home/office alarm monitoring

Figure 4: End-user equipment for the Connected Home solution

A. *User interface design*

During the Innbox Media Centre's development, special attention was devoted to the design of the graphical user interface (GUI). Various design guidelines for the interactive TV were taken into consideration when designing the GUI for the Innbox Media Centre [12]. Additionally, a user-centred design approach was applied. User-centred design is an approach to design that grounds the process in information about the people who will use the product. UCD processes focus on users through the planning, design and development of a product [13]. The knowledge of the actual users with the support of specially formulated analyses, as well as the testing of products by the actual users, enables the direct influence of users on the traditional business areas for customers, marketing and sales, and also helps optimize the business practice of the company. For this purpose, many users were involved and various user studies were conducted throughout the Innbox Media Center's development lifecycle. As a result, several GUIs were created, each of them designed for a specific user group, i.e., elderly people, children, young people and advanced users. In this way the end-users are able to adjust the GUI in a way that best suits their needs and preferences.

The Innbox Media Centre's navigation models and its unified user interface for applications running on the TV are based on scrolling techniques. Because of the highly performing hardware all the necessary meta-data is locally cached and the system response is practically instantaneous. Consequently, the user interface can work faster than the users can perceive. To avoid the problem, another user study was conducted which helped us to identify the optimal speed for scrolling navigation, i.e., it answered the question – How fast is the navigation on a TV user interface that can make sure a wide user segment obtains comfortable and acceptable user performance?

Figure 5: GUIs designed for specific user groups

VI. CONCLUSION

The Innbox Media Centre presented in this paper is a complete NTB solution that supports a variety of TV distribution platforms and integrates a facility for personal multimedia entertainment by offering videos, pictures, music and news. Besides the standard features usually included in other media centres, the Innbox Media Centre provides users with advanced features for telemedicine, home/office automation control, energy-resource-consumption monitoring and real-time communication support. One of the main challenges during the Innbox Media Centre's development was the design of the graphical user interface (GUI). A user-centred design approach was applied for creating features that are useful, intuitive and user friendly. Throughout the development lifecycle, various user studies were conducted. The obtained results showed that the product has strong points and advantages. At the same time, the user studies have helped us find areas where further improvement is needed.

In our future work we are going to use the study results to improve the Innbox Media Centre's future extensions. Therefore, several user proposals will be added to the existing version as additional features. Enhanced Innbox Media Centre versions will be evaluated again with more detailed user-evaluation studies.

ACKNOWLEDGMENT

The operation that led to this paper is partially financed by the Slovenian Technology Agency and the European Union, European Social Fund.

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WEB application design for business process analysis and improvement

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Abstract - This paper presents the Web Site Design Method – WSDM, user oriented method for Web application design in phases that are relevant for Web portal development. The phases are described in a sense of relevance in the methodological framework. This method is proposed for the development of software tools for business process analysis and improvement.

I. INTRODUCTION

The importance of developing software tools for business process analysis and improvement that allow the use of various Internet resources requires the use of a methodological approach to developing software tools [1]. It is expected that software tools for business process analysis and improvement enable completion of the task, which are intended for users in an acceptable time frame. This includes the development of software tools for business process analysis and improvement that are based on user-oriented methods for developing and implementing software tools. This paper presents a Web Site Design Method (WSDM) as a method that may be suitable for development of software tools for business process analysis and improvement, which was developed under the project titled "The development of software tools for business process analysis and improvement" supported by Ministry of Science of Republic of Serbia.

II. WSDM METHOD

WSDM is a user-friendly method for designing Web software applications [2]. The problem of designing related to this method is reduced to a few tasks that must be met, namely:

1. Selection of data to be displayed on the Web software application and conceptual modeling of selected data,
2. Web site design structure based on the navigation modeling,
3. Design of a visual presentation screen display in a Web site to view the program content.

Before you start designing, it is necessary to identify and formulate the intention and objectives of developing software tools for business process analysis and improvement, and to determine the subject of a developing software tools for business process analysis and improvement, and declare the target user group. Figure 1 shows phase model method according to [3].

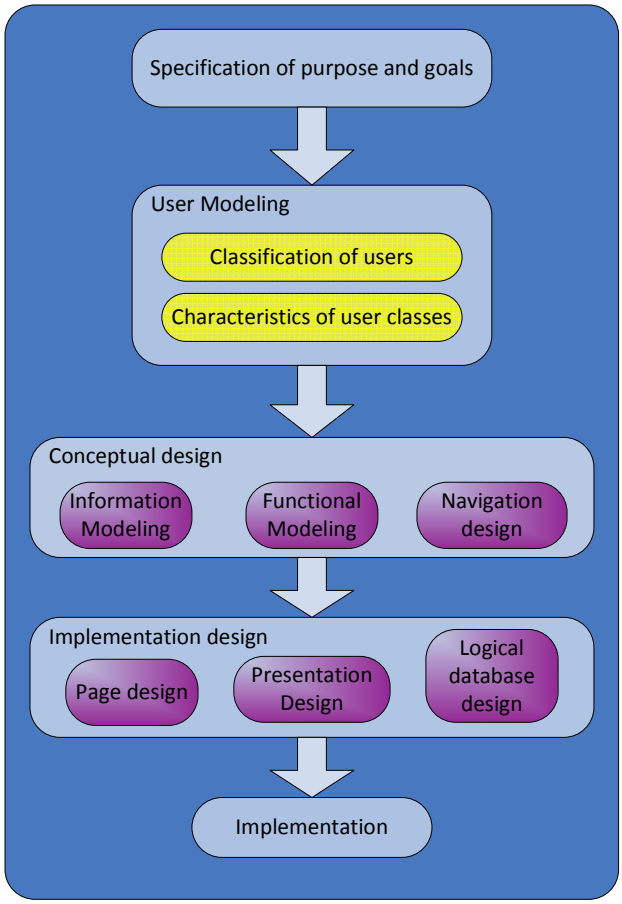

Figure 1. Phase model for WSDM developing method

III. USER MODELING PHASE

Phase two includes the user modeling process: classification and characterization of user's class. The classification process is performed in a way that users are identified and potential users are classified to different classes. Class consists of users who have the same information and functional requirements. In the process of

characterization of the user class, the class describes the characteristics of the users in details.

As a result of user modeling, there is a set of user classes with informal descriptions of their requirements, information, functional and navigation, as well as some other characteristics.

In the user modeling stage, two approaches are separated and are concentrated around two different issues. The first would be a user-oriented approach that focuses on the question ”Who are the users? ”. A second information-oriented approach is oriented around the question ”What information would be necessary for development of software tools for business process analysis and improvement to contain? ”.

According to [2], the first approach that is user-friendly is important in relation to information access. In the studies that were conducted before development of software tools for business process analysis and improvement, it was concluded that there is no reason for giving priority to user-oriented approach to information access. When developing software tools for business process analysis and improvement both approaches have a very important role. In identifying different groups of users, multiple types of information shall be determined that each user group may demand and the type of actions that they may take. Thus, that aspect of the information is equally important as other user aspects.

The processes that take place in the user modelings are:

Identification and analysis of users, based on which carried a process of further division into different customer classes,

Task of modeling the user is a process, which is most relevant for each user class to be identified and described. This task considers activity where the user interacts with the software tool for business process analysis and improvement. Class of users, a group of potential users of the same tasks is characterized by interaction with specific software tool for business process analysis and improvement.

Modeling user profile is a process in which the characteristics of user classes have to be further elaborated by the specific user profiles. Each profile lists the characteristics that have a common role in the design of software tool for business process analysis and improvement and define the requirements for navigation and presentation.

IV. CONCEPTUAL MODELING PHASE

In the conceptual modeling phase four processes take place [4]. The first is that information modeling is performed by the fragmentation of information based on various information requests of the user class. By combining these pieces of information into a single model the shape of the information software tools for business process analysis and improvement is formed. The information model describes the available information independently from the specific usage of software tool for business process analysis and improvement. At this stage, which is also referred as phase information tasks, a conceptual model for each task is generated. Here, we clearly identify the information related to user classes and their tasks. For each task, a conceptual model of that task defines the user class. Conceptual model of the task gets together different conceptual models of certain classes of user tasks.

The second process is the functional modeling or creation of the functional parts that describe the functionality required for different classes of users.

The third process is a design where navigation is modeled, as different user classes will be able to move through the available information on the software tool for business process analysis and improvement. A special navigation path is created for each class of users. In this phase, the requirements for navigation take the stage were they are collected from the user model of the specific user classes. The navigation model of the software tool for business process analysis and improvement design consists of navigation paths. Conceptual modeling results in a conceptual model of a software tools for business process analysis and improvement represents the integration of information model and functional model of the navigation model. In the navigation modeling phase the content of the software tool for business process analysis and improvement are structured.

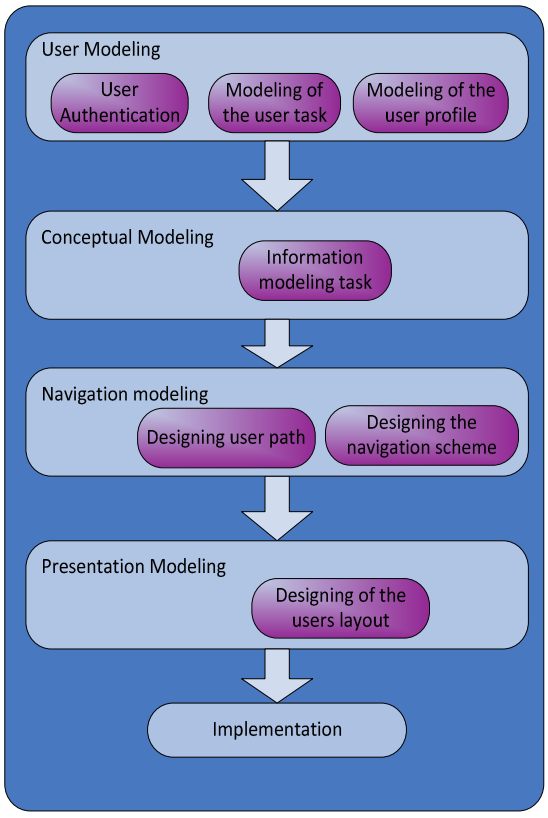

Figure 2. Parse phases of the WSDM method

In the fourth process - presentational modeling, describes how information in the navigation scheme should be presented to user. Presentation modeling should determine the page layout that shows the user where to look, what is important, etc. The partitioning of the page into clearly defined areas and their logical connections will improve the user's understanding of the content. Presentation model focuses on the structural organization of the presentation. It is important to define the outline of the presentation dedicated to each class, which includes the most relevant tasks and links.

V. IMPLEMENTATION - DESIGNING PHASE

The final phase in the implementation of WSDM methodology is a phase of design. The concrete realization phase of implementing the software tool for business process analysis and improvement is done using the selected implementation environment [3]. During this phase, the development of the structure of the tool is improved.

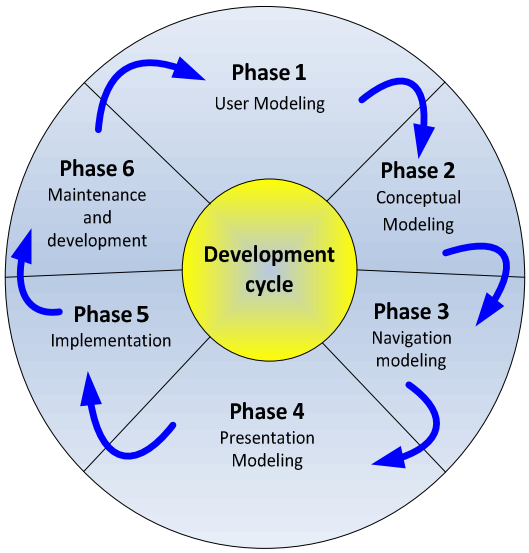

Figure 3. Cyclic development process

The software tool for business process analysis and improvement development cycle can be represented as shown in Figure 3, where the final phase involved the development and maintenance.

However, a more detailed elaboration of the development cycle of the software tool for business process analysis and improvement would be too extensive for the scope of this work. Thus, the implementation phase is just mentioned here.

VI. CONCLUSION

Application of the user based WSDM method can contribute to solving the problem of design and implementation of the software tools for business process analysis and improvement. At various stages of modeling, the WSDM method, which is mentioned in this paper, enables resolving issues related to the problem of determining which user groups exists. In this particular stage, phases are modified in accordance with the supposed requirements that arose from applying the method to design a software tools for business process analysis and improvement. The contribution of this method is provided in the rationalization of time that will be required for the realization and implementation of the software tool for business process analysis and improvement.

ACKNOWLEDGMENT

Ministry of Science and Technological Development, Republic of Serbia financially supports this research, under the project number TR32044 "The development of software tools for business process analysis and improvement".

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THE CLOUD COMPUTING BENEFITS AND CONCERNS FOR SMEs

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Abstract - *The Cloud computing is a new Internet-based technology and its adoption in developing countries will not be an easy process. The lack of knowledge what the Cloud is and what benefits it brings to businesses makes this process even harder than it is usually the case with new idea and technology adoption. The only name "Cloud", as something unsteady and mystical, brings additional suspect in this technology, which will for sure become the newest and most revolutionary utility service. This paper gives short history of Cloud computing and presents in brief some facts derived from several studies conducted in high developed countries and European Union relating to adoption of Cloud services, its economic impact to business creation as well as the main benefits and concerns it brings to SMEs.*

1. INTRODUCTION

The Cloud computing is an innovative Internet technology which offers high computational power on distant processors, storage of information in provider's servers and Data centres and variety of services and applications to users, based on pay-as-you-grow manner. With this revolutionary concept the companies, especially small and medium ones (SMEs), are in position to adopt the latest applications and services on demand, avoiding high up-front costs that are in a current traditional way unavoidable for ICT equipment and software. Cloud computing reduces ICT cost structure and strengthens production and market abilities of SMEs.

The EU recognized positive impact of Cloud computing for creation of small and medium businesses and economy as whole. The e-Business Watch of the European Commission (2008) stressed this aspect clearly (1, p. 2): *"SMEs form significant industry segments in the EU and account for the majority share in EU employment. Thus, they require specific policy attention. While their strength lies in the flexibility with which they can adjust to changing market conditions, their small size makes them less able to face high up-front costs"* (p. 53).

Cloud computing brings numerous positive effects and speed of adoption is crucial. The study which has been done by Federico Etro (1) showed that Cloud computing adoption will contribute to GDP growth in European countries in the range between 0.05% in the short run under slow adoption and up to 0.3% in the medium run under fast adoption.

The policymakers in developing South-Eeast European (SEE) countries must follow the EU policy and promote as much as possible a rapid adoption in all business areas with special attention and help devoted to SMEs. The governments should promote the benefits of Cloud computing, adopt an appropriate legislative to reduce security and privacy concerns and partially finance the cost of Cloud services for SMEs in the initial phase in order to encourage them for faster Cloud adoption. Smaller countries would be able to obtain larger gains from similar policies at least in the initial phase, because they would easily attract foreign investments from the larger countries (1, p.18).

2. THE HISTORY OF CLOUD COMPUTING

Although Cloud computing in its today's forms such as Software as a Service (SaaS) or Platform as a Service (PaaS) is relatively new concept or a business of the 21st century, the idea of similar global shared computer network was introduced in 1969 by J.C.R. Licklider, who was responsible for enabling the development of ARPANET. His vision was that everyone in the world should be interconnected and have possibility to access and use programs and data at any time, at any site, from anywhere. The similar vision, which also dates back to sixties, had John McCarthy who predicted that this way of global computation will be a new public utility, similar to the other utility services such as electricity, gas, telephone, water or heating.

Since its beginning, cloud computing has developed in a variety of forms with Web 2.0 as one of the latest evolution. The popularity of Cloud computing is in line with the development and dissemination of telecommunications broadband access networks and technologies. The global economic downturn seems to have no negative impact on its expansion.

One of the first companies in Cloud computing business was Salesforce.com started in 1999 with SaaS. This company was offering business applications in a simple and economic way via website. Amazon Web Services, which were introduced in 2002, were providing cloud-based data storage and computation. Amazon's Elastic Compute cloud (EC2) service was commercially launched in 2006 through the Amazon Mechanical Turk (MTurk) and it was the first commercial service, which was offering human intelligence as web service. In 2009 Google started offering Web 2.0 browser-based enterprise applications and services with Google Apps, as a good example.

The most important contribution to Cloud computing have the emergence of popular "killer applications" which

have been introduced in last two years by Microsoft and Google. These applications have a huge impact to the market and IT industry as whole, attracting consumers by its simplicity and reliability. Some other factors such as: the maturing of virtualisation technology, the development of universal high-speed bandwidth networks and standardization in the field of software interoperability also have a big positive impact to Cloud computing industry.

The SMEs started with Cloud computing in 2008 but at the beginnig most of them didn't have enough confidence in this technology and the lack of awareness that the businesses is going to run well on Cloud is still evident. Bellow we present some indicators, which are mainly derived from recent researches conducted in the Europe by The European Network and Information Security Agency (ENISA) (2) and by OpinionMatters, an independent pan-European market research company from the UK (3) , commissioned by Easynet Connect.

It is very interesting to see how seriously SMEs were taking the cloud at the beginning i.e. in 2008 and how their interest changed in two following years. The results showed the significant increase of interest in the Cloud computing. At the end of 2008, more than half SMEs which were included in this research, said they would never adopt the cloud, but the interest in the cloud started to grow throughout 2009 and 2010 and the attitudes have significantly changed.

3. ADOPTION OF THE CLOUD COMPUTING SERVICES BY SMEs

The research conducted by Opinion Matters from UK, showed that at the end of 2008, 53% of SMEs included in the survey said they would never use the Cloud computing and remaining 47% said they would do it within five following years. Some fifteen months later the situation significantly changed and only 27% said they would never use the cloud, while 73% said they would use it within next five years.

The survey conducted by ENISA (3) was composed of nine questions related to: Company size, Company location, Drivers or reasons for SMEs engagement in the Cloud Computing, Cloud models, Cloud types, Use of multiple providers, Disaster recovery options, Cloud services and SME's main concerns. The survey participants were 74 SMEs from 16 EU member states, India, Canada and USA with different size, e.g. number of employees: 27 SMEs or 36.5% with 1 to 9 employees, 12 SMEs or 16.2% with 10 to 50 employees, 14 SMEs or 18.9% with 50 to 250 employees and 21 SMEs or 28.4% with more than 250 employees.

The main drivers for SME's engagement in Cloud computing were:

- Elimination of capital expenditure in hardware, software, IT support, and information security (68.1%);
- Flexibility and scalability of IT resources (63.9%);
- Better Business Continuity and Disaster recovery capabilities (52.8%);
- Increased computing capacity and business performance (36.1%);
- Feasibility and profitability of new services in the Cloud (29.2%);
- Optimization of IT infrastructure through automated management of virtual machines (25%).

The SMEs don't have a similar and clear attitude what Cloud model or solution is most suitable for them and they expressed almost the same interest for Public Cloud (24.7%), Partner Cloud (27.4%) and Federation Clouds (31.5%) provided by various sources (partner, private, etc), with only 15.1% of those who consider a privately owned and managed Cloud most suitable solution for them.

Software as a service, e.g. individual software packages would be the most popular Cloud service for SMEs (34.2%), than Platform as Service (28.8%) and a pure infrastructure services such as storage, processor power or network capacity (24.7%). Since SMEs are still concerned about security and privacy, only 9.6% said they would perform security services in the Cloud.

SMEs would rather choose an outsourcing to multiple providers (73.6%) than to the single one (26.4%) expecting a better reliability working with more providers. This attitude is mostly based on their previous experiences gathered from cooperation with network infrastructure operators.

Considering the disaster recovery plan almost half of SMEs (48.6%) would like to fully outsource disaster recovery to Cloud providers and ensure better business continuity while the others (51.4%) would rather keep internal IT resources used before the Cloud. Additionally some 15% said they would like to have both options for disaster recovery regardless of the costs.

Regarding the services which SMEs would like to outsource to the Cloud, list is as follow: CRM and Sales Management (52.8%), Application development (44.4%), Project management (41.7%), Payroll (38.9%), Accounting and Finance (30.6%), Data analysis (29.2%), Human resources (19.4%) and Procurements (16.7%).

4. THE MAIN BENEFITS OF CLOUD COMPUTING

IT professionals in the developed world have recognized the benefits of cloud computing, mainly in terms of unlimited storage, flexibility and cost reduction but some concerns still remain mainly related to the security and privacy of data transferred and stored in the cloud. Once the security and privacy concerns are solved the cloud computing can bring enormous benefits for IT users, mostly trough enhanced flexibility, a wider choice of computing resources and scalable capacity on demand. The significant cost savings is also a very important factor for decision makers within SMEs in order to adopt Cloud services.

As we already have mentioned SaaS is the most popular type of Cloud services for SMEs and they started to use web-based applications such as: email, office applications, data backup and data sharing. These applications are maintained in online data centres and users steadily gain awareness of their numerous benefits that are obvious but not easily quantified. We will here mention some of them.

- Reduced IT Costs: Since the SaaS applications are performed on the hardware situated in large data centres SMEs transfer all maintenance and support associated with that equipment to Cloud providers which as result should have reduced maintenance costs compared to the one they previously had for the hardware in their ownership.

- Easier Access to New Services: SMEs are in position to use a variety of rich services that in the past where exclusive privilege of large enterprises who had their own and expensive IT infrastructure.

- Higher resilience: Since the users no longer depend on in-house based hardware their business applications can be accessed from anywhere using Internet. Users now have a high degree of freedom and flexibility since they can work form the home or whilst commuting.

- Reduced investment and better Cash Flow: Since the Cloud computing users usually works on subscription based schemes, payment in installments without the need for high upfront capital investment is of huge importance for SMEs particularly for those smaller ones.

- Security: Although security and privacy matters are still the main concerns for SMEs, the data centers in the Cloud are exceptionally secured and protected because the income and reputation of Cloud providers directly depends on how customer's data and applications are safe and protected from attacks.

- Easy software upgrades: Cloud services are mostly based on subscription model and user receive the latest upgrades on time without need to pay for them in advance as it was the case when they have used it on their own computers. Working in the cloud user always has the latest version of software and services.

- Flexibility and scalability: The scalability is one of distinguishing benefits of Cloud based services. The user's applications can now be expanded in line with ongoing business demands. Using Cloud based services, customer pay only for what they use or need and it is significantly less then with applications performed on their own IT infrastructure.

5. THE MAIN CONCERNS OF CLOUD COMPUTING

According to Opinion Matters (2) the confidentiality of corporate data, data privacy and integrity of services are the main concerns for SMEs, whilst they are the least concerned about cost and difficulties of migration to the Cloud and the clearness of the pay per use scheme offered by Cloud providers. Average concerns rating of different security aspects for SMEs (in the range from 1 to 5) is as follow: Confidentiality of corporate data (3.59), Privacy (3.36), Integrity of services and/or data (3.28), Availability of services and/or data (3.17), Lack of liability of providers in case of security incidents (3.03), Loss of control of services and/or data (2.98), Repudiation (2.67), Intra-clouds (vendor lock-in) migration (2.63), Uncontrolled variable cost (2.62), Inconsistency between transnational laws and regulations (2.52), Unclear scheme in the pay per use approach (2.37), Cost and difficulty of migration to the cloud (legacy software etc...) (2.33).

6. THE ECONOMIC IMPACT OF CLOUD COMPUTING

In his Study (1, p.13-17), using rather conservative approach, Federico Etro has estimated that Cloud computing diffusion over five years can contribute to the rise of the annual growth rate in the range from 0.05 to 0.3%, depending on how fast will be the Cloud adoption. Even more he has stated that fast adoption can generate several hundred thousand of small and medium enterprises and create almost million new jobs across European Union. This effect is going to be stronger in countries with relatively higher contribution of SMEs in total economy, especially for those more IT oriented and with rapid IT adoption. According to this Study the highest number of new small and medium size enterprises is expected in Italy (about 81,000) in the medium run under fast adoption followed by Spain (55,000), France (48,000), Germany (39,000), UK (35,000), Poland (32,000), Portugal, Greece and Czech Republic (18,000), Hungary and Sweden (12,000) etc.

Such positive economic effects of Cloud computing need a fast adoption and dissemination of this new technology which is not possible without highly developed broadband infrastructure, strong state policy interventions and appropriate regulatory support.

Since Cloud computing is an Internet based technology relying on infrastructure (data centres, servers etc). located in different countries, data will inevitably cross the boarders of states with different regulations and privacy laws. Such situation demands appropriate international standardization regarding free flow of data as well as an independent international auditing and technical standardization for equipment, protocols, software etc.

7. CONCLUSION

The Cloud computing era started few years ago and it will inevitably spread all over the world in this decade. In order to provide faster Cloud adoption and ensure all its benefits to the customers, Cloud providers have to demystify Cloud to the customers because most of them never heard of Cloud or don't have enough information

what "the cloud" means. *"It's not just consumers and lay people who struggle with the cloud, it's experienced IT people who struggle with it,"* says Gartner analyst David Smith. *"The whole idea from a consumer perspective is … it's supposed to be a magical cloud in the sky*" (5).

Demystification is a precondition but Cloud providers and IT specialists have to eliminate SMEs decision maker's concerns regarding security of company's data and applications in Cloud. From regulatory point of view the introduction of public auditing or third party auditing for cloud data storage security will be crucial for fast adoption and Cloud spreading (4).

As far as the technical solutions are concerned, the concept of distributed Host-based Software Solutions promising to be the efficient approach to secure databases on virtual machines in Cloud environments (6).

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Using Alfresco CMS for Storage and Searching of Documents in Small and Medium Enterprises

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Abstract - Document management and storage for each company is a serious and demanding job. Managing of electronic documents solves this problem. Electronic documents and software systems for document management provide affordable, sorted and classified documentation for company, fast search of documents and increased security. Companies that have business units in several cities, using a system of record management can achieve considerable optimization of resources in the form of centralization and optimization of process documentation and flow of documents. There are many diferent document management systems on the market, and it is important to note that there are some very effective systems based on open source standards. This paper presents the Alfresco CMS that can find its application in small and medium enterprises.

I. CONTENT MANAGEMENT SYSTEMS

Content Management System is a application that is used to store electronic documents and scanned paper documents, to track documents through their life cycle and to the integration of different databases. According to [4] content management system is the category of software that helps manage all the unstructured information and content in the enterprise. This information exist in many digital forms such as text documents, images, XML, audio and video files.

Content management includes following technologies [2]:

- Document management - creating, organizing and sharing digital documents.
- Web Content Management - manage files and data that are intended for posting on the Internet. It makes it easier for people without extensive technical knowledge to set the appropriate content to the web sites.
- Records management - provides an environment for creating, declaring, classifying, storing and deleting records.
- Image-processing applications - to transform and manage images of paper documents. This
- technology allows you to scan documents using hardware and software for character recognition (OCR).
- Social content - for document sharing, collaboration and knowledge management support and project teams. In this component were added to blogs, wikis and support for online interaction. Social content, including video, is the fastest growing category of new content in companies. The name of this component is changed from "Colaboration document" in the "social content" to more accurately reflect customer requirements [3].
- Workflow - to support business processes and routing content, assigning work tasks [3].

CMS also controls the publishing of content through multiple channels. For example, a single piece of content may be published simultaneously to a Web site, broadcasted as a fax, printed as a text document, and sent to a handheld wireless device[4].

These systems allow managing informations that passing through the company or the information that are stored on different servers in the database - and deliver them in a way that enriches the business processes and makes employees more productive. The main advantages are [5]:

- Increased competitive advantage through faster decision-making
- Saving time and costs through more efficient organization of work
- Easily adapt to market demands.

All these features have have one common goal, and that is that collected data from the vast knowledge of the company to use as a competitive advantage in the market.

II. ALFRESCO CMS

Alfresco is a content management system for Windows, Linux and UNIX operating systems, based on the Java programming language. It was made as a web application that runs on the server. In this way, any updates or adjustments can execute in one place, and all users at all times have the same access to data.

Alfresco is based on open source standards. Users can add specific functionality through add-ons modules, or to take some of the finished modules developed by the user community of Alfresco. Some of the major open source components that are built into the Alfresco are [1]:

Open source component	Used in Alfresco
Apache Lucene	Search for text and meta data
Apache MyFaces	JSF components in web client
Mozilla Rhino JavaScript Engine	Web script controlers, JavaScript on server
OpenSymphony Quartz	Planning induction process
Apache Axis	Web services
OpenOffice.org	Conversion *office* documents into PDF
Spring ACEGI	Security (autorization), roles
Apache FOP	Transformation XSL:FO into PDF
Apache POI	Extraction meta data from Microsoft Office files
ImageMagick	Image processing

Figure 1. Open source components

Alfresco Record Management provides a safe environment for the creation, classification, and storage of documents. Managing of papir documents is not easy job, distribution of documentation is a manual and slow process. Electronic document management solves this problem. Digitalization of paper documents, create a number of benefits:

- No need for large storage rooms,
- Documents are stored in digital form, eliminating the possibility of damage over time and independent of temperature and moisture
- The system enables fast search of documents
- Increased security of the records by assigning the appropriate rights to different users
- Provided the simultaneous access to documents for multiple users
- Centralized database for documents that belong to different departments
- Provided the integrity of documents using a file for read-only

Alfresco provide creation reports on numerous criteria, such as: data on cases that are commonly used, documents whose validity period has expired, the documents created by the user.

By integrating the scanning and OCR (Optical Character Recognition) technology Alresco provides solution for storing paper documents, transforming it into digital form, whose contents can be searched. Document scanning procedure is quite simple: paper documents are scanned using a device that is associated with Alfresco and converted into TIFF digital format. Then in the warehouse Alfresco determines whether this will be a scanned document saved as a PDF, Word document, or will remain in its original form [1].

There are two versions of the software:

- Alfresco Community Edition – *open source* i free software
- Alfresco Enterprise Edition – *open source*, with commertial support.

Characteristics of Alfresco Community Edition:

- It is designed for highly trained programmers and enthusiasts who are themselves able to perform adjustments and solve problems related to this system.
- It is designed to work on open source systems
- Support is not provided.

Characteristics of Alfresco Enterprise Edition:

- It is designed for companies, government institutions and other organizations that need high quality open source CMS for a price that is 1 / 10 cost of commercial software of its kind on the market.
- It is designed to work on open source systems, as well as with MS SQL Server and Oracle databases and BEA WebLogic and WebSphere
- Includes advanced tools that facilitate the JMX connection with databases, monitoring memory and reconfiguration of server.
- Afresco provides commercial support with Service Level Agreements (SLA) for troubleshooting, fault resolution and installation improvements

- The implementation of rigorous tests to detect errors, checking the stability and security.

III. III USING OF ALFRESCO CMS

The following example will show how Alfresco Record Management could be applied for storage (archiving) and searching of documents in the Green Trade Company.

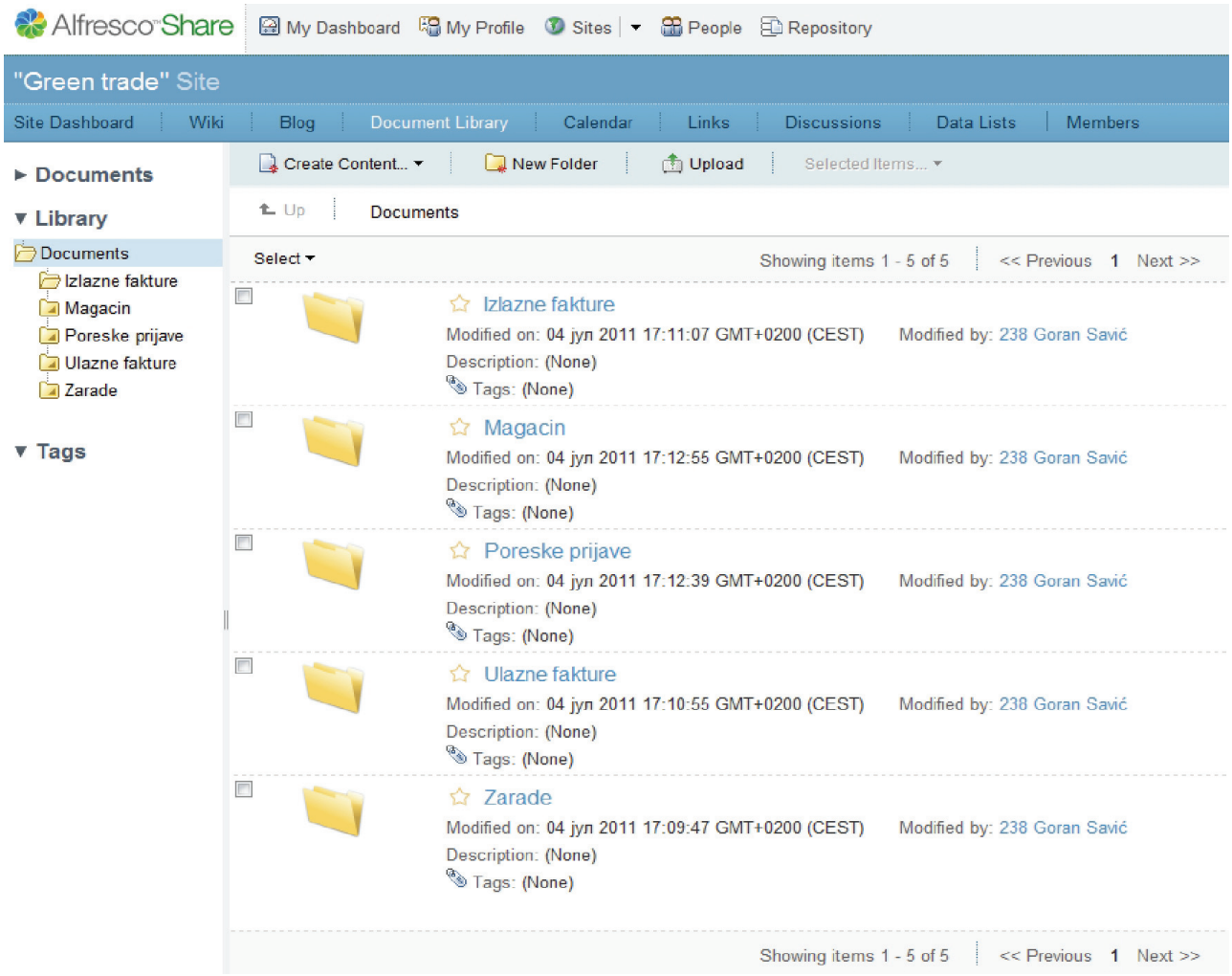

Figure 1. An example of the organization of documents

The structure of this program is in the form of folders on the local computer. The organization of this archive is very simple. Paper documents are scanned and accommodated in the appropriate spaces, and are electronically entered directly into the system. In this way, the documentation is effectively systematized and search results are obtained in a very short period of time, in just few seconds. This way of working with documents in particular has an advantage if the company consists of several business units that are physically deployed in several cities or countries.

Alfresco Record Management incorporates a number of options that facilitate its use, as well as search documentation by numerous criteria, review of selected documents directly in the program (Alfresco has built-in Flash), etc.

Documentation can be viewed by all employees to whom the administrator gave authority to access the system, with defined rules of access to documents and users are assigned to appropriate roles. I can also create groups of users that have the same rights over the documents. Access to the system may have and external users.

IV. CONCLUSION

Using of document management systems that are necessary to any company, working with documents becomes faster and more efficient, reduce paper use, eliminating the need for archive space, employees in different business units, companies can easily have access to the necessary documentation.

Alresco CMS that provides all of this is free to download, install and use.

If in a company does not exist the person who has knowledge of working with Alfresco, the engagement of external collaborators brings additional costs. Training employees to work on this system can take some extra time and a money. Also, system administrator must always be available in order to work with all users, their rights, eliminated mistakes and problems at work.

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Validation of trigger points on the railway road crossing

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Abstract: This labor analyzes the causes of the tragic accident at rail crossing journeys provided by barriers, light traffic signs and traffic signs on the road. It was found that one of the problems that directly affect the safety is location of trigger points that start the device at road crossing. In aim of fast and accurate determination of new trigger points depending on introduced an easy drive on the track it was suggested to use a mathematical software packages.

I. INTRODUCTION

It's common, when it reaches the traveling rail level crossing with barriers, traffic light signs and traffic signs on the road to wait for a variable time arrival of train of relatively short time to the unjustifiably long, even for a few minutes.

Unfortunately, we have seen exceptional events in the traveling rail crossing accidents in the group with the consequence of killing people and great material damage. Despite of secured-railway crossings traveling light and sound signals and barriers, drivers of road vehicles move in the "slalom" ride between barriers. If it is asked why they do this, certainly they do not have rational explanation. However, if we analyze the Reports of the exceptional events in the territory of the Section of infrastructure nodes Novi Sad in the period 2001-2010 (based on official reports of Organizational entity for operational work Node Novi Sad), there is an interesting data. In most cases, participants in exceptional events, who ran road vehicles, are people who live in municipality where the exceptional event occurred and who are familiar with local circumstances. These people had knowledge that the time interval of lowered barriers is longer therefore they "estimated" that pass can be done between barriers before the train comes.

Railway "b" ray of corridor X (number of railroad Inđija-Novi Sad-Subotica) is equipped with electro-relay signal-safety devices of the system "CI WESTINGHOUSE". Within this system there are devices to secure traffic at the point of intersecting roads and railroads in the level. Subject to the provisions of the Law on Safety in railway transport ("Official Gazette of FRY", No. 60/98) resulted Regulation on the railroad crossing and the road ("Official Gazette of FRY", No. 72/1999).This regulation ranked the degree of assurance traveling rail crossing in relation to: a triangle of clarity, purpose and range lines, road type, traffic density, the maximum permissible speed on the track, the length of journeys rail crossings and so on. In accordance with these factors, provision of level crossings may be with [2]:

1. with traffic signs on the road and triangle of visibility,
2. traffic light signs and traffic signs on the road,
3. barriers with traffic light signs and traffic signs on the road,
4. bumpers and traffic signs on the road,
5. direct regulation of traffic on the road crossing and traffic measures in certain cases,
6. fences or other devices on the traveling rail crossing for pedestrians or cyclists.

This labor will discuss the arrangement of rail journeys in the level crossing with barriers, traffic light signs and traffic signs on the road.

The aim is that, for perceived shortcomings that were noted during the exploration, recommend other technical solutions proposed for a safer and more cost-effective traffic management.

II. CHARACTERISTICS ON THE RAILWAY ROAD CROSSING WITH BARRIERS, TRAFFIC LIGHT SIGNS AND ROAD TRAFFIC SIGNS

The technology of the device on the railway road crossing with barriers is related to the calculation of the maximum train speed on that section of track where the railway road crossing and time of closing barriers. In this case it is observed section of the railway Inđija-Novi Sad-Subotica. Signaling and safety devices as well equipment on the railway road crossing were designed and incorporated 30 years ago and for the top speed of 120 km/h. Railway road crossing with barriers are activated by trigger pedal in the time of arrival of first axle of train over them. Trigger pedals are placed in a certain distance from the railway road crossing and in the literature are called "trigger points". Trigger points are set in accordance with the maximum speed of trains on that tracks and features of the track (curves, tunnels, bridges ...) and time is [1]:

- 12-15 seconds for the blinking (turns on and off of road light signals alternately, which are placed on either side of the road) and the time before ringing. Estimated time for this labor is 15 seconds;

- 5 seconds for the psychological effect that is occurring at the time of arrival of a driver who is approaching to the railway road crossing, which begins to close,
- 8-12 seconds for the closing barriers. At each railway road crossing it must be individually taken its length, because we have road crossings that cross two or more tracks (highway Sombor - Subotica at the entrance to the railway station in Subotica). To make this work, we take an arbitrary width of railway road crossing and the fixed time of 8 seconds.

By these elements we can determine the distance from the point of trigger railway road crossings and that is:

$$l = v_{trainmax} \cdot \sum t \text{ (m)} \qquad (1)$$

Where:
$vtrainmax$ - maximum speed of the train,
$\sum t$ - total time required for closing barriers.

Total time required for closing barriers is obtained by:

$$\sum t = t_{blink} + t_{sp} + t_{ps} \text{ (s)} \qquad (2)$$

t_{blink} - a period of 15 seconds for pre-ringing and alternately switching on and off light signals,
t_{sp} - time of 8 seconds for closing barriers,
t_{ps} - a period of 5 seconds was adopted in time for the security (psychological) reserve,

From formula (2) total time required for closing barriers on the road crossing $\Sigma t = 28$ seconds, , and when the time included in the obtained formula (1) gives the distance from the point of trigger railway road crossings, which is for the maximum speed of 120 km/h, 933.33 (m). Figure 1 shows a sketch of the situation.

It is known that the speed on the track Inđija-Novi Sad-Subotica (observed section of the railway in this labor) for the Timetable 2010/2011 of 50-80 km/h. These are the maximum speed of trains and there are frequent coasting, which are introduced due to the poor condition of the track and continue until the cause of the introduction of an easy drive. Resolve the cause of driving light sometimes occurs for several months. After examining the records of driving light on this part of the railway, we can conclude that they are on average 20-30 km/h.

The logical question then arises: what they do and how drivers react to road vehicles waiting in front of the closed barriers for the train that goes smooth ride of 20 km/h. Based on the formula mentioned above which we calculate the distance from the point of trigger railway road crossing, it is clear that the train, moving at a speed of 120 km/h after 33.7 seconds from the time point of activation of trigger find on railway road crossing and drivers of road vehicles to wait in front of closed barriers only 5,7 seconds.

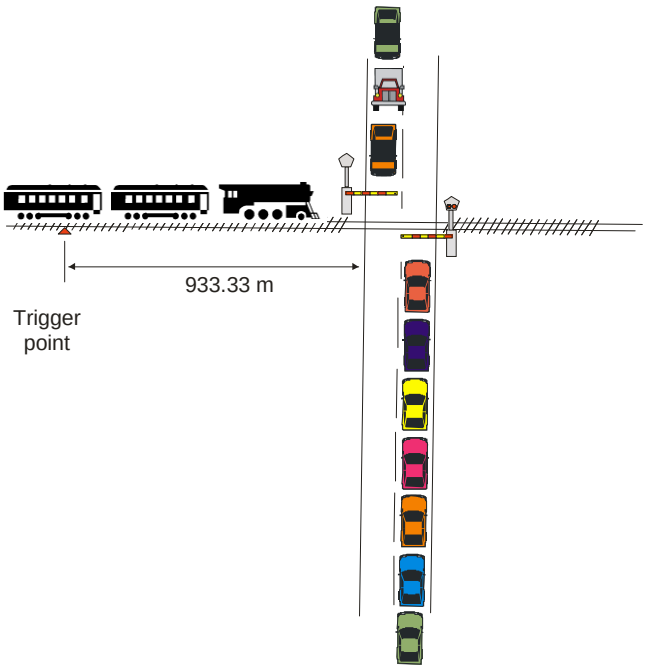

Figure 1: schematic view trigger points

However, if a train moving at 20 km/h it will be, from the moment of activation of trigger point to the arrival of the railway road crossing, moving of 169.7 seconds and drivers of road vehicles will be waiting in front of the closed barriers 141.7 seconds. Here we connect the fact that the local people who participate in traffic as drivers of road vehicles, familiar with the long retention interval in front of closed barriers railway road crossing. This is often the only motive why these drivers indulge in making “slalom" between the closed barrier railway road crossings that sometimes ends fatal.

A model for predicting the number of road vehicles and the total waiting time due to busy railway road crossings have a major impact on traffic flows at railway road crossing, particularly in its optimization, which contributes to shorter waiting time, delays, better utilization of transport capacity and others and on the other hand contributes to the greater income of transport companies as well to better economic development [3].

The intensity of road and railway traffic, then the time distribution of coming vehicle or trains directly affects the number of stopped cars and their total waiting time.

However, if the waiting time in front of closed railway road bumper unduly long, it will affect negatively at least two factors, which we will mention here, although the authors did not thoroughly research them.

These factors are:

• Economic factor

• Ecological factors.

It has not been done any of the recording level crossings for this labor. However, by examining the existing literature that deals with these issues, we come to the conclusion that it can be quantified economically unnecessary delays of road vehicles which wait in front of the closed barriers. That would be performed by calculating the amount of costs due to unnecessary delays of road vehicles. This is primarily to the costs incurred by commercial vehicles (vans, vehicles of various utilities and others). We have no right to disregard the costs of private persons. This is a very complex theory that must be escorted on the field recordings (the longer recording, it is better sample and quality results), recording of the different types of road vehicles (vans, fire engine, ambulance, utility vehicles for garbage disposal, large trucks, car, etc...). Then we would have to deal with the economic parameters such as the costs (direct and indirect) which are incurred by participants in the road that are waiting for the road crossing..

The twenty-first century will certainly be crucial in the area of environmental protection. It is therefore necessary for each project to define the environmental aspect of the project. Any negative impact on the environment requires a special approach and in the most cases requires total or partial elimination of the negative environmental impact.

Conclusively it is unnecessary retention of participants in road traffic generates harmful fumes. We are witnesses of resolution this issue in urban areas with traffic lights where the long wait under the light signal where it is set the timer that counts down the seconds of waiting for the appearance of green light in order to extinguish the engine.

I repeat that the authors are not engaged in the research of these factors, but we take the intuitive assumption that both are absolutely justified. Neither the high costs that were incurred by participants in road traffic, which unreasonably long wait in front of the closed barriers railway road crossings, or environmental pollution that arises in this case is not, nor can it be valued with a lifesaving. Therefore, the authors of this labor suggested a solution to this problem trigger points on the line in terms of speed of the train.

If we quantify the economic value of this work, we cannot without any calculation claim that it is economic justification for hiring two mechanics interlocking means to shift trigger points which is much lower than the costs generated by road traffic participants who needlessly waiting in front of the railway road crossings.

Using mathematics software Matlab [3] accurately and quickly you can get new for trigger chainage points depending on the introduced light train schedule.

III. USE OF PROGRAM MATLAB FOR DETERMINING THE TRIGGER POINTS

A. Setting task in MatLab

Resolving the problem of locating trigger points depending on the speed of trains which we assume that it was designed speed railway line of 120 km / h (railway branch "b" on the part of Corridor X railway Inđija-Novi Sad-Subotica). Therefore the system was designed and interlocking systems, as well railway road crossing with barriers for speeds of 120 km/h. From (2) it is known that activating of railway road crossing with barriers is 28 seconds.

It is necessary to write a program in MatLab so that the result gives the distance of trigger points in relation to arbitrary given speed of the train. Arbitrarily set speed of train is a vector of 120 to 10 with step -10.

As a graphic solution of this task we should get a diagram of train in the move of 120 km/h as the red line in the v-t coordinate system and the blue line to show a given speed of the train. Time is always limited to 28 seconds (1) in order not to change the device of railway road crossing.

For better presentation of the results, it is necessary to do, in the form of a graphical histogram, on the x axis speed movement and on the y-axis time in seconds it is necessary that train arrives to the level crossing with barriers.

B. The decision task in MatLab

Programming this task is performed by the vector of time entries from 0 to 28 seconds. This is the time which is necessary to train, travelling at 120 km/h that came to the trigger point of the railway road crossings. Lp represents the vector distance of train from railway road crossing with speed of 120 km/h. Previously we had to convert the speed from km/h into m/s. However, in the task we had to keep the speed in km/h to the outcome results. In the next view they are given the program steps:

```
>>Tut=[0:28];
>>Tut=0:28;
>>Lp=0:28;
>>V=120*(1000/3600);
>>Lvl=[0:28];
>>Vlv=input('Input decreased speed');
>>Vlv=Vlv*(1000/3600);
>>Lp=(28-Tut)*V;
>>Lvl=(28-Tut)*Vlv;
>>tab(:,1)=Tut';
>>tab(:,2)=Lp';
>>tab(:,3)=Lvl';
>>tab
>>grid on
>>plot(Tut,Lp,'color','b','marker','x')
>>line(Tut,Lvl,'color','r','marker','x')
>>legend('Decreased speed','Regular speed',0)
>>xlabel('TIME IN S')
>>ylabel('THE PATH TAKEN IN M')
```

The result of this program provides an interactive work of users and computer. The computer asks to insert the reduced speed. The user input the speed of the train, which may be of 10 km/h to 120 km/h. Since it is an easy drive to introduce the entire decade values were not necessary to generate a vector to a lower value in other words with shorter step.

In response to the set speed MatLab will calculate and display the result in three columns. The first column of the table is the seconds from 0-28. The second column represents the distance of the train speed of 120 km/h, in meters, and the third column represents the distance from the railway road crossing for a particular reduced speed. The table I give the view of results for a speed of 20 km/h. The first column of the table represents the seconds (0-28) needed that barriers go down. The second column represents the distance of a train from railway road crossing in the observed time when the speed is 120 km/h and the third column represents the distance of a train from railway road crossing for speed of 20 km/h.

From table I it follows that if the train is moving slowly at a speed of 20 km/h, it is necessary to relocate the trigger point for 155.56 meters in front of railway road crossings since the arrival of the train passes through trigger point total of 28 seconds.

TABLE I. RESULT OF LOCATION TRIGGER POINT DEPENDING ON THE SPEED

time	**Distance trigger points for speed of 120 km/h**	**Distance trigger points for decreased speed of 20 km/h**
0	933.33	155.56
1	750.00	150.00
2	722.22	144.44
3	694.44	138.89
4	666.67	133.33
5	638.89	127.78
6	611.11	122.22
7	583.33	116.67
8	555.56	111.11
9	527.78	105.56
10	500.00	100.00
11	472.22	94.44
12	444.44	88.89
13	416.67	83.33
14	388.89	77.78
15	361.11	72.22
16	333.33	66.67
17	305.56	61.11
18	277.78	55.56
19	250.00	50.00
20	222.22	44.44
21	194.44	38.89
22	166.67	33.33
23	138.89	27.78
24	111.11	22.22
25	83.33	16.67
26	55.56	11.11
27	27.78	5.56
28	0	0

. Graphic display is automatically regulated so that the second list highlights the graphical solution of this task. From the above diagram it is clear that the train for 28 seconds presented in Figure 2 is a graphical representation of the task. From the above diagram it is clear that the train for 28 seconds to cross the 933 meters and is moving with vmax = 120 km/h (blue line diagram) and that for the same 28 seconds to cross the 155 meters and is moving with vmax = 20 km/h (red line diagram).

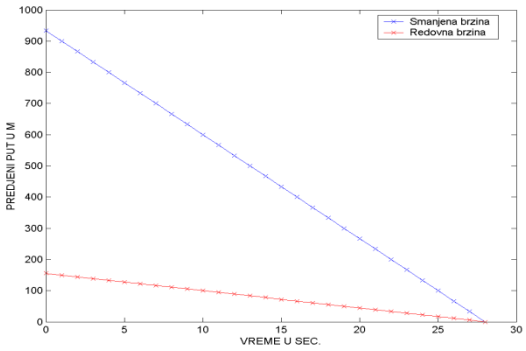

Figure 2: Graphical representation of results

The functioning of this program is based on a for loop that follows the 12 steps of the train speed and distance from trigger point until railway road crossings. The programming solution is:

```
>>vms=1000/3600;
>>l=120*vms*28;
>>v10=[120:-10:10];
>>v11=v10;
>>v10=v10*vms;
>>t10=[1:10];
>>n=length(t10);
>>for k=1:n
    t10(k)=l/v10(k);
>>end
>>bar(v11,t10)
>> Xlabel ('SPEED IN KM/H')
>> Ylabel ('time in seconds')
```

On Figure 3 is represented by a histogram that indicates the time needed for train to arrive from trigger point until railway road crossings. The last column above «120» shows that at a speed of 120 km/h takes 28 seconds (between 0 and 50 seconds). But at a speed of 10 km/h time that passes from crossing the train through the trigger points until railway road crossing close to 350 seconds.

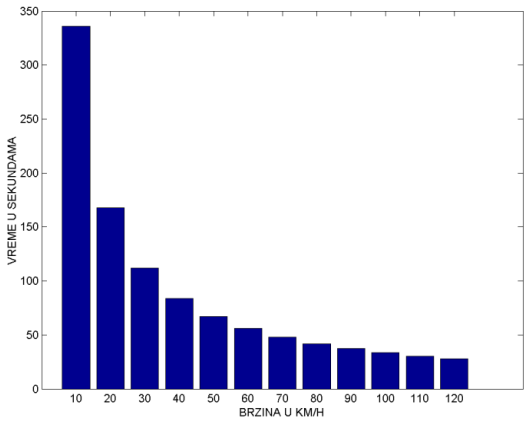

Figure 3: Histogram of time and speed

IV. CONCLUSION

This proposal was given a solution that can increase the level of security on railway road crossing with barriers. We are not engaged in economic evaluation of labor to change the location of trigger points of railway road crossing in relation to the imposed easy ride, nor were the aim of the labor. The aim of this labor was to demonstrate the application of a mathematical software package MatLab in a particular situation or in the process of determining new locations of trigger points.

The program was made to enable any user to, by entering a value easy drive, just get the necessary distance of trigger points. Determining the new positions and displacement of trigger points and replacing them to new positions, to prevent the participants in road traffic unnecessarily long wait in front of the closed barriers of railway road crossings. Thus eliminate the theoretical possibility of making disastrous decisions that drivers of road transport dare to go in the "slalom" between the closed barriers

It is represented the possibility of applying modern mathematical programming language, in practice, and in specific problems.

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Application learning content management systems, virtual classroom and m-learning in enterprises

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Abstract - Several organizations are looking for a way how to manage the overall job performance of their employees, regardless of where the "working age" they are. Learning and competence development, along with management skills is noticeable development, therefore, that organizations want to maximize the capacity of its staff, and with them the skills that the new business conditions become necessary. In the process management capabilities and potentials occupy a key role in content management systems learning (LMS). One capability that users LMS never had this kind should be developed. In this way, the organization gained greater success using his own internal resources.

I. INTRODUCTION

Learning Management System (LMS) is a key application in the model of e-Learning. Includes a set of features designed for the "delivery", monitoring, reporting and administration of learning content, student progress, and interaction of students and mentors and students together. Serious e-Learning system cannot be imagined without the complex software. LMS can be used in a very simple system, and the highly complex enterprise-wide distributed environments, such as public administration, large companies and the like.

LMS is software for managing learning events organized, including online, virtual classroom. LMS can simplify global certification efforts, enable entities to align initiatives with strategic objectives and the means for enterprise-level management skills [6].

The focus of LMS is to manage employees, track their progress and performance in all types of training. Learning and competence development, along with management skills is a noticeable development in addition to education there is a niche, therefore, that organizations want to maximize the capacity of its staff, and with them the skills that the new business conditions become necessary . One capability that users LMS never had this kind should be developed. In this way, the organization gained greater success using his own inner resources [1].

Learning Management System (LMS) is software that allows you to fully administer the global learning process of employees of enterprises. Some research has found that 60% of current LMS, with monitoring of the achievements of its users, and 38% giving timely feedback and have a plan to boost performance [5].

LMS for registration of employees, enables the courses in the catalog of courses, description of data on employment, and enables reporting on completed. In addition, LMS is typically designed to be operated courses that deliver different publishers and providers of services. LMS is usually not included in its configuration authoring tools for creating educational content. LMS system manufacturers typically offer additional tools to create content that is flexible for employees or teams. Reuse a wide course (one course can be delivered to multiple employees, the monitoring of achievements).

II. ADVANCED TECHNOLOGY APPLICATIONS IN EDUCATION AND EMPLOYMENT

Learning Content Management System is a system for creating, storing, preparation and delivery of e-Learning content in the form of learning objects. Search new LCMS and compared to the LMS (least according to SCORM-in) is a Automated Authoring Application and applications for automated authoring process. This application automates authoring (content creation process) introducing authors with templates and storyboarding capabilities that include the principles of instructional design. Using these templates, authors can develop a whole course on the basis of the existing buildings in the repository, creating new facilities or a combination of both principles. In this way, considerably accelerating normally quite time consuming content development.

Content management system learning (LCMS) enables management of creating, storing, using and re-using content for learning within a firm or organization. Content learning is structured in the form of particles of knowledge - learning objects or learning objects [4].

Structure LCMS system may be viewed as an upgrade structure LMS systems, which add a content management system (CMS - Content Management System) and re-usable learning objects (RLO - Reusable Learning Objects). The term originated from the CMS on-line publishing industry, where such systems enable the

creation and administration of various content (articles, reports, pictures, banners and the like).

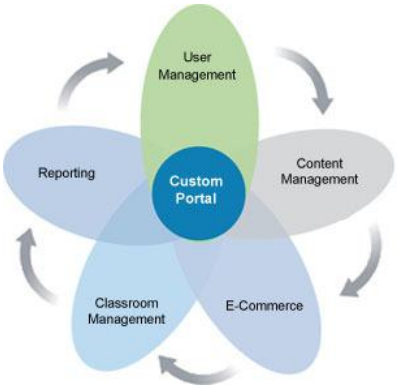

Figure 1. Management in Custom Portal

The CMS system article is entirely made up of a number of particles of knowledge, called content component, whose level is guaranteed, and reuse. One and the same component may be involved in numerous articles and it can be read by many readers. If you bring it in connection with the work, then we talk about re-usable learning objects, which can figurate content in different domain knowledge and can be delivered to different students.

CMS is a software for effective creation, development and content management web site in internet, intranet and extranet use variants. It is designed for large numbers of business users to efficiently and managing web content as a way of presenting the entire business firms and business activities on the Internet.

Characteristics of CMS in a business environment [7]:

- Better information and communication between business functions and staff - CMS is used as an Internet information portal for employees in the company. Applied in this way provides a comprehensive and timely information of employees and the ability to transfer information to the clients of the company.
- Each employee can participate in creating and updating the site - CMS allows the inclusion of "ordinary users' computers to develop and update the site with no previous training to work with specialized tools. In particular it is important that marketing personnel and other sectors of the company without hiring professionals such as web designers and developers the content, create and modify hand, real and connects the menus and links etc.. In addition to users, LINK CMS is available to help system (Help).
- (Only) quality control - CMS allows the user at any time to have an insight into the condition of the structural and functional checks of all the connections. In this way, the user shall establish the correctness of its procedures and controls the quality of entered element. CMS allows the creation of material for later publication on the network with the previous review of the author, and responsible person.
- Integration with databases and Office applications - basically a CMS is reliable and financially viable MySQL database that provides great benefits for the entry, use and organization of stored materials. Content created in some of the Office applications in a simple way of being integrated into the content of the website which is operated by CMS.

It is important that these systems can be applied in a very simple system, and the highly complex enterprise-wide distributed environments, such as public administration, large companies and the like.

III. BUSINESS LMS

LMS in the future should be the basic business applications in large companies (the so-called Trade LMS) in order to increase worker efficiency, facilitate the decision making and automation of work processes. These LMS's need to manage knowledge and competences and cooperation employees. Cooperation employees is established through virtual conferences, forums, chat rooms, blogs. Business LMS should provide career management, to be of assistance in employment, to manage the WBT and CBT in the companies.

Workplace paid attention to education and training at a time, in fact in the work environment. In the context in which to improve workforce skills and competency for rapid change in the labor market and business, e-learning has proven to be very popular as an effective solution [2]. The main beneficiaries of the ICT sector now meet 60% of its needs in training for teaching e-learning. This form of training has the advantage of organizations that cannot bear the cost and waste of time for training in the classroom. Further efforts are needed to small organizations understand, plan and use e-learning in line with their requirements and needs. E-learning offers special advantages when it comes to information and content of the course to maintain modern, given the rapid changes in business environment and regulations.

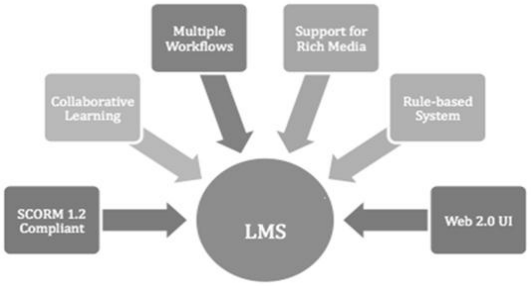

Figure 2. Benefits of LMS

LMS integration with ERP and CRM. ERP (Enterprise Resource Planning) system that enables the integration of engineering, customer service, planning, manufacturing, finance, human resources through a single facility or multiple locations. CRM (Customer

Relationship Management) system that helps manage customer relationship [1].

Grouping (integration) of organizations that use the same LMS, brings many benefits in implementing the education of its participants. This is particularly reflected in lower total cost of training, the time to create competence and provides a consistency of delivery activities encompassed the needs of education. What is the LMS needs to become usable in integrated systems is the necessity of moving on to more advanced levels, in fact LCMS (Learning Content Management System), a system where much attention is given to patterning and evolution of educational content, taking the principles of instructional design. According to the data 60% of current LMS and LCMS has a function.

IV. APPLICATION OF VIRTUAL CLASSROOM IN ENTERPRISES

Virtual classrooms make it possible to develop and enrich the entire range of generic skills, users such as:

- group work and team work (so as to define roles in teams, solve critical problems and discuss the team). Virtual classrooms have a separate "rooms" where users can meet and work on solving the tasks set them.
- problem solving and consideration of various solutions for solutions through discussion that takes place in the group. (In the group may consider different ideas for solving the problem and try different strategies to solve),
- communication skills (asking questions and giving answers, the fact that users are required to take a stand in certain situations, to agree or to express their disagreement, to explain his position),
- effective use of new technologies. Users get used to new technologies used in different activities.

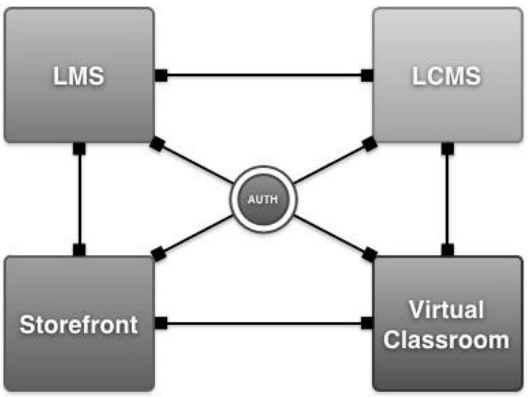

Figure 3. Collaboration in enterprises

Characteristics:

- Usually includes live audio and video communication among employees. Participants use the microphone and headphones (headsets) and communicate with your voice. There are many free tools that can be used for the virtual classroom. Can integrate the separate input devices (for example keys, through which users can vote, answer questions, etc.).
- They can include joint panel to display text and drawing sketches. Lecturer and participants can work together to search the Web ling and joint visits to sites.
- The employer may exchange files with users. Users can join and transfer images from a Web camera when the network capacity to provide. There is a possibility that the presentation include guests from abroad, which is a very good way to include experts in the field. May include "Break out" rooms, the environments in which small groups can work together.
- Sessions can be archived and remember to be reviewed later. These technologies are increasingly integrated into the LMS systems (for example Blackboard, Moodle or Janisons) or CMS systems.

V. M-LEARNING IN ENTERPRISES AND SOCIAL NETWORKING

The future of e-learning, m-learning (mobile learning) - *learning anytime and anywhere*. Thoughts on learning through mobile, wireless internet and so on. The future of education lies in portable devices, primarily mobile phones, iPods, PDAs and laptop computers. In the near future, e-learning systems will be integrated into mobile technologies such as mobile phones, handheld scanners, tablet PCs, Kindle, IPAD and devices that no longer exist. In the long run, e-Learning System (LMS), will be integrated in almost all electronic devices and machines [6].

Social networking (Web 2.0) increase in virtual social interaction on a global scale, is increasingly growing, creating a space in which to share information, knowledge and experience. The newly created space is often the target of testing needs, opinions and ways of organizing as in other sectors, as well as organizing training. Social cooperation is becoming an indispensable way of gathering and management's LMS, where the learning experience, knowledge and a variety of valuable information placed in the lap of social interaction. The newly arrived participants in this form of communication, very quickly learn from their domesticated counterparts, a new generation growing up in this virtual social environment.

What is the big problem is, what is expected of the LMS and what is expected from the only form of social learning, which is present in social networking. In social learning, learning is largely informal character.

The challenge is to design (design) LMS, which significantly by using social interaction through collaborative learning, learning, provides a formal sense. For now, many of the existing LMS is not a satisfactory level of use of Web 2.0 technologies. Some numerical

indicators of the situation with existing LMS products are 42% let index, 20% use blogs, 17% of a wiki page [3].

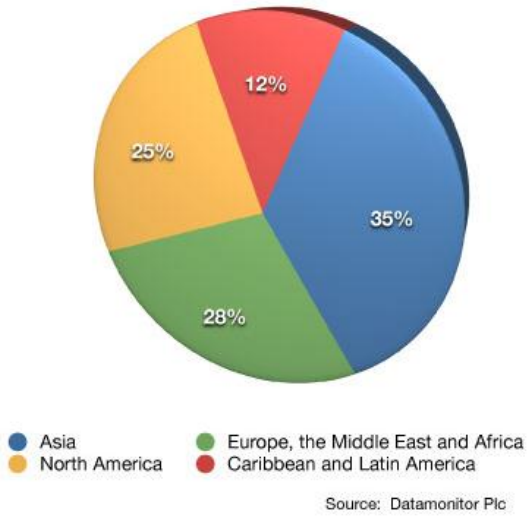

Figure 4. World-Wide Social Networking Users

Strategy for social e-education include:

1. Co-authorship - Users use Web tools to generate and edit together some content.
2. Collaboration in problem solving and collaborative research - Users work together to find solutions to target problems and select strategies to access the following tasks. Social software tools enable users to easily communicate in order to cooperate, be it in textual form or in direct conversation.
3. Tacit knowledge sharing with others - through communication, cooperation in the project, through research and conversations users have the opportunity to share their opinions with others and to participate in adopting common conclusions. Social, networks also allow users to express their specific views, to challenge their opinions and others to participate in building a common attitude and reach consensus.
4. Monitoring-employed, professionals, experts and experienced users can involve the social network in occasionally as an instructor who will guide users in the learning process.

All these software will, as more time is devoted to adoption, as well as simplification of administrative and user interfaces, lead to an increase in simultaneous amateurism (level of knowledge management systems and content creation) and widespread use in all areas of education (school education institutions and in enterprises) as in the domain business since learning can easily be replaced with the term "information" or "relationships with clients."

The future will be different for everyone ranging from hairdressing shops for dogs, medical clinics... until of course, an organization that has to do with learning, as delivered by each individual contribution and use for themselves.

VI. Conclusion

We can conclude that the appearance of more powerful portable communications devices, resulting in the need for future LMS aims to accessibility, independent of the dominant or pre-defined platform for access to educational content and educational activities. The increasing spread of virtual social interaction, gets a significant role in creating applications that are supported by the LMS. In social interaction, consumers are increasingly sharing resources for learning, as well as their ideas and opinions through discussions, presentations, blogs, comments, etc.. tools for this purpose. In this way, learning moves from the corporate model to the global, and therefore the organization LMS need the same adjustment. Accordingly, we conclude that any existing LMS needs to be developed and improved.

Flexibility and adaptability LMS individual and social community, whether real or virtual, individually or through collaborative learning, accompanied by educational standards, is one of the main objectives which aims LMS future. Accessible to large repositories of learning objects, monitoring of standards for the creation of compatible content (for example SCORM), an increase of structural, as opposed to instructional content, forcing non linear ways of learning, follow-up of new IT is the default.

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Bose-Einstein condensation and a free-market economy

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Abstract - Financial systems can be described using a gas analogy. It is possible to calculate equilibrium statistical distributions following from the model. The structure of these distributions depends crucially on average income, democracy, the standard of life and other features associated with political and economic structures of the market economy at equilibrium and may be described by a few parameters, only. One of these parameters can be called a temperature - connected with an average money which economic agents have. The Bose-Einstein distribution of money arises when appear more economic agents who use the largest part of their money in their individual single trading processes.

I. INTRODUCTION

In the past couple of decades, a large number of physicists have started exploring problems which fall in the domain of economic science. Papers on econophysics have been published primarily in journals devoted to physics and statistical mechanics, rather than in leading economics journals. Mainstream economists have generally been unimpressed by this work. Physics is seen by them to be primarily a study of interaction between simple elements, while economics deals exclusively with rational agents, able to formulate complex strategies to maximize their individual welfare. However, the curent wordwide crises revealed the inadequacies of mainstream economic theory.

This has now led some economists to belive that new approach of looking at the economic problems cannot be simple ignored [1]. Bringing together the techniques of statistical physics and nonlinear dynamics to study complex systems along with the ability to analize large volumes of data with sophisticated statistical techniques, econophysics provides a promising alternative to study economic phenomena.

The paper is organized as follows: Section II describes some risks in financial transactions and the random nature of a market, as the introduction for further sections. Section III deals with the linkage between gas dynamics and economy and briefly describes some interesting analogy. Section IV briefly describes Bose – Einstein Condensation (BAC), while section V deals with the application of the BAC concepts to the financial crisis. Finally, section VI is the conclusion.

II. RISKS AND FINANCIAL ASSETS

There are riskless and risky financial assets. An example of a riskless financial assets is a bank account since there is a guarantee to receive usually fixed interest rate *r*, regardless of the market situation. Banks operate in a way that they borrow from those who have the money but are not willing to take risks, and lend at higher interest rates to those who need money. Banks can reduce their overall risk by diversifying their lending [8].

On the other hand a company can also raise capital by issuing stocks or shares. Stocks are risky financial assets because their prices are subjected to unpredictable fluctuations. This is what makes stocks attractive to investors who seek to buy low and sell high.

The stocks exchange is usually done in the organized way, e.g. by the New York Stock Exchange – NYSE or the São Paulo Stock Exchange – BOVESPA. The stock exchanges have indexes that are linked with average behavior of some market. The stock represents a small piece of a company and reflect the net worth of this company.

The basic problem in risky financial market is to predict the future on the basis of present information. If a new information is revealed that might affect the company's future performance and the stock price will vary accordingly. But the future price of a stock is always uncertain in some degree. The behavior of a market is erratic. Although stock prices are rather unpredictable this does not mean that they cannot be modeled in a probabilistic fashion.

Let *S* be a price of a given stock so we can write an equation for the rate increase of *S*:

$$\frac{dS}{dt} = R(t)S$$

where *R(t)* is the rate of return of the stock. According to [8], *R(t)* could be separated into two components:

- a predictable mean rate return, denoted by μ,
- a fluctuating or noisy term $\xi(t)$ responsible for uncertainty in the stock price.

Now, we have:

$$R(t) = \mu + \xi(t),$$

and finally:

$$\frac{dS}{dt} = [\mu + \xi(t)]S$$

One of the best models for "noise" is the white noise, so that it is understandable that Brownian motion and white nose play very important role in finances and economy.

It is obvious that there is an analogy between finances and economy on one side and gas model, BAC theory on the other side. This analogy may be of a great importance for small and medium sized enterprises.

III. GAS ANALOGY

In econophysics, theories like statistical mechanics are applied to large populations of people interacting with each other by exchanging money, goods, and services. In the gas model, people exchange money in random interactions, much as atoms exchange energy when they collide.

While economists' models traditionally regard humans as rational beings who always make intelligent decisions, econophysicists argue that in large systems the behaviour of each individual is influenced by so many factors that the net result is random, so it makes sense to treat people like atoms in a gas [2]. Yakovenko and his colleagues proposed that the Maxwell-Boltzmann-Gibbs formula can be applied by treating money as analogous to energy [3].

IV. BOSE-EINSTEIN DISTRIBUTIONS

It is generally accepted that the statistical distributions of variations of prices of financial assets (shares, indices, commodities, exchange rates) are power laws [4], and (exponentially) truncated power laws [5]. In the article "Bose-Einstein Condensation in Financial Systems" [7] , was shown that financial systems can be described as condensates, similar to Bose-Einstein Condensates (BEC). A Bose-Einstein condensate is a state of matter of a dilute gas of weakly interacting bosons confined in an external potential and cooled to temperatures very near absolute zero (0 K or −273.15 °C). Under such conditions, a large fraction of the bosons occupy the lowest quantum state of the external potential, at which point quantum effects become apparent on a macroscopic scale. The Bose-Einstein distribution for the occupation of energy states is also an exponentially truncated power law. The power law exponents in finance markets are however different from those in BECs. Despite of the significant differences in power law exponents, the fact that the distributions both in financial markets and BECs follow an exponentially truncated power law is remarkable.

Another indication that the financial markets are related with BECs is that both systems are partially random, and partially coherent. The atom collisions in classical gases are completely random (constrains being just the energy and momentum conservation), which leads to Maxwell-Boltzman distributions. The particle collisions in bosonic gases are selective, in that the atoms after collisions prefer to choose occupied states, due to the bosonic enhancement effect. In [6] Staliunas argues that the events in finance markets are somehow motivated and that that motivation in general brings order and coherence into a system: " The bosonic enhancement is responsible for the coherence in atomic (or photonic) condensates, in that the (quantum) particles tend to choose occupied states.

In finance, one obvious behavior scenario is that most market participants tend to invest like the others participants, i.e., to occupy more attractive, more popular, in general already occupied, states. This is due to a choice of investing strategies according to the opinion of majorities. This is also due to a condensation of investors into investment groups, with common investment strategies."

Staliunas proposed the folowing model: each market participant occupies states in a two dimensional space:

$$X=(m,s),$$

where m is the amount of money, and s is the amount of shares in possession. Assuming that two particles (two market participants) involved in a collision (a deal) were initially in states:

$$X_1=(m_1,s_1),$$
$$X_2=(m_2,s_2)$$

with the average occupations n_1 and n_2, and that after collision they occupy new states:

$$X'_1=(m'_1,s'_1),$$
$$X'_2=(m'_2,s'_2)$$

with average occupations n'_1 and n'_2, the probability of the above collision is:

$$n_1 n_2 (1+n'_1)(1+n'_2).$$

Taking into account conserved quantities (money) and the fact that probability of the transition in the reverse direction is equal to that of the forward transition, it was obtained the following solution:

$$\frac{n(m,s)}{1+n(m,s)} = exp[\beta(\mu - m - s)].$$

Here, μ is having the meaning of a chemical potential indicating the level of condensation in the system, and $\beta=1/(kT)$ is having the meaning of inverse temperature. This equation easily leads to Bose-Einstein distribution:

$$n(m,s)=(exp[\beta(-\mu+m+s)]-1)^{-1}.$$

In this analogy temperature kT in finance markets would have a meaning of average richness of market participants. Concluding, based on the assumption that the individual market participants tend to cluster, and to behave according to the opinion of majority, one can derive a Bose-Einstein distribution. However, taking into account above assumption together with the fact that the market participants seek for profit, Staliunas obtained exponentially truncated Pareto and Levy distributions with power exponents corresponding well to the ones observed in financial markets.

V. BEC AND FINANCIAL CRISIS

Interesting results are pointed by Kurten and Kusmartsev in [7]. Thay have studied a simple model of the market with a fixed number of N economic agents interacting in pairs. Originally before a start of the trading processes all agents have different amounts of money with equal probability.

At each time step a randomly chosen agent *i* acts as a buyer, while the connected randomly chosen agent *j* acts as the seller. As the result the wealth of the *i*-th agent decreases as:

$$m_i(t+1) = m_i(t) - pm_i(t),$$

while for the *j*-th agent the money increases as:

$$m_i(t+1) = m_i(t) + pm_i(t).$$

The parameter p is associated with the fraction of money used in individual financial transactions. It was shown that the safe market economy arising at small values of $p<<1/2$ corresponds to a gamma distribution where the majority of economic agents have approximately the same amount of money. In such a case of the safe market economy agents are very cautious to use all their money in a single trading event.

While, when $p>1/2$ the agents are gambling, that is they use the largest part of their money in their individual single trading processes. This unavoidably leads to a fact that some significant fraction of economic agents will loose their money and condense into a state without money. When this happens there arises BEC state, where the majority of agents have zero, or have essentially no money. The next participation of these agents in the market is prohibited unless they will loan the money and receive the debt or be very lucky to sell successfully their property or wealth. On the other hand people get poorer and poorer and most of the people have no money to trade. On average there are few rich people on the market, i.e having a lot of money. But most of the people remain poor for the long time period.

Such a distribution may effectively describe a formation of financial crisis as a Bose-Einstein Condensation phenomenon as well as economic growth of human society.

VI. CONCLUSION

In summary the financial crisis of 2007-2010 started with the US subprime mortgage crisis and still experts are placing different weights upon particular causes of the crisis. The complexity and interdependence of many of the causes, as well as competing political, economic and organisational interests, have resulted in a variety of point of views describing the origin of the crisis.

Econophysics provides a promising alternative to study financial crises. It shows that the model of a stable market can be achived when the economic agents use a small fraction of their money in the financial operations. On the other hand it was demonstrated that market with gambling trading is very risky and unavoidably leads to a fact that some significant fraction of economic agents will loose their money and condense into a state without money.

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Evaluation of algorithmic strategies for trading on foreign exchange market

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Abstract - The Foreign Exchange market (Forex or FX) is the largest financial market. A trading strategy represents a set of instructions which advise or perform opening (entry) or closing (exit) trading positions based on the results of technical analysis. A trading strategy allows to exclude randomness in the trading process, it granites strict following defined rule out the emotional factor in the trade. Simulations on historical data can provide preliminary information about expected performance of trading strategy on live market. Simulation helps to determine does strategy is doing what it was intended to do, also it provides preliminary estimations of possible profit and risk levels before using it on live market. All trading strategies are going to have losing trades. Optimizations are performed to help to select parameter values that correspond to optimal strategy performance based on historical data. During optimization, a trading strategy is run several times with different sets of parameters trying to maximize obtained profit, minimize of losses, reduce risk of trading (drowdowns), find optimal number of trades, increase expected payoff factors, etc.

I. INTRODUCTION

The Foreign Exchange market (Forex or FX) is the largest financial market. Unlike other financial markets, the Forex market has no physical location or central exchange location. It is an market where buyers and sellers including banks, corporations, and private investors conduct business. The Foreign Exchange market is available 24-hour, trading begins each day in Sydney, and moves around to Tokyo, London, and New York. That allows investors to respond to currency fluctuation caused by economic, social and political events at the moment they occur. Traders obtain gains on basis these fluctuations according with a known principle "buy cheaper, sell higher". The major currencies on foreign exchange market are US dollar (USD), euro (EUR), Japanese yen (JPY), British pound (GBP), Australian dollar (AUD), Canadian dollar (CAD), and the Swiss franc (CHF). The major currencies pairs are: EURUSD, USDJPY, GBPUSD, AUDUSD, USDCHF and USDCAD[1].

II. ANALYSIS OF FINANCIAL MARKET

There are two basic approaches for analyzing the currency market: fundamental analysis and technical analysis. The fundamental analysis is focused on the causes of price movements (economic, social and political news and information), while the technical analyses studies the price movements themselves[6]. If fundamental and technical analyses are used parallel one another conclusions could be opposite. Technical analysis is based on the following three axioms:

- market movement considers everything;
- the prices move with the trend;
- the history repeats itself.

Technical analysis is based on assumption that any factor influences the price, whether economic, political, or psychological, has already been taken into account and reflected in the price chart. Every price change is caused by a change in external factors. Second assumption is that the price movement is a result of a trend. The implies that the current trend will most likely continue, excluding disorderly chaotic movement of the market, price on market will follow current trend until the opposite trend are established. Third assumption is that models that worked in the past, will probably work in the future. That is based on human psychology which remains almost unchanged over years[1].

Technical analysis is research of market dynamics with the purpose of forecasting future price development, which is done by charts and technical indicators. Technical indicator is a result of mathematical calculations based on current price, previous prices and/or volumes, figure 1. The values of technical indicators are used to forecast probable price changes. Technical indicators could be classified on oscillators, indicators of trends and volumes.

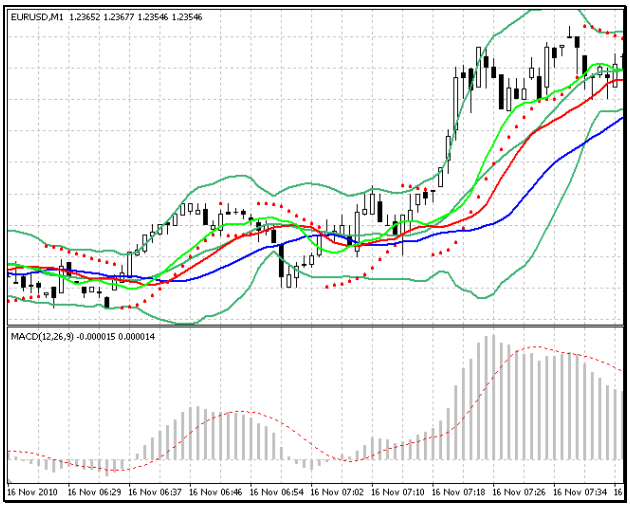

Figure 1 – Chart with technical indicators

Oscillators are: Average True Range, DeMarker, Envelopes, Force Index, Ichimoku Kinko Hyo, Momentum, Moving Average Convergence/Divergence (MACD), Moving Average of Oscillator, Price Rate of Change (ROC), Relative Strength Index (RSI), Relative Vigor Index (RVI), Stochastic Oscillator, Ultimate Oscillator, Williams' Percent Range.

Trends indicators are: Average Directional Movement Index (ADX), Accumulation Swing Index, Bollinger Bands, Commodity Channel Index (CCI), Mass Index, Moving Average (MA), Pivot Points Support and Resistance Lines, Parabolic SAR, Standard Deviation, ZigZag, Williams` Accumulation/Distribution.

Technical indicators for tracking changes in Volumes are: Accumulation/Distribution (AD), Money Flow Index (MFI), On Balance Volume, Price and Volume Trend, Volume Rate of Change).

Trading on Foreign Exchange market is conducted through the client terminal such as MetaTrader, VT Trader, etc. Terminal provides the necessary tools for trading, analyzing price dynamics. The terminal represents the all-in-one concept and combines necessary tools for trade in the financial markets. Client terminal sending orders to a broker server's to execute a deal with specified parameters. Broker server checking orders (correctness of prices, availability of funds on the account, etc.), figure 2.

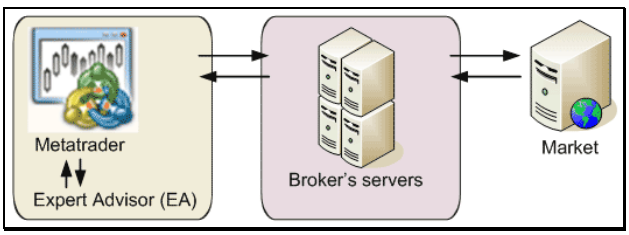

Figure 2 - Client terminal, Broker's server, financial market

III. ALGORITHM STRATEGIES FOR AUTOMATED TRADING

A trading strategy represents a set of instructions which advise or perform opening (entry) or closing (exit) trading positions based on the results of technical analysis. A trading strategy allows to exclude randomness in the trading process, it granites strict following defined rule out the emotional factor in the trade. All trading strategies have three major components: entry and exit, risk management, position sizing. Condition for activate entries and exits of trade can be very simple or in same cases very complex. It can be filtered by one or many different elements. An entry can be at a specific price level or it can be triggered at the specific combination on values of technical indicators. A trading strategy can have more than one entry or exit, also parameters used for define condition for enter a trade could be entirely unrelated with parameters used for define condition for exit. Rules that open position in buy or sell directions are usually opposite of each other[2,3].

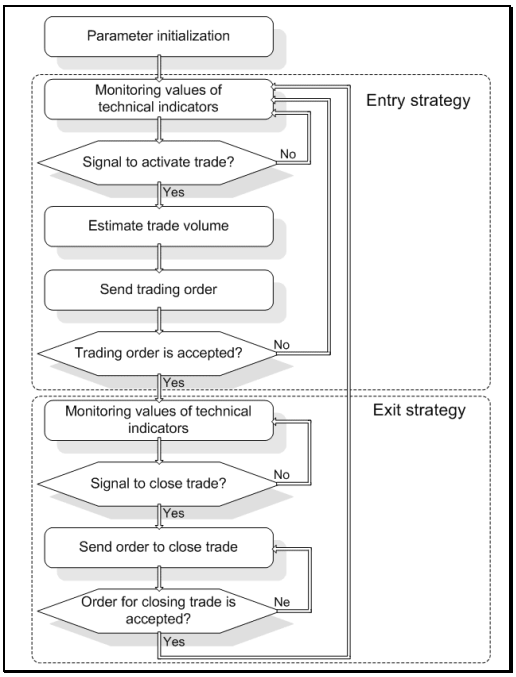

Figure 3 – Structure of Expert Advisor

Client terminal MetaTrader5 enables automated trading. It contains MQL5 built in object-oriented programming language. Syntax of MQL5 is similar of C++, it contains a large number of functions and procedures necessary for access to broker servers, analyzing quotes, monitoring technical indicators and for managing positions. Expert Advisors (EA) are programs developed in MQL5 programming language; they are used for market analysis and automatic trading. Expert advisor manage trading activities on basis of received signals, figure 3. Expert Advisors releases traders from the routine market watching and manually execution of trade operations. A trading strategy can open positions with a fixed size for each position, or size of invested amount could be estimated for each position according to some rule. Performance of trading strategies without algorithm for position sizing strategy could be suboptimal[5].

IV. THE DEVELOPEMET OF THE TRADING STRATEGIES

For development a trading strategy is recommended to follow next steps[6]:

1. formulation,
2. specification trading rules, development software model,
3. preliminary testing (simulations on historical data),
4. parameter optimization (selection optimal trading strategies, most robust and highest profit, lowest level of risk, etc),
5. evaluation of performance and robustness (walk-forward analysis),
6. running trading of the strategy in real market,
7. monitoring of trading performance (compare real results with results of simulations),
8. evaluation and improvement.

Development trading strategy begins with ideas and observations about behavior of historical market, and implementing them into a trading system. All trading strategies are going to have losing trades. Losses can occur one at a time or in series. All trading strategies have different forms of risk. Risk management can not eliminate losses. Main purpose of risk management is to limit losses and keep it under anticipated and affordable boundaries. Risk management is to limit losses so that strategy can continue with trading even after series of trade that ended with losses or after large drawdown. The maximum drawdown is the largest drop in equity measured from account. Maximum drawdown is widely considered to be one of the best measures of the overall risk of a trading strategy. It is recommended that trading strategies contain methods for managing risks.

V. EVALUATION OF PERFORMANCE TRADING STRATEGIES

Simulations on historical data can provide preliminary information about expected performance of trading strategy on live market. This simulation helps to determine does strategy is doing what it was intended to do, also it provides preliminary estimations of possible profit and risk levels before using it on live market[4]. A strategy tester is one of components of the client terminal MetaTrader. It is a multi-currency tool, which allows performing simulations and optimizations of trading strategies. It can be used to estimate performance trading strategies (Expert Advisors) before using them in live trading. During simulations, an Expert Advisor runs on historical data. Performances of Expert Advisor can be evaluated by following parameters:

- amounts of money: withdrawal, gross profit, gross loss, total net profit, profit factor, expected payoff, recovery factor, sharpe ratio;
- risk factors such as: balance drawdowns (absolute, relative and maximal), equity drawdowns (absolute, relative & maximal);
- trades during simulation: total trades, short trades (won %), long trades (won %), trades with profit (% of total), trades with loss (% of total), largest profit trade, largest loss trade, average profit trade, average loss trade, maximum consecutive wins($), maximum consecutive losses($), maximal consecutive profit(count), maximal consecutive loss(count), average consecutive wins and average consecutive losses.

VI. OPTIMIZATION OF THE TRADING STRATEGIES

Strategy optimization represents process of searching for optimal parameters for predefined criteria. During optimization, a trading strategy is run several times with different sets of parameters which allow selecting their best combination. Goals of optimization can be: maximize obtained profit, minimize of losses, reduce risk of trading (drowdowns), find optimal number of trades, increase expected payoff factors, etc.

Optimizations are performed to help to select parameter values that correspond to optimal strategy performance based on historical data. Optimization systematically goes through all potential combinations as it searches for the solution with the highest results on selected criteria. For optimization trading strategies could be used Strategy tester (one of MetaTrader's modules), also for analysis of financial data and searching optimal trading parameters could be used neural networks, data mining and evolutionary methods[7,8,9,10,11,12,13].

Strategy tester enables visually presentation of results of optimization as[14]:

- A Graph with Results, figure 4;
- A Line Graph (1D), figure 5;
- A Planar Graph (2D), figure 6;
- A Three-Dimensional Graph (3D) , figure7;

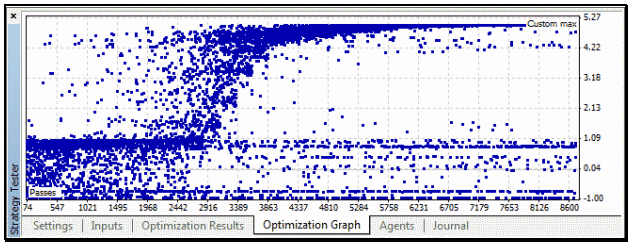

Figure 4 – optimization results shown as a graph with results

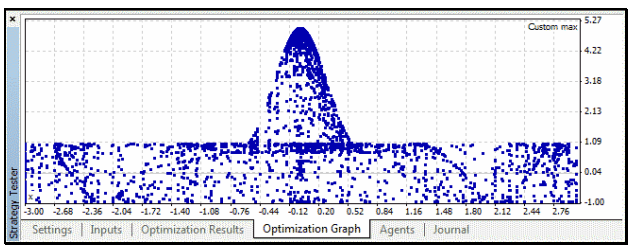

Figure 5 - optimization results shown as a line graph (1D)

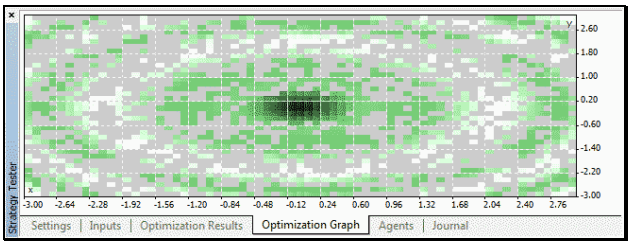

Figure 6 - optimization results shown as a planar graph (2D)

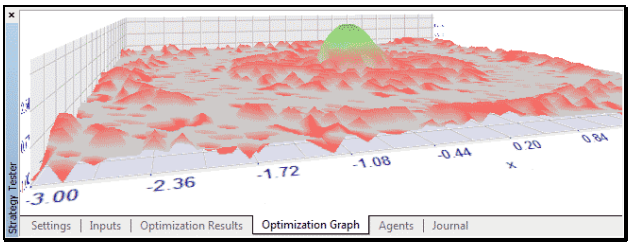

Figure 7 - optimization results shown as a three-dimensional graph (3D)

VII. CONLUSION

Automatic trading software speeds up the process of trading on foreign exchange market, it allows monitoring a large number of parameters and make decisions in real time. Software trading methods reduce the impact of human emotions in decision making process and allow to overcome problems that may arise due to lack of concentration. Modern technology, software, and real-time information does not guaranty successful trading results. Technology provides more information and a faster process of trading, however, for successful trading results is still necessary to find an appropriate approach how to use of available information and how to make correct decisions.

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E-banking as a profitable activity

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Abstract - E-banking, thanks to Internet and technologies, represents the method of making transactions or paying bills via Internet. Over the last few years European banks have spent billions of Euros on new electronic channels. Serbian banks have also invested in expanding and improving the IT systems and a number of new e-banking services have been developed. In this article the authors explore the implementation of IT techniques in the banking sector on the example of Banca Intesa, which operates in Serbia, and RBC Royal Bank. The article shows how it is possible to implement IT technologies in banking and proves empirically that electronic channels help reduce the costs of both banks and their clients. In addition, e-banking eliminates paper waste and the cost to the bank is minimal and in the same time the cost to the consumer, in many cases, is also minimal.

I. INTRODUCTION

During the last decades technological development has reshaped the banking industry, which has become the leading sector in using new technologies. Advantage of the Internet has contributed to the revolution in business and services of the financial industry. Financial institutions offer a new business models and new ways to provide services to its customers, providing 24/7 availability.

One of new business model is online banking, which is the practice of making bank transactions or paying bills via the Internet. Bank clients don't have to leave their house, anymore, thanks to technology and the Internet in particular. People can shop online, communicate and now, we can do our banking online. This way of banking allows clients to make deposits, withdrawals and pay bills via Internet. The necessity of writing checks belongs to past, since the bills are paid online. When client enter the amount and the payee is checked off, the funds are automatically deducted from the payer's choice of account. Moreover, one of the advantages of online banking are minimal costs to the bank and the cost to the consumer, in many cases. A fee for online banking can be extremely low. However, this new kind of technology can be hard to use for the clients who are used to do things the old traditional way. Thanks to aggressive advertising people are now motivated to use e-banking, because it eliminates the hassle encountered when using the old process of banking.

In our country, e-banking is the common trend, too. Almost all banks in Serbia have invested in expanding and improving the IT systems and a number of new e-banking services have been developed. In Europe, all major banks have declared e-business as one of their core strategies for future developments. In addition, Forrester projects that the number of Europeans using online banking will double to reach almost 130 million users in five years — a total of 21 percent.

II. E-BANKING

E-banking is commonly known as the advancement of electronic banking, began with the use of automatic teller machines (ATMs) and has included telephone banking, direct bill payment, electronic fund transfer, online banking and other electronic transactions. Some people believe that the e-banking will go to the direction of mobile banking. However, others believe that online banking will be the most popular method in the future.

It is very important for the banking industry to always adapt to the new technology today and basically make the necessary adjustments to gain competitive advantage with other competing banks. If banks develop their business, customers are able to enjoy many conveniences and lower cost. On the other side, it can be seen that the poor and low-income segment is still underserved or do not fully enjoy the benefits of such innovations.

A. The possible risks

Without a hesitation, this technological growth has considerably affected the profile of bank risks and financial institution formation more generally. Due to this technological revolution, some risks are increased, while others on the contrary are possible to be decreased. Moreover, the degree of exposing to risks, which are related to the electronic banking, depends mainly on the degree of adopting new alternative electronic means of distribution of services and products. Therefore, the bank's strategy should be readjusted globally so that it meets the new challenges and opportunities, which will be shaped in the frames of new technological environment. According to this, final objective will be to acquire a leading place in the sector of electronic banking.

B. E-banking in Serbia

In Serbia is telling a lot about e-banking and e-commerce, it is organized numerous conferences based on this subject, and are frequent topics of newspaper research. Although e-banking is present in Serbia already sufficient number of years, bankers mostly agree in the fact that it was not popularized enough. The reasons for

this situation should be looked for in overall distrust of citizenship in business on the Internet, and lack of awareness of safety and security in this type of business. E-banking is present in Serbia since 2003. with the transition payments to banks. After the initial fear and distrust towards services, the situation is now such that more than half of the payment of legal entities goes electronically, while the percentage of use of electronic payments in the segment of individuals is slightly lower. Simultaneously, slowly is introducing other alternative channels which dramatically change the way people's lives: buying via the Internet and payments via mobile phones will soon become an everyday occurrence of a large number of Serbian citizens.

E-business in Serbia is not yet sufficiently developed. Some steps in this direction have already been made, such as adopting the Law on Electronic Signatures, the introduction of e-business in the National Strategy for Information Society and launching the project of electronic government and e-health.

C. Example 1: Banca Intesa

Banca Intesa is one of the first private banks in Serbia. Since 1991 until now the bank has a total of 1.5 million customers. From 2005 the group operates as a part of Banca Intesa, now called Intesa Saopaolo, Italy's most powerful banking group, the seventh bank in the euro zone by market capitalization and it is present in more than 40 countries worldwide.

Bank offers several solutions in the retail banking and the client chooses the one he is most functional. E-business service is activated by establishing a contractual relationship with the bank. E-banking system of Banca Intesa offers these services to its clients: Intesa On-line, e-mail, SMS services and Intesa Mobi. Intesa On-line service enables:

- Insight into account balances, account turnovers and printing of account statements
- Insight into card balances, card turnovers and printing of card statements
- Insight into loan balances and loan turnovers
- Transfer within your own accounts and settling of liabilities against the credit cards
- Exchange transactions within your own foreign currency and dinar accounts
- Dinar payments to contractually specified, the so-called predefined accounts
- Dinar payments that can be effected to any entered account (for this transaction you need a mini CD with a digital certificate which you can take over for free at any of the Bank's branches).[1]

Figure 1. An example of client's account.

On the other side, in this banks exist e-banking for legal entities. This way of banking offers a possibility to business people to organize their business more efficiently and far more comfortable. With the bank's help, business people can manage with their money quicker and cheaper by electronic way, without leaving to the bank, 24 hours, 7 days in a week, with 40% of discount on the bank compensation for all transactions. Banca Intesa offers the users these services: E-banking, Service center and HAL E-banc, with the note that the user can choose to use one or more solutions, at his desire and necessity.

- E-banking (in house), is a project which enables clients to have simple and quick insight into state and daily changes on the account, to take over statements (from the previous day or from the archives) as well as quick and safe foreign currency payments and all that through:
  - dealing via FX application (off-line application)
  - dealing via WEB application (on-line application)
- Service center (out source), this project solution that offers a service to the clients who already use FX Client application with some other bank.
- HAL E-bank (outsourced) is a kind of client's application that is suitable for dealing of small firms as well as big business systems. With this application clients can make payments quickly, simply and efficiently, without leaving the firm, all based on the installed software.

In addition, bank offers a broker-dealer mediators and e-commerce services. Their Brokers Assistance system is intended for brokers-dealers mediators as completely free of charge service. This Brokers Assistance enables you:

- at every moment to have an insight in the state on aimed account for trade with valuable papers of their client and
- printing of the certificate about state on the named account for trade with valuable papers of his client.[2]

[1] http://www.bancaintesa.rs/code/navigate.aspx?Id=574

[2] http://www.bancaintesa.rs/code/navigate.aspx?Id=682

Other service for legal entities, e-commerce enables client selling of products/services through accepting of payment with payment cards from the system VISA and Master Card on his Internet selling place. The connection to the world's trends is simple and safe and technical and safety aspects of the services are based on that. These are advantages of using the e-commerce service:

- Lower expenses of forming and maintaining internet selling place in reference with classical selling place
- Dealing according to the principle just in time
- Dealing according to the principle 24 x 7
- Availability of the product/service to the buyers from the whole world
- Cross-selling and better segmentation of the market
- The seller will be identified by the buyer as a leader in application of modern technology.[3]

D. Example 2: Online banking for Business RBC bank

Royal Bank of Canada, or simply RBC Bank, is an example of modern World Bank, which goes far beyond traditional banking services to offer its clients true financial solutions that make a difference in their lives. This bank gives its clients all the resources that they need to meet personal and business financial goals. RBC Bank is well known in the world because of its wide range of financial services and advice to individuals, businesses and public institutions throughout the Southeast. Its network includes more than 420 full-service banking centers in six states (Alabama, Florida, Georgia, North Carolina, South Carolina and Virginia), an extensive ATM network and telephone and online banking.

With its online-banking clients have the ability to manage their business finances and cash flow through functionalities that include reviewing account activity, pay bills, transfer funds and file government remittances such as GST, in one place. RBC Bank has online banking which allows clients to access their accounts from any Internet-enabled computer, 24 hours a day, 7 days a week. Its clients can manage their business finance, which includes control cash flow in an easy way and immediate access to all of their accounts:

- View Canadian and US business accounts on one page to check balances and transactions for Canadian and/or US dollar accounts and Visa‡ accounts
- Access one function for payments and transfers
- Transfer funds between accounts, including foreign exchange between Canadian and US dollar accounts
- Send funds to anyone holding an account with a Canadian financial institution through an Interac e-Transfer (for example, pay staff wages).
- Pay bills including telephone, utility, and property taxes
- Make electronic payments to employees, vendors and others at any financial institution in Canada using the Pay Employees and Vendors service.
- Online Tax Filing Service allows you to file taxes and make GST payments and payroll source deduction remittances 24 hours a day, 7 days a week
- Order cheques and deposit slips
- Download account information to the most popular financial management software programs.[4]

In addition, clients can manage investments and loans:

- Expanding your location or adding a new line of inventory? Regardless of your goals, we make it easy for you to manage your financing:
- Manage credit facilities including Royal Business Operating Line™ and CreditLine for small business Visa‡
- View loan balances including operating loans, term loans and Credit Line for small business, Visa‡ and Visa Expense Cards
- Research interest rate information from within Online Banking
- Access RBC Dominion Securities and RBC Direct Investing accounts that are attached to your business accounts.[5]

The essential thing for client's business is time and RBC Bank offers a help. Therefore, its clients can communicate through secure email with RBC Royal Bank professionals, speak to an RBC Royal Bank Online Banking representative 24 hours a day, 7 days a week and they can easily access the Help option within Online Banking to answer questions as they arise. Security is important part of online banking and RBC Bank offers state-of-the-art encryption to deliver complete privacy and security.

[3] http://www.bancaintesa.rs/code/navigate.aspx?Id=683

[4] http://www.rbcroyalbank.com/business/online/online-banking.html

[5] http://www.rbcroyalbank.com/business/online/online-banking.html

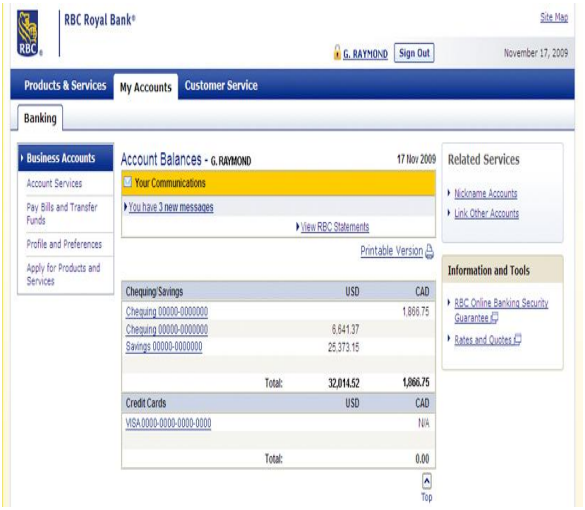

Figure 2. An example of business account.

III. CONCLUSION

We can conclude that e-banking has its own advantages and disadvantages. The first one and the main advantage of implementing e-banking is an increase in customer satisfaction. The reason for this fact is customers do not have to go to the branches in order to access their accounts, make withdrawals and deposits. Customers can check it anytime of the day, a feature that physical branches don't offer thus creating a good relationship with the bank and the customer.

Nevertheless, this kind of banking doesn't have advantages only for customer, but also for the bank because it reduces costs in setting up a branch and the resources to process transactions. Banks can service more people that ever before, too. All mentioned benefits are the reasons why many banks worldwide are already investing in e-banking.

However, everything has its bad sides and disadvantage. E-banking is facing the security problems. Bank are trying to develop its security services and to protect the client's interest, but it's a fact that making transactions online poses a much bigger risk compared to making transactions in a physical branch. The main problems are the hacking and identify theft. Beside these risks, technical difficulties could also arise.

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How to gain customers' loyalty?

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Abstract - When it comes to customer relationship management (CRM), it truly is better to give than to receive. Shine the spotlight on your customers. "Whether it's posted on your website, blog or on a bulletin board in your shop, people love to be recognized for what they do," said Michelle Riggen-Ransom, chief communications offer and a co-founder of BatchBlue Software. Companies need to highlight their most active customers and make them feel special is one of the best ways to increase top customers' loyalty. When customers feel passionate about companies' business they are far more likely to recommend it to other people. This article presents a way how to gain the consumers' loyalty through the following examples of companies: IKEA in Sweden, Merkator and Tempo in Serbia.

I. INTRODUCTION

Customer loyalty is winning the confidence of the customer in favor of an organization such that the relationship becomes a win-win situation for both, the customer as well as the organization. Loyalty is the key to the business growth and profit, because loyal customers generate a continual revenue stream through repeat purchases, they bring to the business-increased profitability at a lower cost. Therefore, customer loyalty can be defined as the totality of feelings or attitudes that would incline a customer to consider the repurchase of a particular product, service or brand or revisit a particular company. Customer satisfaction and loyalty are intrinsically coupled to the well-being and long-term growth of the company. This fact means that the success of the company depends on how satisfied and loyal the customers are. Acquiring new customers is about ten times more expensive than servicing existing customers.

Companies which face both significant competition and high costs associated with acquiring each customer, customer loyalty becomes crucial. Studies have shown that organizations with loyal customers had profits of up to 60 percent higher than those of competitors. They were also twice as likely to exceed the predictions of financial analysts. Moreover, high customer satisfaction scores consistently show a correlation with sales growth.

II. CUSTOMERS' LOYALTY AND EXAMPLES

A. *Kinds of customer loyalty*

- Monopoly loyalty: Monopoly means a single seller in the market.
- Cost of change loyalty: In this type of loyalty, customers remain loyal to their company or organization as the cost of change or switching over to other company or organization will be high. Customers with this type of loyalty have less satisfaction levels and try to compromise with the same.
- Incentivized loyalty: Incentivized loyalty is one of the types of customer loyalty wherein the customers will gain by collecting some points by making repeated purchases from the same seller.
- Habitual loyalty: In this type of loyalty, customers tend to purchase the products or services from the same company or organization because they are habituated to them. The customer when purchases a product and are satisfied initially, they make repeated purchases from the same seller and this becomes a habit to them thereby making them loyal towards the seller.
- Committed loyalty: The customers in this type of loyalty is said to be committed towards the company or organization. If the customers are satisfied initially with the product or brand of the company and their experience with the product's use is more than what they had expected, then they become committed towards the company or organization and do not get carried away by the competitor's products or services.

Types of Loyalty	Customer Behavior
Monopoly Loyalty	No Choice
Cost of change loyalty	Cannot bear the expenses & hassle of change
Incentivized loyalty	Collection of points
Habitual Loyalty	Very handy
Committed Loyalty	The best

Figure 1. Types of loyalty and description of customer's behavior for each group.

B. *How company can measure customer loyalty?*

Model which provides a view of customer loyalty is Harvard Business Review's Apostle Model that segments customers into four quadrants (Figure 2). To measure the attitudes that result in this model, customers are asked to rate their overall satisfaction on a scale of 1 to 10 (horizontal axis) and their likelihood to continue to do business with company on a scale of "Definitely Will" to "Definitely Will Not" (vertical axis). In this model, "Defectors" are defined as anyone who answers the

satisfaction question with a score of 6 or less and reports that they definitely or probably will not continue to do business with company in the future.

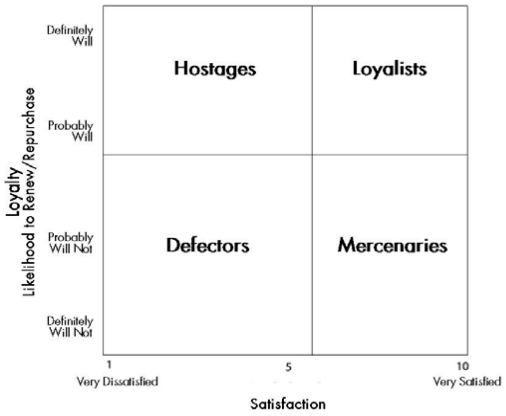

Figure 2. The Apostle Model measures both loyalty and satisfaction. By plotting the scores for both variables, company can segment customers into four categories.

C. How company can build customer loyalty?

- Flow of Information: Communication plays an important role in building customer loyalty. Company need look for new ways of maintaining an on going flow of information with them.
- Initiate new areas mutual profitability: Company has to initiate new areas of business activity between them and the customer that can profit both sides. They have to attract the customer by offering unique and attractive products and services preferably unique to customer's needs that demonstrate company's attention to the small but important details and helps keep their competitor's foot out of the door.
- Loyalty Programs: Think of "loyalty" programs where company can reward their customers' loyalty in ways that their competitors can't easily copy. Customers would be delighted and happy to return to the company for purchases if they were given certain incentives.
- Customer database: Proper customer database should be collected regarding the likes and dislikes of the customers. Each customer is different and their wants are also different and so, accordingly the products or services should be provided.
- Continued Customer service: The relationship with the customer doesn't end in just providing customer service. After sales services should also be provided to the customers.
- Employee training: To begin ensure that the employee is happy. An unhappy employee can never serve the customers the way they deserve to be served. Also employees who have a direct contact with the customers should be properly trained in order to attend to the customers.

D. Customer relationship management (CRM)

Competition in the market requires fast response and good knowledge of customers. The struggle for survival dictates a fast pace in creating loyal customers. It is known that a satisfied customer is also the most profitable. Every client can be satisfied. However, the question is whether it can be done in an economically justifiable way for the company. Finding the answer to that question is the essence of CRM.

CRM or customer relationship management is the alignment of business strategies, organizational structure and culture of the company, information about customers and information technologies with the goal to be in contacts with clients to satisfy their needs and achieve business benefit and profit.

The company must change the way of thinking, culture and organizational structure so that all departments in a company operating in harmony. The greatest attention is given to the client and building relationship with him that in the long term company brings a profit. In the past a lack of technology was an obstacle for the realization of such ideas, and today the technology is foundation for achieving business goals.

Successful introduction of CRM requires a vision that will cover the entire business and that must begin at the highest organizational level. When company defines the directions of further cooperation with their clients, they need to prepare a strategy to implement the set tasks. The CRM strategy takes into account financial goals and business strategy of the company and upgrades its marketing strategy. It determines how the company will build profitable relationships with customers and gain their trust. Introducing the CRM technology companies have not focused on customers, yet. For something like that, except technologies, they need to change habits of thought, culture, behavior and organizational structure.

Advantages of CRM solutions:

- understanding the value of each customer in the overall life cycle,
- structured, consistent and complete data about customers, identifying the client as an individual,
- integrated treatment of customers across all communication channels (phone, e-mail, Internet, visits)
- greater emphasis on customer retention programs to increase the loyalty and
- planning strategy of cross-product marketing,
- measuring the impact of marketing campaigns and sales activities,
- optimization, automation and control of marketing, sales and service processes,
- rationalization of business saving time and money.

E. Example 1: IKEA

IKEA is the world's largest home furnishings retailer, which was founded in 1943 and offers a wide range of home furnishings and accessories of high quality, great value and low costs in order to allow the majority of people to afford their products. This company has more than 225 stores in 33 countries, including 26 stores in the U.S. Well known for its innovative approach customer relationship management, home furnishings retailer IKEA has been giving customers all over the world something to talk about. Focused on providing consumers with the ultimate in function, design and price, Founder Ingvar Kamprad believed in saving in every way possible except on ideas and quality. Largely attributed to the company's commitment to customer service, IKEA continues on inspiration and innovation.

IKEA has begun to introduce self-service checkouts across all its stores worldwide. Self-service has always been an important part of the IKEA concept, but, until recently, payment has been one of the few things in IKEA stores that customers could not do themselves. The vision of the project is to minimize queues and reduce waiting times for customers at the checkout while at the same time increasing efficiency. Self-service checkouts enable their customers to scan and pay for their products themselves, which is in line with the IKEA concept of "we do our part, you do your part, and together we save money". The kiosks support the easy buying process by increasing the speed of service and reducing waiting time for customers at the checkout. The IKEA Warrington, UK store was one of the first to have self-service checkouts, and, during the first couple of weeks of implementation, a customer survey was conducted. The results, based on feedback from 382 customers, found that 90% of customers who used the self-service checkouts said they were easy to operate, and 85% thought they were quicker than the manned checkouts. Ann Pendlebury, IKEA Cash office coordinator, customer relations commented: "Express checkouts fit in so well with the Ikea concept. Not only can you choose the products by yourself and pick up the goods you need by yourself, now you can also checkout and pay by yourself and then go home satisfied!"

Figure 3. Self-service checkout enables IKEA customers to scan and pay for their products themselves.

F. Example 2: Mercator

With the arrival of several European trading companies in our market Serbian trade is beginning to resemble the world but, unfortunately, is still years away from it. Mercator, following the world trends in trade, is the first retailer in Serbia to introduce self-service tills, Tik-Tak, in its stores. Introduction of self-service cash register is an excellent example of the application of information technologies that provide customers faster and easier shopping. The company, which is known for innovativeness and focus on the development and implementation of modern technological knowledge in business, after Novi Sad in 29th March 2011 has provided its customers to use cash registers in supermarket in Belgrade.

On self-service cash registers, customer himself reads the codes of all products that he chose thereby can receive discounts and independently conclude the purchase payment, when choosing the payment method that suits him best, cash or card. The merchants from Mercator explained that firstly customer elects the language in which slot machine will pay, and it is offered the Serbian, Slovenian, English, Italian and German.

Self-service tills, Tik-Tak, which Mercator-S has introduced in its stores, have been met with great interest by customer. Since the introduction of new services March 2010 year, self-service shopping has done a near one million consumers. Practice has shown that customers who use cash registers Tik-Tak in Novi Sad, have the average purchase up to 10 items from the market programs, such as bread, milk, coffee, fruit, vegetables or juices. Tik-Tak cash registers can be used by customers of all age groups, but women are increasingly opting for the application of innovations and purchase average takes about 4 minutes. Consumers, as the main advantages of using these registers, listed the privacy of payment, a new experience during purchasing and saving time.

Figure 4. Self-service tills, Tik-Tak, which Mercator-S has introduced in its stores.

G. Example 3: TEMPO

Tempo centers have been recognized for its unique concept which enables consumers to find in one place the most diverse range of products, from food products, household chemicals, household appliances, technical equipment, textiles, clothing and garden equipment, cars and sporting goods at very reasonable prices. All Tempo centers are regulated and equipped according to the world standards and have a parking space.

Tempo centers are recognized by visual identity. Fully characteristic look of retail space contributes to, among other things, the positioning of goods according to international standards, sales, promotion of the island on which products are exposed to the action with monthly discounts, and overhead road signs that make getting around the object.

From this summer in addition to making a purchase, consumers will be able to recharge deposited on the terminals for mobile phones. Consumers who shop in the market Maxi and Mini Maxi from this summer they have another benefit - the two retail shops in Belgrade are already set payment terminals that allow electronic recharge mobile phones of all operators in Serbia and the largest Internet providers, and as announced, will soon be open the possibility of payment bills. Qiwi company, which, in cooperation with this trade chain allows customers new service, because it is planed that these terminals offer the citizens to pay utility bills, telephone, electricity, gas and all taxes of the Revenue. Terminal is easy to operate, customers just need to follow the instructions on screen and in a few steps they can supplement the phone or use another service without waiting.

Figure 5. Payment terminals in TEMPO centers that allow electronic recharge mobile phones of all operators in Serbia and the largest Internet providers.

III. CONCLUSION

Customer loyalty has always been important to business success and profitability. It has become an important aspect in the marketing world. Marketing managers can build effective customer loyalty through proper communication, customer database, customer service, customer incentives, employee training and finally through product awareness. Therefore, we can conclude that customer loyalty is gaining importance in the marketing era, as customers are the lifeblood of any business organization.

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Diffusion of innovation and adoption of workflow management system in small enterprises

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Abstract - Projects are evaluated from different perspectives, usually time, financial and quality perspective. There are many tools that project manager can use to help with the overview of tasks, communication process, progress of project etc.

Based on a case study we describe how diffusion of innovation – introduction of workflow management system happens in small enterprise, which brings more control in different areas, as it brings some disadvantages. We define specialties of adoption process and what consequences does innovation bring. In described case was innovation decision authority driven. New workflow management system was designed by extreme programming, which means progressive design of workflow management system based on needs of workers and project managers. As we analyze the whole process, we also suggest ideas for further improvements.

I. INNOVATION AND DIFFUSION PROCESS

Innovation is idea, practice or object that an individual or a group recognizes as new.

Rogers [1] describes innovation as process of introduction of activities, which vary from one firm to another. Innovation is application of new ideas to products, processes or any other aspect of firm.

Process, in which an innovation is communicated through certain channels over time among the members of social system, is called diffusion. [1] Messages in communication are about new idea. Diffusion could mean planned and/or spontaneous spread of new ideas.

Rogers [1] defines four main elements in the diffusion of innovations:

- Innovation (idea, practice or object recognized as new by individual or other unit of adoption)
- Communication channels (means, which transfers messages between individuals)
- Time (length of time required to pass through the innovation-decision process, rate of adoption or relative speed with which an innovation is adopted)
- Social system (set of interrelated units that are engaged in joint problem solving to accomplish a common goal).

Individuals go through innovation-decision process, which means individual goes through different stages before adopts or refuses innovation. Five main steps are knowledge of an innovation, persuasion (the formation of an attitude toward the innovation), decision to adopt or reject implementation and use of the new idea and confirmation of this decision. [1]

A. Technology innovation

Diffusion of innovation is often understood as technology innovation, since societies were and are able to benefit from evolutionary development through the process of technology transfer. [2]

We can see the interaction between innovation and diffusion in various stages of technological development.

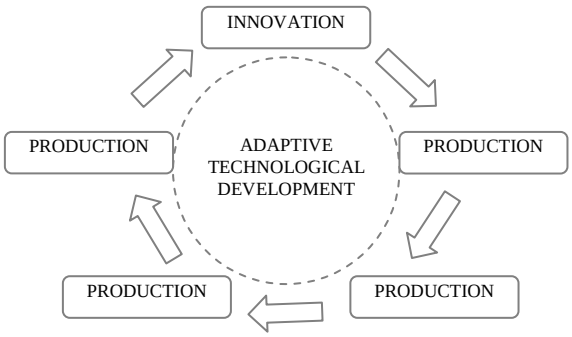

Figure 1: Various stages of technological development: interaction between innovation and diffusion [2]

B. Innovation in organizations

In organizations there usually prevails one of two types of innovation decision: collective or authority innovation-decisions. Collective decision is made by all individuals in group, authority decision on the other hand is usually made by few individuals who have the power or position to influence.

Implementation does not always directly follow the organizational decision to adopt innovation. [1]

Organizational innovation process consists from five main stages, similar to the process of innovation-decision by individuals:

- Agenda-setting,
- matching,
- redefining or restructuring,
- clarifying,
- routinizing.

However, innovation process is much more complex then innovation-decision process by individuals. Implementation typically involves a number of individuals who play a role in innovation-decision. [1]

II. CASE STUDY: DESIGN AND ADOPTION OF WORKFLOW MANAGEMENT TOOL IN SMALL ENTERPRISE

Interpretative case study, unstructured interview with management and analysis of process were used for the survey. Our main objective was to identify the diffusion of innovation process with use of agile methods for software design.

Case study analyzes process of innovation diffusion in small enterprise from Slovenia, BuyITC d.o.o. Firm's core business is design of software and internet solutions, like web portals, intranet, and other business applications. It has 12 employees, who work on physically same location; however there was a need for better workflow management recognized. Project manager organizes work and communication between customers, application designers, programmers, graphic designers and coordinates timeline with leadership. Projects are evaluated from different perspectives, usually time, financial and quality perspective.

There were many existing tools for task and workflow management identified, which did not meet all the managements' needs: compatibility with existing time attendance application, adequate task management system for specific tasks, effective control over workflow and reporting.

Diffusion of innovation was recognized on two levels. First is the level, where decision about innovation was made by firms' management. On second level, design of new software for workflow management was interlaced with diffusion of innovation process among individuals (employees). Due to lack of adequate software and needs of employees, decision to adopt the innovation was made.

A. Organizational innovation process

Innovation process was driven by authority innovation decision, although also some employees, especially projects managers, recognized the need for a tool for better workflow management. Management went through stages of innovation process [3]:

- agenda-setting,
- matching,
- redefining/restructuring,
- clarifying, and
- routinizing.

The process was interlaced with design and use of new software.

B. Innovation-decision among individuals

Life cycle of extreme programming [4], method used for design of the new software, consists from five stages:

- Exploration phase,
- Planning phase,
- Iterations to release phase,
- Productionizing phase,
- Maintenance phase,
- Death phase.

The "iterations to release phase" constitutes of many repetitions and testing of the system. In this phase all the employees actively participated. Although innovation-decision was authority driven, decision for use of the software in this phase was optional. Therefore, diffusion of innovation process occurred. We could classify all the employees in four of five Rogers's adopter categories. [1] Innovators and early adopters were the most active and also contributed the most in the process. Late adopters were last to use the application. Some employees also rejected the use of application in their decision process, but were invited to actively suggest necessary improvements. This raised the level of motivation among all employees, which contributed with many innovative changes.

In this phase most modifications to firs version of application were made, especially to uphold the needs of certain jobs. Compared to previous project, the result was better final product at the end of design phase.

III. CONCLUSION AND FUTURE WORK

Through case study we introduce a different perspective of innovation diffusion. The design of new software is interlaced with diffusion of innovation on different levels. New software was demand-induced for the needs of better workflow management. Extreme programming as an approach of software design was proved as efficient approach, whereas it brings quality software, better user experience with final version of product, with reasonable costs.

Through innovation diffusion among employees (future users of the software) many improvements of first version of the product were made. Opportunity for participation also motivated late adopters and those who were firstly not willing to use the software.

We conclude that similar process would happen with clients, if firm would participate with such approach in "Iterations to release" phase. In order to maintain similar results, this would require clients to provide their own testing groups. The approach would also require definition of protocols and efficient communication to achieve satisfactory level of efficiency.

The approach needs further study, especially analysis of case studies where firm cooperates with clients in “Iterations to release” phase.

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Effect and Use of Internet and Media to Marketing and Customer Impulsive Behavior

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Abstract: In the marketing science are to meet different theoretical explanations of consumer behavior. Classical theoretical explanations are based on the idea that people behave rationally in the role of consumers, i.e. to be primarily guided by economic motives and reasons for the purchase and consumption. The aim of this paper is to demonstrate the potential impact of Internet and Media on consumption. Presentation on the Internet is nothing but a kind of marketing. Internet marketing is not just about presenting the product range with price list and possible contacts, but also fully designed site, created for the person who comes to bidder's website. Communication with the environment surrounding the media and consumers in the store serves as a framework for informing individuals when making buying decisions at the store and also gives an insight into the methods that can be used to effect changes in consumer behavior.

I. INTRODUCTION

Changes in the market followed global changes in the world, placing at the center of business customer satisfaction orientation.

The area of research in this paper focuses on consumer behavior under the influence and application of Internet Marketing and Media, as well as understanding the analysis process through which consumers during the purchase, especially in the impulsive behavior of consumers.

The study of consumer behavior as a separate marketing discipline, began when the manufacturers realized that consumers do not behave and do not always act in accordance with their expectations.

Instead of influencing consumers to buy their products, marketing-oriented managers have concluded that it is much easier solution to produce only those products that previously, the research found that consumers want. The needs and desires of consumers have become the main subject of interest.

Recent research has found that many customers, especially those with higher incomes, are buying on impulse.

Specific aspects of impulsive buying is buying the message that occurs supported media and the Internet.

Impulsive buying every kind of purchase that the customer wants or plans, and it happens.

This work needs to explore what are the influences that contribute to such government customers, focusing the impact of the Internet and media on impulsive purchases. To initiate the topic, the goal is to determine how under the influence of the media and the Internet, but also influenced by other factors, purchases in Serbia.

Only those products whose appearance caused a positive emotional state of the customer, are likely to affect impulsive purchases and increase chances for survival and success of the product on the market of Serbia, and beyond.

It is precisely these products affect impulsive decision in the process of buying customers and contribute to a better position to market products and generate a higher level of sales at chain stores.

II. PROCESS OF CONSUMER INFORMATION

Today, technology is good all the more important component of the best relationships in marketing. As the marketing market matured over time, the need for accessibility products is creating the need for availability information.

Technology has become a tool for improvement of some necessities such as access to information through information technology, which has significantly led to the need for the growth of co-existing with the development of technology.

Popular means "the line" in a general sense refers to communication via the Internet, through direct contact with no intermediaries. Direct communication represents an system of communication with target consumers wherever there is access to the media of communication. It is also suitable for the kind of advertisements that would not be met with understanding of the whole population.

Modern means of technology: Internet, media, databases and computer reservation system enables enterprises all direct contact with consumers to.

The aim of the database is to divide consumers into groups that can be identified (market segments) based on advertising messages that are most active. This means that it is necessary to find out what each group is motivated to purchase products through customer surveys.

The procedures that can provide refunds or customer preference are: introduction of free on-line connection, which operates seven days a week, 24 hours (telephone, fax or e-mail) to receive customer complaints, quickly getting in touch with the customer in order to prevent negative oral propaganda, accepting responsibility for the customer's dissatisfaction, engaging people who are

sympathetic to customer service and resolve complaints quickly and to customer satisfaction.

Internet as a powerful means of communication media has become an important part of the strategic plan of any organization or company through whom the offer is presented and establishes closer contact with consumers, because it"does not present any brand sold and that it does not follow web address".

With the advancement of technology, the Internet has all the attributes of media that have preceded it. Is no longer a means to impress and inspire the younger generation to purchase on line, but as networks become a global social space for exchange of opinions.

On line advertising has helped to reach those audiences to which media advertising may not reach, and online advertisements and advertisements in magazines are considered the most effective combination in building brand awareness.

The popularity especially given the so-called social networks like Facebook or Twitter, which, according to New Media Trend Watch have a large number of visitors and serve for the exchange of views between groups of similar preferences.

III. IMPULSIVE BEHAVIOR BUYER IN PURCHASING

The research presented in this paper was conducted to determine customer behavior during the purchase, their perceptions of impulsive buying, the links between income and '' impulsive ''in purchase and final causes of such behavior.

For this purpose, and conducted primary data collection through prepared questionnaires that are attached.

The survey consists of 20 questions designed to gather:

- **Socio - economic information about respondents** (questions 1 - 7), to allow analysis of their behavior in the purchase of the differentiated approach is conditioned by their social status
- • **Information on the attitudes of respondents** the impact of media and the Internet in their purchasing habits and buying behavior in the process (Questions 8 - 12)
- **Information about the behavior of subjects during purchase** (Question 13 - 17)
- **Information on the causes and consequences of buying habits** or unplanned purchases (Questions 18 - 20).

This study was conducted in urban and suburban area of Kragujevac and the Čumić Čumić rural areas, between 20 September 2010. to 03 October 2010. Whatever.

A survey carried out two interviewers were assigned according to geographic location of respondentsThe first interviewer has processed 30 patients (20 and 10 in the suburbs), while the other interviewer dealt with 20 respondents from rural areas. Having chosen in this way and that the sample survey conducted in person, the success was 100%, where all respondents returned questionnaires retrieved. After this period, surveys were collected and examined their contents are entered into the statistical software SPSS specialist in which the analysis was performed.

It should be noted that the percentage of errors on questionnaires filled in was relatively small, with only three questionnaire was incomplete. Under the error means that one of these questionnaires, or more than 2 questions were unanswered or the answer was not clear. These questionnaires were entered later, and a missing value, using SPSS logical tools, replaced previously common entries filled response to minimize the possibility of misinterpretation of the overall results.

According to the survey processing in SPSS produced, made an overview of research results and conclusions have been made of research that were introduced in the final conclusion of this paper.

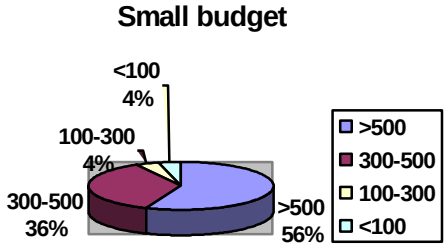
The presentation of research work is given through three segments:

1. Presentation frequency
2. Presentation of selected cross-tabulation
3. Presentation of analysis of responses to the scale offered

A. *Presentation of the frequency response*

In the study performed it is a younger population that is at the peak of intellectual and working ability, and accordingly belongs to the segment of the population that is relatively active in purchasing. The surveyed group consisted of 44% women and 56% of men.

In the analysis of the respondents appreciated the position of the primary economic unit, or family. This is ensured by establishing the financial contribution to the family budget survey question 4 on the ballot. Worded question the objectivity of the respondents was ensured because the salary is sought and the respondents might



relaxed answer to the question (Figure 1). .

Figure 1. In what amount to contribute to the household budget?

When asked *How often do you buy?* 64% of respondents said they bought a week or more often, so if we add the number of those who buy at least twice month (of which there are 26%), we get that 90% of respondents bought at least twice a month. Given that this is a pattern that includes different geographical areas, age, income,

etc., and still there is such a large percentage, we can conclude that kragujevački customers have very intensive purchasing habits.

Volume of purchases was estimated by the average amount spent per month on the purchase and he gave the following results

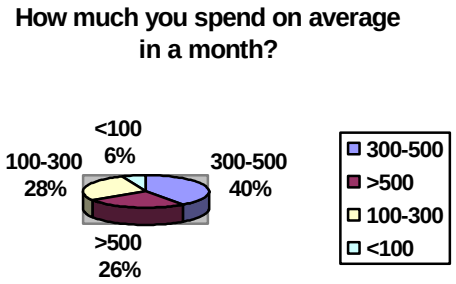


Figure 2. How much you spend on average in a month?

The next interesting fact is the location at which the respondents perform most of their purchases. It is assumed that due to the not-so-great economic situation in Serbia consists of consumers' preference for general consumption, but it's also interesting that the small shops rather suppressed by large hyper and supermarkets, which account for as many as 66% of purchases. This is evident from the review of responses to the question about the location of purchase (see Chart3).

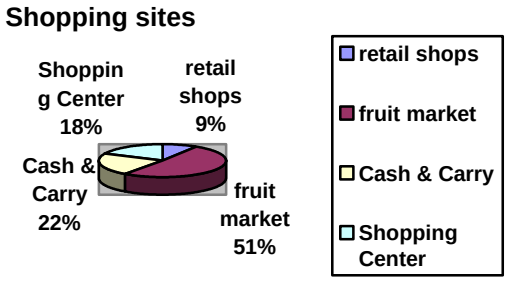


Figure 3. In what type of store you buy?

Also, this distribution gives a good response assumption for the conclusion of work, because it is these retail facilities due to the width of their offers increase the likelihood of impulsive buying. The perception of quality of domestic producers (Figure 4) is positive, as many as 58% of respondents in completely rejects the contention that foreign products are better than domestic.

The question: "Are foreign products quality of our producers?"

It is also a relatively large number indiferentnih respondents (16%), while the rest agreed with the statement.

Obviously, Kragujevac customers consider that our local products as high quality as well as foreign or imported products.

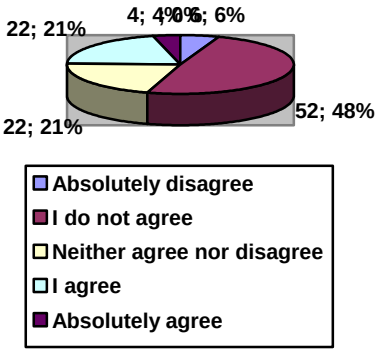


Figure 4. The quality of domestic products

The question: During the purchase can make an informed buying decision based on a credible and high quality package that provides all the necessary information about the product?

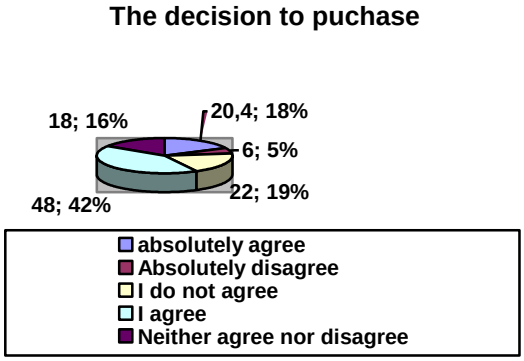


Figure 5. The decision to purchase the

The chart 5th shows that respondents perceived quality as an essential element and indispensable source of information. Even 54% of respondents believe that it is possible to make an informed buying decision based on the quality of packaging. That there is room for further expansion of this number, the fact that even 18% indifferent. Planning and buying habits of respondents shown in Figure 6 shows that buyers in Serbia have a differentiated shopping habits.

Asked *Do you usually make before buying a shopping list?*

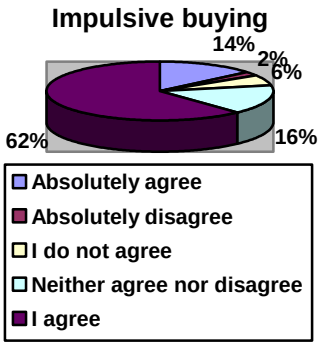


Figure 6. Planning and buying habits

The analysis of Figure 6 shows that the impulsive buying behavior an integral part of Kragujevac customers. Even 76% of respondents stated that unplanned buying products, while 16% indiferentnih.

During the impulsive buying decisions are made in the very near term, *as is evident from Figure 7 and the same is the case in Serbia. Only 38% of respondents consider the need for the products you buy, while 32% do not consider this need.*

When asked "Do you notice a product that I planned / plans to buy, you always think about and assess the need for the same, but no matter what I buy?" Give the answers whose structure is shown in Figure

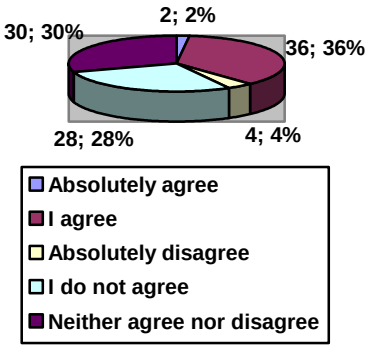


Figure 7. Impulsive purchasing decisions

Figure 8 shows the impact of promotional messages and it is evident that the impact of promotional messages on an unplanned purchase of a very small, as much as 52% of the respondents and deny their influence If we add the number of indifferent customers, the total rises to 70%.

When asked "Do you usually look for when purchasing of products for which I sazanao / by way of promotional messages?"

Respondents gave answers whose structure is shown in Figure 8.

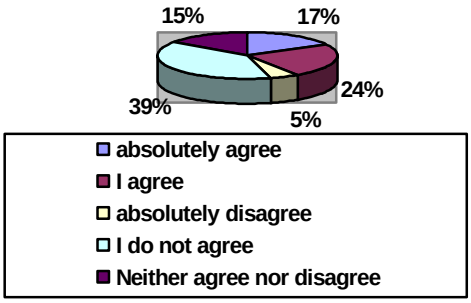


Figure 8. Promotional shopping

This clearly indicates that the impact of promotional messages is negligible. It should be taken into consideration and possible dishonesty in the answers of respondents, or unconsciousness impact of promotional messages.

When asked What do you think is the most common cause of buying products that you did not intend to buy?

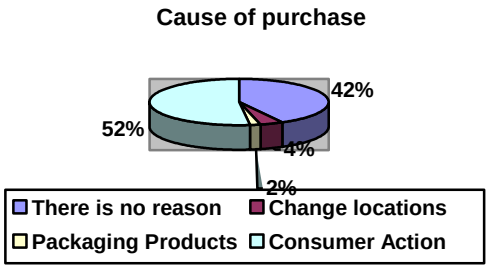


Figure 9. Unplanned purchases

In the opinion of most respondents was due to unplanned purchases to encourage the sale of shares. The first conclusion follows that it can be concluded that the packaging does not have a concrete impact, as only 2% of respondents are aware of the role of packaging.

However, detailed observation of the results it is evident that the majority of 42% of respondents are not aware of reasons for unplanned purchases actually made a decision based on the attention attracted by the packaging.

IV. CONLUSION

Purchase process was for many years the focus of marketing experts. Purchasing habits and the impact on them can often decide the success or failure of the product.

The aim of this study was to structure the relevant theoretical aspects, which include consumer behavior, and environment influence their behavior. A special emphasis is placed on impulsive buying behavior in the Internet marketing and the impact of media on behavior.

By creating the appropriate content of communications with customers, can affect the product pozicionitanje njohovoj consciousness. An integrated marketing communications to reach consumers with the right message at the right time and right place. A good marketing strategy begins with showing emotion emotional benefits that will have a Consumer if they purchase a specific product. Another important assumption is that the marketing strategy to fit consumers' habits and to provide them with the type of information that fits into their lifestyle.

Given that the survey of consumers showed that the recommendations better way of advertising than through the media, we can conclude that it is still the best advertising is still satisfied customer. A impulsive consumers do not only influence others but also make a stable base purchase.

The results of conducted surveys confirm hypotheses, and have theoretical and practical application of topics such as extending the behavior of consumers, as well as efficiency and method of providing information about the product.

Take a survey does not guarantee success, but it increases the chances of a successful business.

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Optimization methods and techniques applicable to food production in irrigation in Serbia

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Abstract: The main uses of the Danube water in Serbia are for domestic and industrial water supply, irrigation, navigation and cooling of thermal power plants. Using data from plans and previous projects and refer to the territory of Serbia, Danube basin were selected area within significant regional hydro system. Water Management Master Plan gives the map of constructed and future irrigation systems by 2021. These are planning 475,000 ha for the water area of Danube with a total water consumption of 1.588 billion m^3. Each household that uses water for irrigation is difficult to identify the method of resource management that is optimal. Proposed and analyzed the methods and techniques can greatly facilitate finding a solution to this problem. The focus of this paper is to analyze the optimization methods and techniques applicable to food production in irrigation.

I. INTRODUCTION

Fresh water is most crucial resource in basic ecosystem functions. But it is also distributed variably over the planet and because of scarcity, lack of financial resources or mismanagement it can fail to meet all competing uses, even fail to meet essential human needs.

Sustainable development was first formalized in the report "Our Common Future", issued by UN World Commission for the Environment and Development, in 1987. The Brundtland Report, as it is more commonly known, defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Key aspect clearly is concern over the impacts on the future generations of actions taken today.

Water is one of the key issues of sustainable development: current global water challenges and future targets are clearly stated in the Millennium Development Declaration (UN, 2000) in resolution 55/2 which securing equal access to safe drinking water and sanitation.

Nowadays, fresh water resources are being exhausted, polluted and overexploited. Human activities and water policies have heavily impacted on the regularity of the natural cycle and on the quality and quantity of water available for human use.

Management of the water system must answer on, at least, following questions:

- what should be the right price of fresh water and how should it be determined,
- how to achieve an acceptable water quality,
- What are the necessary investments to meet the future needs?

Since the beginning of the 1980s, a lot of countries have changed their local water management from public to private as the privatization process. International Institutions such as World Bank, Fao etc. are financing many regional projects. Water firms are becoming more and more international and services and policy are with less and less local influence.

Water being marked like any other good or product and its allocation and pricing are being controlled by economic criteria – supply and demands. Available water must be dividing between agricultural, urban and industrial purposes.

Growing demands are close linked with population growth which makes water scarcity.

Besides water quantity, water quality is very important. Changes in agricultural practices (Scheirling [1]) where agricultural water pollution is become a major concern (Bergman [2]). This is due to the intensification of agriculture, increasing use of fertilizers and pesticides and specialization and concentration of crop and livestock production.

Water is essential to all life, all human activity. Wisely used, water means harvest, health, prosperity. Badly managed, water brings poverty, disease, floods, erosion, salinisation, silting.

The sustainable use of water resources requires efficient tools that can assist decision making. Decision making is the process of choice that leads to action (Simon [3]) and useful tools are all methods, guidelines, software that can achieve implementation water management policy.

Decision process needs to analyze the multiple disciplinary viewpoints referring to the many objectives, judgment and constrains.

From the above it becomes clear that the decision process must use multi-criteria analysis methods based on

model with list of desirable and no desirable characteristics.

Decision Support Systems (DSS) may be tools to help solving operational problems and put the solutions to the practice. A DSS is a computer-based instrument for processing, analysis and presentation of information. It helps decision makers to indentify which information is relevant and which strategy has the greatest impact.

DSS enable future forecasting, design and screening of alternatives, impact assessment, comparing and ranking alternatives etc. DSS is based on communication, interactive and participative decision-making process.

II. MULTI-CRITERIA DECISION MAKING

Decision process represents the structure of preferences of witch decision maker find out a satisfactory decision. Terms "multiple objectives", "multi-attributes", "multi-criteria", "multi-dimensional", used by many authors, are synonyms. In order to understand the structure of Multi Criteria Decision Making model (MCDM), Zeleny [4], and Romero and Rehman [5] proposed term for definition parts of model.

- Decision variable: represents the lever on which the decision maker operates. It presents all the aspects within which the user decides to act. Usually decision variable are water quantity allocated in different users, water quality standard, etc.
- Attribute: The attribute is a parameter that represents any particular aspect of a given problem assumed by decision maker to make their decision (income, savings, debt, pollution level, and so on). It's expressed as a mathematical function of the decisional variables.
- Objective: The objective is the direction (min or max) that the decision maker chooses to follow for an attribute (maximize profit, minimize pollution, and so on).
- Target: Value set by the decision maker as a reference point for the attribute chosen.
- Goal: The goal is the expected level of the chosen attribute that the decision maker aims to achieve with their decision (amount of water for irrigation, nitrate levels in water, and so on).

Goicoechea et al [6] suggest that goal and target are synonyms and term goal reassumes objective the definition of objective and target.

A. The Multi-objective Approach

The multi-objective approach is a development of traditional mathematical programming models. The representation of model is with rational structure and can provide good simulation of the economic facts.

Traditional mathematic models are based on the assumption that the decision maker formulates with well-defined parameter. Model is

$$max/\min Z = \sum_{i=1}^{n} c_i x_i \quad (1)$$

with

$$\sum_{i=1}^{n} a_{ji} x_i \le b_j \quad (2)$$

where

$c_i - contribution\ of\ the\ i^{th}\ decision\ variable$

$x_i - decision\ variable$

$a_{ij} -$ use level of the j^{th} resource to accomplish one unit of the i^{th} decision variable

$b_j -$ availability of the j^{th} resources

The problem is solved by finding the vector x that optimizes Z according to the restriction b_j. This approach optimizes just one parameter (Z). But, decision maker does not usually make a choice based on just one parameter, but refers to multi-criteria utility function. Choice must be made on the basis of just one objective. If problem have more than one (conflict) objectives, compromise must be established.

Efficient solution is weights methods and constraints method.

In the weights method, function expressing the different objectives through attributed arbitrarily. The model (1) change to

$$max/\min \sum_{i=1}^{n} w_i f_i(\vec{x}) \quad (3)$$

with

$\vec{x} \in X, \quad w_i \ge 0$

The constraint method uses a model which one of the objectives is set in objective function and others are transformed into constraints:

$$max/\min f_j(\vec{x}) \quad (4)$$

with

$f_i(\vec{x}) \le L_i \ , x \in X, \ \ i \ne j$

where L_i is parameterizing the constraints.

Compromise programming

Compromise programming was proposed by Zeleny [7] as a method for rationalize set of solution consistence with the preference of decision maker.

Decision maker aspires to come as close as possible to the solution that they consider ideal. Objective function must be defined and quality is measure of the distance between efficient solutions and the ideal one.

A generalization of the concept of distance in n dimensions between an ideal and efficient feasible solution can be represented as

$$\overline{DI}_p = \left[\sum_n |i_n - d_n|^p\right]^{1/p} \quad (5)$$

where is

i_n – ideal solution

d_n – efficient feasible solution, if p equals 2, the Euclidean distance is obtained

Distance for p=1 is algebraic sum of the absolute value of the gaps in n dimension and if p=∞ distance is equal to the maximum deviation in n dimensions. To compare deviation expressed with different dimensions, normalization must be done. Usually, it can be done with respect to the maximum interval of variation given by the difference between the best and the worst performance for each criterion.

Goal programming

Goal programming is the first method in multi-objective decision making field introduced by Charnes [8]. Method simulates a decision making process that tries to satisfy several objectives at the same time. Decision maker introduces their preferences by establish satisfactory value for each criterion.

First step is the identification of the set of criteria to adopt as decisional parameters. The objective value or goal must be defined for each attribute. Also, deviation variable, positive or negative, must be defined, and how close goal must be.

Based on this, generic i[th] goal can be expressed as

$$f_i(\overrightarrow{x}) + n_i - p_i = b_i \quad (6)$$

where $f_i(\vec{x})$ is the function expresing the value of the i[th] attributes.

Decision maker can pursue their goals simultaneously, with different intensity, or can favorite some of them. Normalization is necessary for comparing criteria in different unit measures.

B. The Multi-attribute Approach

Multi-Attribute Decision Making solve problem with finite number of solutions. Predetermined alternatives must be evaluate to a k attributes and each alternatives has a given performance index. Solution can be interpreted as result of a function of the relative vector of decision variables referring to each n alternative. Alternatives and criteria can be related through an evaluation matrix (Goicoechea, [9]). In some cases, evaluation matrix already offers a clear ranking of the alternatives.

The most popular procedures are:

- value function
- Analytic Hierarchy Process

The value function methods

The value function method is widely used by decision maker particularly because method guarantees internal coherence. First publish by Keeney and Raiffa [10], well known in literature and in real cases (Beinat, [11]).

This method attempts to obtain a true value for every alternative. To obtain this value, a value function is identified for each considered criterion and relative importance in global value. The solution is made by finding the criterion which maximizes multi attribute value function. Final choice is made by identifying alternative that maximizes multi-attribute function.

Simplified method with one-dimensional function is more often in use. Scores are normalized from natural scale to a scale between 0 and 1, where 0 represent minimum utility and 1 represent maximum satisfaction for decision maker. The ranking of alternatives is implicitly determined by the transformation and ranking can depend of decision maker choice.

The only problem with this method is the assigning of the value function.

The Analytic Hierarchy Process

The Analytical Hierarchy Process (Saaty) [12] is based on assumption that the decision maker always expresses his preference. It is possible to represent the relative importance on each attribute.

The Analytical Hierarchy Process is realized trough few steps. First step is defining objectives, criteria of valuation and alternatives. Next step is evaluating weight between the options. The most satisfactory alternatives have, at the same time, top rank.

The analysis phase is based on a decomposition principle, comparisons and hierarchical composition. Decomposition principle leads to the definition structure with ranking the reciprocal relation. Procedure can be from bottom-up or top-down.

Structure do breakdown are defined on four levels: super-criterion, attributes, parameters and alternatives. Saaty [12] proposed scale for ranking qualitative preferences with number from 1 (equal importance) to 9 (extreme importance). Some other authors suggest different scale (from 1 to 5 or from 1 to 100).

Estimating weights is very important and many authors have different ideas (Srdjevic [13]). There are many papers (Srdjevic B., Srdjevic Z., Zoranovic T. [14], Srdjevic B., Srdjevic Z., Zoranovic T., Suvocarev K. [15]) where AHP is practically illustrated.

Limitations of this process is highly depending on assumed hierarchy, requires large amount of data and process is very long.

III. STRATEGIC PLANING

Strategic planning is an organization's process of defining its strategy, or direction and making decisions on allocating its resources to pursue this strategy.

Various business analysis techniques can be used in strategic planning, including SWOT analysis (Strengths,

Weaknesses, Opportunities, and Threats), GE/McKinsey portfolio analysis, STEER analysis (Socio-cultural, Technological, Economic, Ecological, and Regulatory factors), and EPISTEL (Environment, Political, Informatics, Social, Technological, Economic and Legal).

SWOT analysis is very popular and understandable and Potkonjak [16] illustrates this method (Fig. 1).

Figure 1. SWOT analysis of irrigation development [16]

Strengths	**Weaknesses**	
- Available large areas of land; - Relatively sufficient water for irrigation; - The possibility of using water transport; - Education of professionals for the irrigation purposes; - Previous experience and knowledge of irrigation; - Hs DTD already built for the use of water; - Start of construction of other regional hydro systems; - Regional hydro projects that would use the water of the Danube.	- Different quality of land suitable for irrigation; - A possible deterioration in water quality due to increased use of fertilizer; - Population age structure; - Restrictions on the use of irrigation water for other users; - The low level of use of irrigation systems; - Insufficient technical equipment of agricultural farms; - Poor maintenance of regional and local systems;	**Internal factors**
Opportunities	**Threats**	
- Possible use of water in summer; - Needs to use water as the dry year; - Better cooperation with countries in the Danube region; - Increase employment in the water management, agriculture, civil engineering and industry; - Increase productivity; - Rural development; - More investment in water management and agriculture; - Increasing exports of agricultural products.	- Deterioration of water quality above the prescribed; - Reduction of water supply due to greater use of upstream; - Labor shortages for intensively production; - Adverse measures of agricultural and water policy; - Unfavorable funding to build local irrigation systems; - Unfavorable conditions of financing agricultural production. - The lack of recent development of water management strategies.	**External factors**
Positive	**Negative**	

IV. CONCLUSION

Fresh water is most crucial resource and sustainable development is demand today. Management of the water system and choose best solution is very complex task. Decision process needs to analyze the multiple disciplinary viewpoints referring to the many objectives. Decision Support Systems (DSS) may be tools to help solving operational problems and put the solutions to the practice. In this paper, some multi-criteria decision making model are analyzed.

This paper is result of work on projects 46006 and 32044 partly funded by Ministry of Science, Technology and Development, Government of Serbia.

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Business Performance Benchmarking based on Medical Services Data:Gynecology Clinics Case

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Abstract - This paper describes data analysis model for benchmarking of two competitive gynecology clinics, based on databases from medical information system of those enterprises. These enterprises have similar software and equal database structure in their information system, so data from these databases are comparable.

I. INTRODUCTION

In competitive environment an enterprise need to establish system of continual improvement based on data that present working results. It also need to compare business performance to other enterprises of the same type in aim to evaluate business processess regarding important parameters having competitive organizations performance as a kind of orientation.

Benchmarking is set of management techniques that enable analysis of business process performance of an enterprise comparing to other enterprise. This comparation is made according to performance indicators values, computed from data that are stored in everyday working processes [1].

It is not easy to do benchmarking. There are several types of benchmarking techniques, but most important part of any benchmarking is getting real process data from business process of a company. The difficulty is in availability of data - some companies consider their working data as internal business secret. Other difficulty is in diversity of data formats and structures, even if core business process are digitalized, i.e. using computers for storing data about business processes.

In this paper we present two competitive gynecology clinics information systems running on the same platform, almost identical user interface and identical database structure [2]. The database structure support core business process regarding patients and medical examinations data. Benchmarking of these two clinics business performance is enabled because of availability of data given from these enterprises and the fact that both databases have equal structure, so comparison of data doesn't have an obstacle of possible need for transformations at eventually divergent technology and structures of data sources. This paper contributes with model of data analysis structure and methods that enable comparison of business performance data, that are derived from clinical data from gynecology clinics' information system database.

II. INFORMATION SYSTEM OF GYNECOLOGY CLINICS

The two gynecology clinics, just like all other enterprises have three segments of business processes:

TABLE I. BUSINESS PROCESS CATEGORIES

BASIC service	SUPPORT activities	MANAGEMENT
Medical examinations	Documents	Decisions
Medical treatments	Finance	Monitoring
	Maintainance	Quality assurance
	Supply	Standards compliance
	Human resources	

Information system (IS) of gynecology clinic is applied for basic business process support for both of private clinics "Dr Ljiljana Bursic" Zrenjanin and "Dr Nada Hrnjak - Eremic" Zrenjanin. Each IS consists of the same four aspects, (Table I). Figure 1. presents a deployment diagram of software module deployment.

TABLE II. STRUCTURE OF INFORMATION SYSTEM OF BOTH GYNECOLOGY CLINIC

Hardware	Two PC computers, one for physician specialist and one for technician / secretary
Software	Two modules of medical software – administrative and medical
Lifeware	Two employees: MD (physician specialist) and medical technician / secretary
Orgware	Regular procedure of patients treatment

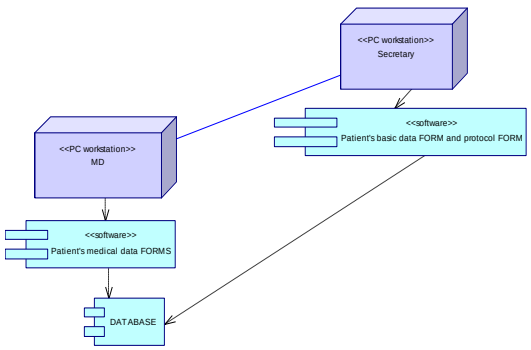

Figure 1. Deployment diagram of both gynecology clinic information system

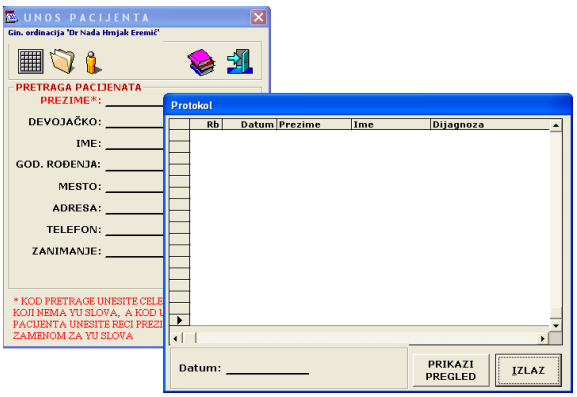

Figure 2. Software module for medical technician – basic patient data and protocol

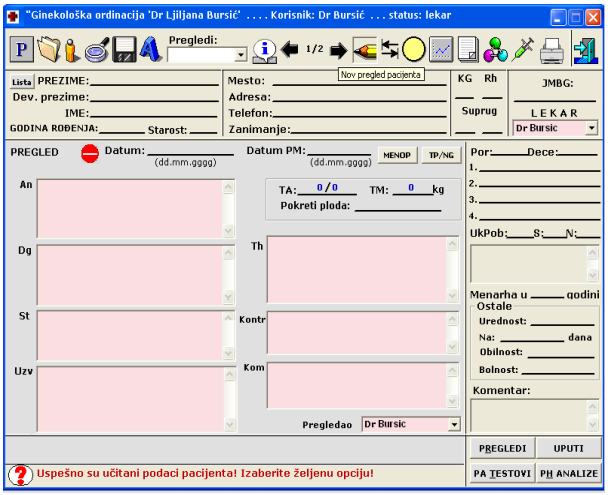

Figure 3. Software module for MD (physician specialist) in "Dr Ljiljana Bursic" version of user interface

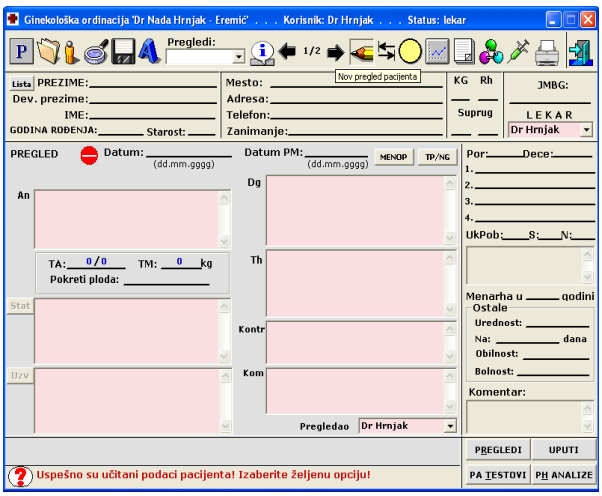

Figure 4. Software module for MD (physician specialist) in "Dr Nada Hrnjak-Eremic" version of user interface

Software module for the two clinics differ in user interface elements organization and some automatisms (at second version of user interface, Figure 4, automatical creation of text regarding entered examined parameters), but cover the same medical and patient data.

User interface is developed under Microsoft Visual Studio 98 development environment (VB6) and database DBMS is Ms Access 97.

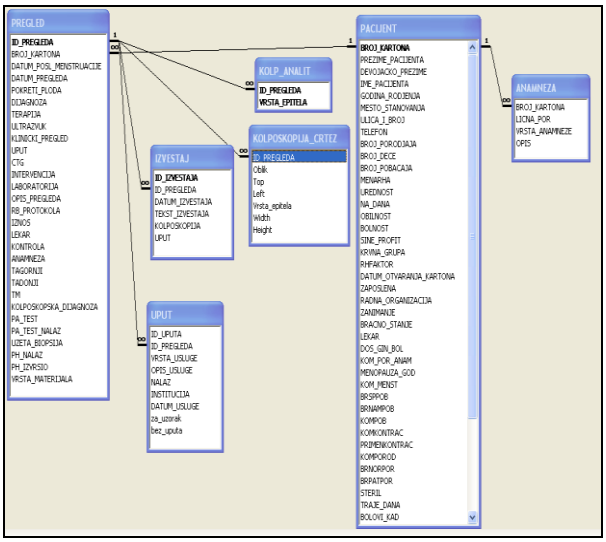

Figure 5. Structure of relational database of both gynecology clinic

At Figure 5. the structure of database is shown. There are two most important tables in the relational database: Patient (Pacijent) and Examination (Pregled).

Other tables are: Report (Izvestaj), External examination order/recomendation (Uput), Colposcopy analitical and drawing (Kolposkopija Analiticki, Kolposkopija Crtez), Anamnesis (Anamneza).

III. DATA ANALYSIS MODEL FOR BENCHMARKING OF GYNECOLOGY CLINIC

A. Research questions

Business performance could be examined regarding:

1. internal audit, where business performance indicators are computed and validated at some point of time (having current state of business) or during time (having information about progress of business, examining effects of management directed activities regarding changes etc.)

2. external audit, comparing to standards levels or comparing to other companies business performance. Benchmarking usually perform comparation to the data that describe "best in class", i.e. data that describe the best performing enterprise in the group of the same type organizations.

In this case, we can perform internal and external business performance evaluation, but only with two enterprises, comparing to each other. Since we have only basic process data support in databases, research questions for this paper are:

1. Can we compare business performance of these two clinics?

2. Which indicators do we need and which indicators do we have?

3. What are the results of this comparison and can we have a general conclusion on business performance success according to computed values of these indicators?

B. Rresearch hypothesis and assumptions

Lets start with the original Balanced Scorecard Approach[3] that emphasize four segments where business performance indicators should be defined: customer, internal process, learning and growth, financial. All these indicators are designed according to strategy, mission and vision of the company.

According to balanced scorecard [4], lets assume that strategy goals for these clinics are moving them in these directions (during time):

1. Satisfied customer (patient).

2. Smoothly operating and improving internal process.

3. Constantly improving processes by learning.

4. Expanding business to new services and new customers.

5. Positive financial results.

According to previously defined research questions, there are following hypothessis and assumptions.

H1. We can compare business performance of two clinics with basic process data, but with these assumptions (since we dont have available data for financial/maintainance/suppoy supporting processes, but only for basic processes):

FINANCIAL SEGMENT

A1. Both clinics have equal costs for maintainance and supply.

A2. Both clinics have the same charges (costs for services in medical examinations and treatments) to patients.

A3. Both clinics give the same sallary to employees.

INTERNAL OPERATIONS SEGMENT

A4. Internal process is operating smoothly (which means constant availability and functionality of all material and human resources and devices).

A5. Both clinics have equal and standard set of basic services (medical examinations and treatments) to customers (patients) and will not add new services during time.

C. Business Performance Indicators

Having these assumptions, financial data could be derived from basic process computed data. This way, business performance, i.e. business success of these two clinics can be compared regarding basic process activities with indicators that describe them.

Having all assumptions because of availability of data, in aim to define business performance indicators, we will focus on strategic goals:

1. Satisfied customer (patient).

4. Expanding business to new customers.

First we give general business performance indicators (Table III), and then we specify goal-oriented business performance indicators, i.e. those according to previously defined strategic goals and available data from database (Table IV).

TABLE III. GENERAL BUSINESS PERFORMANCE INDICATORS

Number of patients.
Number of active patients.
Number of passive patients.
Number of medical examinations.
Number of medical therapy treatments.
Number of medical examinations by diagnosis.
Number of medical therapy treatments by types.
Number of ultrasound examinations.
Number of colposcopy examinations.
Number of clinical examinations.
Number of CTG examinations.
Number of interventions.
Number of laboratory results examinations.
Number of PA tests examinations.

TABLE IV. GOAL-ORIENTED BUSINESS PERFORMANCE INDICATORS

Goal: Satisfied customer (patient).
Metrics indicators:
Number of patients.
Number of active patients.
Number of passive patients.
Number of related patients (patients that are in any relationship with some other patient).
Number of patients left and moved to competitive clinic.

Goal: Expanding business to new customers.
Metrics indicators:
Number of new patients (date of first medical examination, i.e. creating a medical record for a patient).
Number of patients by residence (living) in a certain city/village.
Number of patients by age.
Number of patients by occupation (employment).
Number of patients reffered to certain MD (physician).
Number of patients came from other clinic.

D. Computing results of Indicators with Sample Data

In this section we will present value of indicators computed from both databases in period of 1st November 2004 to 1st November 2005, which was software testing period for Dr Hrnjak's version of software (which means that some patients data could not be entered because of software testing and could not be considered as complete database), while Dr Bursic's version was already fully running. Data about patients and examinations that were entered to database after that date is not available for public presentation, but is stored internally at each clinic.

For each of specified indicators separate SQL query has been entered. Values from queries from both databases were exported to MS Excel and integrated for comparison.

We give example for the indicator:

Number of patients by residence (living) in a certain city/village.

SQL query:

```
SELECT Count(PACIJENT.BROJ_KARTONA) AS [Broj pacijenata],
PACIJENT.MESTO_STANOVANJA
FROM PACIJENT
WHERE
(((PACIJENT.DATUM_OTVARANJA_KARTONA)>#1/11/2004#
And
(PACIJENT.DATUM_OTVARANJA_KARTONA)<#1/11/2005#))
GROUP BY PACIJENT.MESTO_STANOVANJA;
```

Query results:

Figure 6. Query results for dbHrnjak database

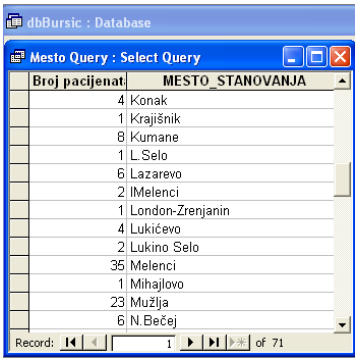

Figure 7. Query results for dbBursic database

Graphical representation of data comparison for both data sources is given at Figure 8. (without numerical data at Y axis).

Obviously, in both cases, there are more patients from Zrenjanin, then from other cities or villages. This fact is related to number of citizens in Zrenjanin comparing to those living in villages.

Other important notice is that dr Hrnjak data should be considered as only software testing data (they are not complete), while dr Bursic data should be considered as fully completed, since testing period has already passed.

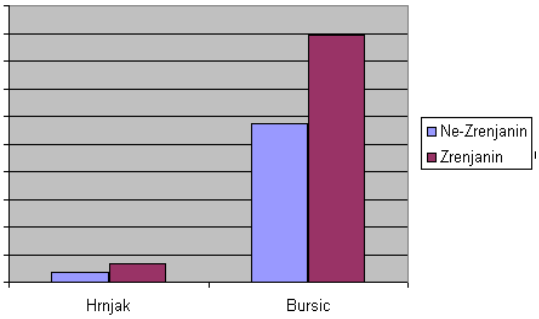

Figure 8. Graphical presentation of number of patients by residence in Zrenjanin and other city/village (ne-Zrenjanin) comparison from dr Hrnjak and dr Bursic database.

E. Discussion

In previous sections we have defined three research questions. Now, it is time to discuss their answers.

1. Can we compare business performance of these two clinics?

Since we have only restricted data - with only clinical data and the amount of data for software testing period for one of them, we cant compare business performance of these two clinics. We tried with assumptions that could enable our focusing on clinical data to be basis for performance indicators definition, but these assumptions make too simplistic, i.e. not realistic working conditions.

2. Which indicators do we need and which indicators do we have?

We need indicators that cover all aspects of business process - basic process, but also supporting processes, which is not available in this case.

We have defined general indicators that describe patients (customers) and medical examinations and treatments (services). We also defined goal oriented indicators, with assumed goals, also focused only on basic processes.

3. What are the results of this comparison and can we have a general conclusion on business performance success according to computed values of these indicators?

We show methodology and technology used for computing indicators and visual presentation, needed for comparison. It has been shown that results are computable and could be visually presented. We cant have results of benchmarking for each of indicator, since we didnt have all the needed data available. Other important aspect is the need for more automated approach, i.e. using DataWarehouse tools for computation automation, such as MS Analysis Services.

By computing each of specified indicator, if we had complete data for each of clinics, we could have separate conclusions regarding each aspect examined. To have a general conclusion about the business performance success, we should have a decision model [5] that would include all relevant indicators values [6].

IV. CONCLUSION

In this paper we presented information system of two gynecology clinics. They have equal structure, starting with hardware, software, orgware and lifeware components. Sofware support has similar user interface and equal database structure.

Equal database structure gives possibility of easy benchmarking of data. This software supports only basic business process, i.e. medical examination and treatment data, without any support process data (such as finance, maintainance, supply etc).

This paper contributes with the model for benchmarking of business performance regarding gynecology clinics, by defining general and goal oriented performance indicators. We also show, at sample data, that this model is computable and could be visually presented, by using sql queries and graphs in MS Excel.

The need for complete database and the database for longer time period, as well as the database with support process data is needed for benchmarking that could cover all business aspects. We also point out the need for more automated software tools for data analysis, such as DataWarehouse tools, like MS Analysis Services.

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Elements of The Customer Satisfaction Model in The Republic of Serbia's Economy

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Abstract: The objective of this paper is to present the research results in modelling the process for providing satisfaction of company's customers and their requirements. This model implies a process approach, acceptable marketing research and appropriate evaluation at the end. The research was conducted in the first quarter of 2008. and included an interview with 84 companies (more than two- thirds from SMEs) as the primary group and 37 experts from the relevant field of work as the control group of the research. The interviewing was primarily carried out by an e-mail survey (one questionnaire per company/expert).

I. INTRODUCTION

A. Customer satisfaction and related concepts - review of literature

Customer satisfaction (CS) is the level of a person's felt state resulting from comparing a product's perceived performance (or outcome) in relation to the person's expectations [1]. In addition, satisfied customers tend to be less influenced by competitors, less price sensitive, and stay loyal longer [2].

There is a large amount of available technical (or marketing) literature [3] which supports moves towards formalizing the measurement of CS. In fact, CS measurement has proved to be one of the most successful products for market research agencies in times of recession [4] .

This field represents the base of, at least, three concepts: quality management (QM), total quality management (TQM) and business excellence (BE), as well as relationship marketing (RM). This is conceptually the subject of the wider analysis of this paper.

Quality components such as dealing with complaints, cooperation between company representatives and customers, the availability of products and services, cost and price policy and activities related to making contracts all exert a considerable influence on CS [5]. On the other hand, CS influences the company's characteristics, such as spreading positive information about the company and its services and products [6].

The concept of TQM and BE as a business strategy, extends well beyond the marketing customer-perceived view of quality [7] to include all key requirements that contribute to customer-perceived quality and CS. TQM broadens prior notions of quality in that it includes consideration of business processes for providing complete CS on the full range of product and service needs [8].

The term RM was first introduced by Berry [9] in a services marketing context. RM, defined as marketing activities that attract, develop, maintain, and enhance customer relationships, has changed the focus of marketing orientation from attracting short-term, discrete transactional customers to retaining long-lasting, intimate customer relationships. Evans and Laskin [10] present the model of effective marketing process which is cyclic in form, with three sub-processes: (1) inputs, (2) positive outputs and (3) checking phase. This point towards constant improvement the PDCA cycle [11] i.e. to QM concept. The authors define RM as a "process by which a company builds a long-lasting relationship with possible and existing customers in such a way that both sides (sellers and buyers) are focused on commonly defined objectives.

B. Serbian background

Companies from transitional countries, like those of the Western Balkans (Serbia among them), have problems with the quality of their business practices and production productivity. Inherited inefficient production systems and transitional recession, which are common to all countries in transition, affect these companies and can be blamed for their insufficient competitive capacity. The problem is especially obvious in companies dominated by autochthonous private capital. The reason why only a relatively small number of Serbian companies have implemented a quality system can be found in the difficult financial situation facing the domestic economy and the fact that the implementation of QMS calls for considerable effort on the part of management. What is of greatest concern is that, while almost all big companies have already implemented QMS, the majority of companies in Serbia are small to medium sized enterprises (SMEs). Taking all the above into account, it is not surprising that the concept of integrated management systems is the most common on the Serbian market while the elements of BE serve more as a theoretic-methodological base. The concept of relationship marketing exists, but only on a

basic level and in a small number of companies (those under foreign ownership). Furthermore, there are no clear indicators concerning this.

In Republic of Serbia small and medium-size enterprises participate in the total number of enterprises with 99.8%, with 65.5% in employment, with 67.6% in turnover and with about 36% in gross national product (GNP). In the total export, SMEs participates with 50.2%, in the import with 64% and with 51.2% in investments in non-financial sector. Micro enterprises are dominant in SMEs – they participate with 95.6% in the total number and employ almost 50% of the total number of the employed [12] .

In accordance with the above, the modelling of an acceptable concept that would satisfy customer requirements by integrating QMS, BE and RM seems a possible solution in a transitional context. Therefore, the objective of the research was to create and present a qualitative theoretical model of a system for providing satisfaction of a company's (firm's) customer needs. The model assumes a process approach, with appropriate marketing research in the beginning and corresponding evaluation at the end. The model was created to facilitate the management of these processes, with the aim of achieving BE.

II. METHODOLOGY SETTINGS OF THE RESEARCH

The research starts from at least three key pre-conditions:

1. It is possible to carry out a systemic synthesis of a theoretic model for providing satisfaction of customer requirements that integrates: the criteria of BE in modern business conditions, the requirements of marketing research and the quality requirements set out in the ISO 9000:2000 series of standards.
2. The existence of the model is justifiable, but there are requirements, elements and activities that were not considered during the preparation of the proposed model although they are specific and important for companies' work (productive and non-productive) in the Republic of Serbia.
3. Certain deviations in requirements related to the model can be expected, in other words, certain differences between the answers given by SMEs and big enterprises. We can estimate that this will be caused by strategic orientation of the theoretic model and organisational set-up.

Argumentation of these pre-conditions would be enough to show justifiability and acceptance of the model.

Target groups in the research were:

- companies (production and/or services) which are certified according to the ISO 9000 standards and which work and/or have residence in Republic of Serbia; managers in quality and/or marketing sector in these companies, as primary group,
- experts, in the sphere of quality and/or marketing (with reference to the subject sphere, published works and/or cited), as a control group. They were to confirm the companies' attitudes. It was interesting to see whether considerable differences would appear in the companies' answers and the answers of those who were dealing with this matter from academic (university professors) or some other standpoint (ex. consultants).

Surveying of available companies and experts was primarily realized by e-mail survey. The survey included about 600 companies and 100 experts. Data base of Serbian Chamber of Commerce was primarily used during the selection of companies and at selecting the sample of experts it was used data base and conatcts in JUSK – United Association of Serbia for Quality, as independent and sufficiently representative body for Serbia. Totally 84 companies accepted the call to participate in the research (which was between 4.5 and 5.5% out of all certified companies in Serbia) and 37 experts from the subject sphere. For the sake of survey it was created a special questionnary (taking care of methodology of the research); communication principle was: one questionnary – one company/expert. The survey was mainly realized at the first quarter of 2008.

The structure of the surveyed companies was: according to ownership structure the companies were mainly private (61 (72.6%)) and public (10 (11.9%)); according to the field of work: agriculture, hunting, forestry and water management 3 (3.4%), ore and stone mining 1 (1.1%), manufacturing industry 46 (52.3%), electrical, gas and water generation and supply 5 (5.7%), building construction 9 (10.2%) wholesale and retail trade ; motor vehicles, motorcycles and house-ware/personal repair 8 (9.1%), traffic, warehousing and connection 3 (3.4%), administration and defence ; compulsory social insurance 2 (2.3%), education 3 (3.4%), health and social care 3 (3.4%), other communal, social and individual services 5 (5.7%); according to the size: micro and small 14 (16.7%), medium 38 (45.2%) and big 32 (38.1%); position of the interviewed: mainly directors 10 (11.9%), leading managers 49 (58.3%), and consultants 3 (3.6%).

The structure of the interviewed experts was: the majority of the interviewed were male (31 (83.8%)); the greatest number of the interviewed were over 50 years of age 13 (41.9%) and between 30 and 40 11 (35.5%); level of education: the majority were PhD (15 (40.6%)), Master's degree and Bachelors (10 (27%)); occupation (answered 22 (59.5%)): the majority (11) were university professors/college professors and 5 experts were employed as consultants; work position of the interviewed in their organizations (answered 36 (97.3%)): directors and/or owners and leading managers.

III. CS MODEL

A. A presentation of the theoretical model

The model for providing customer satisfaction, shown in **Figure 1**, has been harmonized according to

its basic function and primary structure with the requirements of the ISO 9001:2000 series of standards, as well as with relevant proposals and criteria of business excellence and marketing requirements.

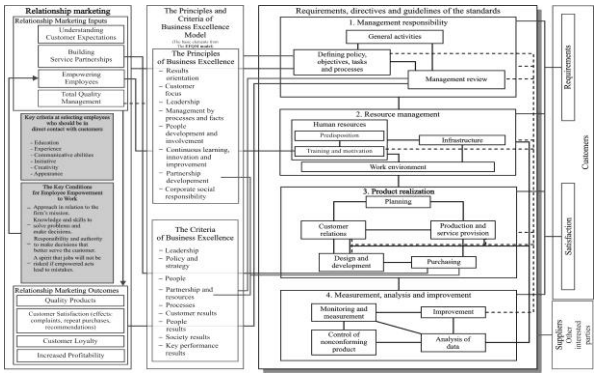

Figure 1. The Customer Satisfaction Model

B. The statistical indicators - a review

TABLE I. A COMPARATIVE SURVEY OF THE AVERAGE SIGNIFICANCE GRADE THAT SHOULD BE PAID TO THE PRINCIPLES OF BE WHEN DEFINING POLICY, OBJECTIVES AND TASKS WITHIN AN ORGANIZATION.

PRINCIPLES of BE	**Average grade of those interviewed in companies**	**Average grade of the experts**
Results Orientation	4.17	4.39
Customer Focus	4.42	4.61
Leadership	3.82	4.18
Management by Processes and Facts	3.80	4.06
People Development and Involvement	3.76	3.88
Continuous Learning, Innovation and Improvement	3.68	3.79
Partnership Development	3.94	3.94
Corporate Social Responsibility	3.58	3.39

66 (85.7%) of the interviewed companies and 33 (91.7%) experts gave the answers. The Likert 5-point scale was used in the research survey.

TABLE II. A COMPARATIVE SURVEY OF THE AVERAGE SIGNIFICANCE GRADE WHICH SHOULD BE PAID TO THE CRITERIA OF BE WHEN DEFINING POLICY, OBJECTIVES AND TASKS WITHIN AN ORGANIZATION.

CRITERIA of BE	**Average grade of those interviewed in companies**	**Average grade of the experts**
Leadership	3.73	4.00
Policy and Strategy	3.87	4.24
People	3.68	4.21
Partnership and Resources	3.65	3.97
Processes	3.90	4.15
Customer Results	4.47	4.48
People Results	3.58	4.15
Society Results	3.52	3.70
Key Performance Results	4.23	4.27

74 (88.1%) of the interviewed companies and 36 (97.3%) experts gave the answers. The Likert 5-point scale was used in the research survey.

TABLE III. A COMPARATIVE SURVEY OF THE AVERAGE SIGNIFICANCE GRADE PAID, AND THAT WHICH SHOULD BE PAID TO THE CRITERIA OF BE DURING MANAGEMENT REVIEW BY THE LEADING MANAGEMENT.

CRITERIA of BE	**Average grade of those interviewed in companies**			**Average grade of the experts**
	1	**2**	**3**	
Leadership	3.67	3.54	3.73	4.00
Policy and Strategy	4.08	4.04	3.88	4.24
People	4.33	3.69	3.50	4.21
Partnership and Resources	4.17	3.69	3.62	3.97
Processes	4.17	3.73	4.04	4.15
Customer Results	4.67	4.42	4.23	4.48
People Results	3.92	3.81	3.50	4.15
Society Results	3.92	3.46	3.62	3.70
Key Performance Results	4.67	4.35	4.12	4.27

78 (92.9%) of the interviewed companies and 36 (97.3%) experts gave the answers. The Likert 5-point scale was used in the research survey. Here, a statistically significant difference was noted in the answers of the different-type companies ($p = 0.043<0.05$) and the grades are shown separately.

TABLE IV. A COMPARATIVE SURVEY OF THE AVERAGE SIGNIFICANCE GRADE OF THE INPUT ELEMENTS IN THE RM CONCEPT.

Input Elements of The RM Concept	**Average grade of the interviewed in companies**	**Average grade of the experts**
Understanding Customers Expectations	4.31	3.88
Building Service Partnerships	3.92	3.42
Empowering Employees	3.66	3.71
TQM	3.76	3.26

The Likert 5-point scale was used in the research survey.

TABLE V. A COMPARATIVE SURVEY OF THE AVERAGE SIGNIFICANCE GRADE OF THE OUTPUT ELEMENTS IN THE RM CONCEPT..

Output Elements in The RM Concept	**Average grades of the interviewed in companies**	**Average grades of experts**
Quality Product	4.64	4.06
CS (effects: complaints, recommendations, re-buying)	4.44	4.26
Customer Loyalty	4.04	4.09
Increased Profitability	4.19	3.91

81 (96.4%) of the interviewed companies and 35 (94.6%) experts gave the answers. The Likert 5-point scale was used in the research survey

When asked to say whether they had a particularly defined process for the identification of customer expectations and requirements, the majority of those interviewed, 66 (79.5%) out of 83 (98.8%) from the

companies gave positive answers. One part, 14 (16.9%) of them, linked this process with some other process in the organization and only in 3 (3.6%) companies was this process not defined at all. The experts' answers followed a similar structure; 31 (83.8%) thought it was important to define this process, and 6 (16.2%) thought that this process could be joined to some other process, with a note that they insisted on its existence.

The process of monitoring, measuring and analysing CS is similar to the previous one. 69 (82.1%) of those interviewed in companies stated that this process already existed as particularly defined, 14 (16.7%) said that it was part of some other process, and only 1 (1.2%) said that it did not exist. The experts were, this time, practically unique in thinking that this process had to be particularly defined with only 3 (8.1%) of those interviewed stating that it could be part of some other process.

For compiling documentation for the identification of expectations process, we received answers from 81 interviewees (96.4%), and for the monitoring, measuring and analysing process we received answers from 83 (98.8%) companies.

TABLE VI. A SURVEY OF THE PHASES IN WHICH RESEARCH INTO NEEDS AND CS IS/SHOULD BE PERFORMED.

Offered answers		RESEARCH INTO NEEDS AND EXPECTATIONS			
		Companies (Firms)			Experts
		1	2	3	
(a)	Defining quality policy, objectives and tasks	5 (20.8%)	23 (18.7%)	18 (16.5%)	13 (11.7%)
(b)	Research into requirements and expectations	6 (25%)	17 (13.8%)	17 (15.6%)	30 (27%)
(c)	Defining resources for the realisation of product or service	1 (4.2%)	9 (7.3%)	15 (13.8%)	7 (6.3%)
(d)	During the review of requirements related to the product	5 (20.8%)	18 (14.6%)	15 (13.8%)	12 (10.8%)
(e)	Through validation of results (within a phase or the project)	6 (25%)	14 (11.4%)	13 (11.9%)	11 (9.9%)
(f)	During the performance of activities (products and services realization)	-	20 (16.3%)	10 (9.2%)	10 (9%)
(g)	After realization or product delivery	-	17 (13.8%)	8 (7.3%)	6 (5.4%)
(h)	Through post-delivery and servicing activities	1 (4.2%)	5 (4.1%)	13 (11.9%)	18 (16.2%)

83 (98.8%) of those interviewed answered the question concerning the identification of expectations process. A statistically significant difference in the answers of different-type companies was noted concerning the questions about the phases in which research into the needs and expectations ($p = 0.001<0.05$) is performed, therefore the answers are given separately.

TABLE VII. A SURVEY OF THE PHASES IN WHICH THE MEASURING OF CS IS/SHOULD BE PERFORMED

Offered answers		MEASURING SATISFACTION			
		Companies (Firms)			Experts
		1	2	3	
(a)	Defining quality policy, objectives and tasks	2 (6.5%)	10 (10.8%)	11 (11.6%)	14 (11.9%)
(b)	Research into requirements and expectations	6 (19.4%)	9 (9.7%)	18 (18.9%)	20 (16.9%)
(c)	Defining resources for the realisation of product or service	-	8 (8.6%)	5 (5.3%)	7 (5.9%)
(d)	During the review of requirements related to the product	5 (16.1%)	11 (11.8%)	10 (10.5%)	10 (8.5%)
(e)	Through validation of results (within a phase or the project)	9 (29%)	10 (10.8%)	6 (6.3%)	14 (11.9%)
(f)	During the performance of activities (products and services realization)	-	8 (8.6%)	14 (14.8%)	9 (7.6%)
(g)	After realization or product delivery	6 (19.4%)	27 (29%)	18 (18.9%)	21 (17.8%)
(h)	Through post-delivery and servicing activities	3 (9.7%)	10 (10.8%)	13 (13.7%)	23 (19.5%)

80 (95.2%) companies answered the question concerning the monitoring, measuring and analysing process. A statistically significant difference in the answers of different-type companies was noted concerning the questions about the phases in which measuring of satisfaction ($p = 0.002<0.05$) is performed, therefore the answers are given separately.

TABLE VIII. A COMPARATIVE SURVEY OF THE WAYS IN WHICH THE RESULTS OF ANALYSIS- CS - INFLUENCE/SHOULD INFLUENCE THE IMPROVEMENT OF QMS.

Offered answers	Firms	Experts
Corrective and/or preventive actions	64 (31.8%)	20 (21.3%)
(Re)definition of quality policy, objectives and tasks	35 (17.4%)	19 (20.2%)
Planning future quality	48 (23.9%)	24 (25.5%)
Training personnel	33 (16.4%)	20 (21.3%)
"Good practice" – collective experience	16 (8%)	11 (11.7%)

81 (96.4%) companies and 36 (97.3%) experts in their answers to the offered questions.

With a certain difference, the companies and experts give advantage to corrective and/or preventive measures in planning quality for the future period, while they give the least attention to shared values.

IV. DISCUSSION

There are certain problems concerning the acceptance of BE and RM in the Serbian economy. The consequences of these problems are the following: the concept of IMS is mainly applied on the Serbian market based on the ISO 9000 series of standards while the elements of the BE concept are mostly used as its theoretic - methodological base. However, it is also obvious that an orientation towards CS and other stakeholders' requirements is present in certified domestic companies. This is confirmed by the acceptance of the principles and criteria of BE (the input and output elements of RM) in defining policy, objectives and tasks in the organization, in other words, in the sphere of planning quality for the future. According to the research results, the criteria of BE and the output elements of the RM concept should also be incorporated in the reconsideration phase on the management side (management review). Taking all this into account, it is not surprising that considerable significance is paid to CS. Namely, particular significance is paid to the principles, criteria and elements which are directly oriented towards customers (the lowest average grade is 4.23); which shows the readiness of the organizations to devote themselves to their customers, as well as the importance which the experts gave to this question.

The greater part of Serbian companies had defined customer-related processes (79.5% of those which participated in the survey), mainly as part of some other process. For the documentation of this part of the product realization process the most widespread method is procedural, i.e. as a segment in the reference book (Handbook) of quality. The experts gave advantage to methodology over integration – which is the opposite of the opinion expressed in the companies. This does not, however, diminish the significance of the biggest part in which there is agreement in the given statements. Feed-back information from customers, including their complaints were considered as highly effective solutions in communication with customers.

Validation of results within a phase or project is present as the phase in which research into customer needs and satisfaction is/should be performed. However, only micro and small companies pay more importance to this (in 25% of the surveyed companies), probably because of the more simplified operational realisation,

Partnership development with suppliers belongs to the four best appraised principles/criteria when the experts and companies had to provide their opinion on the concept of BE, i.e. this is the second best estimated of the input elements in the RM concept. It is interesting to note that it was the micro and and small companies which paid particular attention to the partnership relations with suppliers, perhaps because they in fact are frequently the suppliers in the chain of the realisation of production and/or in the provision of services, thus they expect such a relationship with their 'big' partners.

A study of the phases in which research into customer needs and satisfaction is/should be performed established that this is carried out: during the performance of activities (products and services realization), after realization or product delivery and through post-delivery and servicing activities. However, those phases are not usually foreseen for the realisation of those activities. Performing activities in product realization is only the second most important phase in the research into customer needs and satisfaction for medium-sized firms. Thus, we can say that the theoretical model is partially reduced.

The majority of those companies which participated in the research (82.1%) had a particularly defined process of monitoring, measuring and analysing CS. For the documention of this sub-process the most widespread method is a procedural one. However, here the focus of the activities ranges from defining policy and objectives of quality to post-selling and service activities, thus they gain in importance respectively: dealing with complaints about products, dealing with complaints, monitoring proposals for improvement and monitoring product defects during usage.

The analysis of CS influences the improvement of QMS and the business of a whole organization in general. The research has shown that this is simultaneously both a demand imposed by the standard and the practice of Serbian companies. The ways in which this is performed, or should be performed was demonstrated by 96.4% companies and 97.3% experts in their answers respectively: corrective and/or preventive actions and planning future quality. It is encouraging to note that the "system of award and punishment" has almost completely disappeared in companies.

Although it was to be expected given the strategic orientation of the theoretic model and organisational set-up, there are no statistical differences between the answers given by micro, small, medium-sized and large enterprises except in three cases:

- The level of significance given to the criteria of BE during management reviews; two of the three criteria given the greatest attention are the same (Key Performance Results, Customer Results). The third, key criterion, however, varies significantly; People with micro and small enterprises; Policy and Strategy with medium-sized and Processes with large enterprises.
- The phases in which research into needs and CS is/should be performed. Here one of the three most significant answers is the same for all types of company; defining quality policy, objectives and tasks. The answers are in keeping with the size and organisational structure of the companies and any deviations are related to the phases the same companies may implement: research of requirements and expectations, through validation of results (within a phase or the project) and during the performance of activities (products and services realization).

- The phases in which measuring CS is/should be performed. Here one of the three most significant answers is the same for all types of company; after realization or product delivery. The answers are in keeping with the size and organisational structure of the companies in question and any deviation is related to these factors: research of requirements and expectations and during the review of product related requirements.

Finally, it can be noted from the analysis and discussion that the theoretic model for providing satisfaction of customer requirements proved to be acceptable for Serbian companies in relation to the context presented here.

V. CONCLUSIONS

The structure of the theoretic model follows the bases of the ISO 9001:2000 standard, as well as recommendations concerning managing quality, costs and the process of dealing with customer complaints. The elements, including the criteria of BE and marketing requirements which are also integrated in the model, broaden and fulfil the model thus performing its basic function.

The theoretic model served as the base for further research of companies (productive and services), which operate and have their seats on the territory of the Republic of Serbia – first of all their leaders, owners or employees who are in charge of the implementation of QMS as the primary group, and experts from this sphere as the control group in the research.

The model itself has not been applied in practice or tested but, in our opinion, its usage would contribute to more complete and wider acceptance of the concept of BE and/or RM on the part of certified companies (standards ISO 9000 series) in the Republic of Serbia. In relation to limitations, we think that the model's validity would be more complete if the research included a greater number of domestic companies in the sample, even better if this research could cross the borders of Serbian territory and transfer to the countries of the Western Balkans.

Those companies which are ISO 9000 certified and experts in general suggest the justifiability of the theoretic model of providing CS. The model for providing CS has been harmonized according to its basic function and primary structure with the requirements of the ISO 9001:2000 series of standards, as well as with relevant proposals and criteria of BE, marketing requirements and specific characteristics and the requirements of the Republic of Serbia's economy.

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Organizational knowledge management conception from the perception of employees

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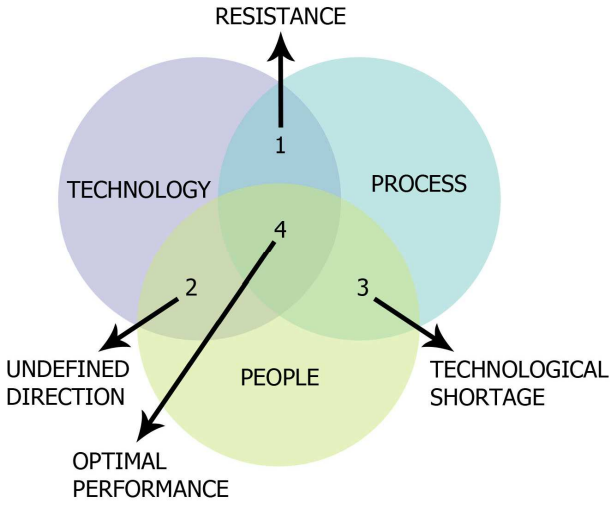
Abstract - This paper represents pilot research oriented to theoretical and empirical approach to knowledge management in small and medium-sized enterprises. The aim of the research was to analyze the concept of knowledge management and organization of knowledge management according to activity and legal status of organization. The sample included 90 examinees from the population of operative management and employess of Helath Centre (N=30), Preschool Teacher Training College ((N=30) and Wood Processing Plant in Sremska Mitrovica (N=30). Questionnaire with 5 items with three level scale of Liquert's type was applied as measuring instrument. Descripitve statistical procedures and Kruskal-Wallis test for comparison of the results of items for three organizations set statistically significant difference at significance level of 0,01. The analysis of statistically significant result with Mann Whitney U test showed that signficant difference between three organizations has strong correlation and values of r = 0,80. The analysis of the results shows that concept of knowledge management from the perception of empolyees who do not belong to top and middle management of organization, is still at the beginning developmental level. Therefore, business intelligence and business strategy of development of observed organizations, especially of Wood Processing Plant have not (yet) achieved competitive organizational market value as the consequence of such structure of knowledge management system.

Key words - management, knowledge, operative management, organization

I. INTRODUCTION

Proper action at the right moment, with appropriate resources, at right place represents evolutionary paradigm of strategy of development of human activities. Conceptions of knowledge management, their implementation and monitoring in contemporary modern organization represent key factors of achievement and maintaining of its competitive advantage. According to Albreht, the origin of the concept of knowledge management can be found in Hertz's conception 'Knowledge Managements' (Hertz,1998). Former labels of similar intention (according to Albreht, 1994) can be found in Zand's *Managing the Knowledge Organization* (Zand,1969) and Drucker's *The Age of Discontinuity* (Drucker, 1969). Unique and only possible platform of organization and knowledge management implies cycle which represents unity of three components: people, processes and technology (Macintosh,1995) from the very beginnings of this concept in the previous century until the starting level of active management of knowledge resource in organizations. Focus at processes and technology would be met with resistance of human factor and holders of knowledge management would be excluded. On the ther hand, neglection of the processes would result with the lack of management direction, whereas the lack of technological operations would disable efficient process management. (Picture 1).



Picture 1. Knowledge management dimensions (Endres,2000)

Such context implies that strategy of knowledge management development in XXI century should include creation, capure, storing, sharing and application of knowledge in the way which would contribute to creation of additional value for organization. This vision of building of system of knowledge management enables organization to create and identify future priorities of key knowledge domains either in the form of implicit or explicit knowledge. Joining of two concepts - knowledge and management should express intention to organize the knowledge. However, there are numerous questions that should be answered: What kind of knowledge should be organized? What kind of knowledge could be structured and shared? Which knowledge system should be most efficiently implemented? How sholuld organizational memory be used (Lehn, 2000) and how should reversible process of communication at all organizational structural levels be maintained? Research studies done by Fraunhofer Institute (Bullinger, 1998) and Delfi Group

TABLE 1. STRUCTURE OF THE SAMPLE OF EXAMINEES

Activity-organization	Operative management	SSE	Number	Employess	SSE	number	Σ
Health- Health Centre	Head nurse - technician	10	VI	Medical nurse-technician	IV	20	30
Education – Preschool Teacher Training College	head of administration, main clerk, librarian, board chairmen	10	VII1 VII2 or VIII	Lectures,senior lecturer,professor	VII2 or VIII	20	30
Industry-Wood Processing Plant	Section head, section menager	10	VI or IV	Industrial section employee	IV or III	20	30
Σ		30				60	90

(Delfi,1997) showed that more than 50% of organizations recognized knowledge as an important factor of production at the end of XX century, and that more than 98% of organizations will invest in knowledge management at the beginning of XXI century. Some questions that occured before, during and after economic crisis were: what would be the percent of investments, inovations in knowledge elements or knowledge clusters, has private sector become fully aware of the usefulness of knowledge management or the process of privatization in Serbia included only the change of the owner, does public sector implements newly-developed systems of knowledge management and in which pace? This pilot reseacrh will try to give answer to one segment of knowledge management by analysis of (only) one component of knowledge system which refers to the structure and forming of knowledge management system and organization of knowledge management according to activity and legal status of three organizations.

II. METHOD

The sample included 90 examinees (Table 1) from the population of operative management and employess of Helath Centre in Sremska Mitrovica (N=30), Preschool Teacher Training College (N=30) and Wood Processing Plant in Sremska Mitrovica (N=30).

All subsamples included equal number of examinees, but examinees, section heads and employees did not have the same level of education. The techniques of questionnaire was used for gathering information on research problem. Questionnaire with 16 items with tree-level scale of Liquert'a type with set of alternatives which denote frequency: rarely, sometimes, and very often, was used as measuring instrument. Set of alternatives in form of three level scale: I do not know, department/sector, as a project/ in some other way, was offered for items number 1. and 2. The questions in the questionnaire referred to organization of knolwdge management and they were formulated as follows:

1. In which way has knowledge management been organized in your organization?
2. Which section in your organization is responsible for knowledge management?
3. Are you willing to continuously gain new knowledge and to be submitted to professional training?
4. Do you respect achievements of other teams and groups in your organization?
5. Knowledge exchange improves chances for professional advancement/carrier
6. In which extent does your organization strive for knowledge transparency?
7. In which extent does your organization strive for the change of organizational culture?
8. Do better communication and cooperation represent goals of organizations in your surrounding?
9. What is the level of professional personnel training in your organization?
10. Has the way of knowledge preservation been improved in your organization?
11. Has an approach to existing knowledge sources been improved in your organization?
12. In which extent does your organization set inventivness as its goal?
13. In which extent does your organization pay attention to cost lowering?
14. In which extent does the organization try to make better turnover due to knowledge selling?
15. Does knowledge management lead to better productivity?
16. Do concepts of knowledge management bring forth better motivation of employees?

We have applied descriptive statistical procedures and discriminative nonparametric procedures (Kruskal.Wallis test and Mann Whitney U tests) in this research in order to set significance of difference of arithmetic means according to the variablity of all items.

III. RESULTS AND DISCUSSION

Since initial procedure for each analysis represents showing of basic statistical procedures, which are very important for subject matter of this paper, we have presented frequencies and percents of answers of all 90 examinees in tables 2 and 2a.

TABLE II. DESCRIPTIVE PARAMETRES OF THE RESULTS AT THE LEVEL OF ENTIRE SAMPLE

Questions	I do not know		Department/section		As a project/ in some other way		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
1.	26	29	22	24.5	42	46.5	90	100
2.	71	79	19	21	10	11	90	100

TABLE IIA. DESCRIPTIVE PARAMETRES OF THE RESULTS AT THE LEVEL OF ENTIRE SAMPLE

Questions	Rarely		Sometimes		Very often		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
3.	14	15	56	63	20	22	90	100
4.	28	31	34	38	28	31	90	100
5.	21	23,5	18	20	51	56,5	90	100
6.	38	42	34	38	18	20	90	100
7.	59	65,5	18	20	13	14,5	90	100
8.	61	67,5	13	14,5	16	18	90	100
9.	64	71	18	20	8	9	90	100
10.	48	53	21	23,5	21	23,5	90	100
11.	44	49	17	19	29	32	90	100
12.	46	51	8	9	36	40	90	100
13.	8	9	10	11	72	80	90	100
14.	76	84,5	11	12	3	3,5	90	100
15.	28	31	16	18	46	51	90	100
16.	25	28	23	25,5	42	46,5	90	100

The analysis of items stated in the questionnairre shows that questions number 2,3,7,8,13,14, which represent indicators of organizational knowledge conception, have the highest frequency (more than 50 f). The analysis of the results of descriptive statistical procedures leads us to real, but worrying status of knolwedge management conception of employees in three analyzed organizations about the concept of knowledge, functon, goal and importance of knowledge management. Because of different levels of education of employees and their different answers, we have applied statistical procedures which imply application of discriminative nonparametric procedures - Kruskal Wallace test and Mann Whitney U tests (Tables 3,4, and 5).

TABLE III. MEAN VALUE OF RANK

	Organization	Number of examinees	Mean value of rank
Questionairre	Health Centre	30	48,29
	Preschool Teacher Training College	30	59,43
	Wood Processing Plant	30	34,18

Mean (average) values of the ranks of groups (Table 4) show that Preschool Teacher Training College has the highest rank, whereas the Wood Processing Plant has the lowest.

TABLE 4. KRUSKAL WALLACE TEST

	questionnaire
Chi-Square	8,36
Degrees of freedom	2
Significance level	0.018

Kruskal Wallace Test (Table 4) showed statistically significant difference between the results of three groups (organizations) at the level of significance of 0,018. Additional group comparison by Mann Whitney U tests (Table 5) showed the results of Z value to be higher than theoretical maximum value of 2,58, as well as statistically significant difference at the significance level of 0,01 and strong correlation between the variables (r= from 0,73 to 1).

TABLE 5. MANN WHITNEY U TESTS FOR COMPARISON OF THREE ORGANIZATIONS

	Z	Significance level (p)	Correlation (r)
Health centre – Preschool Teacher Training College	-8,89	0,01	0,98
Health Centre – Wood Processing Plant	-6,61	0,01	0,73
Preschool Teacher Training College –Wood Processing Plant	-9,01	0,01	1

IV. CONCLUSION

Pilot research showed present conception, function and application of management knowledge in two organizations in public sector and one organization in private sector. Each of above mentioned organizations does not show noticeable market advantage according to capacities and resources. The analysis of the resutls of research shows that concept of knowledge management from perception of employess who do not belong to top or middle management of organization, is still at the beginning developmental level. Therefore, business intelligence as well as business strategy of development of observed organizations, especially of Wood Processing Plant have not achieved competitive organizational advantage (yet), as the consequence of such structure of management knowledge system. The solution should be

found in the first step of creation and designing of knowledge and infrastructure in the form of organizational units which would gather and organize sources of knowledge and distribute them according to the needs of the organization. That would not be easily achieved in these three organizations which have not still adopted combined functional - staff type of organization. Adoption of collective knowledge in order to obtain business goals should become the paradigm of modern organization, but the results of market competitions will show if everything will stay in the domain of theory or knolwedge management will be implemented in practice.

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Information system for school libraries

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Abstract – This paper describes school library application for elementary and high school facilities in Serbia. It is a software solution that enables quick and comfortable work to librarians. Its purpose is keeping evidence of all books and magazines in a library and retaining information regarding checkout of these books and magazines. It considerably shortens time needed to find a person that borrowed particular book, data regarding book funds of the library and to generate reports needed for library functioning. Apart of evidence regarding borrowed and returned books, the program enables sending complete book list on the Internet in XML format. The list is sent by FTP on certain location at the server where school presentation is, and then it is parsed and shown in accordance to wishes and needs of particular school.

Key words: school library, XML, FTP

I. INTRODUCTION

The library is much more than a building or a room fool of books [1]. It is primarily a place where knowledge is widened and information found, and only after that, it is a distributor of books and magazines.

The school library program is a part of general educational plan of the school and encompasses:

- educational activities
- library activities
- cultural and public activities
- other activities (advanced training, cooperation with professional organs in the school)

School libraries are part of two systems: school and library, therefore their work is regulated in two ways – by education regulations and by library regulations. These regulations are complementary to each other and represent unique basis for application of work in school libraries.

The role of librarian is very important in every library [4][5]. The Yale University Library has well-established research education programs and at beginning of the fall 2008 semester, all 1,320 incoming students in the Class of 2012 were assigned their own Personal Librarian or "PL" – one of 32 Yale librarians who serves as the students' primary point of contact in the library [11][12].

Wealth of every library is measured by the number of books and magazines it owns. Wealth of the library induces students to come to the library and to read. During the 2000-01 school year, Williams Intermediate School in Davenport, Iowa, improved use of its library dramatically. The original Colorado study, as it is popularly known, found that the size of the library in terms of its staff and its collection is a direct predictor of reading scores [9]. The amount of test score variation explained by this school library size factor ranged from five to 15 percent across various elementary and secondary grades and while controlling for a variety of other school and community differences. Indirect predictors of achievement included the presence of a professionally trained librarian who plays an active instructional role and higher levels of spending on the school library [3].

The aim of every library is to continually increase and modernize its book funds [2]. With increasing of book number there is a need to introduce an information system that will enable quick search of books and magazines, as well as keeping evidence on their checking out and checking back [6]. It is also necessary to generate quick reports on most-read books, most active students and classes so that school may award them and to induce in that way other students to read more. A list of all books may be sent to the Internet and shown at the school website so that students may know which books are available at the school library [8][10].

The school library application, presented in this paper, fulfills all these demands.

II. PROGRAM REALIZATION

Development of the application for school libraries was realized using C# programming language. This is one of young programming languages, developed in 2002 as a part of Microsoft .NET Framework. C# is object-oriented programming language directly oriented to development of application in .NET Framework platform. Version 4.0 is used in the realization.

The application is logically divided into 5 units. These units are shown in upper part of application, below the menu line. These units are:

- Checkout
- Check-in
- Entry
- Changes and
- Reports

By choosing one of those options, appropriate form in central part of application window is opened. Sub-options are specific for every option and their number varies depending of option chosen. Main window of application is shown in Figure 1.

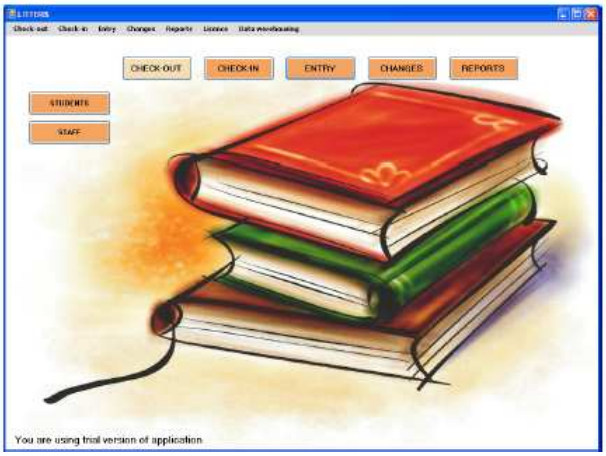

Figure 1. Main application window

A. *Checkout*

Checkout, together with check-in, is most often used action in school library functioning. Therefore, these two options have the first two places in organization of the application. This option has two sub-options:

- checkout by student and
- checkout by staff

Both sub-options are realized in the same manner, but they are separated due to logical difference between data regarding staff and students in a school. When checking out, it is necessary to enter an identification number from library card for a student or a staff member, as well as inventory number of a book. Checkout date is automatically set to current date and check-in date is three weeks later.

This is usual period for book borrowing, but it may be changed depending on school preferences. Check-in date has informative value, in order to remind a student or a staff member when to return a book to the library. When checking in a book, present date will be entered and saved in database. When entering a number of member card for a student or a staff member, as well as inventory number, lower part of the form is automatically filled in with information regarding the student/staff member and the book. This information enables a librarian to check whether information in database is correct and to amend if necessary in order to achieve full functioning of a system.

When entering checkout data it may happen that a student or a staff member has forgotten his library card. In this case, by pressing button "Find" (in lower right-hand part of the screen) a new form is opened, enabling a librarian to find the identification number for the name and surname, allowing the member to checkout a book anyway.

B. *Check-in*

Check-in is the process when a student or a staff member brings back to library a book he/she borrowed before.

This option has two sub-options:

- check-in by student
- check-in by staff

In this instance, identification number of a library card is entered, as well as inventory number of a book, and a search is done by data on checkout books. Data in database that connects a book with a student includes a status that a book is not returned yet. When a book is returned, this entry is not deleted, but its status is changed to notify that a student or a staff member has returned a book. An entry remains permanently in database in order to note how much every student or a staff member was reading, or which book was most popular.

C. *Entry*

An entry is a process of filling the database with data regarding given school library. Sub-options in this process are as follows:

- book entry
- magazine entry
- student entry
- staff member entry
- donor entry
- language entry

Book and magazine entries are filling the database with data regarding library funds. All relevant data regarding a certain book or magazine are entered. This is one of first steps after installing the application and it may be time consuming and quite tiresome, depending on number of entries to do. All libraries have more copies of a same book (author and volume) differing only by inventory number. In order to speed up entering data, an "add and copy" button is added, which adds an entry to a database and copies all its fields apart of inventory number field which is left empty. In this way, time necessary to entering all books may be decreased considerably. "Add and copy" button was added also in entering students, since it is usually done for all students from a class. In this way fields "grade" and "class" are copied, while all others must be entered manually.

D. *Changes*

Data changing process consists of following sub options:

- change in books
- change in magazines
- change in students
- change of staff
- change of donors
- change of language

This allows librarian to change existing data, due to changes that occurred in meantime or because of errors during the first entry.

One of mass changes of data is at the end of a school year, when students are going to next grade. Software has the option to change value of "grade" entry on the next value, while for eight-grade students (in elementary school) and senior students (high school) changes status to "graduated". For those students who failed a year, it is necessary to change value in "grade" and "class" field manually, depending on their new placement.

E. Reports

Reports are generated based on data regarding functioning of a library, which are situated in a database. In the application, it is possible to generate following reports:

- all members
- donors
- alphabetical catalogue
- book inventory
- magazines
- members by grades
- most-read book
- most active student
- expenditure
- non-returned books - students
- non-returned books – staff members

Reports are generated using Crystal Reports. This is the application in wide use for generating reports using data generated in database. Microsoft Visual Studio, which is being used in application development for school libraries, encompasses OEM version of Crystal Reports. Appropriate version is added to installation package in order to enable using it in computers where application is being installed.

III. SHOWING LIBRARY FUNDS AT INTERNET

This application has possibility to upload basic data of books and to create an XML file from these data. This file may be sent using FTP protocol to certain location on server, where a school website is located, so that improves information regarding a school.

When data reach the server, it is necessary to parse and to create a page that will be in accordance to look of other pages. These data are only a review, and it is not possible to checkout books using Internet. The main reason for this is that most of elementary and high schools have no access to high-speed Internet.

The appearance of XML file Books.xml comprising book data is as follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<Root>
    <Book invNumber="155481">
        <Author>Jeffrey Richter</Author>
        <Title>CLR via C#</Title>
        <SubTitle></SubTitle>
        <UDKNum>2009943026</UDKNum>
        <Language>English</Language>
        <PublishYear>2010</PublishYear>
    </Book>
    <Book invNum="2441157">
        <Author>Matthew McDonald</Author>
        <Naslov>Pro WPF in C#</Naslov>
        <Subtitle></Subtitle>
        <UDKNum>2009943025</UDKNum>
        <Language> English</Language>
        <PublishYear>2011</PublishYear>
    </Book>
</Root>
```

IV. CONCLUSION

Information revolution gradually spreads over all spheres of human life. Until recently, school libraries had no computer and all keeping evidence for book borrowing has been done using member cards and papers where data were written. Introduction of software for school libraries enables quicker work and keeping evidence, therefore it improves work quality [7]. Searches and reports, which used to take days and days of work, now are being done within seconds. For certain school libraries, this program allows to put their whole fund on Internet, so students may find out from home whether certain book exists in their school library.

A new global trend is to install computers in libraries and to connect them to servers, allowing access to a large number of e-books for all their members. In this way a library fund is considerably augmented and improved, and students have more possibility to find out things they are interested in.

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The Importance of English as a Global Language for Small and Medium-Sized Enterprises

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Abstract – Every small and medium-sized business (SME) that aims at positioning itself on the global market has to communicate using English, the global language of business. The aim of this article is to explain the concept of communicative competence and suggest how it can be improved and used for the benefit of SME. The importance of English for SME is reflected in many tasks that are carried out in everyday business, which are dependant on fluency in English. Hence, improving communicative competence in English should be set as one of long-term objectives of every SME that wants to be successful and profitable.

I. INTRODUCTION

In the ongoing process of transition towards market economy, the sector of small and medium-sized enterprises (SME) shows the greatest potential for growth in Serbia and it seems that this sector offers the best possibilities for employment. It must be stressed that encouraging the growth and development of SME is also part of the European Commission policy. In the Charter that was agreed upon by the Council of Europe (2000), education and training represent the most important elements of the development of SME. It goes without saying that establishing their position as rivals in the global market as well as marketing and promoting their products and services internationally cannot be achieved without increasing the communicative competence in English. The aim of this article is to explain the concept of communicative competence and suggest how it can be improved and used for the benefit of SME.

According to the data offered by the Serbian Business Registers Agency, there are more than 100 000 small and medium-sized businesses in Serbia and in that way they represent the nucleus of Serbian economy. Vemić (2008: 83) cites that SME in Serbia employ 66% of the total labor force, and make 67.5% of turnover and 56.9% of gross domestic product, though the data might be outdated at the moment, since a great number of SME is put out of business due to current recession. Discussing different types of SME, Stanković (1989: 40–41) makes a distinction between three types of small and medium-sized enterprises, according to their main business orientation. In the first place, there are SME that deal with small-scale industry focusing on traditional sectors of manufacturing and production and services. In the second group, there are subcontractor enterprises that cooperate with big corporations and the third group includes modern and highly innovative enterprises.

However, regardless of their business orientation, number of employees or performance, as well as legal and financial issues, the most important factor that can have a long-lasting impact on the SME is the continuous process of education and training. Clearly, the main goals of any SME are long-term expansion and profitability. Yet, expansion, and hence, profitability can be achieved only by the means of developing specific business skills and education.

II. DISCUSSION

Moreover, the expansion of almost any SME is closely connected with the challenge of globalization, since for the majority of SME, one of the key objectives is marketing their products and services in the global market. The essential precondition for accomplishing this aim is the so-called communicative competence, which undoubtedly implies a good command of English. It is interesting to note here that regarding the phenomenon of globalization, the English language is a case in point – suppressing all other languages, English has become lingua franca of the globalizing economy. According to Crystal (2003), only one out of four users of English in the world is a native speaker of the language, still, English is a global language. As Firth (1996: 240) has it, English represents a 'contact language' for people who share neither a common native tongue nor a common (national) culture, and for whom English is the chosen foreign language of communication. Hence, regardless of the fact whether entrepreneurs are doing business in the local region or internationally, in most cases English will be the language used in communication.

Following Hymes (1980: 24), we can define communicative competence as the ability that combines both the communicative form and function. It refers to speaker's knowledge of a language, his knowledge of

social and cultural elements related to this language and his ability to use this language appropriately in a given communication. In other words, speakers of a language have to focus not only on the linguistic competence or knowledge of particular aspects of a language (for example phonology, morphology, syntax, etc), but on the function of linguistic units as well, taking into account the purpose and context of a particular communicative act. Hence, the aim of any language teaching, in this case, teaching English as a foreign language, should be based on the objective of achieving adequate communicative competence.

Regarding the integral relation of communicative competence in English and the development of SME, it can be said that this relation is manifold. First of all, the communicative competence in English can be realized on different levels and through specific tasks. Communication within the SME can be either personal or mass communication when it comes to the recipients, and if we focus on the mode, a distinction can be made between oral or written communication. Typical situational types, related to communication, which can be found in everyday business, are activities such as making phone calls, welcoming guests, negotiations, making presentations, writing and reading e-mails, letters, reports and similar, as well as translating different kinds of texts.

Since the overall aim of any SME is to promote itself in the best possible way, employees and executives who are in contact with international business partners need to have a good command of English in their everyday business in order to be successful. For example, being reluctant to talk while making a phone call due to lack of fluency in English will make a bad impression on the prospective buyer or business partner. Good command of English includes specific language skills such as reading, writing, listening and speaking skills. Non-native speakers of English should attain at least B2 level of the Council of Europe Framework in order to be rather fluent in achieving the aforementioned specific tasks. In most cases, employees have a certain inhibition to use English fluently if they are not confident enough about their knowledge. This inhibition might present a serious threat to any kind of oral communication, and it is well known that successful communication underlies all business interactions.

Needles to say, a company cannot afford to lose an opportunity to make a successful contact with an international client or a chance to promote its products / services due to insufficient knowledge of English of its employees. On top of that, the inability to translate and fully understand the meaning of an agreement, contract or any other document may have damaging consequences. Namely, at some point every company will outgrow its local market and will need to present itself on the regional or international market where a good command of English is a must. Certainly, there are companies that aim only at the domestic market and that operate just on the national level, yet, even such companies need to take into account global players that in most cases dictate the market.

Therefore, SME should set as its goal training its employees to become effective communicators in English, who are able to do different tasks starting from answering the phone and setting appointments to presenting their company on international trade fairs. In addition to this, working across cultures implies also knowing proper etiquette and differences between given cultures. Hence, learning English should be a part of personal development of employees. It is not just that employees need English in order to communicate with their clients and partners. Being the global language, knowing English enables the employees to get further education in their own field, do additional research, read articles and journals related to their field of work, participate in different conferences and workshops and cooperate with people from abroad.

Furthermore, since language in general is closely connected with advertising and marketing, creation of sales, promotional and marketing materials in English is inevitable. The same applies to presentations of companies in English on the Internet. It is beyond the scope of this paper to discuss the language of advertising in general, however, it must be pointed out that all the material should be written in correct English. Evidently, the Internet offers many possibilities for selling products and services that are yet to be used fully, and that again is closely connected with outgrowing the local market and expanding business on the international market. Still, certain rules have to be followed when it comes to using wordplay, allusions metaphor or any kind of ambiguity as a marketing technique – the use of language should be clear and one has to be careful to avoid reference to specific cultural concepts that are not known outside one linguistic community, otherwise, such concepts will be confusing and difficult to understand. If the material is not originally written in English but translated into it, the material must be translated with great caution, in particular regarding technical terms.

Taking into account the importance of English for SME, at some point in their development SME should consider engaging and encouraging their employees in learning English. However, this process has to be organized carefully. Although most of the companies require substantial knowledge of English as part of their recruitment policy, more often than not, prospective candidates for a particular post do not possess adequate knowledge. In order to avoid such situations, companies should work on their own criteria when it comes to the level of knowledge the candidates should possess, as well as on the ways of testing this level.

Moreover, after defining precisely what kind of needs do they have when it comes to the linguistic competence of their employees, companies can help them in the process of learning. Specifically, that implies organizing tuition that would cater for the specific needs employees, i.e. the company has. In other words, the process of improving the communicative competence of the staff has to be based on those aspects that are most important and relevant for the business the particular company does. Ideally, tuition should be organized to address the needs of each individual, regarding his / her communicative

competence related to his / her position in the company and tasks he / she should do in his everyday business.

Hence tuition and classes should cover not only grammar and general vocabulary but specific vocabulary as well. This is of utmost importance because most of the translators outside the company that can be given the job of translating may not be familiar with specific vocabulary that is used in the particular business and, of course, inadequate translation can have serious consequences. This can be avoided by training employees adequately because in that way they will improve their communicative competence in English as ell as their self-confidence in using the language.

If the company cannot afford providing tuition for its entire staff, priorities have to be chosen regarding the business activities and tasks each employee does. Furthermore, exposing the staff to as many possibilities to use the language and practice their communication will have significant effects on their competence.

III. CONCLUSION

Many companies are aware of the importance of improving the communicative competence in English of their employees, so they often organize or pay for English courses. However, it is important to set this as a long term objective and accordingly, organize the training in such a way as to cater for the needs of the specific company or specific group of people. Basically, this implies determining the level of knowledge the trainees possess, and then focusing on the specific communicative tasks that are carried out in the given company. Being aware of specific needs and defining the goals helps attaining the desired level and increasing self-confidence of the employee related to his / her fluency in English. In the long run, learning English and training for specific purposes a given company will have a positive and far-reaching effect on their business.

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Automation of records of production activity of organization due to application of M-way tree structure

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Abstract – Keeping records of production activity of small and medium-sized enterprises is realized by management of documents of work orders, requests and return receipts. Automatic generation of work orders can be realized by application of normative document, which represents specification of materials and work operations necessary for production of product unit. Work orders linking and application of M-way tree structure in the process of generation, enables automation of registering of production activity. It is possible to precisely define lacking amounts of semifinished products which are necessary for realization of production plan as well as to automatically generate work orders for their production. Linking of work order documents gives another possibility for generation of total requests for entire production series, which makes the control of production process easier. If above-mentioned principle of documents linking is expanded and mechanism for transferring of offer documents to the customer into series of work orders, it is possible to automate entire production process from the moment of customer's consent to the offer to the moment of selling.

I. INTRODUCTION

Production represents process of combination of production factors with the goal of making products which satisfy human needs. Factors which make production process are: material, energy, technology, time, capacity and production organization.

Regardless of the type of activity (command, serial or mass), production process is based upon production plan. Production plan contains information on the type of products and their amount, raw materials used in the production process, the type of processing machines and the type of labor necessary for successful realization of production process. Production plan also represents basis for setting of production cost. Final product, as the result of production process is prepared for distribution, and preparation process includes definition of selling price which includes production costs, as well as energy costs, labor, packaging and transport costs and other factors which have influence on selling price.

From the point of view of business information system, intended for small and medium-sized enterprises, production activity is defined with series of documents which describe production process. Each of them has influence on the state of one or more entities of the system: production, storehouse and customer.

In order to ensure simplicity of application, which represents external factor of software quality [1], it is necessary to structure documents according to mutual pattern.

Types of documents used for description of production activity within information system are:

- **Normative document,** which represents documents which contains information on amount of materials and work operations necessary for production of product unit.
- **Work order,** which represents document based on normative document, as well as the basis for making of production plan. Work order realization marks the ending of one phase of production cycle.
- **Request for material,** which represents document that defines raw materials consumption during the production process.
- **Material return receipt,** which represents document that is used for necessary correction and matching of potential difference between the amount of material defined by normative document and the amount of material used in the production process.
- **Receipt,** which represents document that places final production into the storehouse.

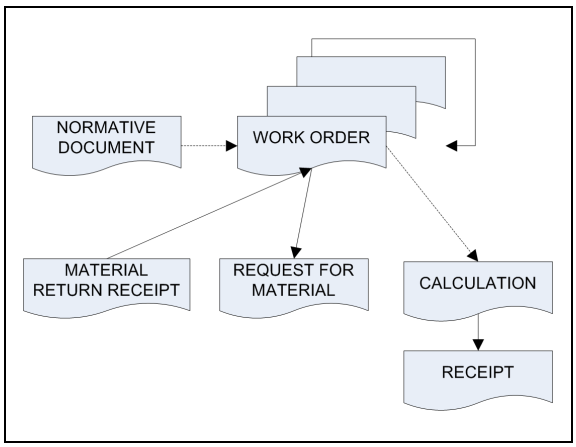

Figure 1. Interaction betweeen documents which describes production activity of organization

- **Calculation,** which represents document that defines selling price of final product.

According to normative document, Fig. 1, work order document is generated, which is, according to available state of semifinished product, linked to other, automatically generated work orders.

Control of material consumption during production process is done with documents of request and material return receipt. Receipt for produced amount of final product is made in the ending of production cycle and work order closing out. In order for final product to be available for distribution and for automation of production to be complete, calculation of selling price must precede receipt document. Calculation document must be generated because of the fact that receipt burdens the storehouse, but it does not make further distribution possible, if selling price is not defined.

II. DOCUMENT STRUCTURING

Each document within information system contains heading and items. The heading contains information important for unambiguous identification, as well as link to some of the entities of the system: product, storehouse, or customer. Document items contain products and services, i.e. work operations, as well as rebates, margins, amounts, purchase and selling prices, according to the type of the document.

Normative document represents key document in the process of automation of registering of production activity of organization. There must be at least one normative document for each product from production selection. Key attribute of the heading of normative document is final product, whereas the items contain material and work operations necessary for production of product unit.

If there is normative document for material from normative document items, this material is considered to be semifinished product. This characteristic enables automatic generation of work order documents for lacking amounts of semifinished products. If this characteristic is generalized, it is possible to automate transferring of offer documents into series of work orders for production.

Automatic generation of documents due to application of normative for production gives us the following structure (Fig. 2), whereas during the process of generation of work orders for each semifinished product you have to go through items of normative document and generate work order, if it is necessary.

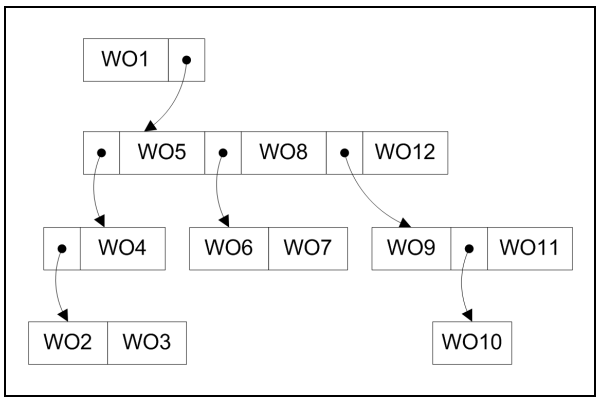

Figure 2. Linking of automatically generated work orders

Original document (WO1 in Fig. 2) generates unbalanced tree according to connections between normative documents and available amount of semifinished product in storehouse. There are two possible scenarios at the moment of automatic generation of work orders:

- you can generate work orders for production of lacking amount of semifinished product regardless of available state in the storehouse.
- you can generate work orders for production of amount which represents difference between necessary amount of semifinished product in order for production process to be successfully realized, and available amount in the storehouse.

Key is assigned to each generated work order. It is the number which follows the prefix WO in the Fig. 2. According to Fig. 2 we can conclude that:

- all key values belong to ascending order
- all values of keys in the nodes of left tree are lower than values of the key of observed node.
- all values of keys in the nodes of right subtree are higher than the value of the key of observed node.

According to [2], the structure with above-mentioned characteristics represents M-way tree.

Even though the balance of the tree has significant part in performances, in this case the tree is generated according to normative documents, whereas their mutual dependence is defined by user according to characteristics of each item from production assortment, so that the system does not balance the tree.

III. AUTOMATIC GENERATION OF WORK ORDERS

The process of automatic generation of work orders is based upon normative documents. During the process of processing of work order for each item of the document, it is checked if there is a normative for production, and if this is the case, available amount in the semifinished product storehouse is checked. If available amount of semifinished product is not sufficient for realization of production of item from original work order, work order for production of lacking amount of semifinished product is automatically generated. If this process is repeated for each item of original work order, as well as for each item of generated work orders, M-way tree of work orders is made by linking of documents.

According to [3] part of the process of automatic generation of documents can be presented by SDL diagram, Fig. 3.

Production plan demands extra effort in the process of definition of production normative. Machines and tools used during production process should be precisely

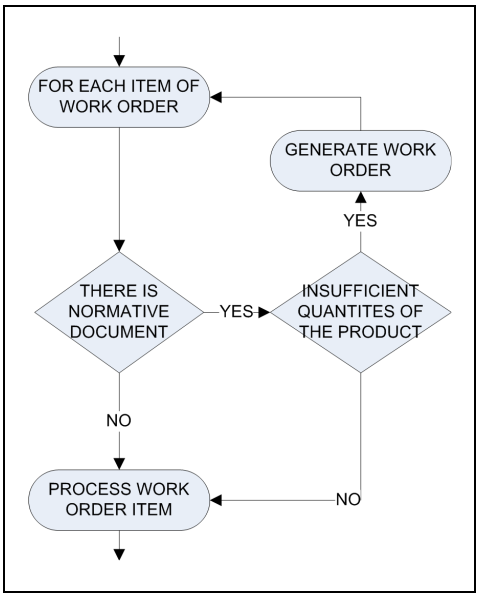

Figure 3. SDL diagram of the part of the process of automatic generation of work orders

defined, as well as the set of work operations executed by them, their mutual correlation and period of time needed for each particular operation. In order to avoid unnecessary multiplication of documents [4] and make the work easier, production scheduling is realized by linking of automatically generated documents. Therefore, information system recognizes original document and knows that its final stage depends on the realization of all automatically generated documents made during the process of making of original document. Part of the process of scheduling is transferred to user since three basic states are added to documents of work order. Work orders can be divided in three basic categories, i.e. states, so that precise registering of production activity would be ensured:

- open work orders,
- work orders in production,
- closed work orders.

Open work orders represent basis for generation of production plan. They give answer to the question what is going to be produced during the following production cycle and which material and semifinished products are needed for successful realization of production. Linking of production plan with available amount of raw materials in storehouse makes automation of purchase process possible, so that slowdown during the production could be avoided.

Arrangement of work orders in the category of work orders in production registers the beginning of production cycle. Requests and return receipt for material can be made only for work orders which belong to this category. The structure of M-way tree becomes even more significant since it enables automatic transferring of all suborders from open category to work orders in production category during the process of transferring of original work order from one category to another. Even though material request can be made separately for each work order, connection between original and automatically generated work orders enables generation of the document of total request for material for original and all automatically generated work orders.

Transfer of work order from the category work order in production to category of closed work orders, ends production cycle for original and all automatically generated work orders. In case there are no documents of material requests for selected work orders, information system will automatically generate document of total request with amounts of material according to all linked work orders. Registering of production cycle ends with generation of documents of receipt and calculation for each work order.

Receipt document places produced amount of product in suitable storehouse, whereas produced amount of product is available for further production, construction or distribution due to calculation document.

IV. ADVANCING OF THE PROCESS OF AUTOMATIC GENERATION OF DOCUMENTS

Generalization of the principle of automatic generation of work order according to normative document and mutual linking of original and automatically generated work orders makes automation of registering of production in cases when production is intended for familiar customer, possible. According to items of offer document, which contain offered series and selling price, it is possible to generate series of work orders for production. In order to maintain high level of automation and enable automatic copying of change of state of linked documents during the change of the state of original document, work order must be changed and entering of document of work order which does not have defined article which represents final product in the title, must be enabled. Original document of work order, in this case, would contain items which would be copied from offer document, whereas the process of automatic generation of work orders and their manipulation would stay unchanged.

According to the type of production, changing of some characteristics of final product (such as length, color, structure) could be enabled according to special demands of customer, during the making of an offer. Such change would be made according to flexibility of existing production process and it would result with generation of new normative documents and their linking to offer documents. Normatives which are made according to customer's demands would be used in the process of transferring of an offer into the series of work orders for production, instead of normatives which were previously defined.

V. CONCLUSION

Automatic generation of documents of work orders and their linking into structure of M-way tree makes high level of automation in the process of registering of production activity of small and medium-sized enterprises possible.

Even though, generally speaking obtained M-way tree is not balanced, this structure enables effective approach to linked documents, which directly influences total performances of the system. The entire process is based upon normative document which directly influences all parts of production cycle, from production plan making to the request for materials which are used for final product making. Thus, user can more easily adopt knowledge necessary for correct system functioning.

Automation of management of documents used for definition of production activity of organization, and enabling the user to schedule production, as well as to correct the function of production cycle, easier introducing of information system is enabled, as well as faster registering of production activity and significant support in the process of production management is obtained.

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The Rexx Enterprise Support Software System

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Abstract – This paper presents an integrative software solution for business support – Rexx System, developed by NovaCom, Niš, Serbia. Various key components of the system, including the document classification and flow routing, contract management, archive support module, invoice, technical documentation and ISO quality certification management have been analyzed. The system has been evaluated against competitive products and directions of further development have been discussed.

I. INTRODUCTION

Labeled "bicycles for the mind" by Steve Jobs of Apple [1] and fostered primarily by the military, computers were aimed at optimizing procedures in various fields, business being a key one from the beginning of their developement. Dating back to 1940's early attempts to utilize machine for demanting calculations, business support software took first form in Material Requirements Planning (MRP) system in 1960's. This expensive and maintenance-demanding system, followed by competitors, evolved through advances in hardware, operating systems and database management systems to be transformed into well-established ERP (Enterprise Resource Planning) in 1990's. [2] This branch of software industry was, at the time, considered a single most important in corporate use. [3] Today, a competitive enterprise is unimaginable without the software support from SAP, Baan, JD Edwards or PeopleSoft (some merged into Oracle [4], Infor [5] and Sage [6], while other software vendors, such as Microsoft [7], still seek to gain significant market share in this area.

While the business support software market grows richer and more complex, other issues emerge. Techniques and methods of business software selection and modes of implementation may decide on the company's survival, since an average enterprise-scale ERP implementation costs $10.6 million and takes 23 months, while a two-year maintenance span puts another $2.1 of weight. [8] For a Fortune 500 company, deployment of an enterprise ERP (such as SAP ERP), with additional hardware requirements, might exceed $100 million. [9]

Business support systems are modular in structure and as a rule designed to allow fine-tuning to each customer's needs, while built as integrative and universal enough to reach wide market. These opposite requirements generate tradeoff, adding more requirements to software vendors, but also opening doors for new business software models to supply niche markets. Since in most cases all components are not applicable to all businesses (i.e. manufacturing or human resources), certain components, such as document management system, human resources management system, enterprise content management etc grew into complete, independent solutions.

This paper describes one such solution – a document management system (DMS) developed by Nova Com software company from Niš, Serbia.

II. REXX ERP

Document management systems, often confused with similar products (like content management systems, enterprise content managers etc.), are integrative software solutions which allow storing, retreival, classification and tracking of various format documents within a closed enterprise system. They usually include document imaging to maintain compatibility with paper documents.

One such solution on domestic market (in Serbia) is offered by Nova Com, Niš. The *Rexx* Document Management System is a family of business support components, available in three flavours: as a general-purpose document management (*Rexx Documentum*), a farmaceutical business support solution (*Rex Farmaceutika*) and a human resource management solution (*Rexx Upravljanje Kadrovima – HRM*). [10] Each of these versions will be described in more detail below.

III. REXX DOCUMENT MANAGEMENT

Rexx Document Management iz an integrative case and document management system. This solution includes acquisition, creation, noting, classification, distribution, management, tracking management and archiving of cases and documents. The system operates with input and output, as well as internal and external documents, and supports processing of both hardcopy and electronic documents. It consists of six main components: Rexx DOCUMENTUM, Rexx ARHIVA, Rexx InFAKTURE, Rexx UGOVORI, Rexx TEHNOLOGIJA and Rexx ISO. Each component will be discussed in more detail.

A. RexxDOCUMENTUM

Primary application of RexxDOCUMENTUM is processing of *unstructured* documents, which constitute 70-80% of documents in a typical business setting. It also enables automated document retreival, enabling users to caputre documents from various specific applications, thus serving as unified document base.

At the core of this component is the Notary Office application (*Pisarnica*). Not only is this the node which all system clients address in order to perform automated document identification and classification; it is also the outlet throught which the user sends/receives shipments. This component can be distributed to multiple, hierarchically organized instances: one central Notary and satellite Notaries. All instances are constantly synchronized.

Input of documents in all possible formats (received through post office, fax, e-mail, Web forms, XML etc) is supported. Upon reception, automatic identification is performed (unique document ID is assigned), as well as classification (by regulations, confidence level, shipment category, document case, priority level etc). If the document is archived as hardcopy, physical backup position is assigned. All input hardcopies can be scanned and stored in PDF format. Document capturing is determined by the document receiver, with possible additional carbon copy receivers. At capture time the document becomes available online and all receivers are notified on reception. Capturing by scanning is customizable; from a large scale OCR system to small scanning devices. This system uses same principles in processing company's internal documents.

RexxDOCUMENTUM enables user to store and search/retreive a case or a document in a straightforward fashion. This is accomplished in two ways: by systematization of cases and documents in the file-case(s)-document(s) structure, and efficient database search capability. Grouping of files is also possible and customizable to company's needs; one such case is shown in Figure 1.

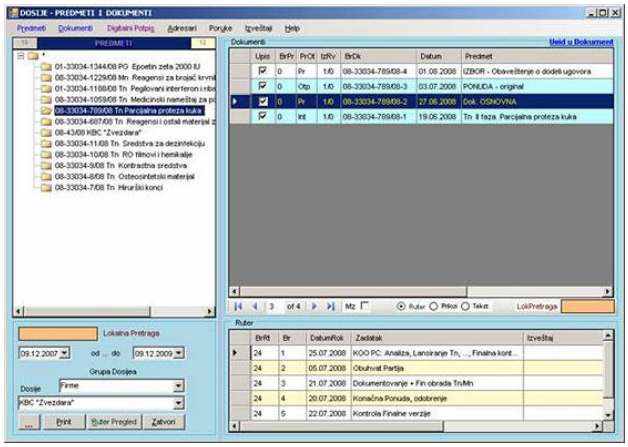

Figure 1. Cases-Files-Documents View

Tracking of cases and documents for sequential processing or viewing is performed by the RexxDokKlijent application, controlled by RexxROUTER. RexROUTER is activated whenever a specific route is required for an entity. Once the route is defined, all included users are notified, and the user sequence is clearly stated. Users can create interdependant documents based on the base document. Additionally generated documents can be viewed at any node of the route they're created in. Routes can be standard and custom, driven by specific needs. Additional corrections of a route are possible. A typical route specification is shown in Figure 2.

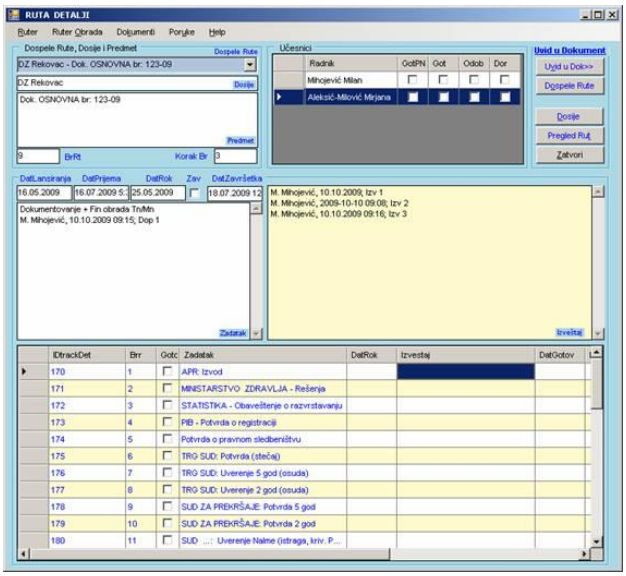

Figure 2. Document Routing

All documents in the system can be watermarked if needed. A watermark example is shown in Figure 3.

Figure 3. Watermarking Example

As a rule, the document is assigned with an ID watermark in order to denote its reception or sending. Wattermark attributes are set by the user. Watermarks other than ID can be assigned as well, denoting specific procedure or document status (eg. Consentaneous, Rejected), expenditure seal for input receipts, containing data about expenditure location, type, event as well as names of persons confirming, concurring and approving.

From the technical point of view, RexxDOCUMENTUM performs equally in LAN and WAN environment, with no constraints in terms of geographical distribution. The system can be deployed in two ways: as host-centric and distributed. The host-centric system is configured upon one server installation, while the distributed variant is deployed through server

subsystems, according to needs. Document creation, acquisition and storring are performed in a specific server domain, while document querrying and editing can be performed over the entire system. Various synchronization scenarios are possible on customer request. These functionalities are enabled by the XML Web Services system architecture. System can also be delivered with or without Microsoft Content Server/Share Point Portal Server, the latter adding powerful collaboration platform. In the non-Content Server configuration scenario the document repository is stored into the Microsoft IIS Web Server. The RexxDOCUMENTUM logic architecture is shown in Figure 4, and its application architecture is shown in Figure 5.

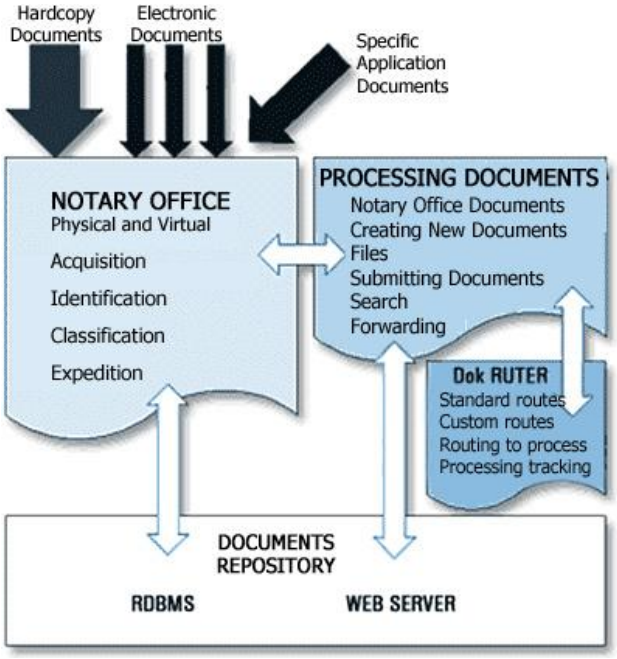

Figure 4. RexxDOCUMENTUM Logic Architecture

B. *RexxARHIVA*

This module is a straightforward and fast electronic archive solution, using the unique database and allowing document accessibility from all points of the system. Archiving expenses are significantly lower, especially if a qualified digital signature is applied for document originality guarantee. This way legal validity of the document is preserved in its digital copy, which allows the original hardcopies recycling.

Document hardcopies are digitally archived through scanning. PDF format is recommended, but the user can choose any preferred. Scanning hardware is delivered according to preferred archiving capacity. Within the archiving procedure each document is assigned with all the attributes needed (document ID, timestamp etc) while identification and classification is automated. Ultimately the document is stored in the Archive Book with the appropriate archiving number. This procedure is fast and allows the archive of nearly any size to be kept up to date daily.

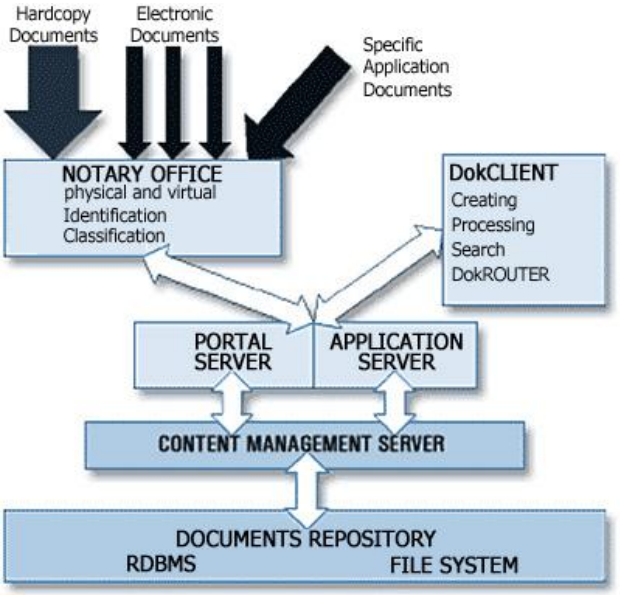

Figure 5. RexxDOCUMENTUM Application Architecture

The archive can be available on the intranet, regardless of network size or topology complicity. The documents are available within the partners' files and through the document database search. Documents can be viewed through the web browser. If needed, any group of documents can be transferred onto any storage media.

C. *RexxInFAKTURE*

This invoice tracking module takes scanned hardcopy documents as input. The input invoices are assigned with all parameters (including VAT parameters) needed in acquisition-time and classified by the system. Receipt routes are custom defined and data on all financial obligations is available to all personnel. Certain stages in invoice processing can be watermarked or sealed as shown in Figure 3. This module is fundamental for accounting, as it provides all the financial data needed in a logically ordered form. For less than 10.000 documents per year this component can run on a single PC (both client and server). Higher requirements would dictate separate server and multiple workstations (clients).

D. *RexxUGOVORI*

This component (RexxCONTRACTS) provides electronic contract management and archiving and follows same basic principles as other RexxDOCUMENTUM components: hardcopy are acquired as scanned, assigned with all data needed and automatically classified. It also provides additional documents management (notes, annex files etc).

E. *RexxTEHNOLOGIJA*

This component (RexxTECHNOLOGY) is the technical documents management subsystem. Documents can be created within any CAD or other application or acquired by scanning (if available as hardcopy only). Specific types of documentation (licensing, service etc) can be watermarked if needed.

F. Rexx ISO

This component is itself an integrative system for managing ISO Quality documents (such as ISO9000, ISO14000, OHSAS etc). The entire document management process is supported, ranging from quality teams and boards operational management to documents creation and editing, to distribution, application and maintenance. All options present in other listed components are available in RexxISO, including structured documents management, acquisition of electronic and hardcopy documents, automated classification etc.

IV. REXX HRM

RexxHRM is a human resource management system that can be deployed independently from the Rexx document management solution, or operate as a complement to it. The single system can support multiple businesses. It has a three-tier architecture and operates both in local and wide area network. It consists of three components: RexxKADROVI (RexxHR), RexxRadnoVREME (RexxWorkHOURS) and RexxEDU.

RexxKADROVI consists of Organization & Systematization and Human Resource Management components. The first includes organizational scheme creation and updating and positions systematization. The second includes applications tracking and filing, employee files, positions distribution, leaves, vacations and reporting on all supported categories. A screenshot of this component is shown in Figure 6.

RexxRadnoVREME, shown in Figure 7, brings comprehensive overview of working hours. The data can be fed by the operator, or the system can operate coupled with automated presence detection system. Entire administration is supported, including carnet reports for income calculation.

RexxEDU, shown in Figure 8, is the education management system. It includes creating and updating course lists, education plans, success tracking, teachers and learners management and education expenses tracking.

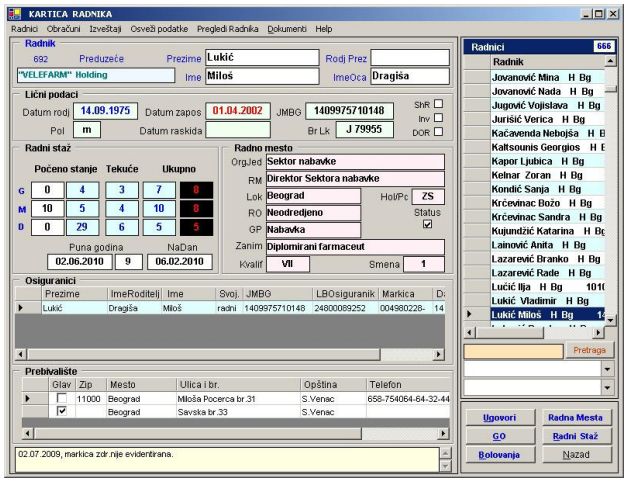

Figure 6. RexxKADROVI HRM Support

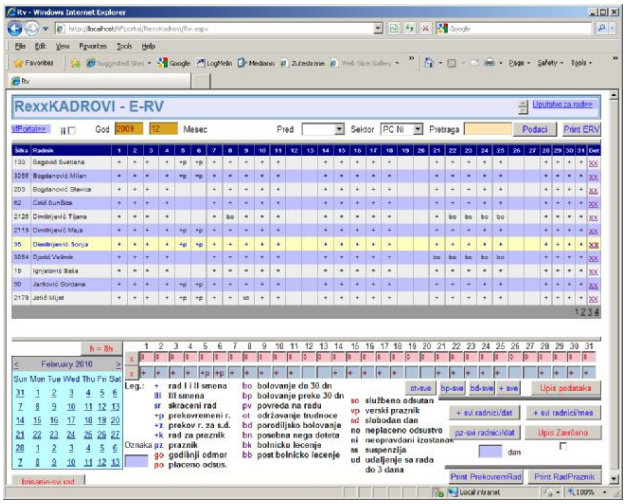

Figure 7. RexxRadnoVREME Working Hours View

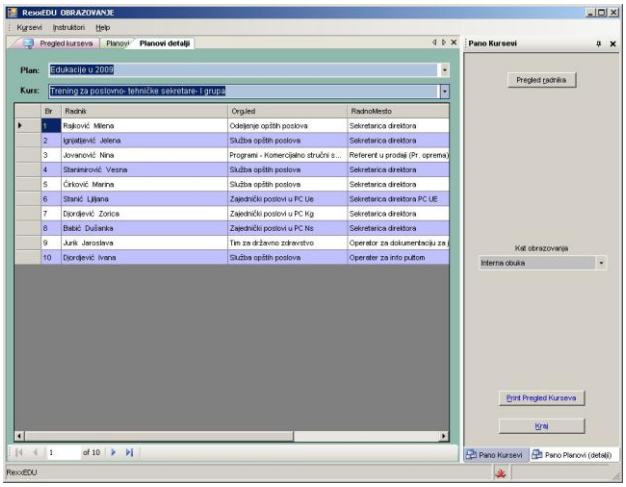

Figure 8. RexxEDU Employees' Training Management

V. REXX FARMACEUTIKA

This solution is a business support software for pharmaceutical distribution enterprises. It consists of four components: RexxTENDERI, RexxATESTI, RexxE-MailATESTI and RexxNAPLATA.

RexxTenderi (RexxTENDERS), shown in Figure 9, supports complete sale process through public purchases, from filing adverts to registering outcomes. The user is capable of TENDER transactions management as well as of document acquisition and processing of documents. The set of tools for data analytics is available.

RexxATESTI (RexxATESTS) enables user to create and manage operational certificate documents and quality attests in any business area. The system supports entire document lifecycle, from e-documents creation and paper documents acquisition to distribution. Documents are network visible and their accessibility can be managed through user privileges. RexxE-mailAtesti is a complementary component that supports automated distribution of operational certificates (which can be attached to delivery invoices or the new documents distribution process to specified partner list).

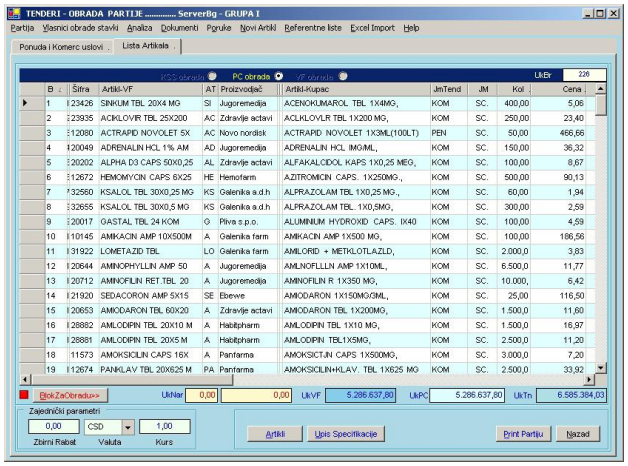

Figure 9. RexxTENDERI Public Purchace Support

RexxNAPLATA (RexxCHARGE) is a operative charge management solution. Entire claims can be processed, as well as Republic Institute for Health Insurance (RIHI) charge claims. This solution is optimized for claim management team's support, from planning to the operational level actions. This component connects to the IT financial subsystem, from which it gains data on claims and payments.

VI. CONLUSION

Rexx set of document management tools, provided by NovaCom Niš, Serbia, is an integrative business support solution. Among competitive products, such as Spider.Net by MFC Komerc [11], OSA [12], Prozone [13], EMC Documentum [14] and SRC [15], the Rexx system offers various similar and certain different functionalities. However, primary advantage of Rexx system is the high level of flexibility of its vendor NovaCom and its ability for prompt reactions to any client's unique needs, as well as the modular structure of the Rexx family, where each module can be deployed separately and custom elements can be combined. Understanding the tradeoff between universality of one comprehensive product (however much it has been designed by multiple clients' repetitive requirements) and specific requirements of each individual enterprise, NovaCom has developed the strategy to closely cooperate with every customer and tailor the Rexx family to any specific business process. Though this puts additional pressure to development sector, this strategy proved best, especially for large clients, such as Velefarm Pharmaceutical Corporation [16] or Ministry of Internal Affairs of the Republic of Serbia [17].

The primary course of further development is oriented towards the implementation of digital signature. Though this area is to some extent regulated [18], digital signatures are not yet put in practice in Serbia, primarily due to unresolved issues regarding certification bodies. The enterprise documents flow turned completely digital, powered by acceptable digital signing feature is expected to facilitate a significant leap towards the concept of green, paperless office, which is the vision of NovaCom Company.

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Business Decision Making by Systematic Syntactic Classification of Objects

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Abstract – This paper presents a possible way of business decision making by Systematic Syntactic Classification of Objects (SSCO). Possibilities that SSCO system offers, as well as its relation with rough sets, are described. Well-known German Credit dataset has been used as an example for business decision analysis. Based on the given data on a credit applicant, each applicant has been marked as "good" or "bad". SSCO system yielded relations through IF-THEN rules which enable the classification of all applicants. A comparison to other systems, also using German Credit dataset, has been made.

I. INTRODUCTION

In the process of business decision making many factors are interlaced such as attribute selection, parameter selection, selection of the type of analysis, dataset selection etc. The business analysis can be conducted by many different approaches. Because of the complexity of contemporary business decision making, the algorithms from the domain of artificial intelligence are used. There are many different approaches such as: neural nets, decision trees, rough sets, graph-based relational concepts and many others. Every particular problem which has to be solved needs a convenient approach.

For business decision making process in small and medium sized enterprises (SMEs) when domain experts are not available, software tools based on the artificial intelligence algorithms are very useful and cheep solution. The main tasks where artificial intelligence tools are commonly used are [1]: Approximation, Optimization, Classification, Prediction, Generalization, Relation-making, Abstraction, Adaptiveness. In this paper will be shown how to use artificial intelligence tools as well as soft computing tools based on SSCO [2,3] for: Prediction, Generalization and Relation-making. The prediction of the output data is achieved according to the inputs which are continuous or discrete. Outputs are continuous only In this property lies the main difference between prediction and classification. Generalization is used when according to a training set some general patterns are extracted and used to classify unseen object. As was mentioned in [1], general patterns enable more precise classification or prediction. Relation-making process defines relations between input and output as well as between different attributes. This approach is used to make a groups of input data as well as a relations in each group.

The paper deals with the possibilities of business decision making by usage of the SSCO system. The German Credit data [4] is used as an example data set in order to decide which attributes are most relevant to decision making process. Based on the given data on a credit applicant, each applicant has been marked as "good" or "bad". The SSCO system generated decision rules in the IF THEN form.

In second section of this paper, theoretical bases of the SSCO system are described The linkage between SSCO and the rough sets theory is underlined The third section contains description of the German Credit data. Fourth section contains the results of the SSCO when applied to German Credit dataset. In fifth section a comparison between SSCO achieved results and results achieved by some other systems is given. The conclusion is given in a section six.

II. SSCO SYSTEM

The SSCO system was developed in the 2005 – 2007 period as a result of doctorial research of V. Brtka [2,5]. The theoretical fundaments are based on the rough sets theory as a part of broader domain of the soft computing and on classical theory of the state space search. Both theories are very useful for automated decision rules synthesis. SSCO algorithm is an original approach which is compatible with the rough sets theory in many applications [6].

A. Rough sets theory

The rough sets theory was originally discovered by Zdzisław I. Pawlak in 1980s. He has developed the mathematical tool to cope with ambiguous and incomplete data, as well as with the vague concepts. As the mathematical basis of this theory, there is an indiscernibility relation defined on an information system in the context of the rough sets [7]. Let U be a universe (finite set of objects), $Q=\{q_1,q_2,\ldots,q_m\}$ is a finite set of attributes, V_q is the domain of attribute q and $V=\bigcup_{q\in Q}V_q$.

Definition 1. *Information System.* An information system is the quadruple $S=\langle U,Q,V,f\rangle$ where $f=U\times Q\to V$ is a total function such that $f(x,q)\in V_q$ for each $q\in Q,x\in U$, called information function.

If some of the attributes are interpreted as outcomes of classification, then the information system $S = \langle U, Q, V, f \rangle$ can be defined as a decision system by $DS = \langle U, C, D, V, f \rangle$, where $C \cup D = Q$, $C \cap D = 0$. Set C is called the set of condition attributes and set D is called the set of decision attributes [7]. In practice, there is one decision attribute.

Definition 2. *Indiscernibility Relation.* To every non–empty subset of attributes P is associated an indiscernibility relation on U, denoted by I_P:

$$I_P = \{(x, y) \in U \times U : f(x, q) = f(y, q), \forall q \in P\} \quad (1)$$

The relation (1) is an equivalence relation – reflexive, symmetric and transitive. The family of all the equivalence classes of the I_P is denoted by $U|I_P$ and class containing an element x by $I_P(x)$ [8].

Definition 3. *Set approximations*. Let X be a non–empty set of U and $\varnothing \neq P \subseteq Q$.

Set X is approximated by means of P–lower (2) and P–upper (3) [8] approximations of X:

$$\underline{P}(X) = \{x \in U : I_P(x) \subseteq X\} \quad (2)$$

$$\overline{P}(X) = \bigcup_{x \in X} I_P(x) \quad (3)$$

The P–boundary of X is denoted by $Bn(X)$:

$$Bn(X) = \overline{P}(X) - \underline{P}(X) \quad (4)$$

One natural dimension of reducing data is to identify equivalence classes. This could be achieved by keeping only those attributes that preserve the indiscernibility relation and consequently, set approximation. The rejected attributes are redundant (superfluous) since their removal cannot worsen the classification. Let $\varnothing \neq P \subseteq Q$ and $a \in P$. Attribute a is superfluous in P if $I_P = I_{P-\{a\}}$, otherwise it is indispensable attribute. The set P is orthogonal if all its attributes are indispensable. The set $P - \{a\}$ is a reduct of P if it is orthogonal and $I_P = I_{P-\{a\}}$ [6].

It is possible to find the minimal set of consistent decision rules (logical implications) that characterize some sample system which describes an information system. It is possible to investigate rules of the form: IF α THEN β. Here α (rule's antecedent) denotes a conjunction (AND logical operator) of descriptors that only involve attributes of some reduct and let β (rule's consequent) denote a descriptor $d = v$, where d is decision attribute and v is allowed decision value [6].

Reduct set is not unique in every situation, there is a possibility that multiple reduct sets are calculated. It is very important to find minimal (shortest) reduct set Minimal reduct set produces shortest decision rules.

The length of generated rules is directly proportional to used reduct set: all attributes from reduct are used in the IF part of each rule [2].

B. The description of the SSCO system

There are multiple variations of the SSCO system. In this research the version 3.4 is used. There are standalone versions of the SSCO system as well as the version which was incorporated to a web based system in order to enable functionality for data analysis (www.tfzr.uns.ac.rs/dawp).

The main menu have four items: File, Task, Output and About. File menu item is shown on Figure 1. This menu item enable the loading of the input data and output of the generated rules in the matrix form.

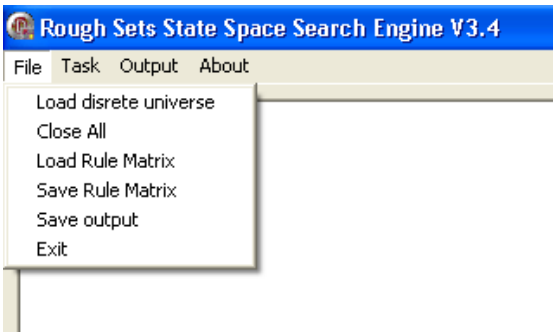

Figure 1. SSCO system – File option

A special feature that SSCO system offers is to generate a small number of rules, which in practice allows easier and faster manipulation. This is well demonstrated in working with medical data [2, 5]. The Task option is shown on Figure 2. This option enables a choice of the format in which results of the analysis are presented.

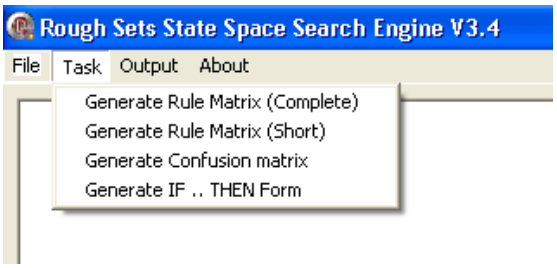

Figure 2. SSCO system – Task option

The results of the SSCO system are in the IF THEN form accompanied by the probability measure, so that results can be evaluated accordingly. In the IF THEN rule:

```
[4,  0.75]    IF  (a1,1), (a2,6),
(a3,4), (a4,1) THEN (a6,1)
```

a pair `[4, 0.75]` represents a number of the objects which support the rule and probability of the rule.

The IF part of the rule contains the condition attributes and their corresponding values while THEN part of the

rule contains decision attribute and the corresponding value.

The previously described rule set is accompanied by so called confusion matrix. Confusion matrix C is a $|V_d| \times |V_d|$ matrix, where V_d is the set of possible values of decision attribute. This matrix with integer entries summarizes the performance of rule set while classifying the set of objects. Entry:

$$C_{i,j} = \left|\{x \in U : d(x) = i, \bar{d}(x) = j\}\right|,$$

where $d(x)$ is the actual decision and $\bar{d}(x)$ is the predicted decision, which counts the number of objects that really belong to class *i*, but were classified to class *j*. The classification percentage is calculated based on a ratio of the number of diagonal elements of the matrix (sum of the diagonal elements) and total number of the objects.

It is important to notice that confusion matrix generated by SSCO system was formed without any voting system so that one object could be classified to more than one class by some inexact rules.

III. GERMAN CREDIT DATA

German Credit data is a well known dataset which was donated by Professor Dr. Hans Hofmann from Institut fűr Statistik und Őkonometrie, University of Hamburg [4]. Number of Instances is 1000. Two datasets are provided: the original dataset, in the form provided by Prof. Hofmann, contains categorical/symbolic attributes. For algorithms that need numerical attributes, Strathclyde University produced the file "german.data-numeric", which contains 24 condition attributes and one decision attribute. Table I shows the attributes and their values.

TABLE I. ATTRIBUTES OF GERMAN CREDIT DATASET

Attribute	Type	Values
Checking account	qualitative	1: < 0 DM; 2: $ 0 and < 200 DM; 3: $ 200 DM/salary assignments for at least one year; 4: no checking account
Duration (in months)	numerical	
Credit history	qualitative	0: no credits taken/all credits paid back duly; 1: all credits at this bank paid back duly; 2: existing credits paid back duly till now; 3: delay in paying off in the past; 4: critical account/ other credits existing (not at this bank)
Purpose	qualitative	0: car (new); 1: car (old); 2: furniture/equipment; 3: radio/television; 4: domestic appliances; 5: repairs; 6: education; 7: vacation; 8: retraining; 9: business; 10: others
Credit amount	numerical	
Savings account	qualitative	1: < 100 DM; 2: $100 and < 500 DM; 3: $500 and < 1000 DM; 4: $1000 DM; 5: unknown/no savings account
Present employment since	qualitative	1: unemployed; 2: <1 year; 3: $1 and < 4 years; 4: $4 and < 7 years; 5: $7 years
Installment rate in percentage of disposable income	numerical	
Personal status and sex	qualitative	1: male, divorced/separated; 2: female, divorced/separated/married; 3: male, single; 4: male, married/widowed; 5: female, single
Other parties	qualitative	1: none; 2: co-applicant; 3: guarantor
Present residence since	numerical	
Property	qualitative	1: real estate; 2: if not 1: building society savings agreement/ life insurance; 3: if not ½ : car or other; 4: unknown/ no property
Age in years	numerical	
Other installment plans	qualitative	1: bank; 2: stores; 3: none
Housing	qualitative	1: rent; 2: own; 3: for free
Number of existing credits at this bank	numerical	
Job	qualitative	1: unemployed/unskilled-non-resident; 2: unskilled-resident; 3: skilled employee/official; 4: management/self-employed/ highly qualified employee/officer
Number of people being liable to provide maintenance for	numerical	
Telephone	qualitative	1: none; 2: yes, registered under the customers name
Foreign worker	qualitative	1: yes; 2: no
Score of the applicant	qualitative	1: Good; 2: Bad

This dataset requires use of a cost matrix:

```
        1          2
----------------------
  1     0          1
----------------------
  2     5          0
```

where 1 = Good, 2 = Bad. The rows represent the actual classification and the columns represent the predicted classification.

So, it is much worse to classify a customer as good when he is bad (5), than to classify a customer as bad when he is good (1).

IV. RESULTS

In the data analysis process all condition attributes were analyzed in order to extract those which have a greatest impact to a decision. Following attributes have been extracted:

- Status of existing checking account

- Duration
- Credit history
- Savings account
- Other installment plans

The objects of the universe are separated to two sets: training set (500 objects) and test set (500 objects).

According to training set, SSCO system produced 350 rules in the IF THEN form:

```
IF THEN Form
[1,1]       IF  (a1,4), (a2,60),
(a3,4) THEN (a6,-1)
[1,1]       IF  (a1,4), (a2,60),
(a3,2) THEN (a6,-1)
[1,1]       IF  (a1,4), (a2,54) THEN
(a6,-1)

…

[1,1]       IF  (a1,1), (a2,6),
(a3,4), (a4,3) THEN (a6,-1)
[4,0.25]    IF  (a1,1), (a2,6),
(a3,4), (a4,1) THEN (a6,2)
[4,0.75]    IF  (a1,1), (a2,6),
(a3,4), (a4,1) THEN (a6,1)
[2,1]       IF  (a1,1), (a2,6),
(a3,2), (a4,3) THEN (a6,-1)
[2,0.5]     IF  (a1,1), (a2,6),
(a3,2), (a4,1), (a5,3) THEN (a6,2)
[2,0.5]     IF  (a1,1), (a2,6),
(a3,2), (a4,1), (a5,3) THEN (a6,1)
[1,1]       IF  (a1,1), (a2,6),
(a3,2), (a4,1), (a5,1) THEN (a6,-1)
```

The objects from the test set are classified by these rules, so that following confusion matrix has been created:

```
Confusion matrix:
        1       2


1       236     90


2       96      83
```

249 objects are classified by exact rules, 128 objects classified by inexact rules, 123 objects are not classified

The SSCO system has correctly classified 75,4 % of objects.

Further test was conducted on two attributes:

- Status of existing checking account
- 1-good, 2-bad

in order to compare the SSCO results wit the results of some other systems. According to training set, SSCO system has generated following rules in the IF THEN form:

```
IF THEN Form
[197,0.091] IF  (a1,4) THEN (a2,2)
[197,0.908] IF  (a1,4) THEN (a2,1)
[31,0.193]  IF  (a1,3) THEN (a2,2)
[31,0.806]  IF  (a1,3) THEN (a2,1)
[144,0.402] IF  (a1,2) THEN (a2,2)
[144,0.597] IF  (a1,2) THEN (a2,1)
[128,0.421] IF  (a1,1) THEN (a2,2)
[128,0.578] IF  (a1,1) THEN (a2,1)
```

For further classification process of the test set, two most reliable rules were separated:

```
[197,0.908] IF  (a1,4) THEN (a2,1)
[31,0.806]  IF  (a1,3) THEN (a2,1)
```

These rules mean:

if Checking account = 4 then Applicant = good

if Checking account = 3 then Applicant = good

The confusion matrix was generated from test set by two these rules:

```
Confusion matrix:
        1       2


1       336     336


2       164     164
```

0 objects are classified by exact rules, 500 objects classified by inexact rules, 0 objects are not classified

This confusion matrix approves reliability of the selected rules.

V. COMPARISON

The comparison is done by the insight to the results published in [9] for the same German Credit data. As in [9] decision rules were generated by multiple algorithms, so training set produced following rules:

if (Checking account ≥ 3) then Applicant = good

if (Duration = 1) and (Other installment plans ≥ 2) then Applicant = good

```
if (Other installment plans ≥ 2) and (Credit history = 4) then Applicant = good

if (Duration = 1) and (Credit history = 4) then Applicant = good

if (Savings account ≥ 3) then Applicant = good

if (Other parties = 3) then Applicant = good
```

Table II presents the results of C4.5, C4.5rules, Neurorule, Trepan, and Nefclass to the discretized data sets. Results that are obtained are:

TABLE II. RESULTS (DIFFERENT ALGORITHMS)

Data Set	Algorithm	Train (%)	Test (%)
German credit	C4.5	80.63	71.56
	C4.5 rules	81.38	74.25
	Neurorule	76.13	75.15
	Trepan	75.38	73.95
	Nefclass	73.57	73.65

Attributes selected by several different algorithms were also selected by SSCO system which is very important. Some rules generated by SSCO system can be merged to one rule:

```
if Checking account ≥ 3 then Applicant = good
```

This rule can also be find in the resulting decision rules list generated by several different algorithms. Other relevant attributes can be used to check the relevance of other decision rules. This is a confirmation of the relevance of the attributes: Status of existing checking account, Duration, Credit history, Savings account and Other installment plans which were selected by SSCO system.

In [10] GP algorithm was compared to C4.5 algorithm, similar results were obtained. Some results are shown in Table III:

TABLE III. GP AND C4.5 COMPARISON

Data Set	Algorithm	Average
German credit	simple GP	27.1
	C4.5	27.2

According to this, we can conclude that SSCO system is applicable for tasks of classification and prediction of the German Credit data.

VI. CONCLUSION

This paper deals with the description of the SSCO data analysis system which is based on theoretical domains of artificial intelligence and soft computing (rough sets theory and state space search) It is shown how to use SSCO system for classification and prediction tasks. Both, classification and prediction are very important in the business decision making process. The SSCO system was described. The performance of the system was tested on German Credit data. It is shown how to operate with multiple attributes in business decision making process.

The results obtained by SSCO system are compared to the results obtained by some other systems on the same German Credit data. It is shown how SSCO system can be used for decision rules synthesis. These rules are accompanied by probability measure. The results of the SSCO system largely coincide with decision rules generated by other systems. This shows a quality of the SSCO system.

Finally, we can conclude that systems for the analysis of data, such as SSCO system, are very useful in the domain of business decision making. These systems are very useful for small and medium sized enterprises because they are cheep and easy to implement and use.

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Software maintenance support activities: Challenges for very small software companies

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Abstract – Software maintenance is a set of activities performed in order to ensure proper functioning of software systems. Maintenance activities are event driven and usually are initiated by customers. Maintenance support or front-end maintenance activities are activities that provide direct contact to customers, and therefore are very important for business success of software companies. These activities in some cases require execution of back-end maintenance processes that are realized on software products. Because of specific organization of small software companies, and identified problems in their business, support activities play important role for their success in market. In this paper are outlined some challenges for very small software companies in the field of software maintenance support.

I. INTRODUCTION

Maintenance technologies supported with information technologies (IT) emerged 40 years ago [1]. Published research results revealed that maintenance has great impact on business performance such as productivity and profitability [2][3]. Implementation of effective maintenance procedures and strategies can significantly reduce problems that occur during system usage. In the context of engineering, maintenance has a wide range of meanings and includes all actions related to preserving consistency and efficiency of complex systems [4]. Cigolini et al. stated [4]: "*The scope of maintenance has grown to include not only system repair, but also system safety, economic viability, quality, and the most appropriate use of environmental resources.*"

Software maintenance is generally defined as any work performed on software system that is operational and used by customers. Parikh provide the most comprehensive definition of software maintenance [5]: "*Software maintenance is the work done on a software system after it becomes operational. It includes: understanding and documenting existing systems; extending existing functions; adding new functions; finding and correcting bugs; answering questions for users and operations staff; training new systems staff; rewriting, restructuring, converting and purging software; managing the software of an operational system; and many other activities that go into running a successful software system.*"

The maintenance phase of software life cycle begins after development and delivery of a software product, although some maintenance activities can be performed also during software development. Software maintenance should be seriously considered because the maintenance costs can be several times higher than the costs during the development, especially for product with long life [6]. In literature can be found that maintenance costs are between 40% and 90% of whole costs in software life cycle. Despite that fact, software maintenance is in literature considered as the last phase in software life cycle with little attention comparing to software development. The consequence is that maintained software contains more errors than initially delivered software [7].

There are many reasons for software maintenance activities, but generally, software maintenance tasks are more complex then tasks during software development. The reasons for that are [7]:

- Documentation does not exist, or it is poor (major cause of distrust of the documentation by engineers in maintenance [8]).
- Difficulties in understanding code written by someone else.
- Programmers that develop software usually are not available to answer questions about software. Programmers are unavailable or they cannot be identified [9][10].
- Software is not designed to be easily modified.
- Maintenance is less attractive than development. Maintenance tasks are often avoided in practice [11], or are consider to be intellectually boring and tedious [12]

The main difference between software development and maintenance is that development is requirement-driven and maintenance is event-driven [13]. This means that maintenance activities are unscheduled or random events initiated mostly by customers, but also can be initiated by maintenance human resource (engineers or managers) or even by market.

Software maintenance activities are usually triggered by customers (software end users), and therefore software companies should provide efficient support services that will help in solving customer requests. The first contact with customer is handled by operative support that assists customer in submitting requests. This operative support is in practice realized as font-end support that can be independent organizational unit in a software company or is integrated into other organizational units (maintenance unit, development unit). Nevertheless, maintenance front-

end support requires more research, especially in small software companies that have specific organization and usually do not have organizational units dedicated to specific activities.

The rest of the paper is structured as follows. In the second section are outlined maintenance activities, while in the third section are outlined basic concepts of maintenance support and support activities. After that are outlined maintenance support challenges for very small software companies, and some concluding remarks.

II. SOFTWARE MAINTENANCE ACTIVITIES

Software maintenance includes short-term activities (e.g., fixing critical problems) as well as long-term activities (e.g., a major enhancement to an existing system that result in new version of existing system or in completely new software system) [14]. Nevertheless, the maintenance is generally viewed as a collection of short-term activities.

Ontology of maintenance activities is presented in [13]. Definitions of the elements in the ontology are given in Table I. Different maintenance activities require different tools and techniques, and also different skills and knowledge for maintainers. For example, different knowledge is necessary for analyzing customer problem reports and for providing training to customers. In practice, training for software system usage do not require knowledge about source code or deeper knowledge about the software architecture, while this knowledge is necessary for solving reported problems that require interventions on the software system. Further, corrective activities may require only the ability to locate faulty code and make local changes, while an enhancement activity may require a broad understanding of a large part of the product (its architecture) and various technologies used during development [8].

TABLE I. MAINTENANCE ACTIVITY ONTOLOGY DEFINITIONS [13]

Activity	An action of one of the following types: an investigation activity, a modification activity, a management activity, or a quality assurance activity. An activity may be made up of a number of sub- activities. Usually, it takes as input one, or more existing artifacts and outputs zero, one or many new or modified artifacts.
Investigation activity	An activity that assesses the impact of undertaking a modification arising from a change request or problem report.
Modification activity	An activity that takes one or more input artefacts and produces one or more output artefacts that, when incorporated into an existing system, change its behaviour or implementation.
Management activity	An activity related to the management of the maintenance process or to the configuration control of the maintained product.
Quality assurance activity	An activity aimed at ensuring that a modification activity does not damage the integrity of the product being maintained. Quality assurance activities may be classified as testing or certification activities.
Resource	Everything that is used to perform an activity. Resources may be hardware, software or human resources.

The most common activities in maintenance are modification activities that are, further, divided into: corrections and enhancements. Both, corrections and enhancements change software systems, but it is very important to clearly distinguish between them because they are differently observed from the financial point of view. In practice, corrections are in many cases free of charge to users, while enhancements are charged to users because they include new development and require understanding of the whole software product.

Maintenance activities can be also classified according to various levels of granularity, including the line of code level, change-log level, module level, and program level [15]. Various granularity levels require different skills and knowledge, different tools and techniques. For example, change activity at the level of the lines of code requires knowledge and skills in appropriate programming language, and usage of tools that help in finding the difference between versions of source code files (for example differences in the code can be found with *diff* utility that is integrated in many modern development environments). At the other hand, maintenance activities at module level, or program level requires additional knowledge about software architecture, requires usage of advanced modeling tools (UML modeling, conceptual modeling, XML modeling), and requires the knowledge of various technologies.

Findings of empirical study about the factors which determinate maintenance activities [16], showed that there exist predictable maintenance patterns for the business software systems. These results confirmed that usage of appropriate management and planning methods can improve various maintenance activities, and even reduce them.

Four processes that pertain to the quality of software maintenance are [17]:

- Translate customer expectations with respect to maintenance into clear service agreements.
- Use these service agreements as a basis for planning and implementing maintenance activities.
- Ensure that maintenance is done according to planning and procedures.
- Manage the internal (in software company) end external (with customers) communication about the maintenance activities carried out.

III. SOFTWARE MAINTENANCE SUPPORT ACTIVITIES

The business in many organizations is highly dependent of IT and, therefore these organizations need various kind of support during the operation and the exploitation of their IT systems. The most of the costs related to IT are IT services costs that consist of the costs of integration, operation and exploitation of IT systems [18]. These IT services include performance and

availability support, end-user and help desk support, education, and technical operation. In practice, there is still a lack of formal and structured customer orientation in IT Service Management, which is also reflected on software maintenance support services. One possible solution for this problem is usage of Service Level Agreement (SLA) as an instrument for the management of the customer's expectations [17][18]. This implies that software maintenance support can be seen as providing services to customers.

A quick and accurate response and support to customers' requests ensures their satisfaction and increases the quality of provided services. This support primarily depends on experience and skills of support personnel [19]. The beneficiaries of the efficient support are both customers and organization that provides support (customer support people and mangers).

In software companies, support activities are part of front-end support, or upfront maintenance. These activities are oriented towards customers to assist them in the operation of their software and/or integrated software and hardware products [20]. This support is focused on providing immediate help to customers when they encounter problems or difficulties that prevent them from conducting their daily business.

In practice, front-end support activities vary from technical support, to participation in testing, quality auditioning, education and training, handling of emergency cases to management of customer profiles. These support activities are more or less integrated or related to the evolution and maintenance work. For example solving reported problem is closely related to evolution and maintenance, while providing training about newly integrated feature in a software product is not related to maintenance work. Each software company provides a set of support activities. The list of empirically identified types of support activities is presented in Table II [21].

The most common constellation of support levels in organizations that provide software maintenance support is presented in Figure 1. This organization is based on research reported in [20][22]. In many software companies do not exists all these levels. Each software company tailors support activities according to available resources.

At customer level are executed customer business processes supported by various software products. At this level customer identified problems or require new features in existing software products, report requests to a software company, and later helps in integrating new solutions in their business environment.

Front-end support level is primarily engaged in providing a continuous feedback to customers. The most of the working time support people spent in interactions with customers. Personnel at this level collect requests from customers, do the preliminary analyses and solve all requests that are in their domain of expertise. During the work, support personnel require help, and they find it in documentation, database, ask their colleagues (from front-end or back-end level), or even ask customers [23].

At this level are placed activities such as consultation, help desk, education and training, problem and requests elicitation, and delivery of solutions to customers. In some cases, companies at this level organize help desk [24], or software hot lines [25]. Personnel at this level have general knowledge about software and required IT infrastructure for its proper functioning. More complex problems or requests that require deeper understanding of software product are forwarded to back-end support level.

TABLE II. TYPES OF FRONT-END SUPPORT ACTIVITIES [21]

Software problem management
Testing
Participate in change management process
Quality Control
Consultation
Technical Support
Education and Training of customers
Self-education and training
Preventive maintenance
Passive Requirements Elicitation
Active Requirements Elicitation
Monitoring the process
Measure customer satisfaction
Managing emergency cases
Managing disaster recovery
Manage customer profile

Knowledge is crucial for software support, because solving specific problems require understanding of specific details relevant for that problem. These relevant details come in many different kinds [25]: details about software product (features, known bugs, etc.), details about the hardware (disk drives, monitors, networks, etc.), details about compatibility with other software (business information systems, operating systems, telecommunications, etc.) and so on. Further knowledge that is necessary part of software support is related to details about customer's business and their hardware and

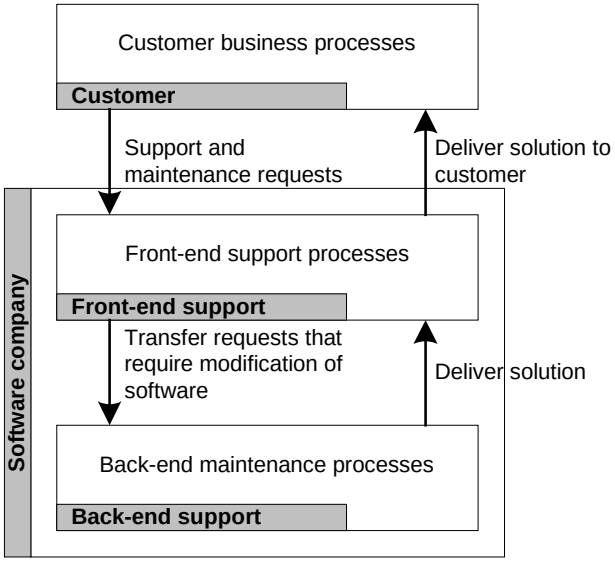

Figure 1. Organization of support levels in software companies

software infrastructure. All this details are important for proper interpretation of problems identified by customer.

Mastery of technical details is not enough for effective software support [25]. Social skills are also very important for personnel in software support. They should possess pragmatic reasoning in all situations, they must be able to discern customers' needs and hopefully, meet them, and they must be able to put some distance between themselves and their work and not take things too personally. Typical situation when social skills are very important are when user makes "stupid mistake" and report serious problem with software, or when user that reports problem is angry.

Software front-end support requires service from back-end support when support personnel cannot solve technical problem or request reported by customers. In such a situation, they transfer confirmed problem to maintenance engineers that are capable to solve stated problem (see Figure 1). The activities at back-end are problem investigation, identification of problem causes (from technical point of view), problem resolving, testing and delivery of solutions. At this level are performed typical software maintenance and evolution tasks related to modification of software products.

Feedback between persons on all levels presented at Figure 1 is important for proper and efficient functioning of support. In the context of software maintenance support that is composed from social and technical elements, the term feedback have the meaning like in management psychology and human factors research. Feedback relates to the presentation of information to individuals regarding different aspects of performance, such as behavior, strategies, or outcomes [26]. Feedback has many dimensions such as source, timing, specificity, type, and frequency. Feedback provides information on how well and effective individuals are performing relative to their goals, how effective specific behaviors are for a given task, and also suggests how much task effort is required to achieve specific objectives [27].

IV. CHALLENGES FOR VERY SMALL SOFTWARE COMPANIES

Small companies are dominant in economies across the globe [28]. U.S. Census Bureau's "1995 County Business Patterns" pointed that the vast majority of software and data processing companies are small, and that those with more than 50 employees comprise only a few percent of the total number [29]. Laporte et al. reported in [30] that in Europe, 85% of IT sector companies have between 1 and 10 employees, while in Montréal area in Canada over 50% have fewer than 10 employees. Organizations that have less than 25 employees are defined as very small enterprises (VSEs) [30][31][32]. The common situation in the majority of software VSEs is that many individuals are responsible for multiple roles (developer, architect, manager and team leader) [33]. Because of many unexpected problems, improvisation is common in the practice [34]. Comprehensive breakdown of the proposed infrastructure and support processes for software VSEs is presented in [32]. This breakdown includes all activities during the whole life cycle of software.

The main challenges posed to software VSEs are [28]: managing and improving their software processes, dealing with rapid technology advances, maintaining their products, operating in a global software environment, and sustaining their organizations through growth. Empirical evidence presented in [35] suggests that software VSEs should combine high level of customer orientation, with high levels of entrepreneurial and technology orientations. Hakala and Kohtamäki reported that 67% of software companies provide various maintenance or user support services.

Challenges identified in [28] can be applied also to software maintenance support activities. Because of the importance and great cost of maintenance activities, there is a need to investigate them in more details. Regarding identified problems within front-end support in [20] the following challenges for software VSEs should be investigated: organizational, process, human factors, and product challenges.

A. *Organizational challenges*

Organizational challenges are related to the size and the complexity of a software company that put restrictions on organizing effective support. The questions are:

- Do software VSEs have enough *resources* (human and technical) to provide effective support to their customers?
- What *expertise* is needed and how to acquire it in order to provide effective support? This aspect is concerned with knowledge, skills, and experience of software maintenance personnel.
- What other *barriers* (social, administrative, political, and cultural) companies meet in organizing and providing support?
- *Outsourcing*. How company deals with problems that arise during outsourcing products and services. This is very important because some very small companies do outsourcing to larger companies worldwide.

B. *Process challenges*

Process challenges are related to defining and establishing effective support processes. The directions for investigation are:

- *Definition of processes and problems of adherence*. This includes investigations which processes exist, are they formalized and agreed with standards or company business policies, and if there is any automated support for processes.
- *Communication within a software company*. This includes communication between people, between teams or departments, and communication with other software companies that deliver third party software components or services.
- *Customer satisfaction*. This includes: how software company meets customer expectations (realistic and unrealistic), does customer orientation increases business of both software

company and customer, does company provide continuous feedback to customers (demands, requests, products), contracts and service level agreements. Active involvement of users in maintenance is important and can positively affect customer satisfaction [36].

C. Challenges realted to human factors

Software engineering is human activity with different roles (engineers, designers, managers, users) and behaviors (motivation, communication, understanding) of involved people. Challenges in software companies are related to shortage with maintenance personnel, and their competences and attitude towards support tasks (in many cases indifferent or detached attitude), while at customer side challenges are related to their knowledge about the used software products, and proper usage of software products. Investigation of these, human or people factors requires usage of sociological and psychological aspects of human behaviors [37][38].

D. Product challenges

Many attributes of software products affect maintenance support activities. These attributes are product quality, product complexity, maintainability, user-friendliness, etc. It is challenging to investigate how these attributes correlate, and how they affect processes, and all people involved in maintenance support activities.

V. CONCLUSIONS

In this paper are presented challenges that software companies face in the field of maintenance support towards their clients. These challenges are not only technical or technological, but are also related to organization and management, social and cultural context. The main characteristics of software VSEs have been presented in available literature (see section IV of this paper), and the question is: *How software VSEs meet presented challenges in the field of maintenance support?*

Although many international standards (for example *ISO 29110 Software process lifecycles for very small entities*) have been recently developed and adapted to software VSEs [39], the most of small software companies do not accept them nor plan to do that [40]. Survey of existing literature provides the evidence that there is a limited amount of empirical research investigating the support activities in software VSEs.

Further research should be directed towards assessment of current practice, and development and implementation of appropriate tools and methods that will improve the practice. One of the main problems in small software companies is the lack of time and resources to invest in the research. This problem can be overcome through cooperation with universities, or joint development and service providing by more small companies.

ACKNOWLEDGMENT

This research is financially supported by Ministry of Science and Technological Development, Republic of Serbia under the project number TR32044 “The development of software tools for business process analysis and improvement”, 2011-2014.

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Engineering Applications of Computer Aided Design for Spatial Transition Curve

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Abstract - In this paper 3D model of railway with transition curves with nonlinear change of curvature is represented. Main goal of this paper is a straightforward application of complex spatial geometry, so that engineers can apply with ease technical conditions of European standard EN 13803-1:2010 on Serbian Railways. European standard installs a modern approach in railway design that implies the selection of geometric form of transition curve and cant transition as a unique spatial element. An engineering choice of spatial form of cant transition is required by type of superstructure or maintenance conditions of track geometry during exploitation. In Serbia and in some countries of European Union, civil engineers use GavranCivilModeller® (GCM®) for railways and roads designing. This paper shows how to create AutoLISP routines which will be used along with GCM® in order to design model of railway with transition curve with nonlinear change of curvature.

I. INTRODUCTION

Transition curve is an element of alignment that connects straight line and circular curve or two circular curves with same or different radius, which can have same or opposite direction of curvature.

Transition curve and cant transition form complex spatial geometric shape with simultaneous change of curvature of both track rails and change of cant of the outer rail [1]. Additionally, both track rails follow designed grade level in longitudinal profile.

In order to secure ride comfort, function of rail curvature change in the zone of the transition curve must coincide with function of cant change in the zone of the defined cant transition.

According to European standard EN 13803-1:2010 six forms of transition curves can be used: clothoid, cubic parabola, Bloss curve, cosine curve, Schramm curve and Klein curve (sine curve) [2].

From denominated transition curves only clothoid and cubic parabola have linear function of curvature and cant change (Fig. 1). Other transition curves require appropriate nonlinear function, namely [2]:

- third-order parabola for Bloss curve,
- second-order parabola for Schramm curve,
- cosine function for cosine curve and
- sine function for Klein curve.

Following symbols are used in Fig. 1:

- D – cant,
- 1/r – curvature,
- R - radius of circular curve,
- l – distance from the random point to the beginning of transition curve,
- BT – beginning of transition curve and
- ET – end of transition curve.

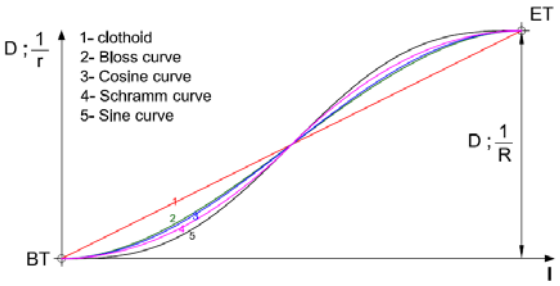

Figure 1. Parallel review of different cant transition geometry [4]

Nonlinear cant transitions are designed in the way to reduce dynamic influences on a vehicle and vertical acceleration that affects the passengers. The main problem that occurs in these cant transitions during exploitation is deterioration of geometry of the track laid on ballast bed due to uneven bed settlement [3].

In general, for curvature equation in random point of the transition curve applies:

$$\frac{1}{r} = f(l) \text{ boundary conditions: } \begin{cases} l = 0 \Rightarrow \frac{1}{r} = 0 \\ l = L \Rightarrow \frac{1}{r} = \frac{1}{R} \end{cases} \quad (1)$$

where:

l - distance from the random point to the beginning of transition curve,

L - length of transition curve,

R - radius of circular curve.

If θ represents an angle between tangent line and tangent in random point of transition curve, then it applies [3]:

$$\frac{d\theta}{dl} = \frac{1}{r} = f(l) \quad \Rightarrow \quad \theta = \int f(l) \cdot dl \tag{2}$$

boundary conditions: $\begin{cases} l = 0 & \Rightarrow \theta = 0 \\ l = L & \Rightarrow \theta = \tau \end{cases}$

Calculation of x and y coordinates is done relatively to local coordinate system whose origin is in the beginning of transition curve and with one axis parallel to tangent line and another perpendicular to it [3, 5, 6].

From observed, infinitely small element from Fig. 2, it follows:

$$\begin{aligned} \cos\theta &= \frac{dx}{dl} & \sin\theta &= \frac{dy}{dl} \\ dx &= \cos\theta \cdot dl & dy &= \sin\theta \cdot dl \\ x &= \int \cos\theta \cdot dl & y &= \int \sin\theta \cdot dl \end{aligned} \tag{3}$$

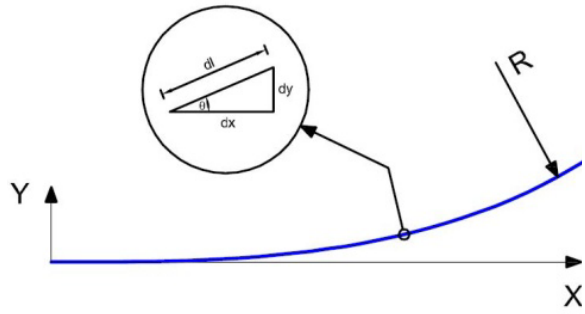

Figure 2. Local X0Y coordinate system and transition curve

First of all, coordinates x and y are calculated relatively to local coordinate system, and then these coordinates should be defined in global coordinate system.

Cant is usually applied by raising the outer rail, while keeping the inner rail at the same level. It is also possible to simultaneously raise the outer and lower the inner rail for one half of cant value. But these types of track alignment are more difficult and more expensive to maintain, so they are rarely applied.

Railway centre line in the zone of transition curve is a complex trilinear curved line. From the aspect of mathematics, it represents smooth spatial curve defined with following parameter relation:

$$F(l) = (x(l), y(l), z(l)) \quad , \quad l \in [0, L] \tag{4}$$

By raising the outer rail for constant value D in the zone of circular curve, railway centre line will be raised for value $D/2$ above the inner rail, so in general it follows:

$$z(l) = z_{ir} + \frac{D(l)}{2} \tag{5}$$

where z_{ir} is level of the inner rail.

II. Main principles of 3D railway model design in GCM® environment

Software products for road design, which are used in Republic of Serbia, support the use of clothoid as a transition curve, while software products for railway design support the use of cubic parabola. Most frequently used software GCM® supports the use of clothoid and offers big opportunities in railway and road design [7] (Fig. 3).

In order to create 3D model of the transition curve in GCM® environment, it is necessary that railway centre line in a horizontal plane and in a longitudinal profile was previously defined. This means creating *.hcl and *.vcl files, which contain necessary data about spatial centre line in both mentioned projections.

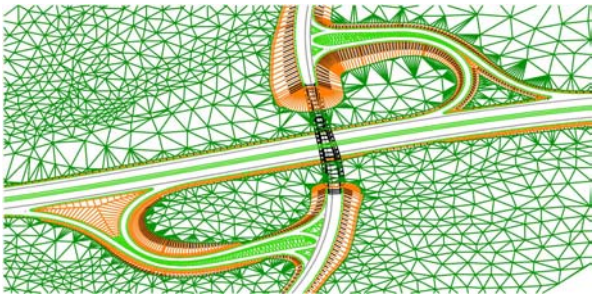

Figure 3. Possible application of software GCM®

Next step is to define the so-called templates. Generally, template represents a set of lines that 3D model should have in its every cross section. For example, it can be only outer contour of ballast bed, or completely defined cross section with all the details. It is necessary to define templates for straight line and for every circular curve, and also for the specific places such as inflection points or for other characteristic places where cant is not applied in the usual manner.

When templates are completely defined, *.tmp files for each one of them are created. Then, these files are "attached" to the centre line on appropriate positions and command for 3D model generation is called. This command generates triangulated 3D model of railway (road or tunnel) by interpolation between the key points on previously chosen, constant distance. Key points are centre line points in which change of template occurs and these points can be stored in created *.tmc file, but also there is a command that can recognize these points by itself. Generation of 3D model between the beginning and the end of the transition curve is based on calculation of a cant value (cross grade) in every pair of consecutive points. Then, between those pair of points, according to created templates, triangulated model of surface that shall be represented in space is created.

In order to create a model of transition curve with nonlinear change of curvature in GCM®, it is necessary

first to develop AutoLISP routines for their construction in horizontal plane.

Next step is final model generation using AutoLISP routine that will, by combining horizontal and vertical geometry, define the set of characteristic points in space on constant distance along the railway centre line. It is best that these points define outer contour of ballast bed, but they also can define upper edges of right and left rail, platform level, i.e. everything that would make completely defined model.

To invoke standard GCM® command for generation of triangulated model from chosen points, it is necessary to create *.pts file that will contain handles and coordinates of these points. This file can be created using the already existing GCM® command, or it can be one of the results of routine invoking. For the purpose of further adjustment of the railway model in the terrain model, it would be useful that routine also creates a couple of *.str files, above all two of them, which will define right and left edge of ballast bed, and if it is necessary those with the data about right and left rail and/or railway centre line. These files will enable further construction of railway cut and fill slopes, right and left rail, platform surface, drainage details etc. This is the way to create fully defined and detail model, which will represent the stage after railway construction.

III. AUTOLISP ROUTINES FOR 3D MODEL DEVELOPMENT

Algorithm for construction of transition curves in horizontal plane is shown on Fig. 4.

First step is to adjust by need proper system variables and control variable cv. Selection of two tangent lines is done using two while loops. Both of these loops repeat until user selects line entity, and only then variable *cv* takes value nil, which terminates a loop. Selection point's coordinates and entity lists are read from both line entities and they are assigned to certain variables. Then user needs to input values of the circular curve radius and the transition curve length, and according to these values geometric elements for construction are calculated, as well as coordinates of all significant points.

Before invoking the command that draws polyline, variable i is assigned to a value 2. It means that points for transition curve construction are calculated in successive distances each of 2 m. After leaving the loop, it is checked if the last calculated point is also the end of the transition curve, and if not so the last segment of polyline is drawn and command is stopped. The same procedure is used for other transition curve. Next, command that draws arc using beginning point, ending point and radius is invoked. Hence, transition curve is actually polyline entity, whose vertices are calculated detail points.

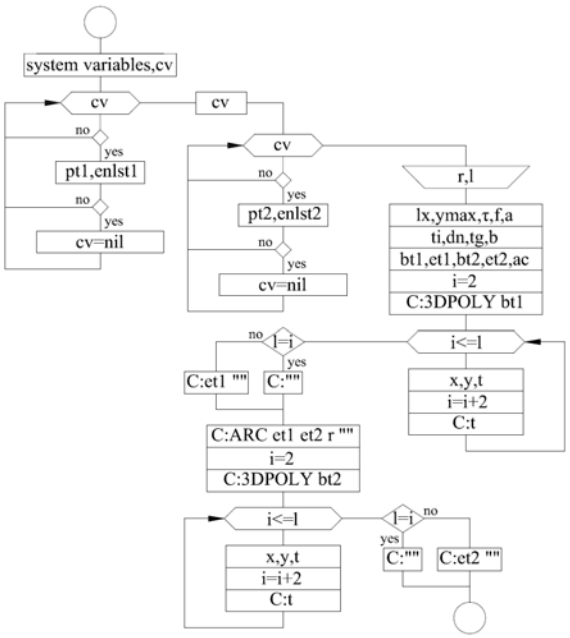

Figure 4. Algorithm example for construction of transition curves in horizontal plane

In order to allow further work with model, every drawn transition curve has additional information that describes its geometry (extended data) attached with entity list. These pieces of information are: form of transition curve, its length, radius of the circular curve and direction angle along the tangent line gainst polygon vertex.

Algorithm for defining points for model generation is shown on Fig. 5.

First step in defining points for model generation is adjusting proper system variables. Then selection of *.hcl and *.vcl file is made, and also user should choose a distance d for calculation of previously mentioned points. Calculation begins at station s=0, but it would be more practical that user chooses this value. Loop repeats until current station becomes bigger than ending station es. In this loop it is first checked to what element of horizontal geometry current station belongs and this will dictate the way of calculation of all necessary points from cross section. After leaving the loop, it is checked if last calculated points belong to the ending cross section.

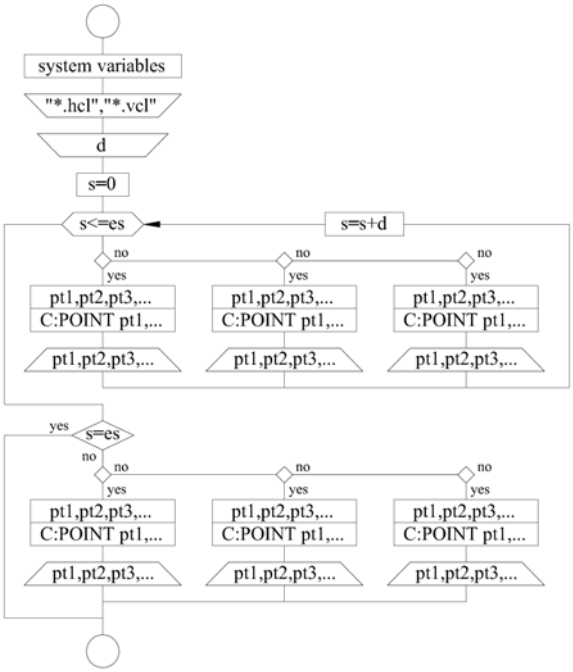

Figure 5. Algorithm example for defining points for model generation

Since this algorithm makes *.pts file, as well as couple of certain *.str files [8], it is only left to invoke commands for calculation and drawing of triangulated model of railway. Now, it is possible to use all GCM® commands that work with strings in order to nest the railway model into the terrain model.

Complex 3D surfaces of transition curves with cant transitions are shown on Fig. 6-10.

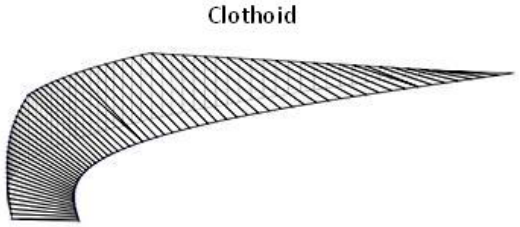

Figure 6. Complex 3D surfaces of clothoid transition curves with cant

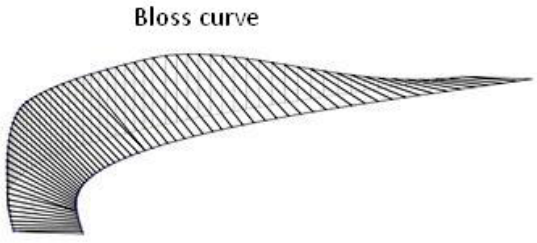

Figure 7. Complex 3D surfaces of Bloss transition curves with cant

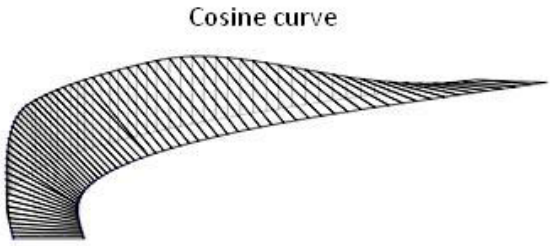

Figure 8. Complex 3D surfaces of cosine transition curves with cant

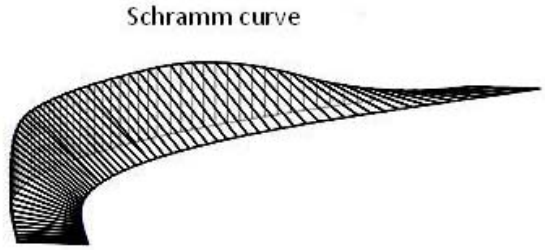

Figure 9. Complex 3D surfaces of Schramm transition curves with cant

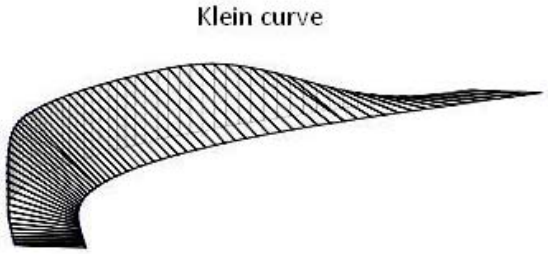

Figure 10. Complex 3D surfaces of Klein transition curves with cant

Final result of 3D modeling is shown on Fig. 11.

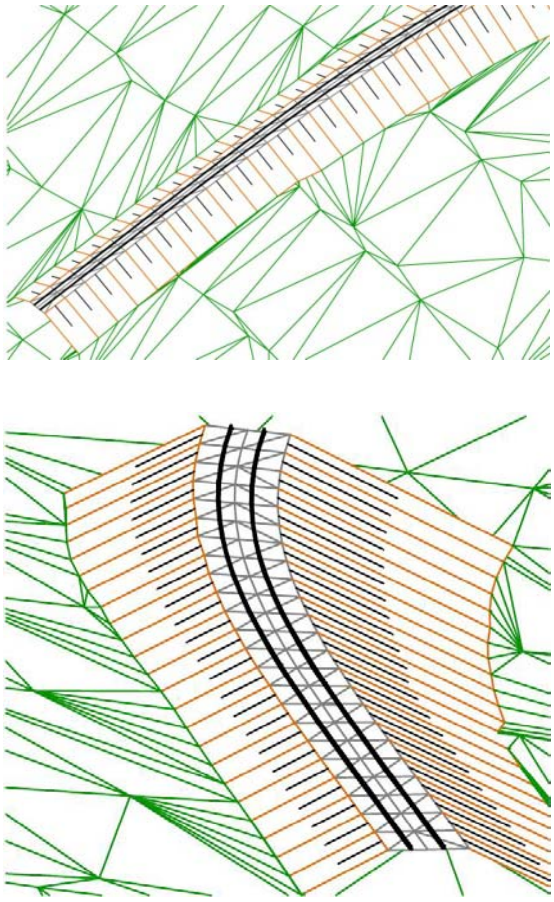

Figure 11. 3D wireframe model

IV. CHOOSING THE DISTANCE FOR MODEL GENERATION

At the end, there is a question about the value of distance that should be used for model generation along the railway centre line in order to achieve its adequate precision. In fact, all needed values for model, first of all a value of cant, will be calculated in every cross section on chosen distance. It means that model will be made of linear segments between calculated cross sections, so it will cause a certain model fault. Diagrams on Fig. 12 show correlation between distance for model calculation and difference between calculated cant value and cant value on linear segments of model (V_R=80km/h).

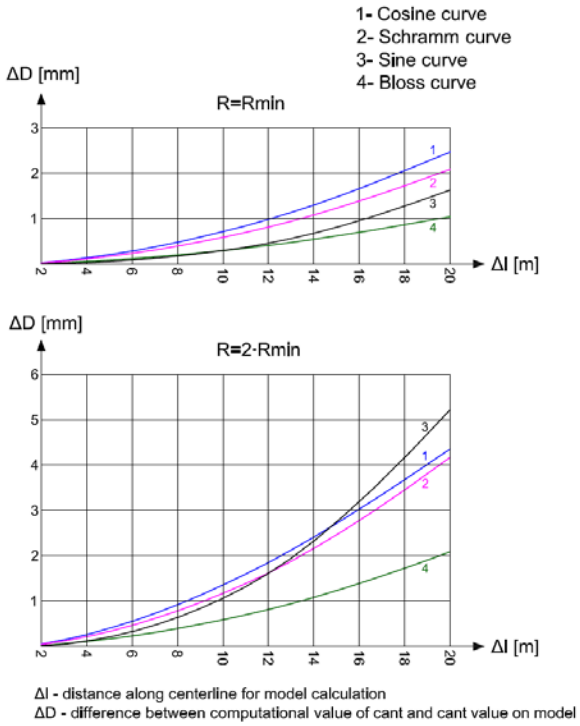

Figure 12. Correlation between distance for model calculation and cant defect

From diagrams follow that in case of maximum length of transition curve, cant defect can be between 1-3 mm. By raising radius of the circular curve, i.e. by reducing length of the transition curve, cant defect raises. Also, from diagram follows that sine curve has fastest cant defect flow.

General recommendation is that distance for model generation should be at most 5-10 m, not only because of mentioned cant defect, but also because of length defect of nonlinear elements.

V. CONLUSION

The European Union has enacted various legislative measures aimed at achieving the opening up, integration and harmonization of national railways to form a European railway network. Harmonization of the national railway legislation with the aquis communitare on safety and interoperability is of a special importance for integration of the Serbian railway systems [9].

Modern approach in railway design implies the selection of geometric form of transition curve and cant transition as a unique spatial element. Selection of spatial form of cant transition is required by type of superstructure or maintenance conditions of track geometry during exploitation.

In this paper 3D models of railway with transition curves with nonlinear change of curvature (Bloss, cosine, Schramm and Klein transition curve) are represented.

Main goal is a straightforward application of complex spatial geometry, so that engineers can apply with ease

technical conditions of European standard EN 13803-1:2010 on Serbian Railways.

In Serbia and in some countries of European Union, civil engineers use GavranCivilModeller® (GCM®) for railways and roads designing. This paper shows how to create AutoLISP routines which will be used along with GCM® in order to design model of railway with transition curve with nonlinear change of curvature.

ACKNOWLEDGMENT

This work was supported by the Ministry of Science and Technological Development of Republic of Serbia through the research project No. 36012: "Research of technical-technological, staff and organizational capacity of Serbian Railways, from the viewpoint of current and future European Union requirements"..

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Impact of information technology on organizational culture

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Summary: **The rapid development of information communication technologies has caused a significant and rapid changes in organizational culture in all sectors of business. Companies often develop appropriate culture to increase the application of leadership, announcing the winner of the philosophy and objectives, organizational structure continuously adapt to rapidly changing business environment, creating appropriate working climate, and direct management of employees and their behavior. Employees must be trained, motivated to work with information technology and directed according to the published short and long term objectives of the company / corporation. We will, in this, the article try to approach the impact of ICT on organizational culture.**

I. INTRODUCTION

The impact is difficult to "measure" and to present an obvious impact of ICT on organizational culture, we started from two basic assumptions:

1st Organizational culture as values, norms and customs, 2 If ICT acts on the element and functions of organizational culture, and then act on organizational culture.

The existing organizational culture to be objectively identified, to enable its efficient development to meet future needs. Most often it will develop a harmonious future needs of the organization, it is appropriate direction by the leaders or top management.

Information and communication organizations, and link management application production through the use of information, we plan to sell goods and services based on information from the market, directing the development with the help of scientific information, and so on. The information is used to create and present the functioning of the organization, as well as to initiate the feedback controller, as an organization. The organization is almost all on the basis of information and optimal organization has no real, current and reliable information [3].

The organization is based on information, organization information, enables the elimination of many unnecessary levels of coordination and leads to higher efficiency, because it eliminates many of which only the coordinates. This organization does not recognize the importance of the notorious "control band", under which determines the number of subordinates one manager. The establishment of new principles of "communication range" instead of span of control that determines the scope of individuals to successfully work within the network. Redefine control, as he transforms from traditional monitoring in the ability to receive information and the quality of processing and use.

Information organization, where the main information flow from top to bottom. The organization is based on the information is based on accountability and information flow is from bottom to top and back down again.

II. ICT IMPACT ON ORGANIZATION

The main purpose of computer engineering, information technology and business management system is to serve as a backbone in dealing with all strategic and operational issues posed by modern market environment. All forms of organization greatly affect the increase in business. The restructuring of management, and its design, requires that the organizational processes based on the information. While the traditional, hierarchical structure, layered, an organization based on information that is "flat", with much less control levels, causing the disappearance of most of the traditional layers of management between the drive and control of top management [2].

Options Using the organization of information and communication technology

Transforming unstructured transaction process routine transactions geographically fast and easy communication over long distances, making processes independent of geographical location Automation Reduce or replace human labor in the process Provide analysis of complex analytical process getting large amounts of information information. Allow sequential changes in the sequence of tasks in the process, which allows simultaneous operation of multiple processes. Knowledge management enables the exchange of knowledge and experts, monitoring monitoring statistics tasks, inputs and outputs Exchange Communicate directly without intermediaries

TABLE I. POSSIBILITIES OF INFORMATION AND COMMUNICATION TECHNOLOGIES AND THE CONSEQUENCES TO THE ORGANIZATION

Options	Use the organization of information and communication technologies
transactions	Transforming unstructured process routine transactions
geographic	Communicating quickly and easily at long distances, making processes independent of geographical location
Automation	Reduce or replace human labor in the process
analytics	Providing for a complex analytical process
Information	Getting large amounts of information
sequential	Allowing changes in the order of tasks in the process, allowing simultaneous operation of multiple processes.
Knowledge and Management	It enables the exchange of knowledge and * experts * tracking
Monitoring tasks	statistics, inputs and outputs
Exchange	Communicate directly without any intermediaries

The organizational structure of companies is the totality of connections and relationships between stakeholders and within its stakeholders at all levels of the organization and exact quantities needed. ICT and greatly affects the organizational structure and thus its elements [2].

A. Location

ICT are the establishment of computer networks have eliminated the entire distance on the location of enterprises and allow companies to connect with the immediate and distant environment. In addition to internal links allow the Division of ICT to link with external suppliers, distributors, transport, consumers, and government organizations, customs and so on.

B. Capacity

Computer networks, knowledge of the current excess capacity in the company, suppliers and so on. At any time you can check the schedule for shipments and tracking of goods during transport, regardless of whether it sent the truck, rail, ship or plane.

C. Type of Business

The quality of the offer is supported and nurtured a whole system using ICT (telecommunications, videotext, video systems, digital switchboards, telephones, electronic data, electronic security systems, computers and multimedia in other words). Information and communication technologies have improved the core business of many companies, thanks to the information available in one place and available to decision makers. In addition to improvements in several core business are responsible for ICT expansion and introduction of new products in the range [4].

III. HUMAN ORGANIZATION RESOURCES

The impact on social change, re-training, the need for IT education, the need for further development of ICT as imposing an obligation of lifelong learning. Such changes in organizations are not satisfied with the welcome he met with resistance. Now employed a different attitude towards work, learning every day, they are motivated to work, they can express their creativity and simple yet full of feeling.

With the advent of ICT, there was a need for additional training of existing staff and training of personnel who understand the technology and the indirect impact of ICT on the structure of teachers, employees of age, habits to follow news and technological advances [1].

A. Organization of work

The use of computers has caused the emergence of new businesses and new jobs. The organization has become much easier, some occupations are completely gone, new jobs with the new work environment. Thanks to ICT companies today have a different job with flexible Hart descriptions.

B. Motivation for work

The responsibility and reputation of IT is increasing, and their motivation for work has declined. The reason for this is a poorly paid job in relation to the administrative staff. You read it, we made a mistake, the fact is that this has happened before and unfortunately still happens in some places. driver of IT innovation, process innovation, reducing costs through "paperless office" access control, records, etc. are not adequately rewarded for it.

Today the situation is far from the side, of course, we talk about developed and developing countries where the law every day more and more problems from left to right in the IT sector companies.

The world crisis has a huge impact, managers have realized that they must pay those who make profits and savings and that the administration is functioning only as a service company.

IV. EDUCATION STAFF

A very important factor in implementing ICT-long training of employees (from suppliers of IT equipment or by sending the appropriate courses, training, etc.) .. Successful companies have recognized this in the time established by the hair and internal staff training sector which is responsible for training staff in using new technology and corporate development services, quality, competitiveness, and so on.

These companies have recognized this phenomenon are available to third parties or companies specializing in training, or those companies that have sold software solutions to its staff to work in the new environment. The advantage is that every day in training while the other two options I was there training when you

introduce new software in the area of manufacturing, quality control, etc. [5].

The formation and organization development organizational units of functional organization at the highest level in the organizational scheme of the company. Information and communication technologies are, as noted changes the traditional hierarchy of the company, the new organizational unit, some existing and some are missing a few restructured. With the help of computer software can be extremely fast, accurate and quality job creation, sectors, tasks, because information has value only when you need it, fresh and reliable.

Functions of ICT companies support most of the features that experienced large amounts of data (eg, office equipment, distribution, accounting, sales, etc.) .. In the beginning of creation and application of information technology is just like I do, however, information technologies are found in every part of the organization of the entrance to the top of the building in the company.

Today you can not imagine functioning without the company computer, the Internet, no voice service, free online communication, and authorized access. On the other hand, production facilities in the robot machines, mobile software under the control strips, control security, transportation vehicles are built in GPRS systems and many other software solutions.

A. The boundaries of the regional office

The establishment of information systems based on a single database, information technology seamlessly cross the functional boundaries and data processing in order to support all processes in the organization. The use of ICT stabilize business processes so that they become predictable, so you are able to analyze and improve their ability to rather than what actually happened [5].

The simulation is possible that the top management at any time, especially between the new collection, distribution, advance to see how it will look like the product, packaging, advertising and so on.

B. Integration processes

Information technology support for all activities, so that it can be called universally valid. ICT can be applied in almost all processes, or integrate multiple processes in one system, databases, distributed systems, Internet and computer networks.

V. EFFECTIVENESS AND EFFICIENCY

New technology has reached all parts of the enterprise to function successfully, that their relationship is flexible, but flexible with which the company became more successful and adaptable to market demands. With the help of ICT it is possible to satisfy all customer requirements immediately, monitor and analise your comments on the product and then improve them.

If the company does not have Internet access, computer networks, software for accounting, payment, Web site, the official e-mail, Facebook account, LinkedIn account, ioutube.com video, a lot of Internet ads, then this company is ridiculous and inefficient.

The impact of ICT on the elements of organizational culture

The impact of ICT on organizational values

The impact on the organization's mission or purpose

The mission or purpose of the organization identify the core functions and / or task organization. The mission of the system messages that indicate the characteristics of the consumer's desires and his needs and resources and technology that can produce specific products to meet customer needs [1].

A. The impact of ICT on the organization's objectives

The objectives of the organization are endpoints that are directed at the organization's activities. The basic plan of the whole organization. The strategic objectives are the main long-term goals of the organization, the adoption of courses of action and allocation of resources necessary to achieve them.

B. The impact of ICT on work environment

The impact on motivation, Motivation is a general term that refers to the entire set of instincts, requirements, needs, desires and other forces that all this has led to satisfaction. Poor ICT connectivity can lead to poor motivation for people that need the protection of data [6].

The impact on productivity, productivity is the rate of entry and exit within a certain period of time necessary in accordance with the quality. ICT effectively monitor productivity, easy to deal with these issues in the immediate production workers and improve performance measurement of non-production workers.

The impact on creativity, creativity is the ability and power to create new ideas, consists of four stages that communicate with each other and often overlap:

1. Automatically search
2. intuition
3. penetration,
4. logical formulation

Impact on innovation, innovation usually means using the creative ideas. An organization usually understand the rules or guidelines to encourage innovation, for example: development of tolerance to errors, rewards those who have a good idea of the new product and are able to form effective action to promote products, establish closer links with customers, sharing technology with others in the organization, maintenance of the project life time allocation or financial support and others. Daily use of ICT to stimulate and develop innovation and creativity in the organization [7].

The influence of managerial style Administrative style is the cause, not the result of the effectiveness of the organization, much of the organizational culture. Under the influence of information communication technologies and information systems generate expected to lead an organization that affect the climate of organizational change are:

- Development of cooperative relationships in the work,
- Loss of traditional boss and subordinate,
- Transformation of the masterminds of the head, instigator, a professor and advisor,
- Change in the classic self-control,
- The advantage that supports people management skills.

The impact of ICT on the other elements of organizational culture management, directors on a daily basis and to use ICT in their business using information technology accelerate your business, make better decisions, are innovative and encourage innovation by employees, at all times have the right, fresh information and at the end of their work is very interesting and happy.

Employees, the transfer of various ICT data and information exchange to increase confidence, values and norms among employees. Creates a new culture of communication and procedures between staff and information technology are human dimension through this kind of building trust with employees [3].

Competition, if you are employed properly trained and prepared for use of information communication technologies can gain significant advantage over competitors who have not yet mastered the technology to say nothing of those who have not yet started. The market is very hard, every day we must follow and implement new technologies and improve the work process, product, distribution, support, etc., and because of these things there is a difference between competitors.

Time, the cultural influence should be measured for years. ICT should be reasonable to use or adverse effects occur. If your employees use computers for Fecebook, video games, movies, clips, then your time is wasted in vain and you pay people and invest in equipment. The thing becomes a disaster when your competitors are ahead of idle and after that you need much time to restore its credibility.

Transparency, ICT effectively supports decision-making to achieve organizational goals. ICTs are especially suitable in case of formalization, can be effective members of organizations and environments with data and information system of values, norms and traditions in which they operate. Almost all transactions, decisions, public notices, and the company has significantly reduced the possibility of fraud.

Resistance to change. Management can not be ignored or allowed to come to the surface resistance and try to manage it. As the opposition, as a rule, managers are afraid to change something, it often leads to their deviations from making difficult decisions and conclusions [8].

As a result, the adoption of "soft" communication program that merely encourages people to adopt change. Information technologies facilitate change, manage, because the simulation can show the employees what to expect in the new system, where they can see how it will look like their job, responsibilities, training, etc...

The monitoring program, monitoring changes in ICT should be included because he realizes many of the effects of communication via electronic communication, communication is easier and cheaper, with no horizon to geographical distance, and faster and with greater accuracy, providing the ability to keep communications between employees, which is later further analyze and thus change what is not well done.

VI. CONCLUSION

At the beginning there was tremendous resistance to new technologies, resistance and suspicion by the generations that were operating in a different environment. Today the situation is much changed for the better, in fact, there is resistance to the generation of information technology and now use all the advantages of high technology.

The fact is that the information and communication technology present in each and every pore of our lives, but to a lesser extent, the 2016th The Information Technology will be integrated into the human body and the body through the systems of care, disease resistance and so on.

Information and communications technology to dramatically affect our lives and culture of life today, and therefore conclude that this technology has great impact on organizational culture within the company. Business has changed significantly, or designed the production, sales, communication, change jobs, constantly learn, progress, innovation, every day at work, and so on.

Organizational culture directs the interaction of employees in the organization to achieve strategic goals and vision. Every organization has a unique culture that is collectively created over the years. This culture is a key prerequisite for achieving lasting success and for fast adaptation to new business conditions [2]. Organizational culture is also strongly emotionally charged, especially during the implementation of significant changes in the organization.

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Manage bussines with Computer

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Abstract: Business management is the process of implementing the decisions made life based on available information. There are different ways ofsharing decision-making, and most of the authors represented, rational-analytic, intuitive-emotional and political decision-making behavioral. In this article , we covered bridge of business and he explained the business model or management software. In his article we will approachthe issues, advantages, including the disadvantages fusing computer management software and solutions, information systems, systems for resource management and so on.

I. INTRODUCTION

Rational and analytical approach to decision making is based on rational, conscious, systematic and analytical approach to information. Intuitive and emotional way of making decisions based on experience, feeling the situation reflexive thinking and instinctive approach to information.

behavioral political-decision-making is based on respect for the interests of stakeholders be they shareholders, employees, suppliers, customers or the wider community. So when we look at what is offered, it is clear that neither approach is fully satisfactory. The whole problem can be simplified if it is confined to the consideration of how to solve everyday problems, ie. little things that mean life.

It is clear that some of the everyday problems caused by the much broader implications from everyday, but analysis indicates that the division into three groups, only about 5% of them can be used behavioral political approach, by about 25% require a combination of all three approaches and the remaining approximately 70% is quite sufficient rational-analytical approach. If you ask what is really rational to obtain and analyze relevant information, the short answer is modern science.

This response discourages even the most jaded and most persistent advocates of rational-analytic approach for dealing with the production of practice rather than science. If the notion of modern science only to reduce operational research, statistics, mathematics, and automatic control methods that offer an independent consulting firm is very little we approached the solution.

However all the above mentioned disciplines have a common denominator. All those methods that deal (with the exception of some methods of consulting firms) can be translated into numerical models that are applied through computer algorithms.

Easy solution to the problem because it is not necessary that every company engaged in science but just enough to deal with the implementation of final solution in practice, etc. to enter data that describe the business and to use the obtained output data and information. Skeptics will say who is brave enough to dare to use the program and its algorithms as a black box without knowing how to get output. This brings us to the division of the A, B and C customers.

The beneficiaries are those who are interested in all the most curious even quantum of knowledge that allows you to independently adjust to your needs built-in algorithms. B beneficiaries are limited to opening the black box and learning about the way her function.

C users only interested in the black box chto implemented effectively. Experience the world with the division of ABC's answer the question whether, some 70% of solved everyday problems enough that the company operates profitably. The answer is yes. ABC's division is such that C is a group of up to 6-7 years ago belonged to the 80% of users, and now all 85%, which explains the improvement of the applied methods. A group is not changed, varies between 3 and 4%. The biggest change was the decline in group B at 11 to 12% of users. An interesting explanation of the C's program allows them to see the tree and the forest so they can find a solution for wood and forest.

Below is exposed to a holistic approach to business management methods in the rational and analytical way, ie. making management decisions based on that obtained iformacija processing business data on your computer. Detailed new solutions have been processed with standard methodology.

II. THE INFORMATION

The word information, informatio Latin, means terms such as: teaching, instruction, information, information. Every day we use terms like information, user information or where the permanent slogan: information, user data or informed about the data, and not to question the meaning of document content defined these terms.

We will give a definition that points to a way of obtaining information and the role of man in solving the problem of obtaining relevant information necessary to manage the production system in real environment. Information management is the relevant knowledge that comes from processing the data and that gained him so we can achieve predefined goals.

If we have data, the business media on one of the permanent record, they can not be used to generate the information until it is organized and aggregated in an appropriate manner, and then presented in a way that suits the user to analyze data. Thus processed data becomes information, when users perceive their interdependence and sense.

Understanding the meaning of data users obtain information about the environment that describe data[1].

From the above considerations indicate the main objective set of computer technologies that are used to build the information system. The main objective of an information system that is sustainable through the collection and recording data about the environment, their structure and aggregation, and processed data presented in a form that allows the user easily knowing that the data point. obtain information about the environment that describe data. We are primarily interested in obtaining that information automatically. through the information system.

Computerized Business Management CBM method is completed with that provides business management in most industrial and service businesses. There will be at the logic that makes the whole method. The basis of the problem lies in the complexity and indentation of business and thus the complexity and indentation methods used in computer controlled operations. In short one method handles only one sometimes very small segment. The problem is related methods into a whole that will enable management.

Structuring of business processes is a basic connective issue between the different methods. So easy to opt any segment of the process will be credited to a method that is its model. If you bring in a clear and relatively easy structured data allow two methods were different however communicate with each other and share necessary information.

III. THE PROCESS

The processes in the production system is carried out within existing resources. Processes occur regardless of the inevitable managerial decisions or control actions taken or not taken. Technological processes and equipment become obsolete, people forget the lessons learned etc..

All processes occur continuously in time. But the state of the system that a man perceived as discontinuous, etc. discrete and is given only upon completion of certain processes and fulfillment of additional conditions. In practice, a state can exist for a long time but it is defined as such only when people notice it, ie. available data translated into information about this condition.

State of the system defined by the data we have about him. It is extremely important that the data that we can describe a situation and they are sufficiently accurate to have a quantitative measure of the state. This requirement is clearer if we understand that only the data that we have to be used in the calculation of a new condition to the computer or human. Error in the initial data of a few percent can lead to errors of several tens of percent in the output data, ie. in the description of the future, the planned state. The theory of the process can be widely story in different directions. We will limit the economic category, ie.

A. Profit

Negligibly small difference between the states of the system which gives a profit and the state system that makes a profit. For a system that has a condition that makes a profit is said to have profit-core. postulated that profit arises only in the phases of the business processes within a profit center. This is usually a process of production of physical or intellectual products or services. All other processes are maintained to allow the existence of the first paragraph. We have adopted a statement that the profit created in one process and all other processes may prevent its emergence.

The conclusion is that the processes are to strive for equilibrium, for the existing energy system, whether relating to states within the firm or outside. The processes are divided into those that can not influence that. internal processes and those that can not influence that. External-If you belong to a group of those whose business strategy includes creating chances then we can partially influence the external processes. In order to overcome the steady states is necessary to constantly invest in the development and improvement of all processes that occur in the system. So it is necessary to increase the internal energy, ie. system resources. The process of continuous improvement of all processes only leads to new states of the system which are superior to the previous state.

From the prior discussion seems to be impossible that there are any problems within one system. But we know that problems are popping up in places where they do not expect. Emphasize that all the problems caused by poor integration in the system. So we claim that if the level of knowledge workers is not enough they are not sufficiently integrated into the system. But the system was not integrated into the environment by producing goods for which the environment is concerned for any reason, or adversely affect the ecology of environment.

IV. STRATEGIC MANAGEMENT

So far we have not said anything or tried to define our company ie. system that we want to manage. It will be easier to edit if we define the structure of strategic management. Thus we define the model for our company will act. Three basic elements of strategic management structure of the mission, goals and policies.

The mission defines the basic relationships that the company will have to work that deal. For example, the basic division is into those who create new ones that use the existing business opportunities. And if simple, this division is defined, and so much profit to be realized[2]. Bill Gates has produced a number of business opportunities and most of them used. Its competitors have made a profit in proportion to the likelihood that he made use.

The objectives of the company are different depending on whom they are addressed. There are various goals that a company has compared to the workers and the goals he has in relation to shareholders. Politics is the relationship between the company's mission and goals. The policy must clarify how the company achieved the objectives defined in accordance with the mission of the company. Policy strategy of the system is limited by the system. The strategy used in the realization of a goal. The basic division is: Strategy (maintenance) of stability, strategy (increase) expansion strategy (to reduce) withdrawal and strategy combinations. And if the partition structure by introducing simple variations to get a comprehensive scheme

of pre-defined strategies. The basic strategy variations are internal or external, horizontal or vertical, active or passive, or like new, and combinations thereof. This defines the strategic management of an infinite number of drawers that are in each other. We know exactly what to which of them should put However, they are empty, only one structure. However it is known in advance that no matter how good solutions and ideas fill in the passive strategy of withdrawal options go into destruction. Nor is it certain that the active variant of vertical expansion strategy ensures business success.

To overcome this problem by using methods such as the WCM, World Class Manufacturing. This is one of many management techniques that are shaped by experience. Their main drawback is the lack of structuring. Naturally, when we already have a ready strategic business structure chosen method we used to fill. We can choose any method that supports the MRP. It is important unifying strategic synergies with strategic structure that method. its business model. The entire CUP method is based on the same principle, ie. to structure the business, which is applied to the methods of computer support business.

V. PLANNING

MRP is a method that allows the operational planning of the use of various system resources. If there is a need to plan products, services or resources in some time that master plan, the MRP for the entire planning horizon based on the condition when the right plan and generate the set of General Plan Plan activities and resources necessary to give master plan implemented within the required time. MRP plans used in generating the current state of the system x and the parameters that are given Strategic Plan. The plan that was genereted MRP MRP plan.

MRP is an example of processing and aggregation of data to generate a plan containing information on the necessary resources and activities. In as much as one-step C goal was not met, the successive application of MRP-operators that manage a system to realize the goal of C.

MRP provides an excellent basis for connecting with other methods such as JIT, TQM, etc. CPM. And these and many other methods can be used as operators.

VI. BUSINESS PROCESS REENGINEERING

Everything is so far above and especially the law of equalization of profit indicates the need for constant change in all business processes. It must be borne in mind that these changes are conditioned by the state of the system when they start. People, equipment, strategy, organizational structure, level of technological knowledge defined initial state. But positive changes never occur by themselves, but need to invest extra energy. So changes in the system, that would have been possible at all, become a learning process through the newly acquired knowledge to understand the need for change and why to adopt and implement changes in practice.

From the above it follows that the above changes in the state system will inevitably start from the current ie. initial state x and takes place under the influence of management activities.

From the fact that change is a result of acquiring new knowledge and knowledge comes to why the change comes hard. The changes create a new state of the system causing unforeseen obstacles and unforeseen opportunities. The problem is that the knowledge available in the initial state is not enough to solve problems and seize opportunities, because that knowledge is not enough obstacles and opportunities would be provided[4].

This brings us to the very essence of BPR method, which enables us to from the current state of the system and existing knowledge, using a matrix interactions, expand the horizon and anticipate that we get information on potential business obstacles and opportunities that await us in future processes. And so once again close the circle and come to the conclusion that the new knowledge the cornerstone of all change, improvement, innovation and so on.

VII. RATING

Business processes occur in time as they set or change the BPR method, or under any other plan. If we know that in every process takes a lot of activity is the only road to success is that we can assess whether the process occurs as affirmed or upgraded as planned. But we have a real indicator of whether an activity or process of improving or standing, no matter what is the plan for that activity or process.

This brings us to the need for general structure and model assessment processes taking place within the system, or for evaluating the state of the system over other systems. This issue is addressed in the assessment methods.

Each method has its own model of evaluation. Possibilities of evaluation become compatible when there is a general model of evaluation. Intuitively it is clear that the possibility of evaluation methods within the WCM as a strategic method of multiple increase when placed within a general method. The results thus obtained from the activities of the process and the status of current or future are far more accurate than the score given by each method individually[3].

Nonlinear methods of turning point and as stated at the beginning of the different segments use different methods. All these methods and business processes are mapped on the effectiveness of its profits. An important fact is that all the methods along with other resources of the system consists of the total system resources.

Let us now consider the possibility of increasing unit sales by product, or the volume of aggregates. In the linear model of a turning point increase by investing in the necessary material, sometimes in fixed assets, and we see how to increase profits. However in practice this model works sometimes, but usually and no investment will not help to increase sales of that profit. This situation occurs because the linear model does not reflect the real situation. It is only when we have the limit of infinite demand.

If we take a general statistical method based on the increase in unit sales for the product then we get the necessary increase in total resources for some percentage. However there is no evidence that the method that converges to the finite time we

reach the goal. Compared to the linear model we obtained the same result, but we have introduced in the account all the information that we needed. Also, no evidence that the method that converges to the finite time we reach the goal. Compared to the linear model we obtained the same result, but we have introduced in the account all the information we need[5].

It is obvious that we need a stronger methodology. In essence, the problem has many variables and dynamic in its basis. We can use any method to approximate the functional dependence, but the best generalization of the functional dependence will be obtained through the neural network. Another important thing which is essentially the problem is the impact of changes in the size of some input from the output size. This question neural network directly answers in one spot, that is not required to be calculated between two points.

This solution supported by DM method ("data mining" data mining of coal mine) allows the user easy access, on the basis of data in the computer, valuable information on all resources that affect the total profit and profit. Initial success is determined by the type of products or services and initial resources. Knee market and competition changes the slope of initial success and gross income increases little or nothing. Make or use business opportunities is the question? This issue may affect the entire business strategy, but the response to it defines whether we will even be able to realize a new initial success.

Over DM methods determine what resources and how to be increased in order to move the situation on the curve in the desired direction. It is interesting to contrast the general adopted the view that only the financial resources required to exit the tunnel, the practice shows that in the Tunnel only helps to increase human resources support.

Nonlinear method, we implemented a turning point in the system observebility which we meet the second requirement for the handling system, ie. allow solving the equation first This enables us to see what to do, that the current situation on the basis of data on the system reach the desired state, ie. changes to the resources we need.

Sometimes it is not possible to immediately move into a desired state, ie. point in state space, so we use the method of point to point system that lead from state to state until we reach the desired state.

VIII. CONCLUSION

Shows the complete method of computer control that allows business to manage operations using point-to-point (point to point). Emphasis is placed on the importance of knowledge in the application of modern managerial practice that is. the synergistic effect that if we have modern software tools such as CUP-M use with modern business methods. As part of WCM's attention is drawn to modern methods in the conduct of business strategy. In the BPR's attention is drawn to problems acquiring new knowledge and its application in practice[5].

The whole method of business management computer is designed to easily via software suite that modern science comes to life in practice. To put it simply needs to learn how modern methods of management to handle the powerful programming tools to the continuous improvement of operations provide a constant profit.

As part of ABC's divisions has been pointed out that this approach to improving the business profitable in up to 85% percent of firms, the smallest volume (C) provided training.

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The Database for Technical Regulations in the Area of Railway Infrastructure

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Abstract - European Union has made a series of regulations with the purpose to achieve opening, linking and adjustment of national railways within the framework of European railway network. In this paper is shown an overview of technical regulations in the area of railway infrastructure that have been made in the EU. Also is shown a current state of railway regulations in the Republic of Serbia. One of the essential conditions for integration of Serbian railways with Railways of European Union is harmonization of regulations with EU railway regulations and standards. In this paper the database for the harmonization of technical regulations in the area of railway infrastructure is represented. The database enables simple research and availability of all necessary data and includes European and Serbian technical regulations. This is a reason why it is of great importance for operation of the enterprises that work in the area of railway infrastructure management.

I. INTRODUCTION

The European Union has enacted various legislative measures aimed at achieving the opening up, integration and harmonization of national railways to form a European railway network. One of the essential preconditions for the integration of the Serbian Railways with those of the European Union is to approximate Serbia's railway regulations and standards to those of the EU [1,2].

Fig. 1 shows the current status of harmonization of subordinate Acts for railway infrastructure in Serbia. One of the significant barriers for harmonization is the expectance of the new Act on railway traffic safety, according to The European Railway Safety Directive (2004/49/EC) [3].

Fig. 2 shows modern concept development for creation of the management plan on Serbian railways infrastructure in accordance with European regulations. Unfortunately, existing Serbian railway regulations and logistics are in collision with those of the European Union (Fig. 3).

Solving this problem, which represents the essential barrier for integrations of the Serbian Railways to the European railway network, requires adoption of legal and technical frameworks for the application of European regulations.

In this paper the database for the harmonization of technical regulations in the area of railway infrastructure is represented. The database enables simple research and availability of all necessary data and includes European and Serbian technical regulations. This is a reason why it is of great importance for operation of the enterprises that work in the area of railway infrastructure management.

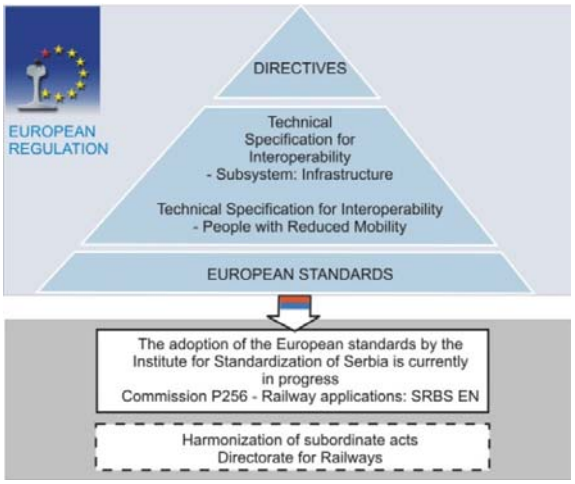

Figure 1. The harmonization procedure for technical regulations for railway infrastructure in the Republic of Serbia

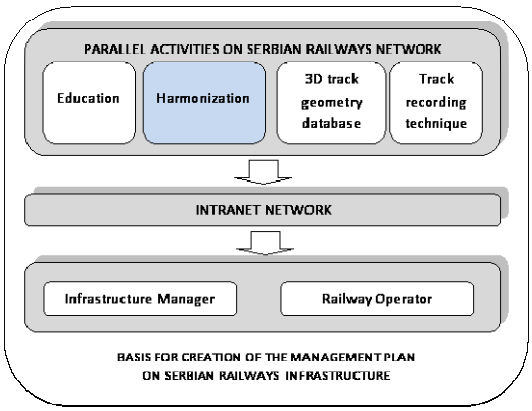

Figure 2. Concept development for creation of the management plan

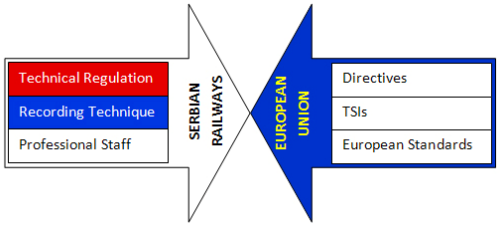

Figure 3. Collision between Serbian and European technical regulation and logistics

II. THE STRUCTURE OF THE DATABASE OF LEGAL AND TECHNICAL REGULATIONS OF THE EU AND SERBIA

Internet search of EU technical regulations for engineering applications is uncomfortable and long lasting. Therefore, database using Microsoft Office Access is developed [4]. The database should enable comfortable and fast search. The database includes European and Serbian technical regulations in the area of railway infrastructure and is bilingual [5-8].

The structure of the database of legal and technical regulations of the EU and Serbia is shown on Fig. 4.

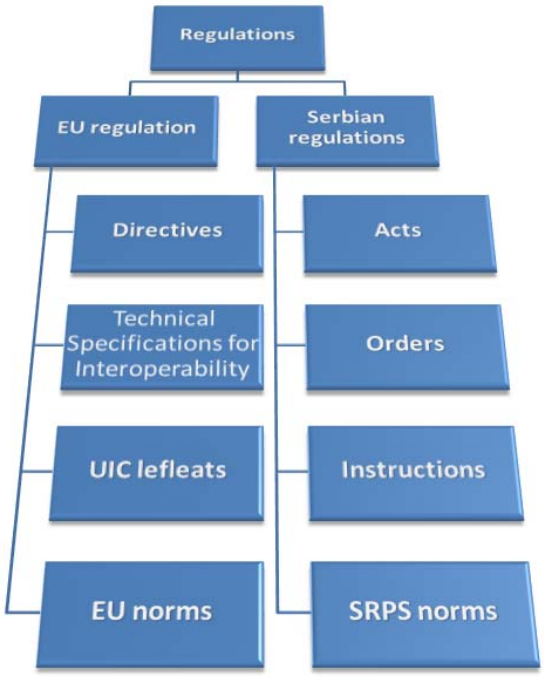

Figure 4. Structure of the database of legal and technical regulations of the EU and Serbia

Search principle is shown on Fig.5.

Figure 5. Search principle on the example of EU Directives

Navigation options enable simple use of the database (Fig. 6).

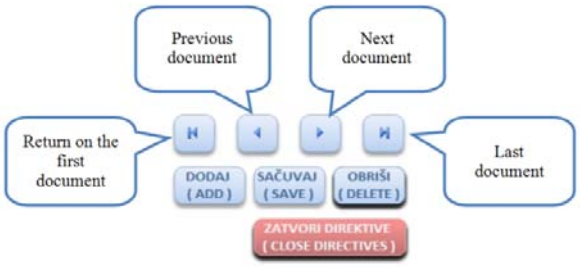

Figure 6. Navigation options

III. ADVANTAGES OF THE DATABASE USE ON THE EXAMPLE OF TECHNICAL STANDARDS

Unfortunately, the search of European Committee for Standardization website http://esearch.cen.eu/esearch/ is complicated and it requires knowing of standard title and/or reference (Fig. 7). Also, the search gives different results using the same descriptors for the different search criteria. This is uncomfortable for everyday use in the engineering practice.

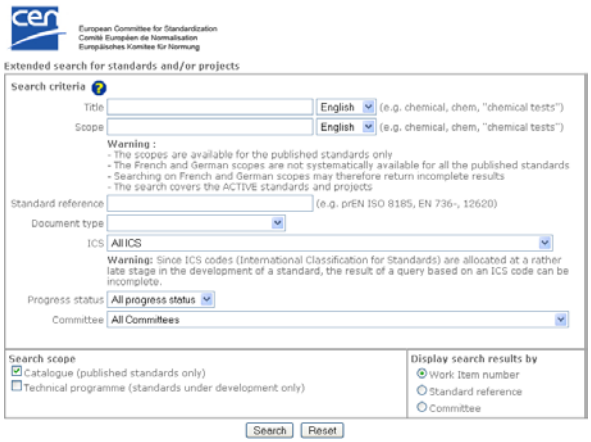

Figure 7. Search tool of EU standards in the European Committee for Standardization website http://esearch.cen.eu/esearch/ [6]

Users have to know in advance part of the titles (in English, German or French) and/or standard references. For example, the search results for descriptors "railway applications" and "track" are shown in the following extensive list:

- EN 13674-1:2003 Railway applications - Track - Rail - Part 1: Vignole railway rails 46 kg/m and above,
- EN 13674-2:2006 Railway applications - Track - Rail - Part 2: Switch and crossing rails used in conjunction with Vignole railway rails 46 kg/m and above,
- EN 13674-3:2006 Railway applications - Track - Rail - Part 3: Check rails,
- EN 13674-4:2006 Railway applications - Track - Rail - Part 4: Vignole railway rails from 27 kg/m to, but excluding 46 kg/m,

- EN 14730-1:2006 Railway applications - Track - Aluminothermic welding of rails - Part 1: Approval of welding processes,
- EN 14730-2:2006 Railway applications - Track - Aluminothermic welding of rails - Part 2: Qualification of aluminothermic welders, approval of contractors and acceptance of welds,
- EN 14811:2006 Railway applications - Track - Special purpose rail - Grooved and associated construction,
- EN 13977:2005 Railway applications - Track - Safety requirements for portable machines and trolleys for construction and maintenance,
- ENV 13803-1:2002 Railway applications - Track alignment design parameters – Track gauges 1435 mm and wider - Part 1: Plain line,
- EN 13803-2:2006 Railway applications - Track - Track alignment design parameters - Track gauges 1435 mm and wider - Part 2: Switches and crossings and comparable alignment design situations with abrupt changes of curvature,
- EN 13145:2001 Railway applications - Track - Wood sleepers and bearers,
- EN 13230-1:2002 Railway applications - Track - Concrete sleepers and bearers - Part 1: General requirements,
- EN 13230-2:2002 Railway applications - Track - Concrete sleepers and bearers - Part 2: Prestressed monoblock sleepers,
- EN 13230-3:2002 Railway applications - Track - Concrete sleepers and bearers - Part 3: Twin-block reinforced sleepers,
- EN 13230-4:2002 Railway applications - Track - Concrete sleepers and bearers - Part 4 : Prestressed bearers for switches and crossings,
- EN 13230-5:2002 Railway applications - Track - Concrete sleepers and bearers - Part 5 : Special elements,
- EN 13481-1:2002/A1:2006 Railway applications - Track - Performance requirements for fastening systems - Part 1: Definitions,
- EN 13481-2:2002/A1:2006 Railway applications - Track - Performance requirements for fastening systems - Part 2: Fastening systems for concrete sleepers,
- EN 13481-3:2002/A1:2006 Railway applications - Track - Performance requirements for fastening systems - Part 3: Fastening systems for wood sleepers,
- EN 13481-4:2002/AC:2006 Railway applications - Track - Performance requirements for fastening systems - Part 4: Fastening systems for steel sleepers,
- EN 13481-5:2002/A1:2006 Railway applications - Track - Performance requirements for fastening systems - Part 5: Fastening systems for slab track,
- EN 13146-7:2002 Railway applications - Track - Test methods for fastening systems - Part 7: Determination of clamping force,
- EN 13146-8:2002/A1:2006 Railway applications - Track - Test methods for fastening systems - Part 8: In service testing,
- EN 13232-1:2003 Railway applications - Track - Switches and crossings - Part 1: Definitions,
- EN 13232-2:2003 Railway applications - Track - Switches and crossings - Part 2: Requirements for geometric design,
- EN 13232-3:2003 Railway applications - Track - Switches and crossings - Part 3: Requirements for wheel/rail interaction,
- EN 13232-4:2005 Railway applications - Track - Switches and crossings - Part 4: Actuation, locking and detection,
- EN 13232-5:2005 Railway applications - Track - Switches and crossings - Part 5: Switches,
- EN 13232-6:2005 Railway applications - Track - Switches and crossings - Part 6: Fixed common and obtuse crossings,
- EN 13232-7:2006 Railway applications - Track - Switches and crossings - Part 7: Crossings with moveable parts,
- EN 13232-9:2006 Railway applications - Track - Switches and crossings - Part 9: Layouts,
- EN 13231-1:2006 Railway applications - Track - Acceptance of works - Part 1: Works on ballasted track - Plain line,
- EN 13231-2:2006 Railway applications - Track - Acceptance of works - Part 2: Works on ballasted track - Switches and crossings,
- EN 13231-3:2006 Railway applications - Track - Acceptance of works - Part 3: Acceptance of rail grinding, milling and planning work in track,
- EN 13848-1:2003 Railway applications - Track - Track geometry quality – Part 1: Characterisation of track geometry,
- EN 13848-2:2006 Railway applications - Track - Track geometry quality - Part 2: Measuring systems - Track recording vehicles,
- EN 13848-3:2009 - Railway applications - Track - Track geometry quality - Part 3: Measuring systems - Track construction and maintenance machines,
- EN 13848-4:2010 - Railway applications - Track - Track geometry quality - Part 4: Measuring systems - Manual and lightweight devices,

- EN 13848-5:2008 - Railway applications - Track - Track geometry quality - Part 5: Geometric quality levels,
- EN 14969:2006 Railway applications - Track - Qualification system for railway trackwork contractors.

Search tool of EU standards in the European Committee for Standardization website provides insight into the scope and the opportunity to purchase the selected EN standards. This is an expensive solution, and the purchased standard is not available for all employees in the enterprise.

On the other hand, database developed using Microsoft Office Access provides bilingual search using key words (common in engineering practice) and access to complete documents. Requirement for access to the complete document for all users of the intranet of the enterprise is purchasing EN standards from the Institute for Standardization of Serbia. This is a cost-effective and a more comfortable solution. Besides, the search tool provides insight into the status of the document. Addition and update of the EN standards in the database is done using an advanced search engine on the Institute for Standardization of Serbia website (Fig. 8).

Figure 8. Advanced search engine on the Institute for Standardization of Serbia website [8]

Fig. 9 presents the simple window for the search of EN standards in the developed Microsoft Office Access database. The database supports importing of standards in PDF format. Moreover, it is possible to import documents into other formats of interest for engineering applications.

Figure 9. Search principle on the example of EN srandards

Fig. 10 shows the possibility of insight in the complete SRPS standard, as well as the possibility of the addition of new standards. The same possibility exists for the European standards by using the appropriate window.

Figure 10. The window for access and addition of the technical standards

IV. USING THE DATABASE ON THE EXAMPLE OF SERBIAN ACTS, ORDERS AND INSTRUCTIONS

The database contains the necessary legislation in the field of railway infrastructure, regardless of whether they are harmonized with EU directives. This is important for engineering practice because in that way existing, reconstructed and new railway infrastructure is equally covered.

Fig. 11 presents the window for the search of acts in the area of railway in the Republic of Serbia.

Figure 11. Search principle on the example of acts

In a similar way, the search of Serbian orders and instructions in the area of railway infrastructure is performed. Serbian orders and instructions are not yet harmonized with EU Directives, Technical Specifications for Interoperability and EN standards [9]. Despite, the

orders and regulations are valid for railway infrastructure maintenance, and therefore for everyday engineering practice.

Fig. 12 presents the window for the search of instructions in the area of railway infrastructure. The similar window is used for the search of orders.

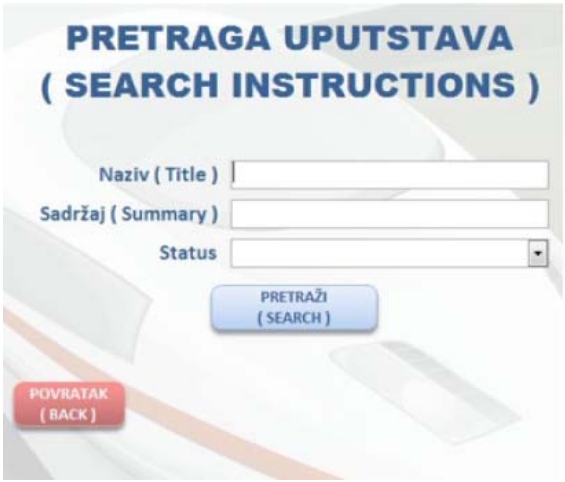

Figure 12. Search principle on the example of acts

Fig. 13 shows the possibility of insight in the Serbian technical instruction, as well as the possibility of the addition of new instructions. The same possibility exists for the Serbian technical orders by using the appropriate window. Generally applied document's formats are PDF and DOC.

Figure 13. The window for access and addition of the technical instructions

V. DISCUSSION AND CONLUSION

The incompatibility of the existing technical regulations in the area of railway infrastructure in the Republic of Serbia with the EU regulations is obvious.

For now, the legal barrier is anticoincidence of the existing Act on safety in the railway traffic (Official Gazette RS, No.101/05) [10] with Directive 2004/49/EC [3]. Adoption of new Serbian Act on safety in the railway traffic is in progress. On the other hand, although the Railway Act (Official Gazette RS, No.18/2005) [11] coincides with the corresponding European Union Directives, its decrees are still not applied in practice in the area of railway infrastructure

Technical limitations for the application of the European standards in the area of infrastructure planning are: lack of database on the existing Serbian Railways network, the lack of strategy and material means for filling in the base, incompetence in the level of expertise of the personnel, lack of knowledge in the area of management and maintenance of railway infrastructure, not following Directives, Technical Specifications of Interoperability and technical standards in this area.

Only after solving the given legal and technical limitations, can the Republic of Serbia possibly achieve harmonization of technical regulations in the area of railway infrastructure.

Obviously, in engineering practice there is a very large number of documents in the field of technical regulations for railway infrastructure. Inaccessibility and disorder of technical regulations hinder practical work of technical staff in enterprises. Frequent problems in practice were noted in the use of European standards due to uncomfortable search and purchase.

In this paper the database for the technical regulations in the area of railway infrastructure is represented. The database includes EU Directives, Technical Specifications of Interoperability, UIC Leafleats and EN standards, as well as acts, orders, instructions and standards in the Republic of Serbia.

The database is created using Microsoft Office Access and it enables simple search and availability of all necessary data. The database is intended for users of the intranet in enterprises. Practical implementation of the database is of great importance for successful operation of the enterprises that work in the area of railway infrastructure management.

ACKNOWLEDGMENT

This work was supported by the Ministry of Science and Technological Development of Republic of Serbia through the research project No. 36012: “Research of technical-technological, staff and organizational capacity of Serbian Railways, from the viewpoint of current and future European Union requirements”.

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The importance of the Internet and social networks in the improvement of Communications

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Abstract – This work is intended to illustrate the existing technology and communications in the light of computer supported work that supports electronic communications. The existing technology solutions in the field of information and communication technology (ICT) are chosen and described in this text. Here you can faind the concrete proposals that can help the discussion of problems and the formation of its final decision.

I. INTRODUCTION

With the development of human civilization, the problems than mankind encountered were increased and exceeded from the capacity of an individual to solve them. People became forced to band together and cooperate to seek for a solution. The need for a faster, easier and more successful communication resulted from this process and become a condition for any further progress, [4].

The quality of communication depends primarily on the social and emotional skills that man posses. Era of information and advanced technological breakthroughs made communication a brand new and a very important dimension. The use of computer technology brought a far greater progress to us. The obvious fact is that computers reduced the distance, the shortened time, they are connecting millions of people and thus increase the focus on solving problems that are more complex, [4].

Intense changes in information and communication technologies (ICT) and parallel growth in the development of these technologies marks the beginning of the 21st century. The terms that were unknown a decade ago, have become a part of the everyday life, [6].

Computer support should provide better quality and more optimized by the process of working should enable the collection, creation, organizing and sharing information and resources among the actors in this process.

II. INTERNET

Internet as a term means network within the network or network interconnection of more PC's. The beginning of a web is associated to the 1961st and Dr. Leonard Klajnrok, a professor at MIT, and his „packet-switching technology" project. Others think that it started in 1969., when pseudo-independent agency for advanced research projects (Advanced Research Projects Agency - ARPA), established by the U.S. government in Ministry of Defence of the United States, to develop strategic projects in communications, funded by a small group of computer programmers and electronic engineers to redesign the way computers work. The result of these efforts was the ARPANET, the first computer network.ARPANET was conceived as a network that is supposed to facilitate communication between military laboratory, government offices and universities, which are implemented in many projects of interest to the Army.

The internet crystallized in 1983 as it exists today, as World Wide Web, whose number is estimated at 150 million users.

Entering the twenty first century, online communication becomes a daily, one can say mandatory thing for many people. In the new millennium it is the more frequent verbal communication for the sake of avoiding the online version of the same thing.

Online communications became a world in itself, which threatens our „human" world where we are, at least for now, [7].

Some are viewing the Internet as an endless source of entertainment, the other want it to serve within their profession, acquired new knowledge and contact with colleagues around the world. In recent years an increasing number of commercial companies are trying to exploit an unexpected potential of the internet, as well as the cheap electronic distribution channels.

Modern banks are getting a stronger foothold in this new virtual world, using the cost-effectiveness of an information infrastructure for the smallest transactions by the internet automation of banking. Small innovative firms, and the whole consortium composed of the largest software manufacturer, hardware, telecommunication companies and such, are investing huge resources and efforts to develop new payment systems and transaction mechanisms on the Internet, such as those based on „smart" cards and digital money. It has, almost „overnight" crept into all spheres of life.

The internet has no owner, ie. no state or private institution does not ownership of its whole. Some countries and companies, are owners of parts communication channels, or equipment used, but the Internet has only one property - everybody is the owner of your computer that is connected to network and has the unrestricted right to use that computer and to storage the

content that it thinks to benecessary. This means that each owner of a computer independently choose which way to be connected to the network, what content is receiving from the network and what will send to others.

The Internet is a global computer network. Structurally, there are small networks that are mutually connected, and thus make this structure. The Internet is increasingly called global network information (large international-global directory data). The amount of information that those servers have is huge and it is difficult to evaluate and show how realistic is it really.

The Internet is a network of tens of millions of interconnected computers in different ways: in local networks, telephone lines, different types of cables, satellite links, cable TV connections etc. Regardless of the way that they are connected to the Internet, every computer in the network can communicate with any other computer connected to the network. In order to provide this, two conditions must be satisfied:

- Each computer must have a unique address on the network
- Computers for communication must use a unique „language“ - a protocol.

III. SOCIAL NETWORKS

A man as an individual Ican not survive on the planet on his own. This fact makes it to look for a friend. Everyone wants to be socially accepted, it wants to heard and want someone to share happy and sad moments. Meeting people, gaining new friends in the 21 century, has never been easier and faster, even for the shy and introverted person, thanks to the Internet.

A few years ago, currently, the best known and most popular social networks, in 2002 the MySpace, and in 2004. the Facebook. The regular global network users, adopted the operation of these sites and social networks in general, surprisingly quickly. The best proof is the fact that Facebook reached the million number of members in less than a year, and today some 200 million people have a profiles on this site! Social networks are growing every day, and only last year Twitter recorded a growth of 664 percent.

Social networks are an increasingly popular way to communicate over the Internet and are increasingly being replaced by writing emails. The American company Nielsen conducted a survey on this subject, and the results show that 67 percent of Internet users regularly visited social networks, and a regular exchange of e-mails have 65.1 percent of them.

The openness of the standard can cause problems for the development of these service and take primacy over traditional email messages. You can connect in one place, all your contacts from different networks, such as the e-mails can be exchanged with users of different services(Yahoo, gmail, hotmail, etc.) and be better and faster informed. Social networks are a new form of communication, something more, better and easier than an e-mail, is considered by one of the designers of Gmail.

In addition to the largest, the well-known global social network, there are also less popular networks of local or national character. These are the ones that are basically a music content such as last.fm, designed for keeping business contacts such as LinkedIn, those that are not closely molded to those intended for the exclusive publication of short messages, where users are writing about what are they thinking right now, what they do or feel in that moment.

What people often do on social networks is writing and editing their status. A change of status, except on the site, can be obtained using a certain desktop applications, and also via SMS.

A. Facebook

Facebook is the largest and the most popular social network. Most of its 200 million users are those with less than 30 years, although the demographics is rapidly changing on behalf of the elderly.

Facebook was created seven years ago when a 19-year-old student Mark Zukerberg, now chief executive officer of most visited social site in the world, formed together with two students from the University of Harvard, in order to make contact with your friends. He called it Facebook, by the yearbook that every freshman at the university recieved. Five years later, Zukerberg became the youngest billionaire in the world, and Facebook a global phenomenon.

Facebook's headquarters is in Palo Alto, California, about 800 employees and it is bigger than its main competitor, MySpace-by increasing its traffic by 127 percent, announced the global news agency. Since it began the campaign, Facebook is constantly improving its capabilities. From photo albums, users spending time together, leaving messages and other basic opportunities, Facebook has grown into an impressive platform for users that is offering many possibilities from month to month, and it Is breaking his own records.

The largest number of Facebook users in Serbia, for a 72.63 percent, is at the age between 18-35, [3].

IV. RESEARCH ON THE USE OF SOCIAL NETWORKS

Collecting data in this study were implemented by the non-standard research sites of higher education institutions. Obtained Data were analyzed using statistical methods.

The survey was conducted by visiting sites of all five state universities in the Republic of Serbia. It is the University of Novi Sad, Belgrade, Kragujevac, Nis and Pristina with the head office in KosovskaMitrovica.

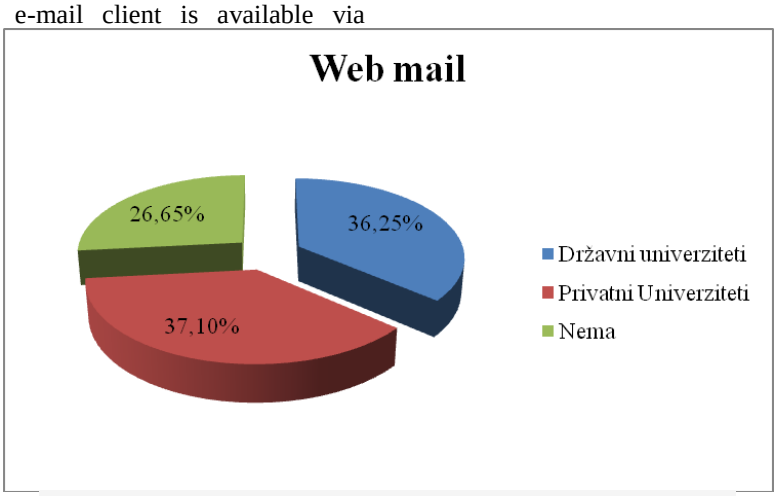
In order to gain insight into what kind of communication are there, along side to the state University, there have been visited eight sites of private University. These are the following private universities: Educons University Sremska Kamenica, International University of Novi Pazar, Megatrend University, University Singidunum, Pan-European University Apeiron of Belgrade, University Business Academy in

Novi Sad, Alfa Belgrade University, Union University, Metropolitan university.

By visiting the sites of these Universities, the student forums and discussion groups were researched where there was more information. On the official sites of some faculty can not be seen any these information at first glance.

WebMail is a web application to access e-mail inbox, which liberates the need for installing and adjusting the settings of traditional e-mail clients(like Outlook, Outlook Express, Thunderbird, etc.). All the functionality offered by traditional e-mail client is available via WebMail – to send, receive and read together with additional files, to save your contacts in Address Book, add a signature to outgoing messages, print e-mails using the printer and so on.

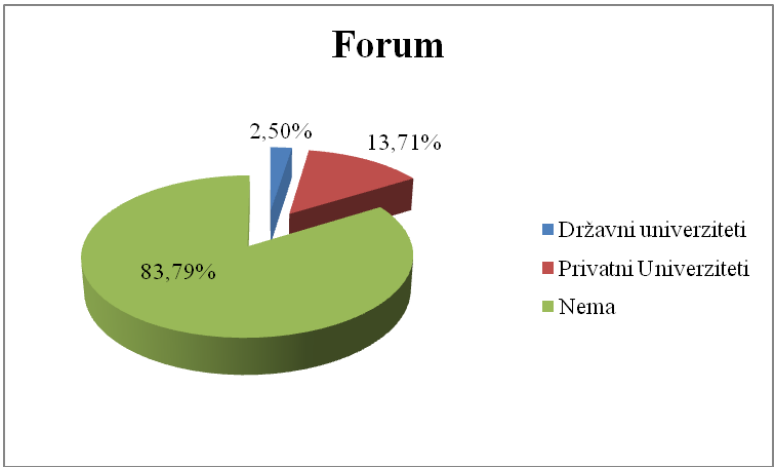
Messages that are read by WebMail remain in the e-mail inbox, while not removed or downloaded to the computer via e-mail client. E-mail messages are available at any time and anywhere from any computer connected to the internet. It can send and receive mail from home, friends, cyber café or while on vacation…



PICTURE 1. GRAPHIC REPRESENTATION OF WEB MAIL COMPARISON

Based on the graphic it can be concluded that this service is represented on the private universities with 37.10%, while the representation of the state universities is 36.25%. At 26.65% of the Universities this servis is not represented.

In the 2. picture there is an overview of the availability of student forums Based upon the graphic it can be concluded that this service is represented in private Universities with 13.71%, while the representation of the state universities is 2.5%. At 83.79% of the Universities this service is not represented.



PICTURE 2. THE GRAPHIC OF THE STUDENT FORUM AVAILABILITY COMPARISON

The results of research on the use of social networks suggests that there is a necessity to change the system in the way of communication, [2].

Using webmail, forums and social networks is increasing and so in addition to discussions, games and useful contacts and exchange of information.

Blog AdriaTalk.com has done research on the use of social networks in Serbia. Most used social network in Serbia is ***Facebook*** with a 1.2 million unique visitors per month.

MySpace has seen a considerable decline in popularity among the fans online in Serbia, but it is still at a high second place with 290 thousand monthly

visitors. The following is a popular site for sharing and storing images ***Flickr*** it has 180 thousand visitors per month in Serbia. Social network ***Hi5*** (high five) record's about 140 thousand visits from Serbia, per month.

On the fifth / sixth place to find social networks ***Tagged*** i ***Karike*** with 100 thousand monthly visits.The following, ***Neogen*** with 69 thousand monthly visitors and a social network ***Poznanici*** with the 53 thousand visitors per month level. ***Furka*** is on the 9th place by the number of unique monthly visitors from 39 thousand visits, while the ***Dodirni me*** is at the bottom of the table with 36 thousand visitors.

Naziv	Broj posetilaca na mesečnom nivou
Facebook	1 200 000
MySpace	290 000
Flickr	180 000
Hi5	140 000
Tagged	100 000
Karike	100 000
Neogen	69 000
Poznanici	53 000
Furka	39 000
Dodirni me	36 000

TABLE 1. 10 MOST POPULAR SOCIAL NETWORKS IN SERBIA

NOTE: The number of visitors referred in the study is the estimation number of visits, rather than exact data. The study used GoogleAd Planner. The aim was to compare the popularity of social networking in Serbia, not to present data on the exact number of visitors each of these locations.[1]

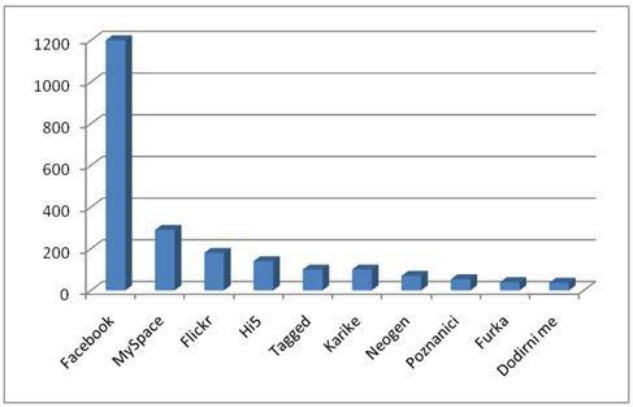
RATEL data show that the presence of internet in Serbian households in the year 2008 was ahead of Romania, Greece and Bulgaria. But in 2009. it was only ahead of Bulgaria. This is because in other countries there has been significant increase in Internet usage.

According to the Republic Telecommunication Agency, the number of registered Internet Service Provider in 2010 year was 192, and the number of subscribers is 2.5 million, or 41 percent more compared to year 2009.

Households with Internet:

- Belgrade - 48.6% representation
- Vojvodina - 37.9% representation
- Central Serbia - 30.5% representation

In Serbia in 2010. 50.4% of households owned a computer, while 39% households had an internet access.[2]



PICTURE 3. GRAPHIC PRESENTATION OF TEN MOST POPULAR SOCIAL NETWORK IN SERBIA

V. CONCLUSION

The internet World is a global computer network to whome is attached a huge number of computers. The number of computers and Internet users is exponentially increasing every day.

The advantage of sending an email, for some, is in the fact that before an e-mail a person that writes an ordinary mail is not completely sure is the recipient interested in what is written, with this technology you can announce your thoughts to everyone, and those who are interested will answer. The age structure of users of social networks changes, and is no longer the mostly young, but there are users of an older population, and the mass use is aged between 35 to 49 years.

Thanks to the Internet, particularly social networks, remote is becoming closer limited is unlimited, final – infinity... A new era is an era of integration.

[1] http://www.adriatalk.com/10-najpopularnijih-drustvenih-mreza-u-srbiji

[2] According to data of the Statistical Office for 2010. year

We should use its power and opportunities in the most appropriate way. When communicating, you should keep a few rules of communication:

- Be in tune
- Be attentive
- Avoid formalities
- Create and foster a friendly relationship.

Social networks have changed the way we talk, congratulate birthdays, communicate, share information... Their attraction is easy explainable. In the fast world that we live in, communication is reduced to a fast message, and direct human contact is replaced by a message on the screen. However, it is not always a bad thing, because any communication is better than none, according to sociologists.

With the birth of social networks and their ever-faster growth, the entrenched ways of business models are changing too. Social networks are ideal platforms for construction and maintenance of positive online strategy. Bringing millions of interconnected surfers together from different locations, potential clients, partners, customers, consumers and even competitors. These groups, in focus, are almost an ideal goal and they carrying the future of sophisticated communication activities, [3].

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Communications in Distributed Software Project Management

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Abstract - Software engineering and project management today are using advantages of modern communication technologies, with processes in distributed working environment. This paper addresses research and practical issues in the domain of distributed software development and management and particularly in communications area. We propose an integrated and layered model of all relevant aspects of distributed software project management communications, suitable for performance measurement and teaching alignment purpose.

I. INTRODUCTION

We are facing the fact that today software is developed by teams that are, for large projects, usually physically dislocated. Terms that are used for this type of software development organization are global software development, distributed software development, teamwork software development etc. Distributed software engineering and project management are facing many issues, categorized as general project management issues, specific to software development and particularly addressed to teamwork and distributed development.

Many years of practical work, issues, solutions and research resulted in sublimation in the form of standards as general accepted approaches to certain working areas. Project management (PM) standard framework include PMBOK guidelines [1], while more precise it is defined in worldwide accepted PRINCE2 body of knowledge. At the other hand, software engineering body of knowledge gives directions in SWEBOK [3].

Some of software project management best practices include [4]: accurate project metrics and measurements, accurate time/cost estimation, project management and software development methodology, project status reporting, automated tool usage, good communication with client, user involvement, adequate understanding of customer problems and requirements, team leadership, participation in decision making, good communication among project staff, morale boosting rewards and performance appraisals.

This paper aims to present most important issues regarding communication in multi-site development working environment. It will present layered model of all structures needed for communication and specially it will present data flow structures regarding PRINCE2 document templates that could be used as basis for standard data format in information exchange during software project management.

II. RELATED WORK

Research in the field of distributed project management and distributed software engineering (i.e. global software development [5]) is recently very productive with general research trends and directions [6] and presenting experiences from diversity of global projects [7]. Results are related to measurement and monitoring performance [8], comparing performances with face-to-face communication [9] and improving performance of distributed teamwork.

Distributed teamwork software project engineering and management are facing issues such as: technical problems of communication [10], coordination [11], communication speed [12, 13], knowledge sharing [14, 15], group awareness [16] and adjustment of heterogeneous teams [17], creativity and quality [18]. Special issues are examined regarding communication practices in different software development methodologies, such as Extreme Programming [19].

As one of solutions to these issues, specialized software ("groupware") is developed to be used for organizing, communication and integration of teams and their work in distributed working environments. They support acitivities such as meetings [20], organizational learning [21], self and peer assessment [22], integration of process and project management [23] for collaborative multi-site development [24].

III. RESULTS

A. Layered communication model for distributed software project management

As one of results of this paper, we present layered communication model, that integrates different aspects of communications in distributed software development and project management.

This model consist of several layers that enable communications, form a communication structure and enable functionality of communications. It is based on

general structure of information system (hardware, software, lifeware and orgware).

TABLE I. LAYERED COMMUNICATION MODEL FOR DISTRIBUTED SOFTWARE PROJECT MANAGEMENT

Layer	Sub-Layers
Orgware	Communication protocols and standards
	Business rules
	Project management methodology
	Development frameworks
Lifeware	Roles
	Responsibilities
	Constraints
Software	Communication software
	Groupware
	Project management software
	Development environment
Hardware	Telecommunication equipment
	LAN equipment
	Workstation hardware equipment

In this model, hardware presents technical equipment needed for personal and teamwork software development and communication between teams, software enable development, project management and communications, lifeware present set of working roles of individuals within teamwork and project (like developer, project manager, team leader etc.) and orgware present procedures and methodology for project management.

Proposed model presents a basis for teaching process in this field, with systematic presentation of knowledge areas. It also presents a framework for performance evaluation of relevant aspects of communications in distributed software development process and software project management.

B. Orgware and Lifeware

Regarding data that are used in project management, more precise prescription regarding document templates and procedures gives PRINCE 2 methodology. Based on this methodology and document templates, business process model (BPM) has been presented (Fig. 1).

This BPM presents workflow, data flow, data stores and basic work roles (lifeware) of the model that are responsible for each activity, data flow and data store. These work roles are: User, Client, Portfolio Manager, Team Leader, Project Manager and Team Member.

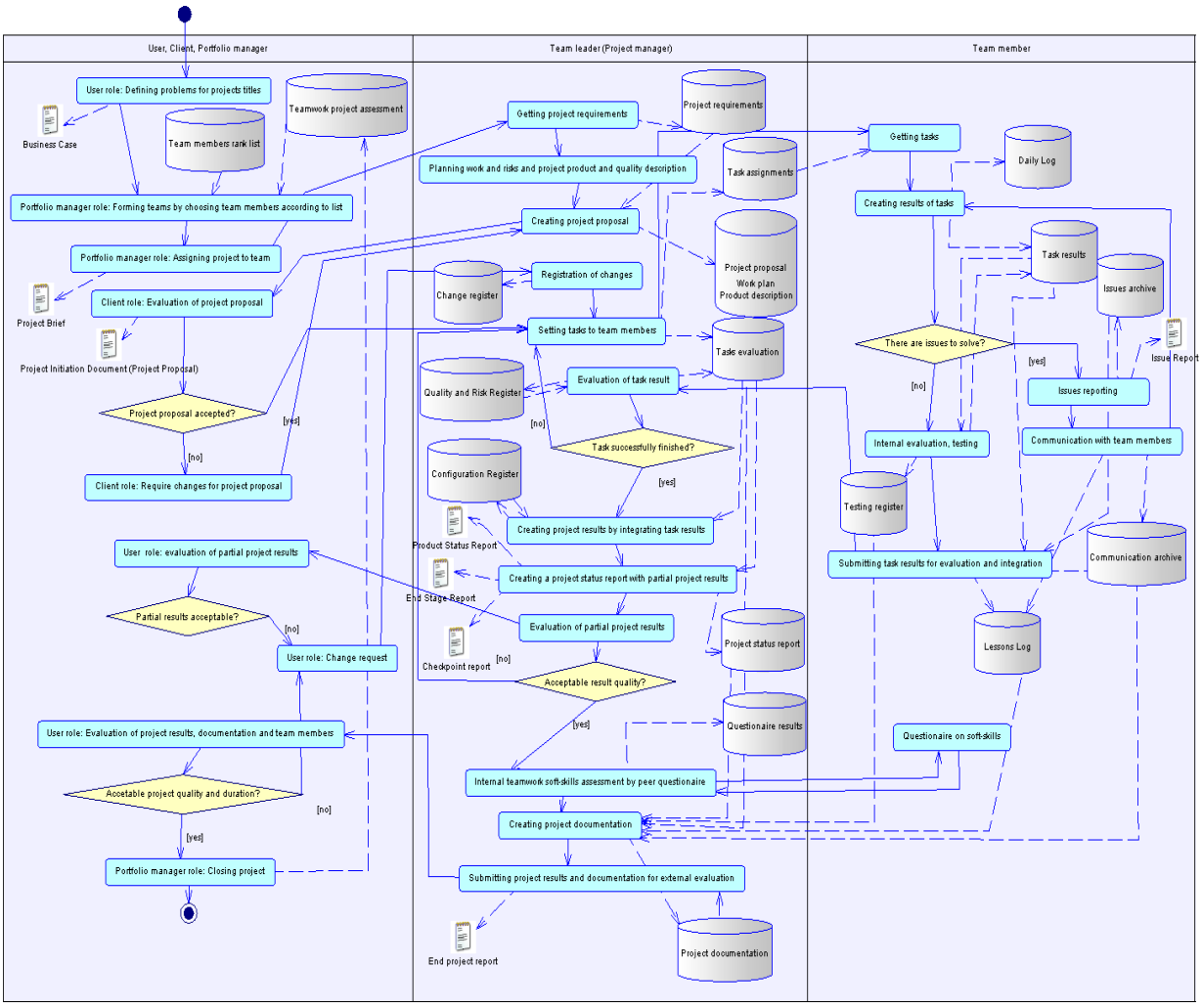

Figure 1. BPM according to PRINCE 2 methodology [25]

C. Software

Software support consist of basic communication software (network system software, applicative software such as e-mail, messangers etc.), project management software, groupware tools and software development environment.

Basic knowledge areas in project management as well as basic PM activities should be covered by project management software support. Knowledge areas define important data structures and group of processes require appropriate software functionality.

TABLE II. PROJECT MANAGEMENT KNOWLEDGE AREAS AND PROCESSES

Basic knowledge areas [1]	***Additional knowledge areas[26]***
Scope	Resources
Time (duration)	Conflicts
Costs	Changes
Quality	***Groups of processes [27]***
Human resources	*Initiation*
Communications	*Planning*
Risk	*Execution*
Procurement	*Control*
Integration	*Closing*

Groupware software as a tool need to support:

- coordination of activities, meetings and setting/getting assignments
- evaluation of results
- integration of work
- knowledge sharing and organizational learning
- social networking and enhance teamwork cohesion
- quality assurance, self and peer assessment
- enhancing creativity.

Recently improved software development environments (like Microsoft Visual Studio 2010) have enhancements in functionality with modules that enable groupware and project management with distributed teamwork. This way software development environments are integrated with previously developed tools - groupware and project management software.

Some of these integrated systems are using web sites or file servers for sharing code and other artifacts during distributed software development and project management.

D. Communication

Figure 1. shows communication between all working roles during project activities, from initiation to finalization in BPM according to PRINCE 2 methodology.

In this model it has been shown that communication between working roles are of several types:

1. Initiation of activity - after completion of one activity, another activity (assigned to another role) can be started.

2. Reading data from data store - data stores are assigned to specific roles and some activities of other roles need to read data from data store that is assigned to another role. Permissions to access data are needed to be defined. Obviously, writing to data stores is restricted only to data store owners and other roles are not allowed to access these data stores for writing new/updating data.

Technology solutions support this communication activities by:

1. Business process management systems - enable orchestration of activities that are processed parallely at distributed locations. Starting one activity depending on another (at some other location) is managed by these systems.

2. XML and web services - Data that are to be exchanged can be in informal, semistructural or structural form. It is obvious that there is no direct access to data stores of other working roles, but only using services (like web services) that enable access to previously prepared and deployed data in XML form.Widely accepted standard format for data exchange is XML. It is recognized from all software development environment vendors and database management system developers, so it is most appropriate to structure and exchange data in this format.

IV. CONCLUSION

This paper gives a brief overview of knowledge areas and issues in the field of communication within distributed software project management.

Recent research show most communication experiences, global trends and issuess that are addressed and solutions that improve these aspects. Special software development methodologies bring specific challenges in communication, such as Extreme Programming, where time-to-deliver is crucial and all unnecessary administration and time consuming is avoided.

We presented an integrated communication layered model for different aspects of communications within distributed software project management. These layers are organized generally as a structure of an information system - orgware, lifeware, software and hardware. Particularly, software needs are addressed from functional aspect.

Special concern has been given to business process model based on PRINCE 2 methodology for project management, where data flow present communication between working roles in project management. It has been shown that communication types are initiating of activities and reading data stores. Technology such as business process management systems, XML and web services are described as support to these communication types.

Future work in this field is planned to be in detailed presentation of data structures of data flows and data stores, projecting databases and XML structures, in aim to enable development of specific software that could integrate all software modules for the needs of distributed software development and project management process.

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Good WEB Design for restourant can increase his marketing and business

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Abstract - In the last ten years, the use of internet has drastically increased in the whole world. This means that while marketing grows other different businesses also grow thanks to the internet marketing.

Meanwhile, internet marketing of certain businesses may have some issues. These may present a problem in the development and the performance of the specific businesses.

Therefore, the main aim of this research is to analyze the design of two different web sites for each of the two restaurants. It is expected to emphasize the advantages and disadvantages of each web site compared to the other one. Also another research is made about a usability of website designing software for restaurants.

I. INTRODUCTION

The marketing of the web site with lower design quality would naturally attract less web site visits and the restaurant would have less customers. In order to have more web site visits and more customers in the restaurants, we will need to have a good design of the web site.

The design and development of useful and attractive web sites demands great skills of creativity. As the products evolve from the first ideas through a conceptual design and prototypes, the repetitive cycles of design and evaluation assist in meeting customers' needs. The decision where and how to evaluate a web site, asks for a careful analyzing and it can be different for different types of businesses.

The process of design begins with the designers working on the web site development, which meets customers' needs. Meeting the demands has a tendency to occur in the negotiations between the designers and customers.

The web site designs reflect designer's understanding and representation of customer's needs. As the customers experience the web site design and the ideas behind it, they are able to provide good feedback. This assists web site designers to improve the quality of the web site design. [1]

The process is a continuous cycle with evaluation which improves communication between the designers and customers.

The evaluation is followed by questions about the design and specific aspects of the web site and how they are meeting the needs of the customers and their experience with the web site.

For example:

- Is the web site attracting the customers enough to use it again and again?
- Are the customers able to find specific item on the menu?
- Are the customers able to interpret specific graphics and is it useful for the web site?

II. EXPERIMENTAL PART

To have a poor web design is the same as if you are in the desert without a compass and looking out of the wasteland.

"I am an artist and I want to know how to get samples of my paintings and samples online". [6]

Design is the most crucial thing in a website. There are many reasons that a customer would want to stay on the website because of multimedia elements, sound, video, animation, and Flash movies for interactivity. Fast loading is built by Flash web design. Website "X" which will be pronounced later on is affordable and contains professional web site designs and graphics.

HTML is not frequently used because of new updated versions like Flash.

Flash is used because of many useful things that other website software's don't have. Interactivity for example, can attract a user's attention. Flash website design has more advantages than a normal website. It helps in creating a good-looking, interactive and vibrant website. Flash is used to create some of the most eye-catching, awe-inspiring, mind-blowing, award-winning work on the Web. The major factors of a website's design are its color effects, lights, visual effects, positioning and size of its contents. [8]

Animations in Flash have complex transitions, and immersing displays more feasible than HTML. The Flash Web site design enables you to create simple as well as

complex Flash animations, where by you can combine different fonts and effects within a single Flash animation. It is very easy to put a video on your Flash website in comparison to the other sites which can't fulfill that obligation. For Flash it is automatic to reload a page after each request but on the other hand, HTML needs the help of AJAX. In Flash, the design for the website is very creative and it looks the same in all browsers. Flash gives us the ability to multiple uploading, it's also easier to style your own form components than HTML. Flash has the capability to interest people and draw attention about a product or service.
Combine that reputation with the often uniformed opinion that Flash is for creating nothing more than exceptionally annoying banners or Web site intros and preloaders that are so bloated in file size they need their own preloaders and you've got a recipe for disaster. On the other hand, when done correctly, flash was your only option if you wanted anything either than a graphic and text.

Don't use the flash to tell the story, use it to enhance the story. If you are trying to sell a product, leave the important information in the HTML of the page, but use the flash to emphasize and promote the product or a restaurant in this case by either displaying it, or pointing out the benefits, your flash should be complementary and not too overwhelming. Finally, Flash website design is the right choice if you are searching for the best design solution for your website. [10]

Flash websites are powerful and impressive. Flash can be effective when used correctly. These days, thousands of designers use Flash to design stunning web sites, they display products and entertain web visitors in those web sites. Flash is highly profitable when used to advertise products or restaurants among prospective visitors. [12]
The web design is equally important for the customers and the managing team which profit through this web site. The next text will be made as a comparison between good and bad web design and through research of customers we will get results. These results will be very important for the bad web designers, to improve in the future.

A. Description for good web design on "X" restaurant

As people are orienting themselves to the page, their eyes scan the page and are all over it for a few seconds, and then fixate on the top left of the page. If you have a flash movie running they have missed a few seconds of that message.
The web site "X" is representing the restaurant with a good web design. The Web design in this site is made in Flash software.
Its contrast leaves a good impression with the customers. With this site, the designer achieved a good contrast, good for the customer's eye by choosing colors, fonts and images wisely.
The design of "X" site also contains repetitive design elements which help to achieve consistent look and improve branding. This is achieved by repeating elements in the header and the footer.
In the "X" site the elements are better aligned and in a good order, so the site looks professional and it shows a clear and simple design.

The design of the "X" site has a very good proximity of the elements, so it gives a sense of calmness and harmony to the customers and is guiding the eye.
The "X" site logo is placed in the top-center and it is clearly visible and in accordance with the design. Bellow the logo there is an attractive flash video for the interior and exterior of the restaurant.

The "X" site typography is with Helvetica font which belongs to San Serif group of fonts.
The home page and the rest of the pages text is justified. This site is designed so it looks great for the customers, it is clear and simple and has consistency. [5]
From the size of the heading, font choice, coloring, button styles, spacing, design elements, illustration styles to photo choices it looks great.

The main menu contains links in the form of submenus such as:

- Home, Menu, Photos, Location, Reservation, About Us, Site Map, Work Time, E-Mail…

In the submenu Menu, there are Entries, Main Menus, Deserts and even the Drinks. Very importantly this submenu also displays the prices of all offerings and their calories.

Since publishing of the web site of the restaurant "X" on the internet, advertising and visits have drastically increased in the next two months. After the first month the number of consumers has increased by 40 %. But after the second month the percentage has grown to 60 %.

B. Description for bad web design on "Y" restaurant

The site with the design "Y" is much worse than the design of the "X" site. The "Y" site is HTML designed.
This design has firstly an ugly background which is a photo of some food and it looses the whole text contrast which makes it look messy.

The text on the Home Page is very long and annoying for the customers and makes them scroll down to read it all.

The site "Y" doesn't have a Site Map which prevents customers to easily find anything on the web site.

The color of the Submenu's Font is irritating and different for every button while typography of whole text is in Times New Roman font which is Serif and it is not recommended for any web site. The Serif type of fonts is tiring for the eyes of the customers. [4]

The heading of the Home Page is very big so the Logo of the restaurant "Y" is almost invisible. No videos.

The Submenu's text has very big spacing between the rows, which means when you finish a line of text and going to the next, your eye can get lost.

Between the images and the text there is no padding. The simple rule in the web site design is that you should always have space there.

The text is with very little contrast and it gets lost in the colors of the background. The Main Menu consists of the following submenus:

- Home, Menu, Photos, Personnel, Location, About Us…

There are no Site Map, Work Time and Email compared to "X" web site.

Even though, this web site has fewer submenus than "X" site, it sounds and looks simpler, it is more irritating for the customers because of mismatching of the colors and the typography make the site "Y" inadequate and inconsistent.

The other disadvantage of this site compared to "X" site is that the photos are with very bad resolution and especially important it has photos of food only and not of the restaurant's interior or the exterior.

A big failure is that this site doesn't have a submenu for Reservations, which may cause the restaurant to loose its customers because of the inability to book a table or make any kind of reservations.

Not having an email item on the submenu, creates an issue for the customers not being able to provide good or bad feedback about the restaurant, even to making bookings via email. [2]

In the submenu Menu, the Drinks item is missing, as well as the price list of the offerings and calories of the food. This wasn't the case with the "X" site. [3]

The only advantage of the "Y" site in comparison to the "X" site is the submenu 'Personnel'.

Since the restaurant "Y" published the web site on the Internet, there weren't any important changes in the visits of the restaurant in the next two months. After the first month the number of consumers has increased by 5 %. But after the second month the percentage has grown only to 6 %.

With this raises the question, "Why don't the customers have trust in the web site "Y"?"

In the text bellow there are two researches about the disadvantages of site Y and which web design software is the most adequate for restaurant web sites.

C. Research for disadvantages of website "Y"

After the description of the "X" and "Y" web sites, 300 people of 25 to 60 years of age, were interviewed via the questionnaire why were the visits of "Y" restaurant not increased even with publishing of the web site?

Questionnaire:

- Would you visit a web site which will enable you to find information about a restaurant?
- Would you like a web site with a menu item to make a table reservation in a restaurant?
- Would you like a web site with information about calories of each food or drink offered?
- Would you like a web site with the price list of food and drinks?
- Would the inconsistency (bad order of items, bad resolution, and unreadable text) of the web site make you leave it?

This questionnaire is answered with "yes" and "no". The results are presented in percents.

After processing data, we have come to the conclusion that 58% of people search for restaurant information through websites. 82% of the people said that they like to have a menu item "Reservations", so they can easily book a table in the restaurants.

The percent of people, who responded that like a website with information about calories of foods and drinks, is 72%. Even the 93% of questioned said that they

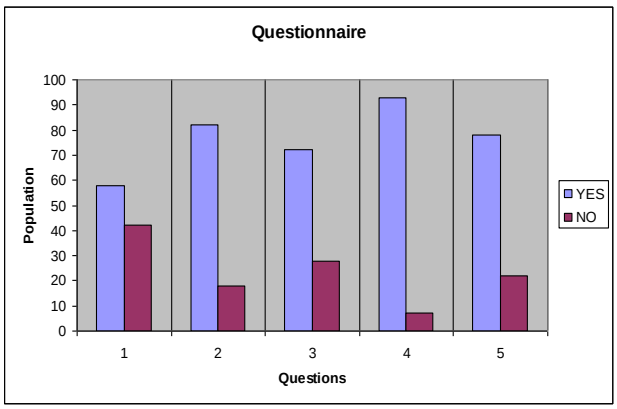

Figure 1. Why the visits of "Y" restaurant didn't increase even with publishing of the web site?

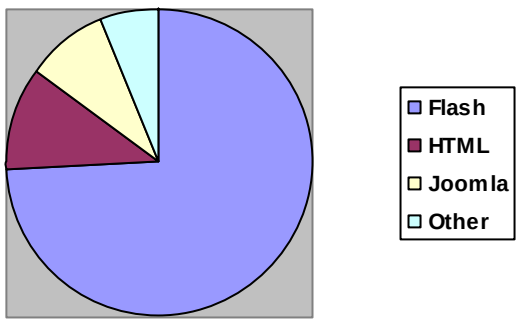

Figure 2. In what software is the website designed for your restaurant?

would like to have a price list on website about food and drinks.

Approximately 78% of people answered that they leave the site if it hasn't got consistency, bad order, bad alignment, bad navigation...

D. Research for WEB Design software for restaurants

In this research 70 websites of restaurants are analyzed. After the research the results are shown in the pie graph above. The main question in this research is:

- In what software is the website designed for your restaurant?

From the chart we can see that 74% from all the websites for restaurants are designed in Flash software, 11% in HTML, 9% in Joomla, and the rest 6% of sites are designed in other software. From this research we can confirm that other than the consumers, the Flash design is agreeable for designers and seekers.

From the questionnaire above we can conclude that the good organization and good design of one website can help the managers get profit and make consumers happy.

In the table bellow you can see advantages and disadvantages on "X" and "Y" websites for restaurants.

TABLE I. ADVENTAGES AND DISADVENTAGES FOR WEBSITES FOR RESTAURANTS

Advantages and Disadvantages	
X	Y
Designed in Flash	Designed with HTML
Good Contrast	Bad Contrast
Good resolution on images	Bad resolution on images
Good navigation	Bad navigation
Good sans serif font	Bad serif font
Has a video for restaurant interior and exterior	Photos and videos for the restaurant interior and exterior are not included
Has a Reservation item	Hasn't got Reservation Item
Has food and calories information	Hasn't got food and calories information
Hasn't got a Personnel menu item	Has a Personnel menu item
All advantages increase attendance to the "X" restaurant	All disadvantages didn't make important changes to the visit of the "Y" restaurant

III. CONCLUSION

An effective and organized web design should be a key element of a restaurant's marketing budget and strategy.

The potential consumer will visit your web site on the Internet and have enough time to see, read your text, see photos of your offers and videos, to see how she/he can book a table at the restaurant and visit the restaurant.

A strong website can boost sales while proving the right information about a restaurant. It should also help increase customer loyalty and retention as well as be a tool to drive first time trial. If you are looking for strategies to incrementally increase your business, then take a good look at your web site. The website must be reconciled in order for a restaurant to successfully capture business from its Internet efforts. [2]

Once you post a short ad on TV, newspaper or other medium, the same ad will be with a highly limited duration of the TV, the consumer or user will not be able to understand anything, but when the same advertisement will indicate the web site address you will know much more about the product you have purchased.

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Basket Coach Board

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Abstract - Information technology development and its integration in all aspects of our social and economic life did not leave out the sports. Increasing professionalism and competition cause clubs to approach all their activities in more and more systematic way. Progress is especially visible in training and analyzing opponents' teams and players, i.e. scouting. Therefore a need arises for such a program package that would enable better knowledge regarding basketball tactics, action analyses and creation, review of video actions and printing reports, i.e. documenting all actions, results and remarks during the work. This program is used by national team of Serbia when preparing the games in all official and friendly matches. This paper describes design and realization of program package for analyzes, scouting and creating basketball actions. Graphic objects comprising the editor with their own drawing methods. To realize such editor it was necessary to realize a number of auxiliary methods as bitmaps operation (rotation, transparency, resizing, shrinking and widening by certain factors), methods for manipulation and drawing the actions (paths) assigned to players (drawing line with particular dots, calculating distances in pixels between dots, dividing lines in certain dots) as well as methods connected to analytic geometry (distance between the dot and the line, line crossing etc.). Basketball actions consist of phases with their own methods of drawing and animation. Animation is an iterative procedure where in every step, under certain conditions (speed, delay) players are moving from spot to spot obtained by "chopping up" the trajectory of the player.

I. INTRODUCTION

In team sports there is a number of methods to prepare athletes for competitions. There are physical, technical, tactical, psychological and integral ways of preparations. Every one of those has its fundamental importance in forming the athlete and the team, bringing to successful performance at the game and to the good result. A good and high quality scouting is unthinkable today without modern information technologies. This especially goes for the American football scouting. Every team has its so-called "whisperer", a person who reads lips of an opponent coach or player in order to anticipate next action. Nevertheless, human factor is still most important in a scouting. It doesn't matter whether scouts have read opponents action properly; the player in the field is the one to decide on last point, last good defense, and last foul… Scouting in volleyball is also interesting, especially in a way of its implementation. According to the best Serbian coach of all times, Serbian national team became European and World champion only when it modernized its information technologies. In basketball, a special place belongs to the "Advance scouting", one of best scouting programs in this field. It was first used by Chicago Bulls and they were six-time NBA champions. They has great individuals in their team, including probably the best NBA player of all times Michael Jordan, they did not win a single trophy until they introduced the "Advance scouting" program. This paper describes the scouting program.. The project is modeled using UML specification. In static aspect of the system, the Use Case model and Class Diagram model were used, and for dynamical aspect the Activity Diagram was used. Activity diagram describes a process with its starting point (initial point) for action or activity necessary to describe a job or a function, and its final or ending point. By activity diagram we describe a process, step by step, with all conditions necessary for the next step, all the way to the ending point. The Use Case diagram enables defining primary elements of a system (participants, user) and the functions he performs. In this way it is possible to format a global picture of a system, which will be a foundation for all future steps in realization. The Class Diagram is the graphical description of a system comprising of classes, its attributes, connections and relations between classes. Class model helps more efficient implementation by clear definition of system aspects. Since present operative systems are highly interactive with the user, a natural choice is the graphic action editor where working space window will be the coach drawing board. Main advance of such application over the drawing board is the possibility to save action, print report with notes during the presentation in front of players, ad well as saving actions in a video format with possibility to play those with various speeds. There are several types of editor in market fulfilling these demands. Here is presented a framework that may become universal for all graphic editors of the type, for all team sports (soccer, basketball, handball, etc.). This paper presents basketball action editor, but with some minor changes this may become the universal graphic action editor. Implementation is realized in programming package *Borland Builder 6* in programming language C++. For creating a video, open source API – *OpenCV* was used.

II. DESCRIPTION OF BASKET COACH BOARD

One of first steps in designing and modeling of a presented problem is the analysis [1,2] and specification of demands [3]. During the analyze process, it is important to obtain answers to the following questions:

1. The basic purpose of program package that is being implemented, i.e. essential demands of the user regarding functioning of the system. The application is a graphic editor, enabling the user to add elements on the working space window, to adjust properties, to add actions to every element. The diagrams also must be shown, as well as

their review by phases, and creating a video record and printing the report.

2. Hardware demands of the program package

Some teams worldwide use PDA devices. They are relatively small and easy to transport. Also they have relative good memory and possibility of writing on top of them.

On the basis of previous steps, it may be concluded that there is a pattern for formation of graphic editor model, as well as standards it must posses:

1. Application is **MDI** [4], i.e. enables working with several documents (and diagrams)

2. Every document consists of two toolbars (one for adding graphic elements on worktop and one with icons for manipulating the phases, animation and operations undo, redo and delete) and the worktop.

3 Before creating a new diagram, enable user to choose in which field the basketball action will be created (half field or whole field), which is the field orientation (horizontal or vertical), how much host and guest players the action will start, as well as graphic mode for depicting layers at the worktop (**type**: circle, triangle, shirt, and **color**)

4. Every graphic element has certain properties

a) Player: name, position, shirt number, size, angle regarding field orientation, status (host, guest), and mode of representation on the worktop. For every graphic element it is possible to make corresponding notes.

b) Ball: size,

c) Action (path): comment, line width, speed and delay of elements moving on the path,

d) Marker to mark part of the worktop.

5. Enable operations *cut*, *copy*, *paste*, *delete*, *undo* and *redo* on graphic elements:

a) Enable user to adjust paths where animations and pictures will be recorded, and to make adjustments for working with diagrams: animation sped, whether paths will be visible during playing the animation, player positions, as well as adjustments of values for element size on worktop – size of selection dots, b) Basketball action is happening in stages. After adding actions to players, moving to next stage is done by clicking the icon, and before next stage present one is being animated. Players in second and following stages are not able to move using mouse, in order to provide logic consistency of the action, c) Enable manipulation of stages, i.e. deleting and adding stages, moving to next one, previous, first and last stage, d) Enable animation of the action, i.e. showing animation of active diagram

6) Basketball action may be saved in *AVI* or *SWF* file. Enable playing these formats within the application.

7) Enable *screen capture* of active diagram

Generating two types of report: **general** – with user's comments, and **report of basketball action** with characteristic pictures of action, i.e. all stages and all comments added by user.

Figure 1. Aplication in the moment of action creating

If there will be no overlapping, that is the distance between players in next stage is less than set value, a message is written on the screen that user must re-check all connections assigned to players, so there would be no overlapping. If everything is fine, will be no overlapping on the screen. Afterwards the *DeselectAll()* method is being called, to deselect all elements. Figure 2 shows dialog for setting properties of the path. User clicks right mouse button on the path and chooses item Line Properties. Text entered by user is short commentary about player's movements, for printing in reports. Width parameter is thickness of the line by which a player is moving, and parameters Speed and Delay determine speed and delay of the player. In case of a referee and his assigned path, user chooses in which direction the referee will be moving and by which angle his view point is moving (in fact, referee's moving is determined by the path, and view point is determined by head movements according to the Target Point parameter).

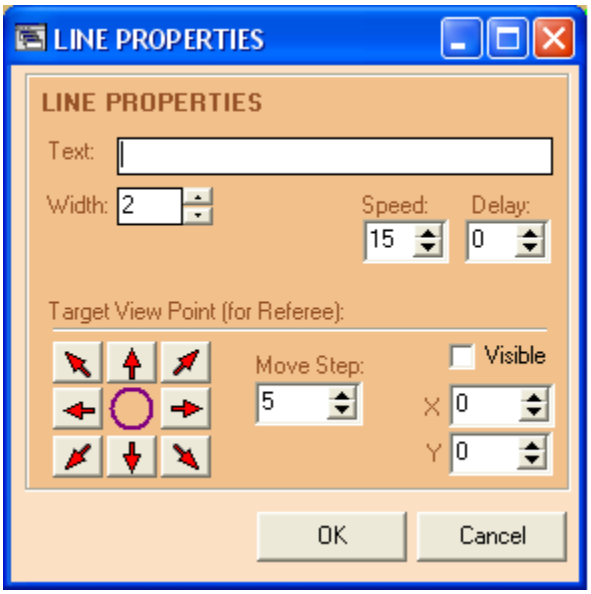

Figure 2. Dialog for setting properties of the path

The *CalculateNewPosition* method is being called, returning the dot where the element will be moved. In the

end, calling the *MoveTo* method provides movement of the object itself.When the element reaches the end, i.e. when *distance* is equal to value of *previousDistance* attribute, then *finishedAnimation* attribute obtains value *true* and animation is being finished.When playing the whole animation, a list of all stages is being checked which is the attribute of *TanimatedAction* class and for every stage an *AnimatePhase*() method is being called.

Fig. 3 and Fig. 4 are showing the process of creating a basketball action.

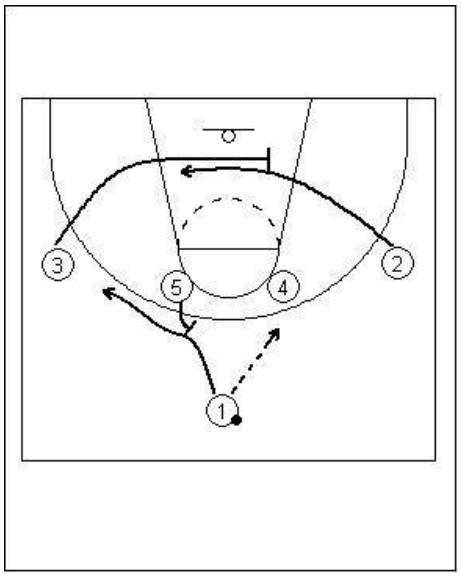

Figure 3. Example of basketball action

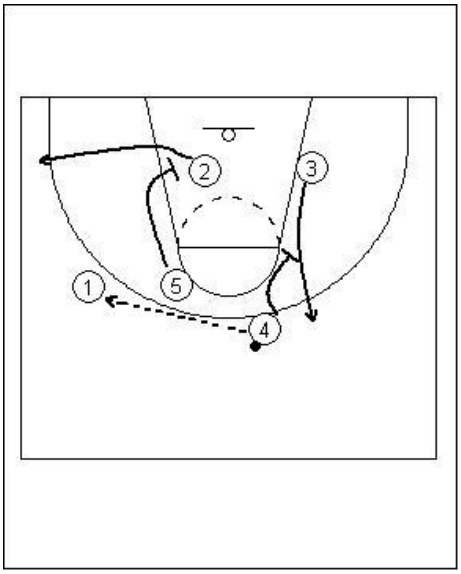

Figure 4. Example of basketball action

III. PRINTING A REPORT

For printing reports, components of *QuickReport* are being used. The basic component is *QuickRep* or the report that is to be printed. For every information or a group of data, there is a component *SubDetail* where data are placed. In short, every *SubDetail* must have its parent component, i.e. *QuickRep* component, and every information must have *SubDetail* for a parent. Components are created dynamically since report depends on number of stages and the choice of the field. If user chose half field for creating a basketball action, in report four pictures are created in a same row, for every stage separately (picture represents starting state of every stage). Figures are obtained by calling *createBitmapsForPrint*() method. This method places a whole worktop (for every stage separately) into a list of pictures, which later will be dynamically created at certain positions. Every stage has *Bitmap* attribute, which is initial state of a stage. After that, listing all comments given by user for graphic comments is in order (if there are those). By clicking the right mouse button and choosing item properties, the following dialog is being opened.

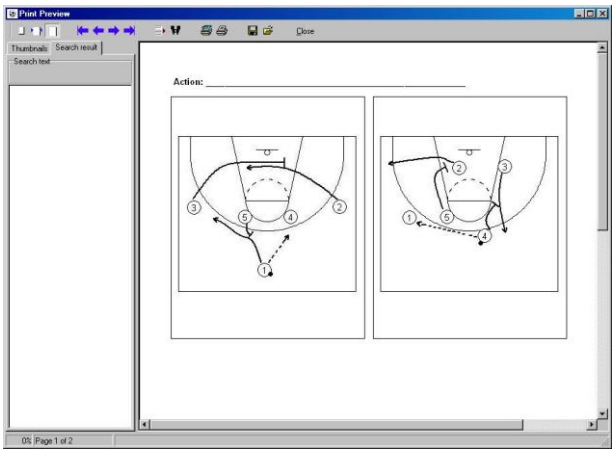

Figure 5. The example of the report

IV. CONCLUSION

This paper presents the implementation process for graphic editor for creating, editing, animation, and creating video for basketball actions. Steps from modeling to implementation are described. In every step, starting from model of Use Case diagram, class diagram, to dynamic aspect of a system, procedures are described that enable defining implementation issues of such an editor in a gradual and complete way. As it may be seen, this task demanded from our team to implement knowledge not only in modeling and coding, but also of the posts, its tactic element, parameters important to coach in scouting and tactical training of the player, and in adjusting user interface to final user. Basketball actions comprise of stages with their own methods of drawing and animation. In solving animation problems and animate stages it was necessary to learn how to handle lists of graphic objects, lists of distinct dots, ad well as moving objects regarding user's adjustments: speed and delay. Largest problem was the way in which different speeds of players will be realized. Methods had to be written establishing current position of a player, his dots and on the given speed move him to strictly designed place. Before animation it was necessary to "divide" lines between distinct dots into more dots by which player may move. This was necessary in order to provide smooth animation, and speed problem was solved by moving a player for several dots in one iteration. This means that animation is iterative process, where in every step under certain conditions (speed,

delay) players move from one spot to another, obtained by „chopping up“ the path of the player. Possible improvements in this segment may be better algorithms for checking the lists or maybe a new data structure, which will speed up object manipulation. Aim of projecting and realization of such a problem is to enable basketball coaches that, together with players, in an interactive way, develop tactical skill for challenges waiting for them. On the basis of previously said, we may conclude that implementation of this kind of editor may be broadened in order to fulfill demands of other team sports, such as soccer, water polo or handball. Use Case model, class diagram and state diagram, with some changes, may become a pattern for creating specialized editors for these sports.

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APPLICATION OF THE TEST IN TESTING PROGRAM

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Abstract - Within software's life cycle, program testing is very important, since quality of specification demands, design and application must be proven. Testing of large and complicated programs must be done as systematically as possible, in order to obtain reliability. In case of large and complex systems and their operating systems ad hoc testing is used, which often could not prove quality or validity according to specification, construction or application. Validation and verification are terms often connected to program testing. Verification is checkup of testing of objects (or programs) in order to determine are they in accordance with specifications. Verification contains analysis, inspection, trying, as well as testing of program. About testing the software, ordinarily we do statically analyses (exploring of basic programs, searching for primary problems and collecting data's without executing the program) and dynamic analyses (exploring behavior of program in executing, so we acquire the data about the ways of executing, chronological sections and integrity of testing). Every company, which educes the software, is performing tests of their products, and the software from market usually contents complex variants of defects. Sometimes it is difficult to understand how it is possible that the test omits so obvious error.

Key words: verification, validation, test information, specification, testing programs

I. INTRODUCTION

One of the most important aspects of the projects for software development is the strategy of integration. The integration can be performed at once, from the top to the bottom, from the bottom to the top, critical part first or with the first functional subsystem of integration and only then to integrate the subsystems in separate phases using any kind of basic strategy. In general, if the projects are bigger, the strategy of integration becomes more important.

Very small systems are often collected and tested in one phase. For the majority of real systems, this is not practical for two important reasons. The first is that the system would failed in many places at once and the attempts to debug and to re-test would be completely impractical [PRESSMAN]. The second is that the correspondence to the testing criteria of white box would be very difficult, for the big quantity of details separating the entrance data banks from the individual ciphers of the modules. In fact, the majority of integration testing is traditionally limited to the techniques of "black box" .The big systems can demand many phases of integration, beginning with the collection of modules in low-ranged subsystems, and then the gathering of the subsystems into bigger subsystems and finally the composition of the subsystems of higher level into the whole system.

In order to make the strategy of integration the most efficacious one, the techniques of integration testing have to go well with the whole strategy of integration. In the poly-phase integration the testing in every phase helps to discover the error before, and to keep the system under control. With the execution of the glance testing in the early phase of integration, and then with the application of rigorous criteria it is real only the big risk variant of the "big bang" approach. Nevertheless, the execution of rigorous testing of the whole software engaged in every phase of integration engages a lot of unnecessary effort doubled through phases. The solution is to overcome the complete integration systems, to execute rigorous testing in every phase and to reduce the effort doubling.

It is important to understand the relations between the testing modules and the integration system. On the one hand, the modules were tested with the use of drivers before any integration was tried. Then the integration system completely concentrates on the modules interaction supposing that the details in every module are correct. On the other, the modules and the integration testing can be combined, verifying the details of execution of each module in the integration context. Many projects compromise with the combination of testing modules with the lowest level of subsystem integration testing, and then execute the pure integration testing on higher level. The two aspects related to integration testing can be convenient for any kind of task project and the integration testing method has to be sufficiently flexible in order to be adequate for all of them. The rest of this section explains the techniques of equal integration structure testing, initially only in special cases and then completely.

II. WHEN THE PROGRAM TESTING IS TO BE STOPPED?

This is the most frequent question encountered by testers. Here are some possible answers:

- When you don't have time,
- When further testing provokes new denials,

- When further testing does not discover new errors,
- When you cannot create any new testing item,
- When you arrive to the point in which reduces the number of responses,
- When the requested covering is reached,
- When all the errors are eliminated.

Unfortunately, the first answer is the most frequent one, and the seventh cannot be guaranteed by anyone. This leaves the tester somewhere in the middle. The models of software reliability offer the solutions that support the second and the third answer, both of them are largely used in the industry. The fourth answer is insecure: if you followed the procedures and the instructions that we talked about, this is probably the good solution. On the other hand, if the reason is lack of motivation, this solution is unfortunate as much as the first one. The fifth solution is attractive: implies the continuation of serious testing, but the discovering of new errors reduces dramatically. The further testing becomes very expensive and maybe it will not be discovered any new error. If the costs (or risk)of the rest of the errors can be defined, the advantage is clear.

III. GENERALIYATION OF MODULE TESTING CRITERIA

The module testing criteria can often be generalized in some possible ways. As discussed above, the most frequent generalization is to correspond to the module testing criteria in the context of integration, using the whole program as the environment for testing of the drivers for every module. But, this trivial generalization does not use the difference between the module and the integration testing. The application on each phase of the poly-phase strategy of integration, for example, leads to excessive number of unnecessary testing.

More than the testing, separately, in the module, of all outs chosen on purpose, the structure testing on integration level focuses the purposes of the outs that are activated with the call of the module[MCCABE]. The design of the technique of reduction helps those outs chosen on purpose in the way that becomes possible to exercise them separately during the integration testing. The idea related to the designing of reduction is that it begins with the control of the course of the graph of the module, eliminates all structure controls that are not activated with the call of the module and then it has to use " reduced" course of the graph related to the integration testing. Although, but it is not obligatory, the rule of reduction, i.e. the rule of the *call* says that the function of the call ("black point") of the knot cannot be reduced. The rest of the rule works together in order to eliminate the parts of the course of the graph that is not activated with the call of the module. *The deriving rule* eliminates the result of non called ("white point') knots because the application of this rule eliminates one knot and one edge from the course of the graph and the cycle complexity remains unchanged. But, this generalizes the graph in the way that the rest of the rules can be applied. The rule of *repeating* eliminates the top-test of the rings that are not involved in the call of the module. The rule of *conditioning* eliminates the declaration of conditionings that do not contain the call in their bodies. The rule of *twisting* eliminates the bottom-test that is not activated with the call of the module

IV. EFFICACIOUSNESS OF TESTING

The thing that we would certainly want to know about the sequence of testing items is how efficacious they are, but it is necessary to clear what does the "efficaciousness" mean. The easiest way is to be dogmatic: to define the method, to use it for the testing items generating and then to execute the testing items. But this can be corrected if we reduce the dogmatism and if we demand that the testers choose "appropriate methods". We can get even bigger improvement if we compose appropriate hybrid methods.

The structure testing techniques give also another choice for the testing efficaciousness. We will be able to examine the sequence of testing items in the sense of ways that are passed in execution. When the certain way is passed more than once, we can talk about the redundancy. Sometimes the redundancies have also the purpose.

The best interpretation of the testing efficaciousness is (and this is not a miracle) the more difficult one. In fact, we want to know how much the sequence of testing items is efficacious in discovering errors in the program. This is problematic for the two reasons: the first it that it is supposed that we know all errors in the program. But this is moving into the same cycle: if we knew them, we would correct them. Since we don't know all errors in the program, we will not know, maybe never, if the testing items, on the grounds of the given method, succeeded in discovering them. The second reason is more theoretic: demonstration that the program is without errors corresponds to the famous problem of stopping from the computer science, for which it is known that it doesn't have the solution. The best think we can do is to go back, from the types of errors. When we have certain type of error, we can choose the testing method (functional or structural) and it is most probable that it will discover the errors of that type. If we connect it with the knowledge related to most probable types of errors, we will get the pragmatic approach to the testing efficaciousness. This implements furthermore if we follow the types (and the frequency) of errors in the software that we develop.

There must be test set chosen with every physical input and test set provoking simulation of every interface control. One more criterion is very interesting. Many authors, Cukarelas, Gerogianis, Ekonomides [9], call it a discrimination criterion. It demands random selection of input sequences until statistical representation of whole endless domain is obtained. Third stage is execution and evaluation of test scenario. Here we have two directions: built-in test program and formalism. In principle, every program should have two tests: one is hidden and not available to users, and other is visible. Some programs may contain self-testing programs also. Formalism mostly includes hard work at formalization of ways in which specifications are written. Structurally and object oriented programming both contains mechanisms for formal

expression of specifications, in order to simplify comparison between expected and real behavior. The way in which program responds to different input data is regulated by specification. For example, notions "input" and "output" may be regarded in widest sense if input values are noted with x and output values with y; then specification may be understood as a relation connecting input set with output set. Concerning specification, it is not necessary to be even determined; meaning that numerical program may give results with different precision in different computers.

$$[S] \subseteq X \times Y, \quad X \equiv \mathrm{dom}([S]) \tag{1}$$

If the specification S is noted as a relation [S], and X is input set and Y output set, then [S] is a sub-set of

Descartes product of sets X and Y, and set X is called domain of specification. Program is modeling by so-called programming function which copies set of inputs X into set of outputs Y, but now as a function and not as any relation:

$$[P]: X \rightarrow Y \tag{2}$$

where:

P is program, [P] is notation of program function, $X \equiv \mathrm{dom}([S])$ presents set of inputs for which a program terminates (as in endless loop). Program P is correct if:

dom([P])[S])=dom([S]), or if for every input

V. CONCLUSION

Software producers would like to anticipate the number of errors in software systems before their application in order to estimate the quality of acquired program and the difficulties in the maintenance. This work gives the summary and describes the process of program testing, the problems that are to be resolved by testers and some solutions for the efficacious elimination of errors. The testing of big and complex programs is in general the complicated process that has to be realized as systematically as possible, in order to provide adequate confidence and to confirm the quality of given application.

The testing activity shows if the given software is harmonized with the specification. The specification is key thing in testing. So, as the results of testing are collected, the proofs about quality level and program reliability appear. If the testing often discovers the important errors, the quality and the reliability of the program can be considered insufficient and the further testing is necessary. On the other hand, if the errors are minor and easy to be corrected, then the level of quality and reliability is acceptable. The testing cannot say definitively if the program is correct, because the not discovered errors can remain in the program even after the most voluminous testing. So, the usual point of view considers successful the testing that does not discover incorrectly any error and this is underlined with the following testing purposes:

- the testing is the process of program execution in order to find out the errors;
- the good testing item has the high possibility of covering the error;
- successful testing discovers the error that until then was not discovered .

The program testing is often identified with the discovering of any kind of errors. There is no sense to test errors that most probably do not exist. It is much more efficacious to think well about the types of errors that are most probable (or provoke the biggest damages) and then to choose the testing methods that will certainly be able to discover this kind of errors. The success of one set of testing data corresponds to the successful execution of detailed program testing. One of the main questions that appears in program testing is the reproduction of the error (the testers discover the errors and the programmers eliminate the bugs). It is evident that the coordination between the testers and the programmers should exist. The error reproduction is the case when the best thing to do would be to re-execute the problematic testing so that we know when and where exactly the error occurred. So, the ideal testing and the ideal product do not exist.

Lot of effort has recently been made in order to apply the constructive approach, if it is not possible completely, then partially, i.e. on certain parts of the program.

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AJAX web application for basketball statistics

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Abstract - AJAX is a group of interrelated web development techniques used on the client-side to create interactive web applications or rich Internet applications (RIA). With AJAX, web applications can retrieve data from the server asynchronously in the background without interfering with the display and behavior of the existing page. This paper describes web application that shows live basketball statistics of a certain game to viewers over the internet (netcasting). It is programmed using PHP, HTML and JavaScript. Presented solution is, with small changes, applicable to other sports.

I. INTRODUCTION

The domain where desktop applications beat web applications is user interaction. In desktop applications, user do not have to wait and stare at a blank screen (most of the time) until an action completes. The user interface is integrated with the actual application and allows instantaneous response. In classic web applications, when some information is submitted or requested user has to wait for an entire new page to load. AJAX is changing all of that and bringing desktop response times to the Web.

This paper describes web application that shows live basketball statistics of a certain game to viewers on the internet (netcasting). It is programmed using PHP, HTML and JavaScript.

II. AJAX

AJAX is a group of interrelated web development techniques used on the client-side to create interactive web applications or rich Internet applications (RIA) [1]. With AJAX, web applications can retrieve data from the server asynchronously in the background without interfering with the display and behavior of the existing page. The use of AJAX has led to an increase in interactive animation on web pages and better quality of web services due to the asynchronous mode.

The name itself is an acronym for Asynchronous JavaScript and XML, and it was coined by Jesse James Garrett from the Adaptive Path in 2005. Despite the name, the use of XML is not actually required, nor do the requests need to be asynchronous.

AJAX uses a combination of:

- XHTML and CSS for marking up and styling information.
- The Document Object Model (DOM) for dynamically displaying and interacting with the information presented.
- A method for exchanging data asynchronously between browser and server, thereby avoiding page reloads. The XMLHttpRequest (XHR) object is usually used, but sometimes an IFrame object or a dynamically added <script> tag is used instead.
- A format for the data sent to the browser. Common formats include XML, pre-formatted HTML, plain text, and JSON. This data could be created dynamically by some form of server-side scripting.
- A client-side scripting language such as JavaScript binding everything together, allowing retrieving dynamic information, displaying and modifying the page elements. Other languages such as VBScript are also capable of the required functionality.

In the classic web application, communication between the client (the browser) and the web server is performed directly, using HTTP requests. Most user actions in the interface trigger an HTTP request back to a web server. The server does some processing and then returns an HTML page to the client. It's a model adapted from the Web's original use as a hypertext medium, but what makes the Web good for hypertext doesn't necessarily make it good for software applications. This approach doesn't make for a great user experience. While the server is doing its thing, the user is waiting. And at every step in a task, the user waits some more.

When an application uses AJAX, a new layer is added to the communication model (Fig. 1). The page is loaded entirely only once, the first time it is requested. Besides the HTML and CSS code that make up the page, some JavaScript files are also downloaded: the AJAX engine. This engine is responsible for both rendering the interface the user sees and communicating with the server on the user's behalf. Every user action that normally would generate an HTTP request takes the form of a JavaScript call to the AJAX engine instead. Any response to a user action that doesn't require a trip back to the server – such as simple data validation, editing data in memory, and even some navigation – the engine handles on its own. If the engine needs something from the server in order to respond – if it's submitting data for processing, loading

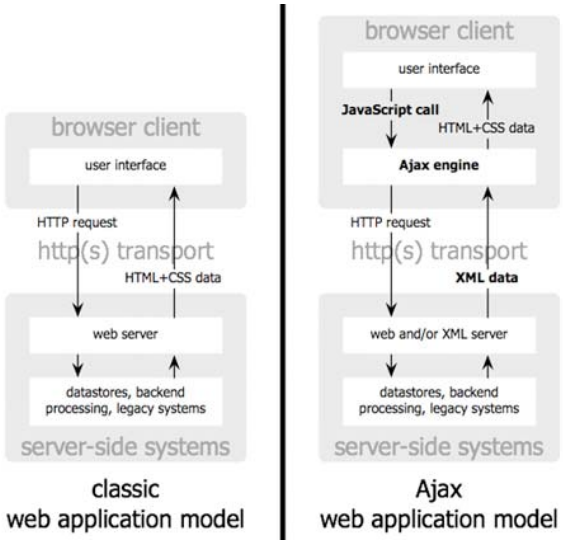


Figure 1. The traditional model for web applications (left) compared to the AJAX model (right)

additional interface code, or retrieving new data – the engine makes those requests asynchronously, usually using XML, without stalling a user's interaction with the application [2].

An AJAX application eliminates the start-stop-start-stop nature of interaction on the Web by introducing an intermediary – an AJAX engine – between the user and the server. The AJAX engine requests information from the web server asynchronously. Thus, only small page bits are requested and sent to the browser, as they are needed by the user. The engine then displays the information without reloading the entire page. This leads to a much more responsive interface, because only the necessary information is passed between the client and server, not the whole page. This produces the feeling that information is displayed immediately, which brings web applications closer to their desktop relatives. So the user is never staring at a blank browser window and an hourglass icon, waiting around for the server to do something.

AJAX engine is nothing more than some JavaScript code that instantiates and uses the XMLHttpRequest object. This is a JavaScript object that allows sending, receiving and processing HTTP requests to and from the server without refreshing the entire page.

Although adding an extra layer to any kind of model should add to the response time, this is an exception. Through the use of this new layer – the AJAX engine – response time shortens and the user interface seems much more connected to the application logic (Fig. 2).

III. WEB APPLICATION

System for collecting statistical data in basketball and netcasting consists of three applications: main application used to collect statistical data during basketball game in relational database, Uploader application used to send data to central web server over FTP and web application used to show statistical data from following game.

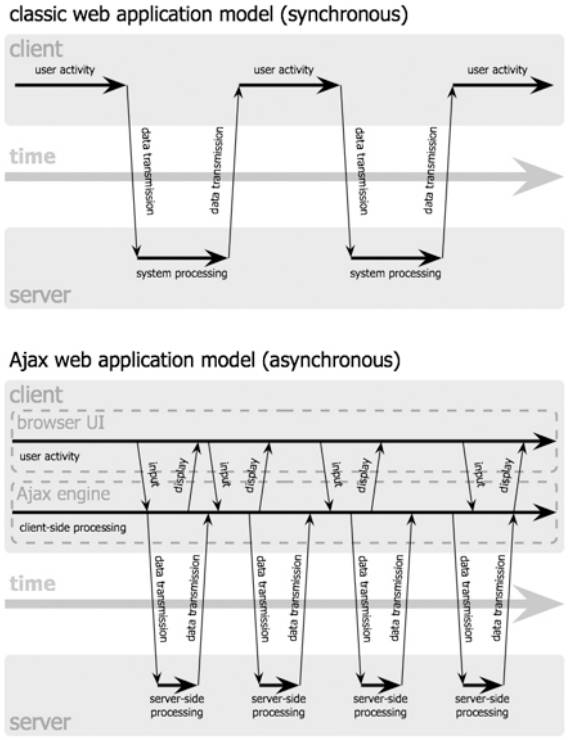


Figure 2. The synchronous interaction pattern of a traditional web application (top) compared with the asynchronous pattern of an AJAX application (bottom)

Htm file sent by Uploader application contains game statistic data in form of semi-colon delimited plain text. It's very small in size, about 3 KB at the start of the game and only about 7 KB at the end of the game. Web application's purpose is to show this statistical data to viewers over the internet. It is programmed using PHP, HTML and JavaScript.

PHP Hypertext Preprocessor is a widely used, general-purpose scripting language that was originally designed for web development to produce dynamic web pages. For this purpose, PHP code is embedded into the HTML source document and interpreted by a web server with a PHP processor module, which generates the web page document [3]. PHP primarily acts as a filter, taking input from a file or stream containing text and/or PHP instructions and outputs another stream of data; most commonly the output will be HTML. PHP only parses code within its delimiters. Anything outside its delimiters is sent directly to the output and is not processed by PHP (although non-PHP text is still subject to control structures described within PHP code). The purpose of delimiters is to separate PHP code from non-PHP code, including HTML [4].

When user wants to follow netcasting of a certain game, he/she clicks on a link for that specific game on an internet site designed for netcasting. That starts Web application as a request for a single PHP source document, passing the game ID to it. Web server interpretes PHP code and generates HTML source document, which is sent to user's web browser.

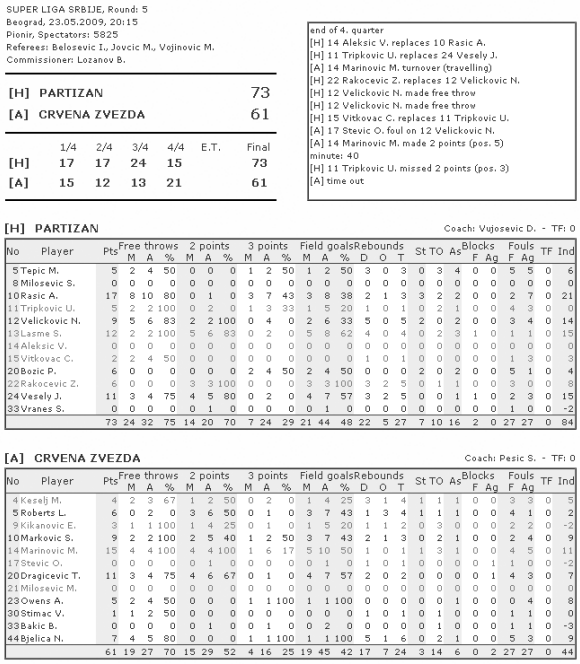
HTML, which stands for HyperText Markup Language, is the predominant markup language for web pages. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists etc as well as for links, quotes, and other items. It allows images and objects to be embedded and can be used to create interactive forms. HTML documents are composed entirely of HTML elements that, in their most general form have three components: a pair of element tags with a “start tag” and “end tag”; some element attributes given to the element within the tags; and finally, all the actual, textual and graphical, information content that will be rendered on the display. An HTML element is everything between and including the tags. The ID attribute provides a document-wide unique identifier for an element and can be used by scripts to alter the contents or presentation of that element [5].

HTML page sent to user’s web browser consists mostly of INPUT elements as part of several FORM elements. For every single statistical data there’s one INPUT element that stores and shows that data on the page. Every INPUT element has a unique ID attribute, used by JavaScript to update statistical data stored in that element.

JavaScript is an object-oriented scripting language used to enable programmatic access to objects within both the client application and other applications [6]. The primary use of JavaScript is to write functions that are embedded in or included from HTML pages and interact with the Document Object Model (DOM) of the page. The DOM is a cross-platform and language-independent convention for representing and interacting with objects in HTML documents. Aspects of the DOM (such as its "Elements") may be addressed and manipulated within the JavaScript [7].

After the page has loaded in user’s web browser, a call to a JavaScript function for fetching current statistical data from web server is made. It’s done by loading game’s htm file sent by Uploader application in an invisible IFRAME element of HTML page. When the file is loaded it is parsed by other JavaScript function to extract all statistical data from it, and using DOM all INPUT elements of the page are updated with new data. The refresh interval for getting newest htm file is set to 10 seconds. This way, game’s statistical data shown to the user is refreshed at every interval, without need for a whole page reload.

The web application is shown in Fig. 3.


SUPER LIGA SRBIJE, Round: 5
Beograd, 23.05.2009, 20:15
Pionir, Spectators: 5825
Referees: Belosevic I., Jovcic M., Vujinovic M.
Commissioner: Lozanov B.

[H]	PARTIZAN					73
[A]	CRVENA ZVEZDA					61

	1/4	2/4	3/4	4/4	E.T.	Final
[H]	17	17	24	15		73
[A]	15	12	13	21		61

end of 4. quarter
[H] 14 Aleksic V. replaces 10 Rasic A.
[H] 11 Tripkovic U. replaces 24 Vesely J.
[A] 14 Marinovic M. turnover (travelling)
[H] 22 Rakocevic Z. replaces 12 Velickovic N.
[H] 12 Velickovic N. made free throw
[H] 12 Velickovic N. made free throw
[H] 15 Vitkovac C. replaces 11 Tripkovic U.
[A] 17 Stevic O. foul on 12 Velickovic N.
[A] 14 Marinovic M. made 2 points (pos. 5)
minute: 40
[H] 11 Tripkovic U. missed 2 points (pos. 3)
[A] time out

[H] PARTIZAN — Coach: Vujosevic D. - TF: 0

No	Player	Pts	Free throws M	A	%	2 points M	A	%	3 points M	A	%	Field goals M	A	%	Rebounds D	O	T	St	TO	As	Blocks	Fouls F	Ag	TF	Ind
5	Tepic M.	5	2	4	50	0	0	0	1	2	50	1	2	50	3	0	3	0	3	4	0	0	5	5	0	6
8	Milosevic S.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Rasic A.	17	8	10	80	0	1	0	3	7	43	3	8	38	2	1	3	3	2	2	0	0	2	7	0	21
11	Tripkovic U.	5	2	2	100	0	2	0	1	3	33	1	5	20	1	0	1	0	2	1	0	0	4	3	0	0
12	Velickovic N.	9	5	6	83	2	2	100	0	4	0	2	6	33	5	0	5	2	0	2	0	0	3	4	0	14
13	Lasme S.	12	2	2	100	5	6	83	0	2	0	5	8	62	4	0	4	0	2	3	1	0	1	1	0	15
14	Aleksic V.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	Vitkovac C.	2	2	4	50	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	3	0	3
20	Bozic P.	6	0	0	0	0	0	0	2	4	50	2	4	50	0	0	0	2	0	2	0	0	5	1	0	4
22	Rakocevic Z.	6	0	0	0	3	3	100	0	0	0	3	3	100	3	2	5	0	1	1	0	0	3	0	0	8
24	Vesely J.	11	3	4	75	4	5	80	0	2	0	4	7	57	3	2	5	0	0	1	1	0	2	3	0	15
33	Vranes S.	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	-2
		73	24	32	75	14	20	70	7	24	29	21	44	48	22	5	27	7	10	16	2	0	27	27	0	84

[A] CRVENA ZVEZDA — Coach: Pesic S. - TF: 0

No	Player	Pts	Free throws M	A	%	2 points M	A	%	3 points M	A	%	Field goals M	A	%	Rebounds D	O	T	St	TO	As	Blocks	Fouls F	Ag	TF	Ind
4	Keselj M.	4	2	3	67	1	2	50	0	2	0	1	4	25	3	1	4	1	1	1	0	0	3	3	0	5
5	Roberts L.	6	0	2	0	3	6	50	0	1	0	3	7	43	1	3	4	1	1	1	0	0	4	1	0	2
9	Kikanovic E.	3	1	1	100	1	4	25	0	1	0	1	5	20	1	1	2	0	3	0	0	0	2	2	0	-2
10	Markovic S.	9	2	2	100	2	5	40	1	2	50	3	7	43	2	1	3	0	2	1	0	0	2	4	0	9
14	Marinovic M.	15	4	4	100	4	4	100	1	6	17	5	10	50	1	0	1	1	3	1	0	0	4	5	0	11
17	Stevic O.	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	1	1	0	-2
20	Dragicevic T.	11	3	4	75	4	6	67	0	1	0	4	7	57	2	0	2	0	0	0	0	1	4	3	0	7
21	Milosevic M.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Owens A.	5	2	4	50	0	0	0	1	1	100	1	1	100	0	0	0	0	0	1	0	0	0	4	0	8
30	Stimac V.	1	1	2	50	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	1	1	0	0
33	Bakic B.	0	0	0	0	0	1	0	0	1	0	0	2	0	0	0	0	0	1	0	0	0	1	1	0	-3
44	Bjelica N.	7	4	5	80	0	0	0	1	1	100	1	1	100	5	1	6	0	2	1	0	0	5	3	0	9
		61	19	27	70	15	29	52	4	16	25	19	45	42	17	7	24	3	14	6	0	2	27	27	0	44

Figure 3. Web application

IV. CONLUSION

The AJAX approach to building web applications sheds a new light on the Web and helps close the gap between web applications and desktop applications in terms of usability and responsiveness. The biggest challenges in creating AJAX applications are not technical. The core AJAX technologies are mature, stable, and well understood. The most important thing to remember is to create the best possible user experience.

This paper described AJAX web application that shows live basketball statistics of a certain game to viewers over the internet (netcasting). Presented solution is, with small changes, applicable to other sports.

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Collecting statistical data in basketball

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Abstract - In last few decades sport has become more than just a game. Today it's a big business, with lots of money invested in it. Getting right information as quickly as possible makes a difference between winning or losing. Statistics in sport is most valuable to coaches, but also the whole population of sport lovers. Using modern technology and mass media like TV and Internet, people are able to follow their teams and players. This paper describes application used to collect statistical data during basketball game in Firebird relational database, programmed in C++ programming language. Presented solution is, with small changes, applicable to other sports.

I. INTRODUCTION

At the beginning of a season, coaches are mostly interested in using different statistical reports for analyzing and evaluation of individual players. Once they have insight into advantages and flaws of their players, their interest is moving towards the team as a whole. They want to know how good a team is. The team statistics therefore becomes most important. After all, a basketball is still a team sport. And finally, having in mind that different statistic reports may be used also for analyzing opponent's play, during a season coaches' interest is moved towards their opponents. More often than not, well analyzed opponents' play means a difference between winning and losing [1].

Coaches are not the only ones to use statistics. On the contrary, whole population of sport fans and audience is able, using mass production of technology and media as TV and Internet, to follow efficiency of teams and individual athletes. To many people, as reporters and commentators, statistic is an important tool in doing their job, and for some, as sport managers, it is a vital part of their profession. After all, during last decades sport became more than a game: it is a large business, with considerable amounts of money invested [2].

II. ANALYSIS AND DESCRIPTION OF SYSTEM

A. Basic Information About Basketball

Basketball is a team sport. Actors of a basketball game are the players from a two opposing teams, their team officials with coaches as well as officials (commissioner, referees, table officials, statisticians). Every team may have no more than 12 players per game, and of those 5 are actively engaged in every moment.

Regular basketball game is divided into 4 quarters of 10 minutes each, and if a result is draw, after regular time additional time of 5 minutes is played, as many times as necessary to decide a winner of a game.

There is no limitations regarding number of substitutions of players during a game, but there is limitation regarding personal fouls. If a player gets fifth personal foul he must leave the court and may not play any more.

A basket scored gets 2 or 3 points, depending on a distance from which the ball has been thrown. A line discerning two cases is drawn on the court [3].

B. Standard Statistic Elements in Basketball

Basketball is highly dynamic, and during a game a number of events may be seen on court. Since the aim of this paper is consideration of collecting and processing standard statistic elements in basketball, it is necessary to define those elements. In this purpose a statistic manual of FIBA (International Basketball Federation) was used [4]. It lists following elements of game: successful free throw, unsuccessful free throw, successful 2-point throw, unsuccessful 2-point throw, successful 3-point throw, unsuccessful 3-point throw, defensive rebound, offensive rebound, assist, steal, turnover, foul, technical foul, block, play time.

By collecting data regarding those elements, it is possible to generate most of the standard statistic reports. But, in order to have complete statistics with additional statistic reports, it is necessary to add certain elements [5].

Possibilities for adding to certain elements of game are:

- For throws, successful or not, for 2 or 3 points, it is possible to add information from which position on the court a throw was made.
- For turnover it is possible to add information regarding a way that ball was lost (poor dribbling, poor pass...).
- For fouls, it is possible to note on which player the foul was made.
- For blocks, as well as for fouls, it is possible to note on which player the block was made.

C. Problem of Tracking Time

Tracking time is a problem that requires special consideration. Is there a reason to keep track on time, and how precise it must be? The fact is that basketball periods (quarters and additional time) are precisely defined but it is not the reason to keep track of time, since beginning and end of the period may be defined as separate actions and to be noted as such.

The main reason for including time is a need to obtain information how much time certain player spent on court. Without this information, efficiency of a player may not be measured by other statistic element alone. For instance, by comparing number of points for two players we may conclude that the one with 20 points scored is better player (or at least that he played better at the game observed) than the one who scored 10 points. But, if we have additional information that first player played 40 minutes and the second one only 5, conclusion is completely different [6]. There are other reasons to introduce keeping time, for instance need to note in which parts of a period certain actions occurred, or possibility to separately analyze only certain periods of game, etc [7].

Regarding precision, our opinion is that it is quite sufficient to express time in minutes. For this purpose another action must be added: user may enter scoreboard time after every minute of the game. In this way, there is possibility to correct time intervals. In case when more precise information on time is needed, it is possible to re-define such action to shorter intervals (for instance 15 seconds).

D. Structure of Actions

In order to collect statistic data, coding must be done, i.e. every statistic element must be given unique numerical code. In other words, user collects statistic data by evidencing relevant events, entering following data for each: which player was involved in particular event, which action it is (a code of statistic element for this event and, depending on element evidenced, additional data - throw position, type of turnover etc.). Such set of data entered for observed event is called action. Therefore an appearance of an action may be specified.

Action comprises of 4 elements:

A0 – team mark (1 - host, 2 - guest)

A1 – number of player's shirt

A2 – code of event (statistic element)

A3 – code for addition to event

E. Choosing Periphery Unit for Data Collection

There are two standard periphery units that enable user to input data: keyboard and mouse. Both have strong and weak sides. Strong sides of one are the weak sides of other, and vice versa.

Keyboard input demands user to know event codes, while for mouse input he may not know codes: it is enough to click on button with event name. But, if user knows event codes, and especially if he has routine using numerical pad on keyboard, this way of data input is considerably quicker than using mouse since there is no time lost on precise positioning the cursor. Another advantage in this method is that user may pay more attention to events on court instead constantly watching monitor while using mouse for input.

Since number of possible events and their codes is not too large, authors decided to realize data input using keyboard. It is also possible, if the need arise, to expand system for mouse input too. In such case, a user interface for mouse input is available, while functionality simply amounts to calling realized functions for keyboard input while clicking individual keys.

F. System Description

Aim of this system is partly to generate reports after game is finished. This may not be directly after the game is over, but also in a consequent period. Therefore, one of functions necessary for the system is a permanent storage of information. This is accomplished by storing information in a database. After every input by user, action is saved into a database. In this way a potential problem of power shortage during a game is solved or any other problem of a similar nature.

By analyzing other aims of this system and having in mind all that is presented in this section, we will give a short review of functions that a system should have:

- Collecting statistic data by keyboard input of actions by user. Input must be quick and precise.
- In order to enable input of actions, there must be possibility to create in advance a new game, including definition of basic data about it.
- Possibility to open existing game from a database, with potential proceeding of new actions input or changing basic data regarding the game.
- In all these cases, possibility to generate (show and print) dynamic statistical reports. Word "dynamic" means possibility to generate report at every moment during a game (both during and after a game).
- Possibility to update data about all actors in a game from database. Updating means possibility to add new actors, change data about existing actors and deleting actors.
- User friendly system with textual and graphic forms of help.
- System stability and precision in processing and presenting data is understood, and it is also desirable that a system is easy to use.

III. APPLICATION

A. Conceptual Data Model

In analyzing the real system, following object classes were found: game, league, club, coach, player, position, commissioner, referee, roster and action.

Object classes from a real system were copied one-on-one into objects of information system. Every object class is represented as a table in data model, and properties of a table represent characteristics of corresponding object class in a real system [8].

Conceptual data model was realized using CASE tool PowerDesigner as shown in Fig. 1.

B. Use Cases

Use cases [9] for the application may be divided into two basic subsets: 1. Updating of data in database, and 2. Keeping statistics of a game. Updating of data in database encompasses cases of updating leagues, clubs, players, coaches, commissioners, referees and statisticians. Keeping statistics of a game encompass cases of creating new game and opening existing one, and those comprise of collecting data and generating a report.

The diagram of use cases is shown in Fig. 2.

C. Database Implementation

Using PowerDesigner tool, a translation was done from conceptual data model into a physical data model compatible to chosen system for database management (Firebird).

On the basis of physical data model, PowerDesigner generates file "crebas.sql" consisting of SQL scripts for creating complete database, with all tables and their interconnections.

Using Firebird console, which together with Firebird server is a part of Firebird package, as well as using SQL scripts generated by PowerDesigner, a physical database have been designed [10].

Communication between application and database is done using Firebird server. Therefore, Firebird server is a necessary link between application and database, and it must be installed and running while system is in use.

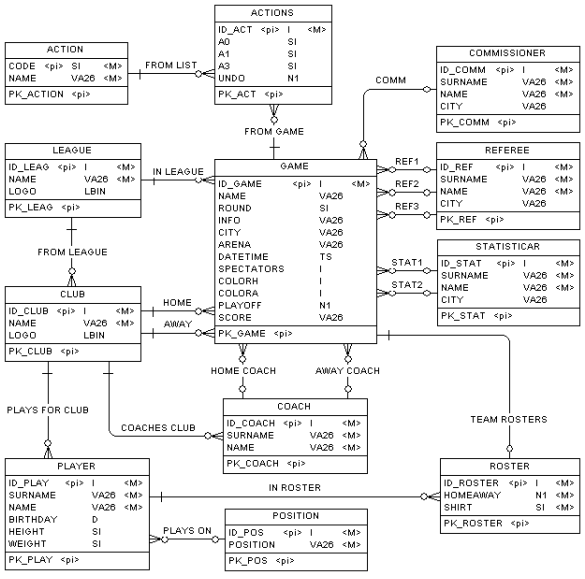

Figure 1. Conceptual data model

D. Functionality and Graphic Interface

In this section of paper functionality and graphic interface of application are shown on example of keeping statistics at a basketball game.

Before the game, statistician collects basic data regarding the game, as well as team rosters. After obtaining all necessary information he starts the application. When application is started, a basic window with a menu is shown.

Option "Game" has items for starting functions: to create a new game, open existing game, and leaving application. Items in option "Data" start functions of updating certain data within database.

Item "Settings" shows a form to update different options within application. Items of "Help" option show user help, as well as basic information about the application.

After application has been started, statistician may, if a need arises, correct settings of the application. In this way it is possible to set different parameters of report, environment, report graphic and security.

Statistician, using an application part for updating database, may check data from it and change or add new data into database (new league, clubs, players, coaches, commissioners, referees or statisticians).

After checking and updating database, statistician is ready to create a new game. After starting this function, a form for input game data is being shown.

Statistician confirms accuracy of input data by pressing "Confirm" button, and after that a game window (game form) is being shown. This window is, in a way, the main frame of the whole application since statistician spends most of the game working within it, entering actions and generating reports. Game window is shown in Fig. 3.

Under "Game" option there are items for changing game data, defining roster and lineups, as well as for exit

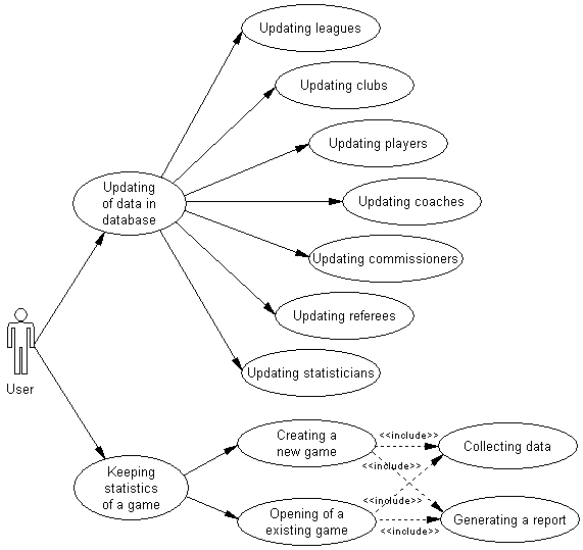

Figure 2. Diagram of use cases

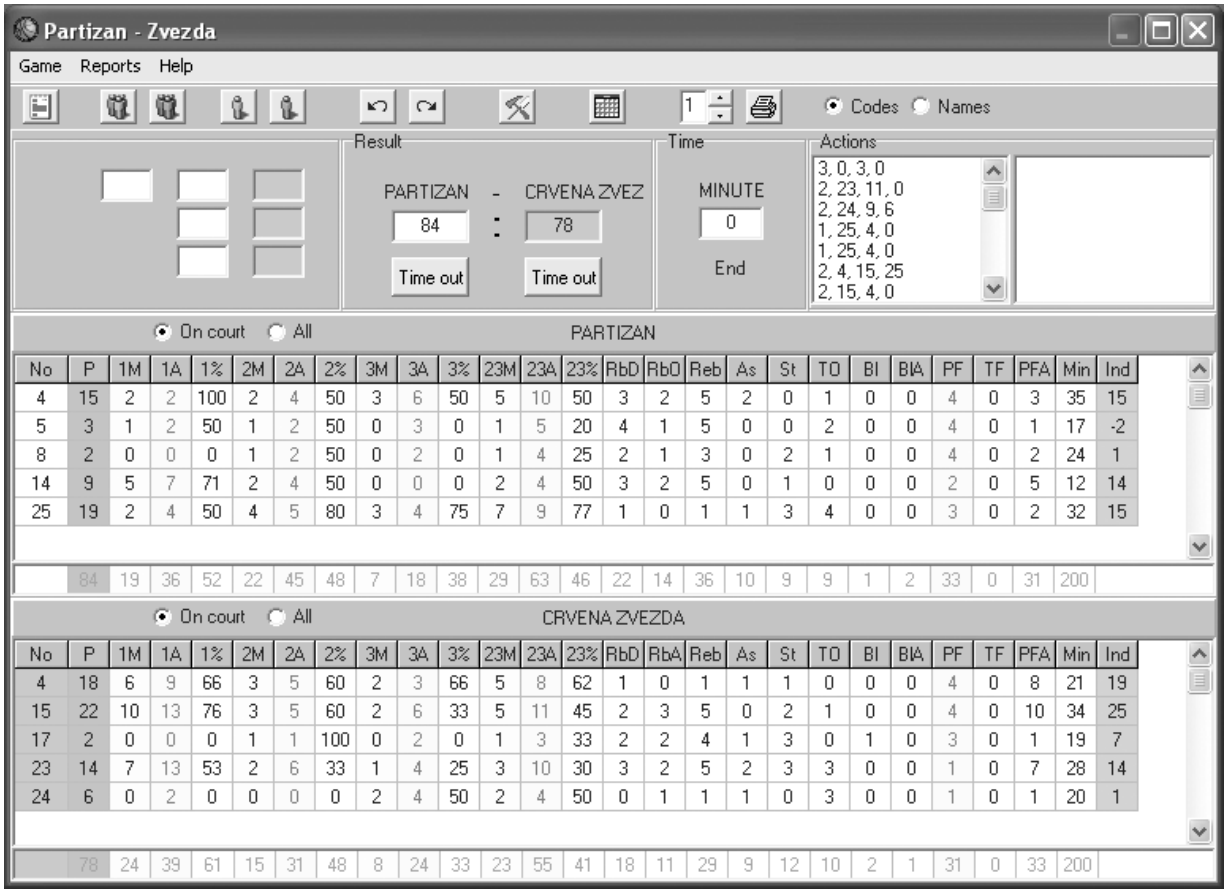

Figure 3. Game window

from current game. Items for "Reports" option start functions for generating (showing and printing) corresponding reports. Items from "Help" option show help options, quick review of actions and positions on the court, as well as possibility to assign certain colors to teams in order to facilitate management within a game window.

After creating a new game and entering all relevant information, statistician begins to define roster of both teams, entering shirt numbers for all players on a list, and defines team coaches.

Immediately before starting the game, statistician is informed about lineups for both teams and defines those in application.

From this moment on, statistician will follow events on court and enter appropriate actions in appropriate fields. All actions entered by statistician are shown in a list of input actions. If statistician makes a mistake when entering action, there is possibility to correct it. List of input action is an Undo list at the same time. By clicking the Undo button, last action entered will be deleted from the list and removed to Redo list. By clicking the Redo button, last action from Redo list is removed to list of input actions. Deleting is also possible by double-clicking the action and confirming delete.

Statistician has at his disposal a quick help in form of review of possible actions and court positions.

Most of realized statistic reports is possible to print in any moment during a game. Nevertheless, printing reports is usually done in following way. Before the game, after entering data about the game and the team rosters, report "Game announcement" is printed and distributed to coaches, media and managers. At the end of every quarter or additional time, "Basic report" is being printed for coaches, and in half-time this report is distributed to media and managers, even to players if required. If a coach during a game demands any report it will be printed for him. After the end of a game, a report is distributed to all actors, while coaches get all possible reports from a game. In this order a form for printing all reports is realized, so the statistician would not have to open one report at a time in order to print.

IV. CONLUSION

After testing application implemented on a number of basketball games, conclusions are as follows:

- Action input using keyboard is fast and precise.
- Generating statistic reports is practically instant, so coaches may obtain timely information at every moment during a game. Data in reports are correct.
- Application is stable, and due to realized functionality of backup database, it is resistant to

possible unexpected situations during a game, as power blackouts etc.

- Application is very simple to use. With short training and trial work at only a few games, users are fully prepared to use application and to work on their own.

Implemented application fully realized aims set at the onset, as well as functionality by specifications in system description.

Implemented application is conceived to be open for further improvements and expansions.

Some of improvements possible are already mentioned in a paper, regarding widening set of statistic elements, corrections of time intervals, realization of interface for mouse data input and generating new statistic reports. Additional improvements could be found in an error-avoiding part in case of wrong data input by user. System offers action delete, and further improvements would be possible regarding changing already entered actions, inserting new ones between already existing ones and changing sequence of entered actions.

System expansion could be about collecting statistic data from several games and generating a general report for all player, clubs, and leagues. It is also possible to send joint statistic data to internet after the end of a game, so they are available to more people. Availability may be obtained by connecting to graphic data-showing systems in TV broadcast stations.

Finally, it must be noted that a whole system, with certain changes and adjustments, may be applied to other team sports.

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Virtualization for Small and Medium Sized Enterprises

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Abstract — **In order to improve their business and answer to the nowadays challenges, enterprises of all sizes, especially small and medium sized (SMEs) ones, reconsider possibilities of virtualization. In situation where business needs to run many applications on a server and use Internet services, having one or more virtual computers on a single machine can optimize the work. Furthermore, there are many benefits, such as: reducing equipment and energy costs, hardware independence, easy upgrade and managing of virtual machine, backup and disaster recover, etc. All of that enables SMEs to achieve strategic advantage too.**
This paper stresses the meaning and importance of virtualization for small and medium sized enterprises. Also, it presents virtualization solutions such as: VMware, Parallels, etc.

I. INTRODUCTION

Growth of Information Technology (IT) sector eased almost every aspect of people's life and business, and nowadays, in the phase of Green IT, this quality is even improved. The main focus of Green IT is on saving energy and decreasing wastes and one of its elements is certainly virtualization.

Among other, virtualization enables reducing the usage of physical resources. This means that instead of running one application on a server and using less than 20% of its capabilities, one server can be used for running many applications with full utilization. Furthermore, virtualization enables: cost savings from server consolidation, strategic benefits for companies, reducing energy costs, hardware independence, easy upgrade and managing of virtual machine, backup and disaster recover, etc.

Above mentioned is important to companies of all sizes, especially to small and medium sized ones. Those companies can use benefits of virtualization in order to optimize their work through increased efficiencies, flexibility and responsiveness.

For example, according to [1] businesses in nearly any industry can consolidate workstations for a variety of workers, including: Creative professionals using Macs and Microsoft Windows development tools, contract workers who use their own machine and a client machine, Unix users running Windows, production Design professionals running Linux and Windows.

Main reasons [2] for adopting virtualization at SMEs are: increasing the efficiency in managing the server environment, controlling hardware sprawl and spending and reducing the number of servers needed to run the production systems to repurpose hardware for other needs. Also, by adopting virtualization SMEs can see improvements in [3]: time spent on routine IT administrative tasks, backup and data protection, application availability, ability to respond to changing business needs, business continuity preparedness, company profitability and growth rate.

This paper presents the characteristics of virtualization for small and medium sized enterprises, as well as the virtualization solutions.

II. ABOUT VIRTUALIZATION

The main characteristics of traditional computing environment are that one computer runs a single operating system and a single application. It is often that the capacity of server exceeds the requirements for any single application, which results below 20% hardware utilization rates in many data centers. On the other hand, virtualization is an approach which enables that several applications – sometimes running on different operating systems – run on the same computer, and, in that way creates multiple "Virtual" servers from a single computer. It seems that the several virtual servers on each host are isolated from one another, the same as on separate hardware.

Computer virtualization refers to the abstraction of computer resources, such as the process of running two or more logical computer systems on one set of physical hardware. The concept originated with the IBM mainframe operating systems of the 1960s (VM/370), but was commercialized for x86-compatible computers only in the 1990s. With virtualization, a system administrator could combine several physical systems into virtual machines on one single, powerful system, thereby unplugging the original hardware and reducing power and cooling consumption. A hypervisor is a virtualization platform that enables running multiple operating systems on a single physical computer called the host computer. Hypervisor provides isolated execution environments for each virtual machine and to manage access between the guest operating systems running in virtual machines and the hardware resources on the physical computer [4]. Virtualization can assist in distributing work so that servers are either busy, or put in a low power sleep state. In the beginning the virtualization was very popular, because of high hardware prices and low utilization of these systems. The decline of virtualization started with the growth of PC market and lower cost of computers. In 1988. The technology slowly regains its popularity with number of products, starting with company Connectix and its product Virtual PC [5]. Today, the virtualization makes one of the top IT technologies.

For small and medium businesses, though, the most important types are server and desktop virtualization [6,7]. Server virtualization presents partition of a single physical server into several virtual servers. Desktop virtualization

is when central server is divided up into multiple virtual desktop computers. Users remotely access those systems, like in the old mainframe model with "dumb" terminals.

III. VIRTUALIZATION SOLUTIONS

The virtualization technology market is very developed. There are number of commercial and open-source products available. In order to present this variety of product in the following section of the paper will be presented major and characteristic virtualization software product.

There are three major companies [6] that are leaders in development and distribution of virtualization tools. Their leading role is determined by their variety of product as well as the high level of its usage. According to the survey from December 2007 [3] VMware covers 70% of the market, followed by Microsoft (23%) and Citrix (3%). Other virtualization solutions have only 4%. Because this survey was released before promotion of Microsoft Hyper-V, the results may be different today in the sense of higher percentage for Microsoft and Citrix Hyper-V.

Citrix XenExpress Edition is free edition that is a production ready virtualization platform and supports dual socket servers with up to 4GB of RAM. XenExpress can host up to four virtual machines on each system and can be upgraded to Standard or Enterprise Edition. Citrix XenServer Standard Edition is a virtualization platform for Windows and Linux guest operating systems, and is a native 64-bit Xen hypervisor. The version with extended features beside Standard Edition is Citrix XenServer Enterprise Edition or OEM and Citrix XenServer Platinum Edition.

Besides Server editions Citrix offers desktop version of their software called Citrix XenDesktop which comes in three sub variants (Standard, Advanced, Enterprise and Platinum). This product is targeted for desktop virtualization.

The second vendor, Microsoft offers Virtual Server 2005 R2 SP1 and Virtual PC 2007, which are both free products. Its enterprise-class hypervisor product types, Microsoft offers Hyper-V as a part of the Windows Server 2008 OS in version for only 64-bitplatforms. Microsoft Virtual Server is a free tool available in both 32-bit and 64-bit versions. It only supports and runs 32-bit virtual machines. Virtual PC 2007 is a free virtualization software package for usage in small environments. It represents good solutions for hosting few virtual machines on a Windows XP Workstation or Windows 2003 Server.

VMware also offers variety of virtualization tools. That products can be divided in two categories. The desktop software has two representatives: VMware Workstation developed for PC x86 and x86-64 platforms and VMware Fusion designed for Macintosh platforms. VMware Workstation is first released in 1999. and current version is 7. It runs on Windows and Linux platform and supports variety of guest operating systems like Windows, Linux, BSD etc. The second version of the software is VMware Fusion designed for Macintosh platform with Intel processors. It runs on MAC OS and supports variety of guest operating systems such as Windows, Linux, Solaris etc. On the other hand, the server software has three variants: VMware Server, ESX and ESXi hypervisor products.

VMware Server is free package targeted for use in small environments, testing, or for individuals. It has memory limitations for VMs and low disk performance. It supports 64-bit machines as hosts and guests. VMware ESX/VMware ESXi are hypervisor product developed for large environments. They have 64-bit architecture. ESXi is successor of ESX and available for free.

Besides presented market leader product, there is also variety of other commercial and free solutions as well [8]. User-mode Linux (UML) is Linux kernel modification that uses root file system to create a virtual machine. UML is included with all 2.6.x kernels. It supports only Linux platforms as guest operating systems.

Bochs is a free, open source, Intel architecture x86 emulator that runs on UNIX and Linux, Windows, and Mac OS X, but only supports x86-based operating systems (Windows, Linux, BSD etc.). QEMU is also free, open source emulation program. It runs on variety of platforms, such as: x86, x86_64, and PowerPC. The available guest operating systems are also supported well (x86, x86_64, ARM, Sparc, PowerPC, MIPS, and m68k). Linux KVM (Kernel Virtual Machine) is a modified QEMU. KVM supports Windows, Linux, and FreeBSD. It uses the Linux kernel as a hypervisor and runs as a kernel loadable module. Other products are Sun xVM (earlier VirtualBox), Solaris Containers (Zones) and OpenVZ. VirtualBox is best suited for small networks and individuals for the same reasons as VMware Server.

IV. RESEARCH COMSERNING THE USAGE IN SMES

There is a question about willingness of small and medium enterprises to implement the virtualization technology. Another important question about this issue is the main reasons for that implementation. One research commissioned by VMware Inc. and Intel Corp. in May/June 2007. The survey was conducted with IT professionals of small and midsize. The goal of the survey was to better understand the usage of virtualization technology at small and midsize businesses. Total number of 104 IT experts familiar with virtualization technology participated in the survey. They are employed at organizations with 100 to 1,000 [2].

The results showed that 84% of participants responded that their companies currently using or think about usage of the virtualization technology. The percentage of companies that already implemented technology is 49%. Other 35% companies plan to implement technology in the near future.

This research also showed that small and medium enterprises run average of virtual machines (VM) in each physical machine.

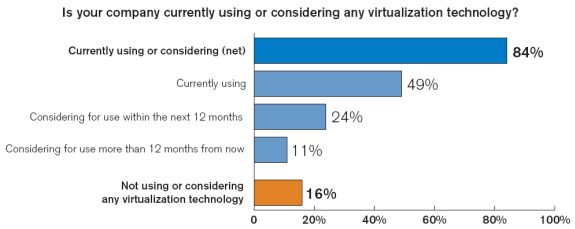

Figure 1. The results about plans for introduction and usage of virtualization of technology [2]

Top reasons for implementing virtualization at SMEs are:

- Increase of efficiency in managing the server environment (66%),
- Hardware sprawl and spending control (58%),
- Reduction of number of servers needed to run the production systems to repurpose hardware for other needs (46%),
- Increasing the productivity of the IT staff (39%),
- Move to a fully scalable disaster recovery system (35%).

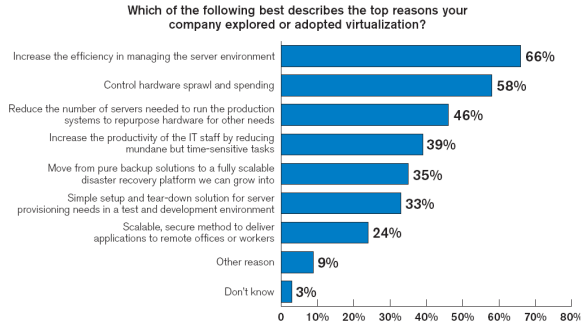

Figure 2. The key reasons for implementation of virtualization [2]

Types of applications currently being virtualized at SMEs are:

- Web services (48%),
- Active Directory (40%),
- E-commerce (28%),
- Industry-specific applications such as banking/financial applications, ERP and document management applications (24%) and
- Supply chain (13%).

The VMware Inc. conducted survey for senior business and IT managers at companies with 20 to 1,000 employees. This survey has total number of 309 participants from United States and Canada companies. The survey conducted in November 2009 [3]. The survey results are presented in the figure below.

The key benefits and impact of virtualization on cost, security and applications are [3]:

- Time spent on routine IT administrative tasks,
- Application availability,
- Ability to respond to changing business needs,
- Backup and data protection,
- Business continuity preparedness,
- Company profitability and growth rate, etc.

Factors, according to the same survey that inhibits penetration of virtualization are: lack of available budget, uncertain about the business benefits and which solution is right for company, lack of resources and skills to deploy and absence of identification the right stakeholders or approvers.

Figure 3. Impact of Virtualization on Costs, Security and Applications [3]

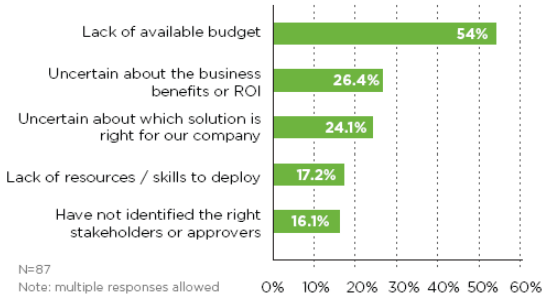

Figure 4. Factors That Inhibit Adoption of Virtualization [3]

Another important question is in what environments and cases virtualization makes sense for SMEs. According to [7] these cases are:

- In environments with less than 20 servers, let alone the more typical small business environment with perhaps 1 to 6 servers,
- If a company is starting a network from scratch, but in most cases there's an existing network in the company.

According to the same source [7] the benefits of virtualization for small businesses are:

- Better and cheaper disaster recovery,
- Scalability - because more servers can be added without extra hardware costs,

- Flexibility - servers can be added and removed for reconfiguration and testing, and servers can restore their older configuration if something is going wrong with the new one.

V. CONCLUSION AND FURTHER WORK

The potential economic benefit or cost changes after implementation of virtualization technology is outlined in this section. Hardware cost will be the same or lower. Virtualization affects lower costs because fewer computers needed for company. Cost can be raised again, due to need for utilization of more powerful computers in order to run several servers on the same platform. The costs needed for licenses will be same because the virtual computer, as well as physical, uses the same operating systems and applications. All virtualization software needs to be purchased. The software costs will be at least the same, except in the cases where the virtualization software will be purchased; in that cases the cost for licensing will be increased.

The IT support costs are going to be much lower than before utilization of virtualization technology. Furthermore, virtualization simplifies the maintenance of the systems. All virtual computers and servers, their configuration and software are placed into one single image file for each virtual machine. These files can be frequently backed up, which makes the whole process of maintenance much easier. The disaster recovery will be simplified as well, because in the case of system crush, whole virtual machine can be easily recovered by simple replacement of the image file. In the case of reconfigurations and software upgrade, as well in testing the new software solutions, effective roll-backs are available if something is going wrong.

The last cost changes are connected with infrastructural issues. Setting up the one virtualization server as a central point of company infrastructure creates also the single point of failure. In such scenarios, majority of users connect through network infrastructure on this central point. This approach requires efficient and stable network links with higher bandwidth. Environment like that requires implementation of new technologies and that affects on increasing the costs and investment in the infrastructure.

The last, but not the least, cost changes concerning computer center space and bills. Putting all servers on one or few physical servers with virtualization software, decrease the need for data center space. The power consumption for machines, and for air-condition and ventilation devices also decreases as well.

At the end, it is important to say that this paper presents the review of the situation in the field of utilization of virtualization technology in small and medium enterprises in the world. The similar research can be conducted in Serbia. The main significance of that research will be introduction of these technologies to SMEs sector and encouragement for SMEs to utilize this useful technology in order to improve their efficiency and incomes.

ACKNOWLEDGMENT

This research is financial supported by Ministry of Science and Technologic Development, Republic of Serbia; under the project number TR32044 “The development of software tools for business process analysis and improvement”, 2011-2014.

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CRM 2.0 - Creating New E-business Value for SMEs

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Abstract - One of the most popular trends when it comes to modern e-Commerce and marketing is the application of Web 2.0 services like blogs, wikis, video, RSS, widgets and podcasting on marketing and customer relationship management (CRM) processes. This paper explains newly created term of Social CRM or CRM 2.0 and its differences in relation to standard CRM characteristics. It also describes the impact on modern enterprises and suggests how it can be used for creating business value with 2.0 services.

I. CONCEPTS OF WEB 2.0

Term Web 2.0 was established in 2004 when O'Reilly Media and MediaLive hosted the first Web 2.0 conference and offered the definition "Web as Platform", meaning that the software applications are built upon the Web instead of the desktop. To be more precise, Web 2.0 referred to web-based software which is continually and collaboratively updated by its users, and is getting more developed and efficient when there are more people who are using and changing it. That meant the individual users are adding their own data and services to collaborative web software, developing the Web 2.0 sites into efficient and more useful tools.

There are number of services and applications that make the basis of Web 2.0 concept. We cannot say they are literally new technologies but rather that they are built using existing and improved technological solutions and standards which are operable on the web. They include blogs, wikis, multimedia services for data exchange, audio and video podcasting, services for content tagging and more. The unique Web 2.0 architecture of participation creates a collaborative environment which allows creating a more satisfying user experience.

Web 2.0 enables [5]:

- Influential customer communities that would not have otherwise existed.
- The identification of new problems and solutions by members of these communities.
- Uniquely accelerated interactions among customers, partners, and employees.
- Altered — and often enhanced — relationships between a company and its stakeholders.

II. WHAT IS CRM 2.0?

Modern successful businesses are now merging the best of the Web 2.0 technologies and services and building them into the classic customer relationship management (CRM) platforms and processes. The main goal is to actively include their customer in creating a collaborative customer experience that will put the customer in the centre of their relationship and create such central customer centric ecosystem where the customers reside within core of multiple business units and connection points [6].

In order for this transition towards a customer centric marketing ecosystem to be successful, and to always be informed of customer's wants and preferences, businesses need to have a centralized customer profile platform that can retrieve information from several data storage, update the info in real time, and also enable customer interaction and Web 2.0 applications. This means that the new CRM systems must be created to support customized, meaningful, and automated communications that benefit the customer on a more personal level.

CRM 2.0 describes an interactive exchange that goes on between businesses and customers in order to match customer needs, requirements and expectations with the business that can best fulfill them [6]. This relationship should lead to more than just a onetime contact and could be extended over time, even years, and be a multi-channel interaction for more involved purchasing relationships.

The next generation of e-commerce is predicted to be a unique customer experience that will create an environment where companies and their customers function as a community, creating new solutions and using existing ones in close collaboration. The constant flow of information will allow the community to identify the needs of both sides immediately and deliver the right solutions.

CRM 2.0 or Social CRM is a philosophy and a business strategy, supported by a technology platform, business rules, processes, and social characteristics, designed to engage the customer in a collaborative conversation in order to provide mutually beneficial value in a trusted and transparent business environment. It's the company's response to the customer's ownership of the conversation [5].

The 2.0 applications and services should be used to promote the ongoing dialogue, both online and offline, and to build high value relationships as a foundation for CRM 2.0. This should lead to creating personal relationships between companies and customers that enable continuous communication improvement and ultimately put customers in the centre of the relationship. Companies also achieve continuous improvement by embracing collaboration between all members of its customer ecosystem. The result of these actions is an improvement in the quality of product and service delivery, an upgrade of the customer experience and new classification within the company's value chain. The experience and insights of one customer, partner, or employee benefits the common experience of all.

Progressive companies are realizing the importance of making the sales and marketing process an interactive conversation, and starting to include user groups, social networks, message boards, blogs and video sharing in the communication. They are engaging the customer via personal pages, RSS, social filters and making it on-demand through mobile web, mobile applications, SMS, podcasting, streaming video etc. CRM applications are quickly adopting features of Web2.0 like [6]:

- Tagging – One can tag to any information like tag to any contact, lead and company that helps finding data in one click.
- Blogging – Users can have their own blog which can be used for knowledge sharing, discussion within the organization and it also to help employees to come closer in any big organization by allowing them to remain in contact easily.
- RSS feed –RSS feeds can be integrated with any RSS reader that helps in keeping everyone updated whether they are logged in the system or not.
- Rich GUI –CRM 2.0 user interfaces now have more rich UI features like drag and drop, graphical reports, interactive statistical report with chart and graphs.
- No refreshing – CRM apps 2.0 focuses on lesser reloading with maximum use of Flex and Ajax technology.
- Rich features – CRM apps 2.0 have a number of rich features that allow faster communication like audio and video chat, digital phones, screen sharing, using real time whiteboards etc.
- ID card implementation – Is like a tool tip but with more information. It contains all basic and necessary information so it reduces clicks required.
- Mail client integration - Integrating Outlook and Thunderbird – CRM apps and mail client can talk with each other. One can merge mails, contacts, to do lists and calendar to their CRM system.
- Web services –CRM 2.0 apps can communicate with other business networking site where company is performing marketing activities. It helps apps to share data to each other so it saves time to enter/maintain same data at multiple places.

III. DIFFERENCES BETWEEN CRM AND CRM 2.0

Traditional CRM is based on an internal operational approach to manage customer relationships effectively while Social CRM is based on the ability of a company to meet the personal agendas of their customers and at the same time meeting the objectives of their own business plan. It is aimed at customer engagement rather than customer management [5].

Now the customer wants to be engaged in creating business value together with the company and that places new demands on existing CRM software vendors. Their technologies will have to evolve in a way to integrate the features of newer technologies that facilitate market conversations, social networking, user communities, in order to transform businesses into aggregators for all participants in the customer value chain. Some differences between CRM and CRM 2.0 are shown in Table I [5]:

TABLE I. DIFFERENCES BETWEEN CRM AND CRM 2.0

CRM 1.0 Features/Functions	Social CRM Features/Functions
Customer-facing features—sales, marketing, and support; still isolated from back office, supply chain	Fully integrated into an enterprise value chain that includes the customer as part of it
Tools are associated with automating functions	Integrates social media tools into apps/services: blogs, wikis, podcasts, social networking tools, user communities
Encourages friendly, institutional relationships with customers	Encourages authenticity and transparency in customer interactions; Utilizes knowledge in context to create meaningful conversations
Models customer processes from the company point of view	Models company processes from the customer point of view Recognizes that the customer relationship encompasses information-seeking and information-contributing behavior
Resides in a customer-focused corporate business ecosystem	Resides in a customer ecosystem
Utilitarian, functional, operational	All those plus style and design matter
Marketing focuses on processes that send improved, targeted, highly specific corporate messages to customer	Marketing is front line for creating conversation with customer—engaging customer in activity and discussion—observing and redirecting conversations among customers
Business produces products and creates services for customer	Business is an aggregator of experiences, products, services, tools, and knowledge for the customer

Intellectual property protected with all legal might available	Intellectual property created and owned together with the customer, partner, supplier, problem solver
Business focus on products and services that satisfy customers	Business focus on environments and experiences that engage customer
Tactical and operational	Strategic
Customer strategy is part of corporate strategy	Customer strategy is corporate strategy
Innovation from the designated	Innovation from both internal and external sources
Focus on company customer relationship	Focus on all iterations of the relationships (among company, partners, customers) and specifically on identifying, engaging, and enabling the "influential" nodes
Company manages the relationship with the customer	Customer collaborates with the company
Technology focused around operational aspects of sales, marketing, support	Technology focuses on both the operational and the social/collaborative and integrates the customer into the entire enterprise value chain
Relationship between the company and the customer is seen as enterprise managing customer—parent to child to a large extent	Relationship between the company and the customer must be peer to peer (C2P or P2C, so to speak) and yet the company must still be an enterprise in all other aspects

IV. CREATING BUSINESS VALUE WITH CRM 2.0

CRM 2.0 can change the way enterprise reaches its customers, builds relationships with them, and widens the brand objectives. Successful enterprises are now using Web 2.0 concepts to encourage their customers to build communities around their products, provide feedback on products, and in some cases adopt marketing initiatives from them. Until now it seemed that estimations and offerings from the sales and marketing departments are safer and more familiar than participation and collaboration with the customers, but it is becoming clearer that the results are better when processes are open to more input.

CRM 2.0 apps could also increase the collaborativeness between the employees and, through it, make the enterprise more successful over time. Employees that collaborate efficiently by sharing intellect and resources create stronger and more successful products. The problem with the existing solutions is that they are often difficult to use, and do not empower employees to share their content. They are built on values of control, containment, and secrecy in environments where employees are encouraged to compete more than collaborate with one another [10].

CRM 2.0 concepts like wikis and integrated chat can make a big difference in creating business values. Companies that are more collaborative, participatory, efficient, user-driven, and action-oriented are recognized as the most successful. IBM, for example, has just launched "Innovation Jams" where thousands of IBM employees are encouraged to participate in virtual chatrooms simultaneously on a given day. IBM hopes to uncover transformative business ideas through these virtual discussions.

Enterprises should use Web and CRM 2.0 applications and services to [10]:

- Make use of underutilized resources.
- Let users be co-creators and contributors.
- Nurture unique, hard to reproduce data sources.

CRM 2.0 and the new emerging type of social customer have lead to creation of new concept of enterprise - Enterprise 2.0. It could be defined as following [2]: Enterprise 2.0 is the use of emergent social software platforms within companies, or between companies and their partners or customers.

Former model of the enterprise was operational and based on processes to ensure satisfying productivity. The new model is based on collaborative social relationships and knowledge exchange, which should lead to increased productivity of the employees.

McAfee identifies the characteristics of Enterprise 2.0 as SLATES and the explanation is given in Table II [5]:

TABLE II. DEFINITIONS FOR THE ENTERPRISE 2.0 CHARACTERISTICS

Term	Definition
Search	The ability to find information easily using tools that can organize structured and unstructured data, typically through the use of keywords
Links	The means to be able to "hook up" to web pages and other areas internally through the use of hyperlink technology
Authoring	Writing for a broad audience using tools and spaces that make the content available to that broad audience, such as a wiki or blog
Tags	The organic categorization of content using one or two word tags where the categorization is done by individuals
Extensions	Tools that provide some automated form of analysis that enriches the productivity of their users
Signals	Tools like RSS that inform users when new content is available or relevant content is available elsewhere

V. CONCLUSION

The contemporary workforce has a different outlook than the traditional workforce, which leads to a different kind of thinking. One of the most important concepts to carry out when creating Enterprise 2.0 is forming and fostering a new kind of business culture. It is best seen through investing in customer service, as well as in company's employees. This new form of enterprise values its employees and thus creates satisfied business partners and, most important, loyal customers. The use of Enterprise 2.0 tools fosters a culture of collaboration and outreach which can only benefit the transformation of a company to a customer-centered culture that's defined by

how it administers the customer experience and engages customers in a continuous fashion. The successful use of those tools reduces cost and increases productivity. Familiarity with their use helps in the implementation of the same or similar tools with the customers.

ACKNOWLEDGMENT

This paper is supported by Ministry of Science and Technological Development, Republic of Serbia, under the project number TR32044 "The development of software tools for business process analysis and improvement".

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NFC Technology for the Optimization of Business Processes

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Abstract - Near Field Communication (NFC) is a part of RFID Technology based on inductive coupling with a reading range of a few centimeters. NFC is used in particular with smart cards, electronic passports, loyalty and signature cards and mobile telephones that act like smart cards. In 2004 Nokia, Sony and Philips founded the NFC Forum (www.nfcforum.org). NFC provides better communication than Bluetooth and WLAN and enables simple, intuitive communication. Instead of using an elaborate pairing process with several distinct steps, the user simply holds a NFC enabled device close together for a short time. The devices identify each other without the usual bandwidth search, device selection, service selection or password transfer. NFC is expected to be used with smart cards, RFID tags, bank cards, credit cards, entertainment electronics, mobile phones, PCs and other smart objects. Leading financial companies have already issued NFC credit cards that accelerate wireless payment transactions and enhance their security.

I. INTRODUCTION

NFC is designed as a short-range standardized technology for providing contactless communications for mobile devices [1]. NFC is intended to be an intuitive method of establishing ad-hoc connections, simply requiring that two NFC-enabled devices are brought in close physical proximity to each other. NFC also allows for devices to interact with existing contactless/RFID (Radio Frequency Identification) systems. In 'passive' communication mode NFC allows devices to emulate passive contactless smart cards, while 'active' mode allows for devices to act as contactless smart card readers or to communicate with each other. The use of NFC-enabled devices in contactless systems has received much publicity.

II. TECHNOLOGY BACKGROUND

NFC technology allows for the integration of contactless technology into active devices, such as mobile phones. A NFC enabled device can act as both a "contactless card" and a "contactless reader".

NFC devices, as specified in ISO-18092/ECMA-340 [1] and ISO-21481/ ECMA-352 [2], are compatible with existing contactless systems adhering to ISO 14443 [3], ISO 15693 [4] and FeliCa [5]. The NFC standards also define a communication mode for peer-to-peer (P2P) or 'active' communication, with the purpose of facilitating communication between two NFC-enabled devices.

At first sight, NFC is not an RFID system, but a wireless data interface between devices is similar to Infrared or the well-known Bluetooth. However, NFC has several characteristics that are of interest in relation to RFID systems. Data transmission between two NFC interfaces uses high-frequency magnetic alternating fields in the frequency range of 13.56 MHz. The maximum communication range typical for NFC data transmission is 20 cm because the respective communication counterpart is located in the near-field of the transmitter antenna; therefore the communication is called near-field communication.

Figure 1 illustrates the physical principle of data transmission between two NFC interfaces.

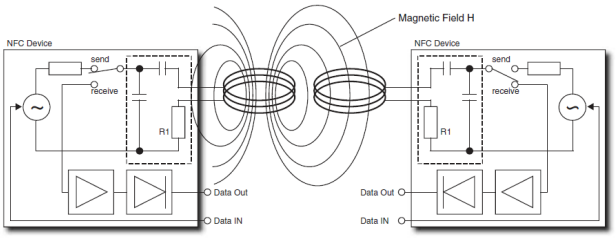

Figure 1. In active mode, the NFC interfaces alternately emit magnetic fields for data transmission [6]

For communication between two NFC interfaces, the individual NFC interface can take on different functions, i.e. that of an NFC initiator (master device) or an NFC target (slave device). Communication is always started by the NFC initiator. In addition, NFC communication distinguishes between two different operational modes, the active and the passive mode.

A. Active Mode

In order to transmit data between two NFC interfaces in active mode, at first one of the NFC interfaces activates its transmitter and thus works as the NFC initiator. The high-frequency current that flows in the antenna induces an alternating magnetic field which spreads around the antenna loop. Part of the induced magnetic field moves through the antenna loop of the other NFC interface which is located close by. Then a voltage is induced in the antenna loop and can be detected by the receiver of the other NFC interface. If the NFC interface receives signals and the corresponding commands of an NFC initiator, this NFC interface automatically adopts the roll of an NFC target. For data transmission between the NFC interfaces,

the amplitude of the emitted magnetic alternating field is modulated ('Amplitude-Shift Keying' - ASK modulation), similar to the data transmission between RFID reader and transponder. However, the difference between an NFC target in active mode and an RFID transponder consists in that the magnetic alternating field has to supply the transponder with power in order to operate the microchip. As opposed to this, the electronic device containing the NFC interface supplies the interface with power. The transmission direction is reversed in order to send data from the NFC target to the NFC initiator. This means that the NFC target activates the transmitter and the NFC initiator switches to receiving mode. Both NFC interfaces alternately induce magnetic fields where data is transmitted from transmitter to receiver only.

In 'active' NFC, the participants communicate in a "client-server" model. The device that starts the data exchange is known as the Initiator and the recipient is known as the Target. In 'active' mode, the Initiator and Target uses their own generated RF field to communicate with each other. First the Initiator transmits an RF carrier, which it uses to send data to the Target. Once an acknowledgment for the data sent has been received from Target (by modulating the existing field), the Initiator switches the carrier off. The original Target then reprises the role of Initiator, switching on its carrier, and transmits a response to the original Initiator. For the purposes of reader's clarity, we call the NFC enabled mobile phone configured as the Initiator to be in "writing" mode and the phone configured as the Target to be in "reading" mode.

On NFC-enabled mobile phones the Secure Element (SE) provides the security means to establish trust between service provider and the device. The SE also provides a secure environment for hosting sensitive applications and storing cryptographic keys. Currently there are three main architectures for NFC.

The first involves an SE that exists as an 'independent' embedded hardware module, i.e. a stand-alone IC (Integrated Chip) is built into the phone. In the second option, the SE is implemented within the UICC (Universal Integrated Circuit Card) [7]. The third option implements the SE on a removable memory component such as a Secure Multi-Media Card (Secure MMC) or Secure Digital card (Secure SD).

B. Passive Mode

In the passive mode, too, the NFC initiator induces a magnetic alternating field for transmitting data to the NFC target. The field's amplitude is modulated in line with the pulse of the data to be transmitted (ASK modulation). However, after having transmitted a data block, the field is not interrupted, but continues to be emitted in an un-modulated way. The NFC target now is able to transmit data to the NFC initiator by generating a load modulation. The load modulation method is also known from RFID systems.

Using this method for NFC interfaces provides a number of advantages and interesting options for practical operation. Thus the different roles of the two NFC interfaces within the NFC communication can be negotiated and changed, at any time. An NFC interface with weak power supply, e.g. with a low-capacity battery, can negotiate and adopt the role of the NFC target in order to save power by transmitting data via load modulation.

The NFC interface that is the target is also able to establish, in addition to other NFC interfaces, the communication to compatible passive transponders (e.g. according to ISO/IEC 14443) that the NFC target supplies with power and that, via load modulation, can transmit data to the NFC interface. This option enables electronic devices equipped with NFC interfaces, such as NFC mobile phones, to read and write on different transponders such as smart labels or e-tickets. As the NFC interface in this case behaves similar to an RFID reader, this option is also called 'reader mode' or 'reader-emulation mode'.

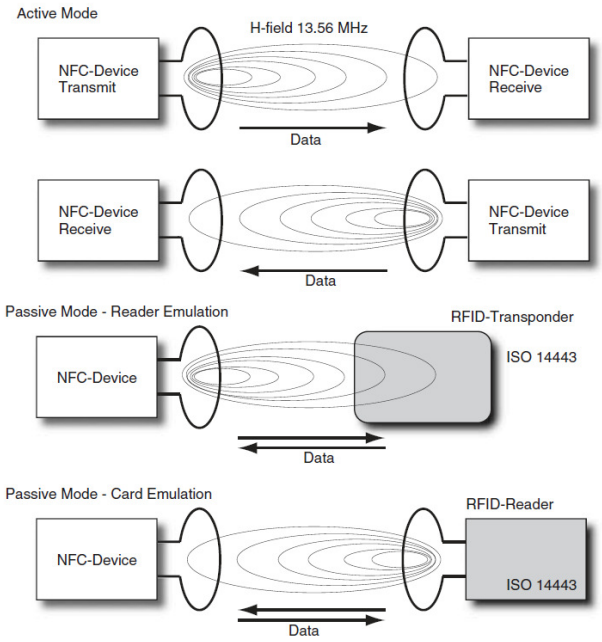

Figure 2. NFC distinguishes between three different operating modes: active mode (i); and passive mode in the operating modes reader emulation (ii); and card emulation (iii) [6]

If an NFC interface is located close to a compatible RFID reader (e.g. according to ISO/IEC 14443), the NFC reader is also able to communicate with a reader. Here, the NFC interface adopts the roll of an NFC target and can transmit data to the reader using load modulation. This option enables RFID readers to exchange data with an electronic device with NFC interface, such as NFC mobile phones. From the reader's perspective, the electronic device behaves like a contactless smart card; this option is also called 'card mode' or 'card-emulation mode [6].

III. NFC Applications

NFC provides a technology that makes it possible simply to add a very flexible RFID interface to electronic devices. In addition, NFC is compatible with MIFARE, a common NXP contactless smart card technology, and with FELICIA, Sony's contactless smart card system [8] as well as with all ISO/IEC 14443-A-specified transponders and readers. NFC application can be divided into different categories [9]:

- Touch and Go: in this category we find applications such as access control systems, logistics reporting systems or security technology as well as ticketing systems. Here the NFC device behaves like a contactless smart card that contains an access code or ticket and has only to move quickly past the reader.
- Touch and Confirm: applications such as mobile payment where the user has to confirm the interaction by pressing a button or entering a PIN into the NFC device.
- Touch and Capture: here, the NFC device is located close to the transponder (smart label) which for instance can be attached to a smart poster. The NFC device can read out transponders for information such as phone numbers or a URL for further information.
- Touch and Link: applications that require an online connection of the NFC device. Data read by the NFC interface are forwarded via an online connection (GPRS, UMTS) to a server. The server can process these data and send back information to the NFC device where it is shown on the display.
- Touch and Connect: a connection of two NFC devices for transmitting images, MP3 files or simply for matching phone directories of two NFC-enabled mobile phones.
- Touch and Explore: it is possible to randomly combine the above categories. Touch and Explore allows the user to intuitively 'find and explore' new applications.

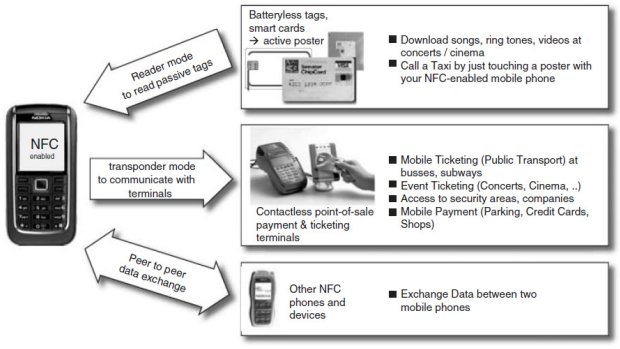

Figure 3. NFC provides three different operating modes with a variety of applications [6]

There are clear signs that in the future the mobile phone will be the personal NFC device. As most people carry their mobile phones on them all the time there is a valuable additional benefit if everyday services can be provided through an NFC-enabled mobile phone. Starting in 2005, throughout the world NFC applications are being introduced. NFC devices are most easily used in applications that already dispense with of a reader infrastructure. Therefore, contactless smart cards of a public transportation ticket application can be easily replaced by NFC-enabled mobile phones. The phone's NFC interface takes on the function of the contactless smart card, with the ticket data sets being safely stored in a secure element. However, the special advantage of mobile phones is that, via the GSM interface, new additional functions and services can be offered that may lead to novel business models. OTA services (OTA = over the air) can administer data in the secure element of an NFC-enabled phone. OTA services make use of the mobile's option to transmit data via GPRS or UMTS. Using OTA services ensures secrecy of personalization data due to strong encryption and authentification [10]. This way it is possible for public transportation businesses to use OTA services to automatically send customers an electronic monthly season ticket at the beginning of the month which the customer can save in his or her NFC phone. Even a single ticket that was ordered with the Internet browser of a modern mobile phone could be directly transmitted to the secure element of the mobile after processing the order with OTA services; and it will be immediately available to the user.

IV. NFC Applications for Consumers

In April 2006, Royal Philips Electronics and Visa International published the results of a study on NFC technology for contactless payment, with the title 'How Would You Like to Pay for That? Cash, Card or Phone?'. According to the study, consumers rate the convenience, ease of use and 'coolness' of NFC mobile telephones very highly [10]. The study participants used NFC mobile telephones to make purchases in coffee shops, download films in DVD shops and buy concert tickets via smart posters, among other things. Further expansion of NFC technology is thus very probable.

A. Application scenarios for NFC mobile telephones

A smart poster has an RFID tag with a suitable marking. If an NFC telephone is held close to the tag, it can read the data stored in the tag. It can then call the ticket centre of a concert promoter or similar organization to reserve tickets immediately and pay for them. When the concertgoer arrives at the event location, he or she holds a mobile telephone next to the check-in terminal at the entrance and is immediately allowed to enter. For the concertgoer, standing in line to pick up a ticket is a thing of the past. It could hardly be faster or easier.

NFC-enabled mobile phones could even be used to implement applications that are problematic regarding the installation and networking of the readers (e.g. in vehicles) or that are too expensive (if the target is nationwide coverage, for instance). Here, the stationary reader and portable transponder simply switch their traditional roles. This was the case of the project Touch and Travel introduced in 2005 by Deutsche Bahn AG where NFC-enabled mobile phones used as tickets for long distance travel [6]. Railway stations that are part of the Touch and Travel network only need to be equipped with passive transponders (ISO/IEC 14443) that are located in eye-catching 'touchpoints'. To buy a valid ticket, the previously registered customer starts a specific application – the Touch and Travel applet – on an NFC-enabled mobile phone immediately prior to the journey and moves the phone into the reading range of the touchpoint transponder. The Touch and Travel applet now builds an

online connection via mobile phone to a data centre, transmits the data read out of the transponder to a server and writes some of the data received by the server into the mobile phone's secure element. This way the customer is booked into the system and the railway station where the touchpoint was read is entered as departure station of the forthcoming journey. The booking data set entered into the secure element now constitutes a valid ticket and can be easily verified by the conductor with a portable reader. At the end of the journey, the customer simply goes to the nearest touchpoint and repeats the reading procedure. This way, the customer checks out of the system, the journey is registered as ended and the corresponding price is calculated.

Even for payment transactions, the use of NFC phones

Figure 4. An NFC-enabled mobile phone with the corresponding payment application simulates a contactless credit or debit card [8]

opens up completely new opportunities. An NFC mobile phone that is used for payment simulates contactless credit or debit cards (card emulation mode). The POS terminal cannot distinguish whether the card holder uses a contactless card or an NFC phone with the corresponding payment application. The advantage is obvious: If the POS terminal includes a contactless reader NFC technology can be accepted for payment without any additional efforts. This does not affect the processing of the payment with NFC phones as the existing infrastructure can be used. Even if the battery is empty, NFC phones can still be used for paying as the POS terminal contactlessly provides the necessary power to the NFC chip.

Differences become obvious when the 'credit card in the phone' supports additional functions that traditional cards do not have. An NFC-enabled phone is, strictly speaking, a highly complex IT system and can store several card data sets in the secure element, i.e. also several credit and debit cards of different payment systems. During the payment process, the 'card holder' (i.e. the phone user) only has to select a preferred card or has the option to previously make this selection with a special menu entry in the NFC phone. Other possible functions include the temporary inactivation of the card; for instance, if owner lend the phone to somebody else who is not supposed to use the stored credit cards. OTA services can be used to personalize the secure element with personal credit card data and extend an existing expired card. If the owner of an NFC-enabled phone registers the phone as lost and wants to remotely inactivate the card functions he or she can easily use OTA services to do so.

Some pilot projects and scenarios [10]:

- Philips Arena, Atlanta, USA. Sports fans can use NFC here to buy products or download mobile contents – such as ring tones, screen savers or video clips – by holding their mobile telephone next to a smart poster.
- City of Caen, France. During a six-month trial project, 200 residents of the city used Samsung NFC mobile telephones to make payments in shops and car parks and download video clips, bus schedules and information about interesting sites.
- Taiwan Proximity Mobile Service, Taiwan. Prototype BenQ NFC mobile telephones were used to test secure payment transactions for public transport in Taiwan.
- Ordering a taxi at a hotel. An out-of-town hotel guest needs to order a taxi. In the future, the guest can simply touch his or her mobile telephone to the tag of a taxi poster in order to be connected to the taxi dispatch centre. The dispatcher knows the customer's location right away without asking and thus knows where to send the taxi.
- Arriving in Paris by train. A traveller is looking for the schedule of trains returning to the airport. The traveller touches the tag on the schedule and enters the desired departure time, and suitable connections are downloaded to his or her mobile telephone.
- Paying parking fees and bus fares. To pay for a parking ticket in a controlled parking zone, you can hold your mobile telephone next to a parking ticket dispenser. You can pay for a bus fare by swiping a mobile telephone past a check-in unit.
- Access to ski areas. Smart cards are already widely used in large ski areas for contactless access to the slopes. In the future, you can use your mobile telephone and avoid queuing at the lift station for a smart card. This also puts an end to arriving back home and discovering that you forgot to return the smart card and collect your deposit.
- Calling a service hotline. If you have a malfunction with a home appliance or trouble using the appliance and you want to sort this out by calling a service hotline, you usually do not know the telephone number. In the future, you could simply hold your mobile telephone next to the nameplate of the appliance and the call would be placed for you automatically.

B. Industrial Uses of NFC

NFC mobile telephones also offer new possibilities for industrial uses, since they are an order of magnitude less expensive than current RFID readers. They are thus a logical choice to replace RFID readers. This naturally

assumes that employees who use the RFID readers already have mobile telephones. The 13.56 MHz NFC frequency is also widely used for RFID tags on individual objects (items), so the ROI in RFID methods can be accelerated considerably in trade and industrial applications. For example, Nokia offers a service product for security and maintenance organizations that require full-coverage communication with their technicians or contractual partners [10]. NFC mobile telephones can be used to manage and monitor the tasks of technicians and security personnel. For example, if the check points of a security round are fitted with RFID tags, the security guard only has to hold his or her mobile telephone next to the tags to document proper performance of the round in terms of locations and times. The same holds true for maintenance technicians if the equipment to be maintained is fitted with RFID tags. In this way, the necessary documentation of the work or the rounds can be generated automatically and concurrently with the activities.

V. CONCLUSION

The use of NFC Technology not only creates a great method for mobile payments and data communications but it also allows these experiences to be extended and create vision of future - technological ubiquity, one in which computing through dedicated devices will slowly disappear, while information processing capabilities will emerge throughout our surrounding environment. With the benefit of integrated information processing capacity, industrial products will take on smart capabilities. They may also take on electronic identities that can be queried remotely, or be equipped with sensors for detecting physical changes around them. Such developments will make the merely static objects of today dynamic ones - embedding intelligence in our environment and new business opportunities. The Internet of Things will enable forms of collaboration and communication between people and things, and between things themselves. With continuing developments in miniaturization and declining costs, it is becoming economically feasible to make everyday objects smarter, and to connect the world of people with the world of things.

One of the most important challenges is convincing users to adopt emerging technologies like RFID. Concerns over privacy and data protection are widespread, particularly as sensors and smart tags can track a user's movements, habits and preferences. But whatever the concern, one thing remains clear: scientific and technological advances in these fields continue to move ahead at breakneck speed. Further, the traditional phone interface is generally too bulky for anything beyond dialing numbers and the simple act of touching an object to gain access to information and services is both simple and intuitive for the majority of users.

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ADAPTATION OF WEB PORTALS

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Abstract - In the modern way of life, the Web (World Wide Web – basic Internet service) has important role and is used in almost all spheres of life. The Web is today a global source of digital information, which may be in various formats (text, pictures, multimedia), and they are called web documents. Message sent by Web page is meant to attract attention of current and future clients, or visitors, to inform them about products or services and to prompt them to buy or use those. Authors of Web pages must consider different abilities, skills and faculties of users and therefore try to adapt the Web to all of them. Every attempt at facilitating accessibility is useful for persons with special needs and for all Internet users. This paper describes explanations and deepening of knowledge regarding development of effective design of web page, adaptation to visually impaired persons and persons with color blindness, as well as senior persons with changed visual abilities due to ageing. All individuals have a right to use all advantages of information society. Persons with special needs (disability) and elderly persons often encounter difficulties in using new technologies and services. Some of those difficulties are result of inappropriate design of technology.

Keywords: Web, Internet, visually impaired persons

I. INTRODUCTION

In the modern way of life, the Web (World Wide Web – basic Internet service) has important role and is used in almost all spheres of life. The Web is today a global source of digital information, which may be in various formats (text, pictures, multimedia), and they are called web documents. In order to use all these, accessibility of Internet pages is important to all persons, disregarding their status. Internet enables to share knowledge in unprecedented scale, and therefore it must be at the focus of society development. Internet and Web are in constant rise, and consequently are being used as a high-quality medium for advertising and presentation. The purpose of the Web is to present a firm, agency, party, association, person or anything worth presenting in the best way possible. Possessing of a Web page equals business sense and following modern trends. Advantages of advertising and selling products on Internet are numerous. Some of most important are: it is always accessible to large number of people, who are potential clients; has no time or space barriers, enables many information; this is the fastest-growing medium accessible to everybody at every moment of every day. Internet is the largest worldwide computer network, or network of networks. It may be observed from several aspects, for instance, as a means of mass communication, as a set of communication services, available to users worldwide, and also as an exquisite means for enforcement of a number of business activities. Today, millions of people around the world use Internet services on a daily basis for communication, to follow stock markets or news, to check on a weather forecast, to make vacation plans, manage their business, to buy commodity goods, to enjoy games and to learn.

II. USE OF INTERNET IN BUSINESS

In modern world, it is hard to imagine any serious business organization or institution that would renounce benefits of Internet in their business. There are several basic aspects of use of Internet in business.

User aspect – The Internet is a set of different communication services to which user accesses using Internet Service Provider (ISP) and a computer or another device, for instance WebTV. User is connected to the Internet via ISP in order to use different communication services.

Aspect of financial gain from Internet – The Internet is a communication medium by which a financial gain is realized by accessing certain information, selling products or services, promotional presence of a company on the Internet and/or organization of its entire business. For these activities, communication resources of the Internet are used.

Conceptual aspect – The Internet is a means of communication. When possibilities of this medium are known, modes for adequate and quality presence of the company in online environment may be chosen.

Not all users of the Internet have the equal working capacities, the conditions or capabilities. Many of them

- can not see, or can not hear, or can not move or use certain types of information;
- have difficulties reading or understanding text;
- can not use keyboard or the mouse (or have none);
- have only a text display or have poor Internet connection;
- do not understand the language of a text, or understand it with difficulties;
- are in a situation when their eyes, ears or hands are busy with other activities (driving or working in a noisy environment);
- have a different operation system or an older version of a program.

Authors of Web pages must consider users' different capacities, conditions or capabilities and try to adapt to all of them. Every attempt enabling accessibility is in favor of special need persons, and all Internet users as well

III. BASIC ELEMENTS OF WEB PAGES

The design makes for first impression, so it is important to have the best quality design if possible. The Web page is also a shop window. It enables indirect communication to the user. Communication will depend on a way the page is designed. In order to attract as many costumers as possible, it must be original, nice, and yet not be centered on the page itself, but on products. The Web page must be different from competition pages. The best design is the original design. The Web is a complex artificial system with following dimensions: (a) content, (b) design and (c) structure of documents. Content of documents is what is given in natural language, pictures, sounds, animation etc. The purpose of a message is recognized by its content, being defined by the aim of communication. If the aim if well defined, and the message well structured, it will reach the target. It is about visualization or simply the way of showing message content to the target group. It must help easier spotting the message being sent. Display of document is a way in which the document is represented (for instance, as print, or two-dimensional graphic presentation, or text, or synthetic speech, Braille, etc). The element that determines document display (for instance B, FONT, CENTER) is the presentation element. Document structure is the way in which it is logically organized (by chapters, with introduction and table of contents). The element (for instance P, STRONG, BLOCKQUOTE in HTML) that determines document structure is called structural element. This is regarding the process and procedure of making the Web pages, i.e. the technique and technologies involved. A good Web designer must be able to represent the global message to the target group in the best light possible. He also must have in mind different capacities, conditions or capabilities of users and try to adjust Web pages in order to make them close to all users. Target visitors are one of basic factors to bear on mind. The logotype or the visual identity of a company is the visual symbol that, as a frontispiece, stays etched in memory of users, which is the aim. The logo is the association to the brand in day-to-day communication to consumers. Therefore, the design of logotype and of total visual identity is a major item in creating image and positioning in consumers memory. It must be placed on most prominent spot on the page, presumably in upper left-hand corner, and must be clear, legible and easy to remember in order to make company logotype even more recognizable. Company's visual identity must be recognizable to special needs persons too, and this must be considered as well. The perfect logo guarantees that you will be noticed at the market! Consequently, special attention must be paid to logo design, having in mind combinations and psychology of colors, symmetry, composition, visual effect and overall impression on observer. For instance, trademark colors are not changing ever. It is important for trademark colors to be harmonious and well defined. Colors are not defined by their name only (i.e. gray, orange) but in percent ratio of basic colors in print as in C.M.Y.K. or PANTONE palette or in color catalogue, where every color is represented by its numerical value. This is especially important for print, since only a clear definition of colors provides uniform print, not depending on particular printing shop. Positioning of primary navigation is also important. It is best to be positioned at the prominent place on a page, usually at the very top or on left-hand side. Navigation links must have clear, descriptive names. Also, it is necessary that navigation links have certain reactions when cursor is passing over, and that there is a change on a link on the page where user is currently located, so that user may know on which subpage he or she is in every moment.

Web standards certainly lower costs in long term, since they enable mush easier maintenance. Longevity of such solution is the main reason for companies to standardize their web pages according to W3C instructions. Today, all popular browsers, including Microsoft Internet Explorer and Mozilla Firefox, support these web standards. Web standards enable web content to be accessible to vast number of people and to be presented as same or similar on different devices, under different operative systems and in different browsers. Standards in code writing contribute to better accessibility of websites

IV. WEB ACCESSIBILITZ FOR VISUALLY IMPAIRED PERSONS

Accessibility of Internet pages means that special needs persons may use the Internet. Therefore, accessibility is the general term used to describe level to which a certain product (device, service, environment etc) ids accessible to most people. More precise, accessibility of Internet page means that people with special needs may understand, browse, add their content and interact with other Internet users. Internet accessibility is useful to others, including senior persons with ability changes due to ageing. Recommendations consider possible examples of page design and propose solutions to improve accessibility. People that may have the most to gain of informatics society development often are in danger to be excluded. For instance, to elderly people use of information and communication technologies is often too complicated, and it is not adapted to disabled persons. Such barriers may cause person to feel isolated at home, on workplace and in society in general. European Union has pledged to support investigations connected to solving the problem of accessibility of information and communication technologies to persons with special needs. In this moment, 30% of European population is not actively involved in information society. Among them, disabled persons are most vulnerable, although new technologies have high potentials regarding these problems. European Commission is determined to solve this problem, providing support to investigations and development of products and services that would enable easier use of the Internet. Two basic principles in creating an accessible Web page are convenient display and understandable format content easy to use. There are several ways to design Internet pages so that they are accessible to all persons with physical, sensory or

cognitive difficulties, working limitations or technological barriers:

- Separate document content, structure and presentation. Document content is what is told within it by natural language, pictures, sounds, animation etc. Document structure is a way in which it is logically organized (by chapters, with introduction and table of contents). Presentation of a document is the way in which the document is shown (for instance, as print, or two-dimensional graphic presentation, as text, speech, Braille, etc). The element determining document presentation (for instance B, FONT, CENTER) is called presentation element.
- Format documents in order to be accessible even if user can not see or hear them. Make sure that information has the same purpose or function as audio or video, in ways adapted to other sensory channels.
- Format documents that are not based on a singly converter type. Pages should be accessible to persons without the mouse, with small monitors, without display or with voice or text outputs.

Authors should try to make content more comprehensible and easy to use. This does not include only simple and clear language, but also simple mechanisms to navigate within and between pages. Design of navigation tools and orientation information will increase accessibility and availability. Not all users are able to use visual symbols as hyperlink pictures, sliders, frames, navigation graphics, graphic browsers etc. Users also lose information context if they can see only a part of the page, or they access it word by word (using synthetic speech or Braille) or segment by segment (small display, enlarged display). Without orientational information, users will not comprehend large tables, lists etc. Web accessibility is useful even for people without disabilities. For instance, the key principle of Web accessibility is design of Web pages and software that are flexible according to different needs of users, their preferences and situations. Such flexibility in certain situations may be useful for persons without disabilities, as people with slow internet connection, to persons with "temporary disability" (broken arm, for instance) and persons with ability changes due to ageing. Accessible web pages are those to which persons with certain physical, psychic and mental disabilities may access. Accessibility of web pages takes into account all kinds of disabilities, i.e. health conditions that may influence access to web pages, including visual, auditory, physical, cognitive and neurological impairments, as well as speech difficulties. Ability varies from person to person, change with time, even in a group of persons with similar kind of disability. A person may have combination of different impairments, which may vary in degree. Many persons are not regarded as disabled, although they may experience sensory barriers or problems in physical or cognitive functions due to acute or chronic illnesses. These difficulties are usually worsened with age and may bring to changes in eyesight, hearing, memory and motoric functions. Conditions due to ageing may be relieved by the same solutions of e-accessibility used for disabled persons. Term "information barriers" is used to describe situation when a disabled person finds a set of information that are inaccessible to him or her due to their presentation format or to inaccessible technologies. Eyesight problems, or visual disorders, may be roughly categorized in three groups:

- Blindness as the hardest disorder is not only a total loss of eyesight, but also a condition when a field of vision is 20% or less than normal.
- Bad eyesight is usual for elderly people, although it occurs in all age groups, caused by genetics, trauma or illness.
- Color blindness is the last large group of visual disorders, although it is maybe not right to call it a disorder since there are not much of situations when color blindness is a real limitation.

V. CONCLUSION

A life cycle of the web presentation does not stop with its construction, on the contrary: this is the beginning of new tasks and if we fulfill those successfully, they will make our presentation even more attractive. Visually attractive web page attracts visitors, and a visual element is certainly the first experience, the thing that visitors notice in the web page. Updating is very important in keeping the sight visited, and maybe even the prerequisite for continued existence of the site, regardless its theme. Besides design and content, the page must be highly ranked in web browsers, as this brings vast number of visitors. It is also important that the page must fulfill its purpose, so that its brand may look professional and serious. It is often said that a successful web page is the one with high visitation, or the visually attractive one with abundance of interactive and multimedia animations, or the one with much contents. The truth is somewhere in between. Key words are multidisciplinary approach, perception and purpose. Successful web page is determined by all these elements, intertwined in interaction.

„The principle of inclusive design, and use of technology as an appliance, must be promoted and supported in order to enable people with disabilities to use al possibilities of technology, completely and in identical conditions as non-disabled ones."

ACKNOWLEDGEMENT

This work was supported by the Provincial Secretariat for Science and Technologic Development of Autonomous Province of Vojvodina, No. 114-451-3044/2011-03, project title: Accessibility of personalized web portals to persons with poor eyesight and with color blindness.

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Transformation of coordinates from local to global coordinate system and visualization of data by using Google Earth

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Abstract – Detail surveys measured on the local level use local coordinate systems. To make the data obtained from such surveys compatible with Google Earth, a geodetic transformation is required – from local Gauss-Krüger coordinate system to global WGS 84 coordinate system. Goal of this paper is to describe a computer program developed to generate KML document from surveying data, so that it can be visualized with Google Earth.

Keywords - Google Earth, KML, GIS, Gauss-Krüger, WGS 84

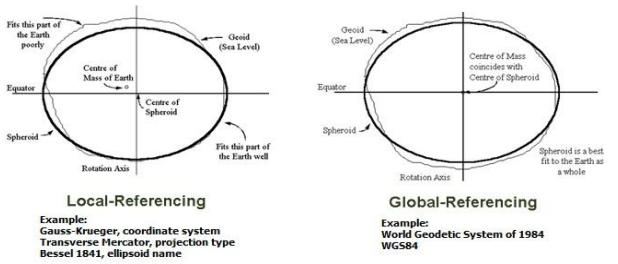
I. INTRODUCTION

Google Earth is a free computer program which uses a virtual globe to map the Earth using satellite and aerial imagery. Google Earth is a virtual globe that represents the whole planet and uses global GPS coordinate system WGS 84. On the local level all data obtained from land survey use local (e.g. Gauss-Krüger) coordinate system. It is essential to convert data from local to global coordinate system. Doing so will enable user to view their data in any application which is compatible with KML [1] format. This application will use Google Earth [2] for the visual representation of exported objects.

II. BACKGROUND

A. Coordinate Systems

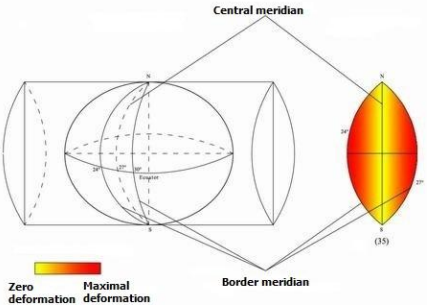
Data can be classified into two broad categories: local referencing data and global referencing data. A local referencing datum is a datum which best approximates the size and shape of a particular part of the Earth's sea-level surface. A global referencing datum best approximates the size and shape of the Earth as a whole. These data is not intended to be used as a good approximation of any particular part of the Earth. Rather, their application lies in mapping projects that are more global in nature (Picture 1).



Picture 1, difference between local and global referencing

In Serbia local coordinate system utilizes Gauss-Krüger projection. Serbia has direction north to south what makes it ideal for this type of projection (Picture 2).

Also known as Transverse Mercator, this projection is similar to the Mercator except that the cylinder is longitudinal along a meridian instead of the equator. The central meridian is placed on the region to be highlighted. This centering minimizes distortion of all properties in that region. This projection is best suited for land masses that stretch north–south. The Gauss-Krüger (GK) coordinate system is based on the Gauss-Krüger projection.

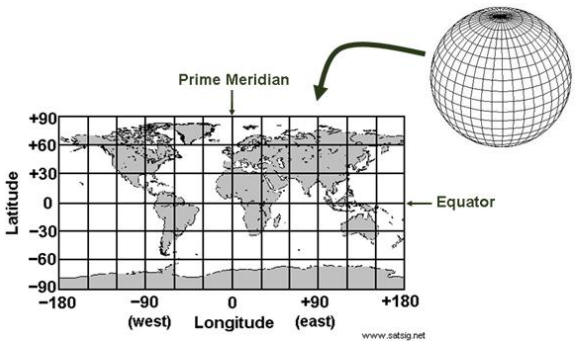


Picture 2, Gauss-Krüger projection

The country is divided in three zones each three degrees wide, roughly from 19 to 23 degrees longitude (Picture 3).

Picture 3, Gauss-Krüger projection for Serbia with zone division

The World Geodetic System datum is the only world referencing system in place today (Picture 4). WGS 84, the latest revision of World Geodetic System, is also the default standard datum for coordinates used in recreational and commercial GPS units. Google Earth uses GPS coordinate system WGS 84 for latitude and longitude and Earth Gravitational Model 1996 (EGM96) for height. WGS 84 is a coordinate system based on the GRS 80 (Geodetic Reference System 1980) ellipsoid, an ellipsoid which approximates the Earth as a whole in the most detail.



Picture 4, World Geodetic System layout

In order to transform coordinates from regional surveying points to WGS Helmert transformation can be used.

B. Transformation algorithm

The Helmert transformation (named after Friedrich Robert Helmert, 1843–1917, also called a seven-parameter transformation) is a transformation method within a three-dimensional space. It is frequently used in geodesy to produce distortion-free transformations from one datum to another using:

$$X_T = C + \mu RX$$

Where:

- X_T is the transformed vector
- X is the initial vector

The parameters are:

- •C is translation vector, it contains the three translations along the coordinate axes
- μ is scale factor, which is dimensionless, and as it is usually expressed in ppm, it must be divided by 1,000,000
- R is rotation matrix. It consists of three axes (small rotations around the coordinate axes) r_x, r_y, r_z. The rotation matrix is an orthogonal matrix. The rotation is given in radians

The coordinates of a reference system B are derived from reference system A by the following formula:

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}^B = \begin{bmatrix} c_x \\ c_y \\ c_z \end{bmatrix} + (1 + s \times 10^{-6}) \cdot \begin{bmatrix} 1 & -r_z & r_y \\ r_z & 1 & -r_x \\ -r_y & r_x & 1 \end{bmatrix} \cdot \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}^A \quad [3]$$

Or for each single parameter of the coordinate:

$$X_B = c_x + (1 + s \times 10^{-6}) \cdot (X_A - r_z \cdot Y_A + r_y \cdot Z_A)$$
$$Y_B = c_y + (1 + s \times 10^{-6}) \cdot (r_z \cdot X_A + Y_A - r_x \cdot Z_A)$$
$$Z_B = c_z + (1 + s \times 10^{-6}) \cdot (-r_y \cdot X_A + r_x \cdot Y_A + Z_A).$$

Projection parameters for Serbia		
Gauss-Krüger projection zone number 7		
Parameter	***Symbol***	***Value***
Semi major axis	a	6377397.155m
Inverse flattening	1/f	299.1528125448
X-axis rotation	R_x	0°00'04.910687''
Y-axis rotation	R_y	0°00'03.003308''
Z-axis rotation	R_z	-0°00'11.094034''
X-axis translation	Δx	-534.787m
Y-axis translation	Δy	-133.682m
Z-axis translation	Δz	-501.482m
Scale factor	R_m	-1.15673966 ppm

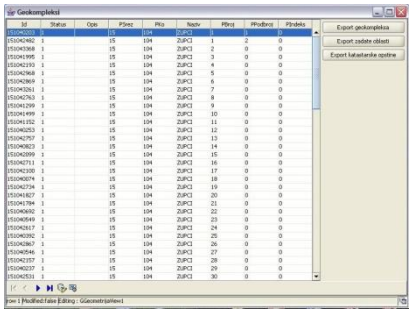
III. Computer Programming

The computer program was developed using Java, a modern object-oriented programming language. Java is portable, meaning programs developed with the Java

programming language can be run on any computer that supports the Java platform. Java is supported by all major PC operating systems, as well as many web browsers, mobile internet devices and mobile [4].

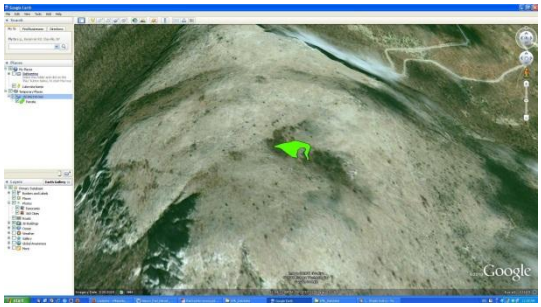
This program was developed using integrated programming environment Oracle JDeveloper 10.1. [5] This environment was chosen for development because it covers full development lifecycle: design, coding, debugging and optimization. For database manipulation programming environment of choice was Oracle SQL[6] Developer. All data that the program is using is stored in Oracle 9i database. Use of development tools and database management system from one software manufacturer ensured compatibility and fast and relatively trouble free development of application.

The computer program has two functions. The first is to generate polygon that represents single cadaster parcel. User chooses cadastral parcel from the list of all parcels for the given cadastral municipality. When the chosen parcel is marked user clicks the button "Geo-complex export" (Picture 5).



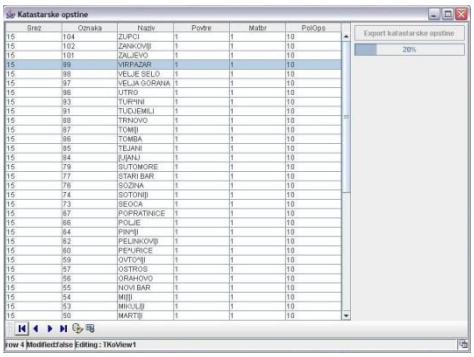
Picture 5, list of geodetic parcel's for one municipali

Once the action is invoked, the program generates KML file and opens it with Google Earth (Picture 6).



Picture 6, graphic representation of exported geodetic parcel in Google Earth

The second function is to generate polygon that represents cadastral municipality. This action is invoked by clicking on the "Cadastral municipality export" button, when desired cadastral municipality is selected from the list (Picture 7).

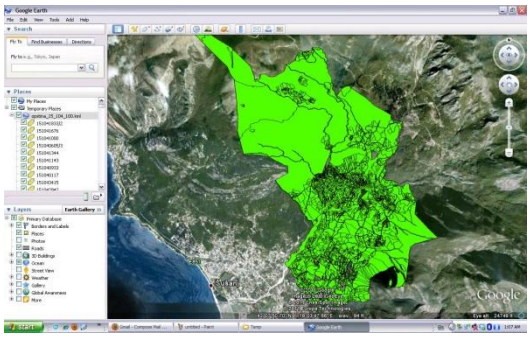


Picture 7, list of cadastral municipalities

Every cadastral municipality is made of a number of parcels that often can number several thousands. This can result in extremely big number of coordinate transformations. Implementing progress bar is absolutely necessary, so user can be informed about process progress.

The result of these actions is a number of single polygons that together represents the whole municipality (Picture 8).

In the tree structure on the Google Earth user interface, user can choose any parcel or simply can click on the graphical representation in the main window of Google Earth users interface.



Picture 8, export of all geodetic parcels for chosen municipality and graphic representation in Google Earth

The result of both actions is creation of a file in the file system of the user's computer.

Both functions use the input data to create a KML file, which includes the new WGS 84 (transformed) coordinates and formatting details. Google Earth uses the KML files to superimpose the data on top of its aerial imagery.

A. Java classes of interest used in the application

This class is responsible for the actual coordinate system transformation. Input parameters are coordinates in Gauss-Krüger system. After transformation output parameters are coordinates in WGS 84 system.

Once transformed these values are written in as XML tags using `DocumentBuilderFactory` class. This class defines a factory API that enables applications to obtain a parser that produces DOM object trees from XML documents. [6]

The `COORD` class encapsulates all methods related to Earth coordinate transformations. It can transform Earth coordinates between a huge number of Earth data, and it can transform from/to Gauss-Krüger coordinates. [7]

`SwingWorker` is an abstract class to perform lengthy GUI-interacting tasks in a dedicated thread. [8]

B. *Future enhancements*

There are two areas on which current application can be improved. The first is the interaction with user, the second is data representation.

User interface which would enable configuration of colors for cadastral objects that are generated and displayed could be implemented.

Second, if suitable data can be obtained, KML multi-geometry polygons can be generated. These polygons could represent not only the outline of cadastral parcel; they could represent built objects on it and other major characteristics.

Additional information can be displayed using KML balloon in Google Earth; for example, the size of parcel, name of the owner and other information of interest.

IV. CONCLUSION

WGS is a globally accepted coordinate system readily available to wide range of users. On the other hand, Gauss-Krüger coordinate system is used mostly by small number of expert users for specific purposes by specific software. Therefore this software bridges the gap between these two groups.

KML format, which this software uses for generation documents, is used by a number of different GIS software solutions so it can be easily used for data exchange between them.

This program is not intended for precision use. It enables users to quickly see the cadastral objects and relations of them to other objects as well as relation to the terrain in Google Earth or other compatible KML software.

ACKNOWLEDGEMENTS

I would like to thank to my colleagues: Mirko Raca, Ivan Lukić and Luka Ranisavljević for their help with programming in Java language. Also special thanks go to Đorđe Pržulj for his guidance and patience while working on this project.

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The Design and Implementation of a Computerized Adaptive Test for Student Testing in C++ and Java Exam

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Abstract - The use of computerized adaptive testing (CAT) has expanded rapidly over recent years mainly due to the advances in communication and information technology. This paper describes the design issues that were considered for the development of a CAT for student testing programming languages C++ and Java. The application was realized in MATLAB.

I. INTRODUCTION

Testing is one of the most common ways of knowledge testing. The main goal of testing is to determine the level of the student's knowledge from one or more subject areas in which knowledge is checked. Different methods of knowledge evaluations are in use, such as in class presentations, writing essays, projects, etc. However, the most common "tool" that is used to test knowledge is the test and oral exam. Since the computer as a teaching tool has been in use more and more in recent decades, and its use has spread to all levels of education, the computer based test has become very popular. This paper presents a computer adaptive test that was realized by the software package Matlab.

II. THEORETICAL BASIS OF COMPUTERIZED ADAPTIVE TESTS

CAT (Computerized Adaptive Testing) is a type of test developed to increase the efficiency of estimating the examinee's knowledge. This is achieved by adjusting the questions to the examinee based on his previous answers (therefore often referred to as tailored testing) during the test duration. The degree of difficulty of the subsequent question is chosen in a way so that the new question is neither too hard, nor too easy for the examinee. More precisely, a question for which it is estimated, with a probability of 50%, that the examinee would answer correct is chosen. Of course, the first question cannot be selected in this way because at this point nothing is known about the examinee's capabilities (the question of medium difficulty is chosen), but the selection of the second question can be better adapted to each examinee. With every following answered question, the computer is able to evaluate examinee's knowledge increasingly better.

Some benefits of the CAT are [1] as follows:

- Tests are given "on demand" and scores are available immediately.
- Neither answer sheets nor trained test administrators are needed. Test administrator differences are eliminated as a factor in measurement error.
- Tests are individually paced so that an examinee does not have to wait for others to finish before going on to the next section. Self-paced administration also offers extra time for examinees that need it, potentially reducing one source of test anxiety.
- Test security may be increased because hard copy test booklets are never compromised.
- Computerized testing offers a number of options for timing and formatting. Therefore it has the potential to accommodate a wider range of item types.
- Significantly less time is needed to administer CATs than fixed-item tests since fewer items are needed to achieve acceptable accuracy. CATs can reduce testing time by more than 50% while maintaining the same level of reliability. Shorter testing times also reduce fatigue, a factor that can significantly affect an examinee's test results.
- CATs can provide accurate scores over a wide range of abilities while traditional tests are usually most accurate for average examinees.

Despite the above advantages, computer adaptive tests have numerous limitations, and they raise several technical and procedural issues [1]:

- CATs are not applicable for all subjects and skills. Most CATs are based on an item-response theory model, yet item response theory is not applicable to all skills and item types.
- Hardware limitations may restrict the types of items that can be administered by computer. Items involving detailed art work and graphs or

extensive reading passages, for example, may be hard to present.

- CATs require careful item calibration. The item parameters used in a paper and pencil testing may not hold with a computer adaptive test.
- CATs are only manageable if a facility has enough computers for a large number of examinees and the examinees are at least partially computer-literate. This can be a great limitation.
- The test administration procedures are different. This may cause problems for some examinees.
- With each examinee receiving a different set of question, there can be perceived inequities.
- Examinees are not usually permitted to go back and change answers. A clever examinee could intentionally miss initial questions. The CAT program would then assume low ability and select a series of easy questions. The examinee could then go back and change the answers, getting them all right. The result could be 100% correct answers which would result in the examinee's estimated ability being the highest ability level.

The CAT algorithm is usually an iterative process with the following steps:

1. All the items that have not yet been administered are evaluated to determine which will be the best one to administer next given the currently estimated ability level
2. The "best" next item is administered and the examinee responds
3. A new ability estimate is computed based on the responses to all of the administered items.
4. Steps 1 through 3 are repeated until a stopping criterion is met.

Several different methods can be used to compute the statistics needed in each of these three steps, one of them is Item Response Theory (IRT). IRT is a family of mathematical models that describe how people interact with test items [2].

According to the theory of item response, the most important aim of administering a test to an examinee is to place the given candidate on the ability scale [3]. If it is possible to measure the ability for every student who takes, already two targets have been met. On the one hand, evaluation of the candidate happens based on how much underlying ability they have. On the other hand, it is possible to compare examinees for purposes of assigning grades, awarding scholarships, etc.

The test that is implemented to determine the unknown hidden feature will contain N items, they all measure some aspect of the trait. After taking the test, the person taking the test respond to all N items, with the scoring happening dichotomously. This will bring a score of either a 1 or a 0 for each item in the test. Generally this item score of 1 or 0 is called the examinee's item response. Consequently, the list of 1's and 0's for the N items comprises the examinee's item response vector. The item response vector and the known item parameters are used to calculate an estimate of the examinee's unknown ability parameter.

According to the item response theory, maximum likelihood procedures are applied to make the calculation of the examinee's estimated ability. Similarly to item parameter estimation, the afore-mentioned procedure is iterative in nature. It sets out with some a priori value for the ability of the examinee and the known values of the item parameters. The next step is implementing these values to compute the likelihood of accurate answers to each item for the given person. This is followed by an adjustment to the ability estimate that was obtained which will in turn improve the correspondence between the computed probabilities and the examinee's item response vector. The process is repeated up until it results in an adjustment that is small enough to make the change in the estimated ability negligible. The result is an estimate of the examinee's ability parameter. For each person who is taking the test this process is repeated separately. Nonetheless, it must be pointed out that the basis of this process is that the approach considers each examinee separately. Thus, the basic problem is how the ability of a single examinee can be estimated.

The CAT problems have been addressed before in the literature [3, 4, 5].

III. THE DESIGN OF COMPUTER ADAPTIVE TEST

For purposes of determining the effects of applying the computer adaptive test for knowledge evaluation, the adaptive test was realized in MATLAB software package (acronym for MATrix LABoratory). MATLAB is an environment for numerical computation and the programming language of MathWorks [6]. MATLAB contains mathematical, statistical, and engineering functions to support all common engineering and science operations. Key features of MATLAB are mathematical functions for linear algebra, statistics, Fourier analysis, filtering, optimization, and numerical integration, 2-D and 3-D graphics functions for visualizing data, tools for building custom graphical user interfaces. Functions for integrating MATLAB based algorithms with external applications and languages, such as C, C++, Fortran, Java, COM, and Microsoft Excel. Add-on toolboxes provide specialized mathematical computing functions for areas including signal processing, optimization, statistics, symbolic math, partial differential equation solving, and curve fitting. MATLAB was chosen because the students during the first year of the study have exercises in this environment in the subject Basic of computing. This subject is mandatory for all students in the first semester. They also use MATLAB during the second and the third year of studying in some specialized subjects.

The computer adaptive test that was implemented in the experiment is a modification of the adaptive test that could be downloaded from the web address [7]. The original test is the adaptive version of the GRE test

(Graduate Record Exam) and runs in a MATLAB command window. The examinee gives his/her answer by typing a letter in front of the answer which they believe is a correct answer. The existing application has been modified to suit the needs of C++ and Java curriculum. The test consists of multiple choice questions with the five possible answers. The appropriate GUI for this application was also realized [8].

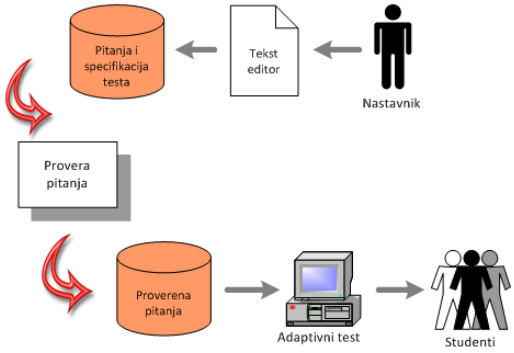

Figure 1. System architecture

The system architecture is shown in Figure 1. The teacher writes questions in some text editor in a pre-define way. For this, only the basic computer literacy is needed and also the basic skill of some text editor (MS Word or Notepad). First, it is necessary to formulate the question, the list of the five possible answers and also the correct answer for that question. The questions for the test are divided into three clusters according to the level of difficulty (easy, medium and difficult), so there are three text files with the questions. All the questions are checked and those ones that passed the control make the question database. From that database questions are given when the test starts. The following section focuses on the explanation of the calibration issues, the assignment of initial question, the choice of the following questions and the rule for stopping the test.

A. Item calibration

For each item (i.e. question) in the database it is necessary to perform calibration. According to [9] there are three different approaches: conventional, expert, and online calibration.

The conventional calibration includes methods such as joint maximum likelihood (JML), conditional maximum likelihood (CML), and marginal maximum likelihood (MML). The number of examinees required for the item calibration varies from a minimum 1000 [10, 11], while others recommended between 200 to 1000.

Expert calibration involves calibration of IRT parameters with the use of subject domain experts. The authors in [13] describe the item calibration of 3PL model for computer adaptive test.

Online calibration means using the examinee's response to previously calibrated items is done to estimate parameters of new item during a test.

For creating the database expert calibration was chosen as its implementation was the easiest one. The item calibration is based on Bloom's taxonomy of cognitive skills [14]. During the period of question development and selection for this research, the authors were focused on questions that are capable of giving effective estimation of the first three cognitive skills in Bloom's taxonomy: knowledge, comprehension and application. Table 1 illustrates the question categorization in three clusters according to cognitive skills.

TABLE I. (QUESTION DIFFICULTY ACCORDING TO COGNITIVE SKILLS)

Težina	Sposobnost	Kratak opis
1	knowledge	Ability to remember and/or recall previously learnt material
2	comprehension	Ability to interpert and/or translate previously learnt material
3	application	Ability to apply learnt material in new situations

The database consist of questions that were verified in practice (questions from the mid-term tests and the exam in Object-oriented programming and Java) during the period from the year 2005 to 2010, as well as new questions that appeared during the research. The total number of questions was 210 for Object-oriented programming, and 150 for Java. The questions were formulated by the subject's teachers. The questions were classified into three clusters of difficulty as shown in Table 1: 1 (easy), 2 (medium) and 3 (hard). The questions that appeared in the exams in previous years were classified after the statistical processing of the student's answers to them. The new questions, that were created for this research, were classified based on the subjective belief of the authors. The analysis of the experimental results carried out after the research showed that it is necessary to make reclassification of some questions from one cluster to another one. The questions were recorded in .txt files, thus for each cluster there is one .txt file.

B. Starting the test

In CAT the question to be selected next for administration depends on the set of previously answered questions. There is a problem of how to select the first question to be administered, although Lord [15] states that, unless the test is very short, the wrong selection of the first question to be administered has little effect on the final result.

One of the possibilities to select the first question was to randomly choose a question from the database. A potential limitation of this choice can be a random choice from either end of the difficulty scale, i.e. choice of very easy or very difficult questions. According to [9] the questions from the end of the difficulty scale are less useful than the questions of medium difficulty. The second approach is to select a question based on

information about the examinee, such as scores on previous tests, or scores in similar subjects. Because this historical information about the examinee is not always available, it was chosen to start the test with the question of medium difficulty (cluster 2).

C. *Selecting the next item to be administered*

The test starts with a question of medium difficulty. If the examinee answers this question correctly, the next question to be administered is the first question from cluster 3, i.e. the level of difficulty is one level higher. If the examinee answers incorrect on the first question, the next question is the first question from the cluster 1. After each given is checked and based on that the next question is selected to be administered. Also, after each answer it is checked if the total amount of questions (in this case 20) is reached. If the student gave an answer to all 20 questions, the final score is calculated and shown to the student.

D. *Zaustavljanje testa Stopping the test*

The CAT can be completed when answers are given to a fixed, predetermined number of questions, or if the pre-scheduled time for the test has expired. This kind of test is called computer adaptive test of fixed length. Another possibility is for the adaptive test to be considered complete when it reaches a satisfactory level of measurement's precision, for example when the standard error of estimating the ability of the examinee reaches a pre-defined level. This kind of test is called computer adaptive test of variable length. It is also possible to define a stopping rule that is a combination of the two rules, for example, the test is completed when the examinee answered all questions provided for administration, or when time runs out to for solving a specific test, depending on which of these two conditions are met first.

In [11] the authors pointed out that if the length of the test is variable, the examinees with low abilities have to answer much shorter tests than those who are skilled, while in [16] the authors indicate that examinees have doubts about the tests that are very short. The different length of the test raises doubts among the examinees regarding the fairness of grading.

Computer adaptive tests of fixed length are easier to implement, and also if the number of questions is fixed it is much easier for the examiner to predict how many questions need to be in the database. In [17] the authors recommended three to four times more questions in the database than the number of questions required for the test.

Having in the mind all the previously stated, the test with fixed length of 20 questions was selected with limitations of 30 minutes for completing the test.

The interface of the application is described in [18].

IV. IMPLEMENTATION

The research was done at Subotica Tech – College of Applied Sciences, Subotica, Serbia. The total number of students who participated in the research was 352, representing 48.35% of the total number of students at Subotica Tech.

The results of the research are shown with a certainty of 95% and the risk of 5%, namely, that in six of eight cases examined there is a statistically significant difference between the results of the control group (the group working on the conventional test method) and the experimental group (adaptive test), i.e. students who have done a computer adaptive test achieved a better result compared to students who have done the test in a conventional way. The average difference in the test score was about 10 points in favor of the students of the experimental group.

Based on student responses to a questionnaire regarding their opinion about the computer adaptive test, it is clear that there is a positive attitude towards it. Asked whether they would recommend a computer adaptive test to colleagues, 86.90% students of experimental group had affirmatively attitude, while an equal number of students were undecided or would not recommend it. More than 60% of students found that this method of taking the tests is less stressful than the classical paper-and-pencil test. Based on the comments that were written by students it may be stated that this way of taking the test is more comfortable because it adapts to their knowledge and skills, thus reducing the frustration when the questions are too difficult for some students, or boredom that occurs with good students when questions are not challenging (too easy) for them. In both cases, there could be the problem of demotivation and dissatisfaction, as well as the lack of desire for progress.

V. CONCLUSION

During the process of solving the classical test, students may feel discouraged if the questions are too difficult, or, on the other hand, they may lose interest if the questions are too easy for their level of knowledge. The solution to this problem may be the application of computer adaptive tests (CAT), which, along with quality oral assessment, have the option to alter the level of questions difficulty to the capabilities of the respondents.

The research results provide the basis for further work which would be directed towards improving the application by adding multimedia elements (images, sound and video). Also, the improvement of the application should go into the direction of realization of the feedback to the student. The function of feedback is not only to give indications that the answer is true or not, but also to point students towards the lesson in which there is an answer to the question at hand.

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PILOT STUDY OF TELEULTRASSOUND EXEM OVER LOW-BANDWIDTH INTERNET LINKS: FEASIBILITY OF CLINICAL APPLICATION

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Abstract - Telemedicine is a rapidly developing application of clinical medicine where medical information is transferred for the purpose of consulting, and sometimes remote medical procedures or examinations. In this paper we tested feasibility of the low-cost teleultrasound model for developmental dysplasia of the hip (DDH) exam in variety of network settings and computer configurations. Sending of data was accomplished with a software package specifically designed at Dartmouth College, Hanover, USA for teleultrasound transmission through limited Internet bandwidth. Hardware and software solution used for teleultrasound screening showed good characteristics for ultrasound image transmission in real-time. Clinical application of this model includes consultation and training at a distance while for the navigation or management of an ultrasound examination at a distance, the delay is in one of the limiting factors.

I. INTRODUCTION

Rapid growth and development of information systems and communications that fueled development of telemedicine enabled a constant increase in quality of telemedical service, primarily exemplified in improved telemedicine interfaces and increased speed of transmissions. Worldwide availability of Internet infrastructure has opened door for exchange of medical information on a global level [1] [2].

Transmission of still images and cross-sectional data has been widely used in both developed and developing world [3]. However, we focused on utilization of ultrasound and transmission of ultrasound image and video data. Reasons for this are twofold, the unique features of ultrasound and technological challenge of ultrasound data transmission.

Low-cost, availability of portable ultrasound units, safety features all enable its easy integration into both primary care and secondary care settings in developed as well as in the developing world. Two consequences, immensely important for the medical field are the educational potential and opportunities for public service [4].

Here, we tested feasibility of the low-cost teleultrasound system for DDH exam and clinical application of this model.

II. MATERIAL AND METHODS

In the initial phase of this research, we tested software solutions and hardware configuration of the low-cost teleultrasound system for DDH exam, in four settings:

1. Local area network (LAN) with connection speed of UL/DL: 100 Mbps,
2. Metropolitan Area Network (MAN) within one internet service provider with connection speed UL/DL: 2000/2000 Kbps,
3. Wide Area Network (WAN) with connection speed UL/DL: 512/64 Kbps,
4. Wide Area Network (WAN) for trans-atlantic teleultrasound with connection speed UL/DL: 3358/863 Kbps.

A variety of computer configurations tested for transmission of ultrasound images included 2 to 3 GHz Pentium 3 and Pentium 4 processors, operative memory from 256 MB to 3GB and multiple graphics cards. All computer configurations were running on Windows XP OS.

All imaging was done with a portable ultrasound unit donated by Dartmouth-Hitchcock Medical Center (Lebanon, NH), USA and utilized in General Hospital "Djordje Joanovic", Zrenjanin, Serbia.

Ultrasound image was transmitted to the computer via a Pinnacle PCTV Analog USB TV tuner video capture card.

We tested software platform capable of transmitting real time ultrasound images as well as supporting audio

communication (Remote Ultrasound and Skype) in teleconference setting.

This unique application was developed at Dartmouth College, Hanover, USA and enabled us to use ultrasound in the settings of limited resources [5] [6].

Figure 2 depicts software screen interface for application based on Qt programs environment and VLC multimedia libraries. Both components hold for cross-platforms and open source [7].

This software application has been tested under laboratory conditions within Department for quality and scientific-educational researches of General hospital "Djordje Joanovic" and during the DDH ultrasound examination of 20 babies that were from 2 to 7 months old, within Radiology department of General hospital "Djordje Joanovic". During the testing in laboratory conditions there were 280 tests carried out with different codec and the values of Bandwidth and Framerate of the 100Mbps LAN. During the DDH examination of 20 babies, Remote Ultrasound software application was used for transmission of ultrasound image via low bandwidth (250kbps) public internet links without security measures between Serbia and the United States (Philadelphia, PA).

III. RESULTS

Final hardware platform used in all teleultrasound screening sessions was a notebook MSI EX610X-082EU, with AMD Athlon 64x2 TK55 chip, DDRII 3Gb, ATI HD2400, running MS Windows XP with Service pack 2.

Software application enables:

1. direct monitoring of ultrasound exam in real time via teleconferencing module that in addition to audio link transmits ultrasound video stream,
2. ability to add additional text to images,
3. recording and review of still ultrasound images, similar to functions available on ultrasound machine,
4. remote saving of ultrasound imaging - a function that saves images on local and remote computer and thus enables direct comparison of images by personnel on both locations.

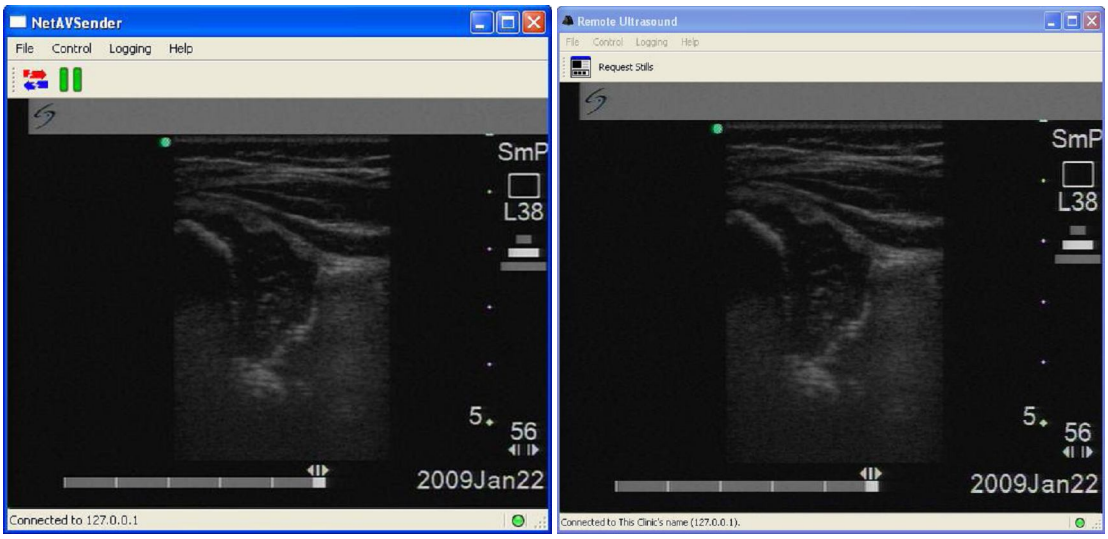

Figure 1. Software screen interface NetAVSender: the transmitting interface, Remote Ultrasound: the receiving interface.

The teleultrasound session was initiated by the sender who starts connection by adjusting the desired destination IP address.

In software solution destination IP address is registered in the Control menu options by selecting Connect and then it is possible to start the connection by pressing the button Connect to a Remote Server.

After about 2 second, the video stream appears on the receiver's computer and the exam is started.

Request Stills in application of the Remote Ultrasound interface was used to record the still images while the ultrasound probe was moved or when the images were «frozen» on the ultrasound machines. Every time Request Stills is used, it records a dataset of images on sender's and receiver's computers in date base "Still Images".

The testing of software application in real-time, during the DDH ultrasound examination of 20 babies, on strain Remote Ultrasound was carried out by trained sonographer. On the basis of his subjective value there were no interrupted connections, or fluctuations in the quality of video.

Time delay of video image between the video sender and receiver is tested with different codecs and different values of bandwidth and framerate in the laboratory conditions for the 100Mbps LAN.

In the software application of the sender, a digital clock mechanism was set and further in real-time forwarded to the receiver. Interface of the sender and the receiver is painted so that it can record the current generated intervals. Subtracting the time recorded by the sender of recorded time, the receiver obtained the time delay video. During the test, 840 measurements was performed and it was determined that it is moving in the range of 2.046 to 2.544 seconds.

Of typically achieved over a 10/100 Mbps Ethernet network low delay is anything below about 200 milliseconds for two-way video, and about 1 second for desktop video [8]. If this fact is taken into account then it is noticeable that the results achieved are slightly above the upper limit of low delay.

During testing software application we showed that the quality of transmission image and video is successful with the proper value of the parameter framerate and bandwidth for different types of used codec (Table 1).

Table 1. Minimal values of the parameters for the transmission of ultrasound images

Codec	*Bandwidth*	*Framerate*
WMW1	>224	≥3
WMW2	>160	≥3
DivX2	>224	≥3
DivX3	>160	≥3
H263		
Theora	have not been satisfactory	
Dirac		

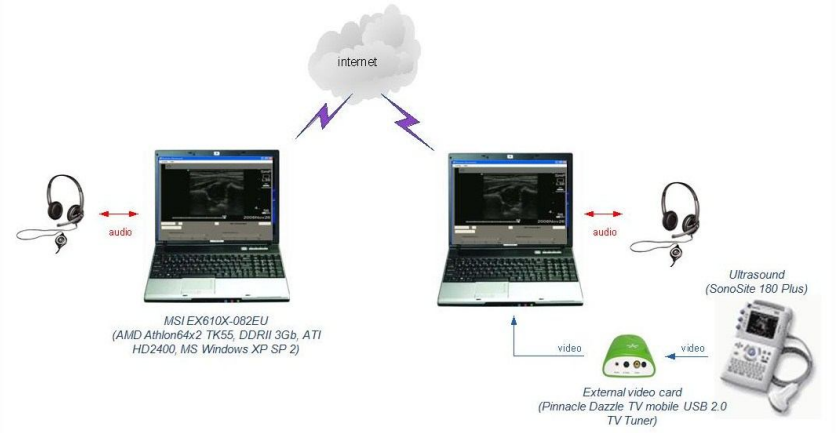

Figure 2. System Structure

IV. DISCUSION

Nowadays, in rich and highly developed countries there is a capability of medical image transmission through highly sophisticated, specially purposed and expensive equipment, with great transmissive power of computer networks. This possibility is limited with the use of licensed and expensive software and equipment. In current situations of highly developed countries telemedicine is not practicable except in big medical centers, and beside that there is no simple and universal software for usage of telesonography. Therefore, communicational problems between developed countries are bigger, and the number of feasibility researches with low budget equipment is still unexplored.

One of the most popular standards in medicine is DICOM (Digital Imaging and Communications in Medicine). This Standard specifies the exact procedures under which the digital images are sent between devices, whether to use a network connection or a storage device. DICOM compression for still images uses JPEG format and for video uses MPEG-4 data format [9] [10]. Beside data compression, DICOM still requires a large bandwidth of computer networks.

Possibility of teleultrasound examination with limited technical resources on distance is practicable and clinically usable [5] [6].

This research created a model for low cost real-time teleultrasound exam containing commercial equipment that is far cheaper than the sophisticated equipment intended to telemedicine. Portable Sonosite 180 used in this research is standard medical equipment for clinical practice and satisfies all current legal regulations and professional criterions.

Also, bandwidth computer network using sophisticated equipment is far greater than the bandwidth used by applying this model.

Software solution is based on open-source libraries and it showed good characteristics for ultrasound image transmission in real-time in the settings of limited resources.

Teleultrasound screening with limited resources provides access to these methods in the regions where health service is not highly developed and where there are no adequately trained medical professionals. In this way, health care practice is being improved and enables its integration into both primary care and secondary care settings.

This model can be used in clinical practice for consultation, the process of distance education and for conducting an ultrasound examination at a distance (Figure 3, Figure 4 and Figure 5). The tested model allows the application for consultation and education by video transfer in real time and deferred to the database file "Still Images". For the process of navigation, or for conducting an ultrasound examination at a distance, important reference makes a delay.

Definition of the term "real time" are different and are basically conditioned by the task with which it formed a chain of telemedicine [11] [12] [13]. Only the delay does not significantly affect the need for consultative examinations and education, while the process of navigating the delay which is slightly above the low

delay, significantly complicates the process of teleultrasonic examination on distance.

A delay in the process of navigating teleultrasound examinations could be overcome by using the navigation module that would allow coordinating the movement of ultrasonic probe at a distance or some other method.

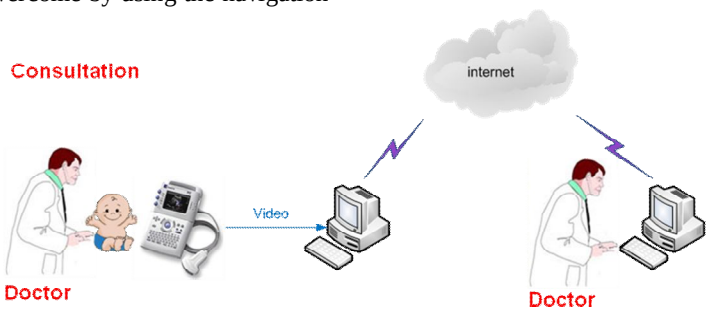

Figure 3. System structure for application in consultation

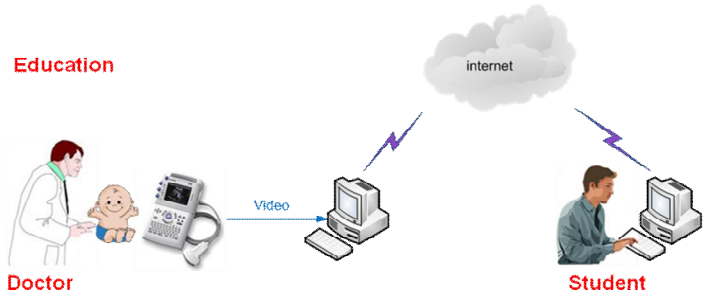

Figure 4. System structure for application in education from remote location

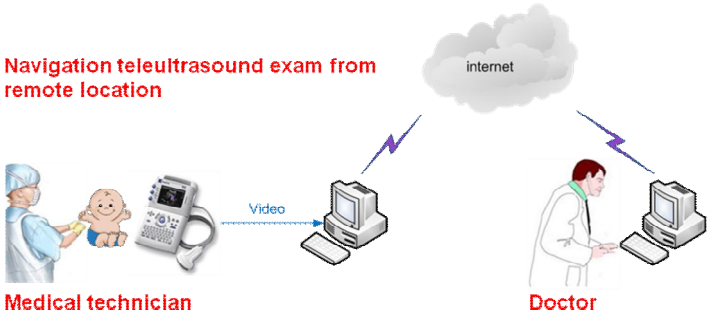

Figure 5. System structure for application in navigation teleultrasound exam from remote location

V. CONCLUSION

Transmission of ultrasound data was accomplished with software package specifically designed for teleultrasound exams through internet connections of limited resources. Using this software application, in conjunction with a hardware setup and low bandwidth internet link, we performed sonographic DDH exams in real-time. In addition, continuous monitoring of the exam via video stream, software application, offers remotely controlled recording and selection of still images on the sending and the receiving computer. Low cost model for teleultrasound examination is configured in this way.

During the testing, it was ascertained that hardware characteristics significantly affect the quality work of software application and that it is important to provide adequate speed values of processor for its successful use, the size of RAM memory and graphic card, which is essential for sender (the computer which send ultrasound image on distance).

Model for low cost teleultrasound screening of DDH showed good characteristics for ultrasound image transmission in real-time and its potential clinical application.

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Application of marketing to education

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Abstract

The aim of this paper is familiarizing with the basic conceptions of e – marketing and promotion and their significance, role and possible application in the education field. In the paper is presented the application of the elementary principles and techniques of the Internet marketing and the web presentation use for the on – line promotion of secondary schools. The basis of the modern business and marketing is the development of the information and communication technologies. These contemporary (digital) technologies set trransforming of the industrially based economy to the information based economy, simultaniously creating global market, the international production system and the information economy with the global marketing.

The Internet is the catalyst of the changes in the traditional approach to the marketing, bringing a new way of consideration, a new mass medium, and a new culture of behaviour and access, something that has never earlier been seen in marketing. As for every organisation so as well as for the educational organization, the Internet has very great importance in launching and representing a school to potentional user of the educational services.

Key words: Internet, marketing, promotion, education

I. ROLE, SIGNIFICANCE AND FORMS OF PROMOTION ACTIVITIES

Promotion is a communication process between an offerer and a consumer. Its aim is to create a favourable attitude towards products or services and their acceptance in the purchase process (*The group of authors,1999: 375*.)

The elementary forms of the promotion activities are:

1) *Commercial advertising* – it covers all the the forms of the paid non – personal presentation and promotion of ideas, products or services that performs a company through the mass media communicating;

2) *Sales promotion* – includes the activities that directly stimulate the products or services purchase and spur the market to faster and more decisive reaction;

3) *Public relations* – are a promotion form aiming to create good relations between its internal and external public;

4) *Direct marketing* – are launching activities which enable direct communicating with potentional byers for the sake of getting direct answer or transaction and

5) *Personal sale* – is an oral presentation of a message through talking of the sale representative with one or more potentional consumers to the effect of sale generation or establishing longterm business relations (*Kotler, 2006:791).*

In order to perform the organization promotion successful, the launching objectives have to be clearly defined – the organization has to know what it wants to achieve. The promotion aims must be in direct connection with the wanted answer. There are three basic objectives of every organisation:

1) informing
2) convincing
3) reminding (*Kesić, 1997:243)*

The steps in the strategies of promotion planning are:

1. Identifying targeted audience, establishing promotion strategy and the elements of promotional mix (when at stake is middle school launching, the targeted audience are pupils of the final class in elementary schools and indirectly their parents);

2. Establishing the impacts on behavior e.g. the character of decision about the purchase influenced by family (in our case the parents' impact on the pupil who wants to enter a certain school);

3. Defining the information need with targeted audience (on the example of school promotion it would be determining the matter which attracts the potentional school attendants at the most, beginning with educational profiles, school fees and other conditions provided by the school);

4. Determining the objectives and tasks of the promotion (the objective and task of every school is to realize the planned number of pupils as well as classes at the beginning of every school year);

5. Defining the total budget anticipated for the promotion (to establish how much money the school can appropriate for some promotion forms and, according to it, adapt further steps);

6. Defining the schedule of tasks in the launching mix;

7. The application (the school access at the educational institutions' market);

8. Measuring and control (efficiency measuring in regard to the beforehand fixed objectives and standards set as the imperatives by the school management) (*Lanster, Massingham, 1997:223*)

II. THE BASIC CHARACTERISTICS OF THE INTERNET

Forces forming the Internet age can be divided in *for basic groups*:

1. Digitilization and connexion – The great part of modern business operations runs through the nets that connect people and companies. Intranet – is the net which connects the employees within a company. Exranet – is the net connecting a company with its suppliers, distributors and other business partners, while Internet is a large public net that comprises computer nets that connect mutually users all over the world with inconceivably great quantities of information.

2. The sudden Internet development – The creation of the world net World Wide Web (WWW) during the ninetieth years of the past century turned the Internet out of ordinary communication tool into a revolutionary technology. During the last years of the 20th century, the number of the Internet users in the world has increased onto nearly 400 million. Abrupt growth of the Internet use worlddwide is in the heart of the new system of business operations. The Internet enables to users and companies approach to immense quantities of information with only several clicks by mice. Some recent studies have shown that before making important life decisions, byers search through the Internet information. The quantity of the technical information doubles every two years. For the students of the technical studies it practically means that the half of their knowledge they have got till the third year of studies, is not nowadays up – to – date (www.socialnomics.net).

3. New kinds of go - betweens – New technologies have made thousands of entrepreneurs to found the Internet companies, so – called dotcoms, expecting off – hand enrichment. The incredible success of the first companies which have done business only through the Internet as AOL, Amazon.com, Yahoo!, eBay and many others, has presented many known producers and tradesmen.

4. Adapting to clients and their wishes- The new way of business operations turns round the information companies. Information have advantage so much in as much as they can be easier differentiated, individually adapted, personalized and sent through nets by unbelievable speed. On account of the quickly spreading advantages of the Internet and other communication technologies, companies became more skillful at collecting information about individual byers and business partners.

III. INTERNET MARKETING

The use of the informatics technologies has caused the emergence of a new type of electronic business operations. The internet as one of the greatest creations of the 20th century, changes the world of business operations, as well as it varies the world through internalisation and creation of new views on science, education, economy etc. The Internet has during ten years had the immense growth of the number of users. It has succeeded in short time at some developed markets, to become a medium with proportionally the most spent money on advertising. At the time of recession appeared a different distribution of the advertising media. The quicker and measurable results, more inexpensive investments are being expected, and the possibility of narrow targetting of the users' groups, all that what the Internet as a medium can give. To these modern tendencies have not resisted not even educational institutions. In accordance with the type of ownership, schools can be in personal or state property, and in this way they access onto the market. State schools and generally all educational institutions can be classified in the category of non – profit organisations. These organizations endeavour to realize some social / public interest, but their essential purpose of existence is not profit gaining. The school fees in private schools is in average from 1.200 to 12.000 euros per year, so that their access onto the market has to persuade potentional attendants to commit themselves, i.e. opt just for their institution and to pay a substantial money amount.

Marketing can be presented through a four steps process that begins with an analysis and defining of the "macrocosm" of potential users or buyers. After the first phase of the marketing process follows the process of calling the attention of the users open to buy from the "universe" of the targeted population. In the third phase it is necessary to influence systematically on potential buyers to take an interest in the existing concepts or offers and accept them. They have been created on the basis of the marketing activities of the organization. At last, the sucess of the three previous phases should lead potential buyers among the "real" ones during the implementing activities in order to agree to perform the wanted action – purchase, invitation, release of documents, subscription, membership, sale, etc.

While defining e – marketing conception, one should begin with the fact that that idea can be considered on the various expanse of extension. Facts speak that the analysts point de facto existence of a world wide specific global market structure, classifying it under the concept of a new economy or net economy (Network Economy) where the Internet Economy appears at the same time as well as a cause and as a consequence. So in a special meaning e – marketing can be considered as the process of offer creation, price determining, distribution and promotion with the aim of the remunerative satisfying buyers' needs exclusively at the electronic market. This kind of marketing, as a conception and technique, perform proprietary subjects which produce products and process services exclusively assigned to e – market. Into this spread it is possible to include the software solutions whose marketing – mix almost in full is being realized through the Internet. (www.vps.ns.ac.rs)

IV. SETTING UP PRESENCE IN THE INTERNET MARKETING

It is clear that all organizations as well as the educational ones, have to consider how to realize transition to e - marketing. They should conduct e – marketing in one of four ways, although there is recommended a kind of the synthesis of the above mentioned tactics:

1. The Internet station;
2. The Internet promotion;
3. E-mail and network transmission;
4. The Internet associations (Kotler, 2007:144)

1) Web page creating

A good web site can be used in many purposes, interesting from the marketing attitudes, as: commerical advertising, developing the organisation recognizability, promotion of services, PR, giving information for media, sponsor activities, supporting users of services and the like (Salai, Hegediš, Grubor, 2007:294 str.)

For the most of organisations the first step in applying the Internet marketing is designing web page. But it is not

adequately plain to open a web page at the Internet. It must be attractive, and one has to find a way how to win over potentional consumers of services to visit the web page and remain exactly to it. The web pages promoted by schools, mostly give the next information: school history, its program, training conditions, registration periods, kinds of education, education profiles, teaching staft, school management, various actualities, interesting things, news, polls, galleries, contacts. Schools as well often announce competition results of their pupils and various interesting articles in order to attract and retain their site visitors. At the end of the page, they can offer possibilities to the visitors so that they can ask questions, give remarks, recommend the page to their friends, visit the school profile at various social networks (Facebook, Twitter) and the like.

During several last years the expectations from the Internet have grown very much. Nowadays Internet users quickly leave the pages which do not satisfy their expectations. Two thirds of them will not probably return to that page (www.internet.com)

It means that schools have to create pages plain to be read, use and they constantly have to be updated so to be actual, recent and exciting. It demands, of course, time and money, but that expense is indispensable if they want to hold out among their competitive schools. It especially regards the schools in private property. Apart from it, many Internet specialists consider that they can not make names for themselves only on the Internet, but that they have to spend much on the good, old traditional advertising and other offline marketing means, so to attract visitors to their pages (broadcasting institutional advertising on TV, radio, in newpapers, outdoor poster advertising, placing advertising tables).

If the Internet pages creators want to attract new visitors and spur repeated visits, they should pay special attention to the following "laws" of successful designing of web pages:

1. Context: appearance and arrangement of web sites should be attractive and plain for use.They have to be interesting, useful and provocative;
2. Contents: text, pictures, sound and video context – that what will attract, keep and bring back visitors is the value of page contents. Good web pages contain detailed and useful information, interactive tools, the links that address to the other connected pages (e.g. great number of schools on their web page has the link that addresses to the site of the Ministry of Education, The Institution for textbooks and the like), amusing programs (e.g. photos shot at excursions, school – leaving parties, surveys, wise thoughts and other);
3. Association: The way in which web enables communication among its users (majority of schools have their webs on the Facebook);
4. Adjustment: Page eapability to adjust to various users or to enable to users to personalize it;
5. Communication: The way in which is enabbled the communication among web page (school respectivelly) and users;
6. Cohesiveness – How is web connected with the other sites.
7. Commerce – Web capability to enable commercial transactions (for school it would mean that prospective attendants commit themselves for registration in their school) (Jeffrey, Rayport and Bernard, Jaworski,2001:116)

Sometimes it would be necessary to access again the attractivness and usefulness of web page. It would be also necessary to get opinion of a speialist for web design. Although it is much better to ask users' opinions what they like on web site and what they dislike (usually schools put the questions on web and ask visitors to express their attitude on a scale with the marks from one to five).

In the school management of Novi Sad we have observed specialized secondary (vocational) schools in state property (there are totally 31) and we have got these knowledges:

- one half of the watched schools (exactly 15 of them) have a web page;
- all schools have their profiles on the Facebook, two schools on the Myspace, too;
- nearly all schools appear on one more popular social network YouTubu.

All private schools (21 specialized secondary vocational schools), have web page and profile on the Facebook.

2) Promotion on the Internet

The Internet promotion has a useful purpose, especially as addition marketing actions Meawhile, in spite of all first successes, the Internet will not so fast become a main competitor to the electronic and printed media. Many marketing specialists still reexamine the value of advertising on the Internet as a successful tool. However, in order to use the Internet to the best as a communication means, the marketing specialists as well as advertisers, have to think up the ways, how to use fully the Internet interactivity and its potentional for more successfull targeting, because they are its most powerful characteristics.

3) The creation of web associations and how to participate in their work

The popularity of forums and interest groups has led to the creation of numerous commercial, sponsored web pages, that are named web associations. Such pages enable the members to bring together on the Internet and exchange opinions about the themes they are interested in, Web associations are recently multiplied, after the Face book, Twitter and other social networks have appeared. People, irrespective of their age sex, interests can engage themselves into web associations dealing with education, health, sport, music etc. The visitors of these web pages develop a strong seanse of community. They are attractive to the organizations that advertise because they attract users with common taste. For example, if one keys in on Google browser (device) the key words as forum schools, he will get 11.600.000 pages that he can visit and take part in the forums in the education field.

4) Using e – mail and web transmission

Electronic mail (e-mail) has forced itself as an important e – marketing tool. An organisation can induce potential service users to send it questions, proposals and complaints through e - mail. Sending e – mail has become

the most inexpensive and the most successful means for representation to wouldbe users of service. With the wish that competition in constantly "jammed" environment would be more successful, marketing specialists develop "enriched" e – mail messages, animated, interactive, personalized messages with video and audio contents. Such messages are being directed towards the ones wanting them, so it is considered that they will positively react on them. For example schools offer to visitors their web page e – mail address, on which they can ask questions and so be informed of school work, and they can also leave their proposals and suggestions.

V. SOCIAL NETWORKS IN THE FUNCTION OF SCHOOL PROMOTING

Social networks are individuals and groups connected by common status, similar functions, cultural and other similarities or common interest. They can be founded and be put out depending on needs. The investigation in academic environment indicated that the social networks function at many levels, beginning from the family level to the nation level. They have the key role in defining the ways in which they will function and the level where an individual will succeed reaching individual objectives

The most popular social network in Serbia and region is Facebook. It is the Internet web serving as a service for the social network. It began to function on February the fourth 2004. This web page on which everybody can bacome a member, is in the propriety of the company having the same name which manages it. Facebook users can enter the networks organized in towns, at working posts, schools, regions in order to connect and communicate the other people. People can also broaden their circle of friends, send them messages and can put new data into their personal (or business) profiles. In the beginning the membership on this web had been allowed only Harvard students, but later it was enabled to all students and secondary school pupils, and at the end it was enabled to all persons aged over 13 years. Facebook had in the year 2009 more than 250.000.000 users all over the world. If Facebook was a state, it would be the fourth in the world according to the number of inhabibitants, somewhere between Indonesia and the U.S.A. The number of visitors of this social network, aged over 35 increases for 116% per year. Nowadays Facebook has more than 400.000.000 users.

All 25 private schools in Serbia possesses Facebook station on which are put various information connected to school: which educational profiles school offers, photos of scool itself as well as its premises, contact telephones, e – mail address for visitors' questions, address and the like. Most primary school pupils count on Facebook when they search for information of school which they want to enter.

Except Facebook, another social network according to popularity is Twitter. It began to work officially in the year 2006. Twitter enables to its users to follow the others and the others to follow them, and all this with the help of many methods of "twitting". This social network numbers 220.000 members in Serbia. In comparison with Facebook, this one has 2,7 million of users from Serbia. The most Facebook users are the ones old between 18 and 35 years, although their percentage is decreased for about 6% in relation to the previous period, so that there are about 60% of them now, in relation to all users. The users between 35 and 54 years amount about 40% of all users in Serbia.

VI. COMPARISON OF ONLINE AND OFFLINE PROMOTION

Online marketing is in contrast to traditional marketing (offline) directed to individuals. Its essence is in its directing onto the mass of individuals instead of onto the mass of the market. In the online approach consumer becomes value. The online user of services is more sophisticated and he possesses prominent discrete income. He does not symphatize traditional promotions and traditional promotional messages where communication is one – way. Through online communication user of services searches information from many organizations, and he quickly gets answer to his questions (Salai, Hegediš, Grubor, 2007:294).

Traditional marketing as the modality of off – line marketing practive has very long and rich history – beginning with personal sale (face – to – face selling), the sale through mail (direct – male marketing) and catalogue sale to telemarketing, TV sale (direct- response television marketing) or the sale by special machine – apparatus (kiosk marketing). On the other side, these traditional (off – line) modalities of direct marketing are mostly directed to so – called transaction marketing concept, and because of that, they have only a part of characteristics that distinguish online marketing praxis within the Internet marketing.

The Internet capability is manifested in speed, adaptiveness, interactivity and capabilities to approach to the targeted consumers at global level directtly and immediately. The comparison between online and offline promotion one can present in this way:

1. *The relation of online promotion and television* – Television is directed to present day and potential consumers who are generally, at a guess known to the masses, because the communicator is not sufficiently known to the target auditorium. It is not directed to individuals, but it can be directed on interests, wishes, needs, emotions. Online advertising is less aggressive than television one. Virtual advertising should offer wider and further information and to be directed onto individual requests;
2. *The relation of online promotion and radio* – Radio is being used as an additional activity, where is not necessary special, strong powers of consumers concentration. When consumer searches on the Internet, reads e – mail or offers (bids) on the Internet pages, he is concentrated on contents that should interest and motivate him;
3. *The relation of online promotion and press* – Press, i.e. news media, is non – interactive, medium flexible and a little more target directed. In the case of line promotion every form of briefing is actually advertising. There is non – limit for advertising on the Internet;
4. *The relation of online promotion and direct mail* – Directing, capability of sending messages and flexibility, when direct mail is at stake, are excellent, but

interactivity is poor. The assessment of goodwill on online advertisements is not possibile, but it is even basic;

5. *The relation of online promotion and posters (bills)* – for the establishing of audience rating or perception and watching bills (posters) there is not a precise method. The Internet users can react on online advertisements and one can get accurate data (Salai, Hegediš, Grubor, 2007:299)

Number of years necessary to different media in order to get the market group of 50.000.000 users:

- Radio – 38 years;
- TV – 13 years;
- Internet – 4. years;
- I-pod – 3. years;
- Facebook – 2. years (www.consult.rs)

When the Internet promotion is at stake, one can't help mention some challenges appearing in accordance with such way of business operations. Namely, one of problems is that the Internet always provides restricted display and distorted, lop – sided demographic cross – section of consumers. Then, if web page does not attract visitor's attention within 8 seconds, he will go to another page. Privacy on the Internet is perhaps the greatest cause for concern on the occasion of the Internet commerce. The most of the Internet marketing specialists has become nimble at collecting detailed data of consumers and their analysis. It could subject consumers to information abuse if organization use those information in inadmissible ways. They are afraid that, for example the numbers of their credit cards will be misused. In spite of these challenges, both little and big organizations quickly include the Internet marketing into their marketing mix. The Internet marketing will show itself as a strong tool for establishing relations with user of services, providing information about organization and more successful, faster realization of service.

VII. CONCLUDING CONSIDERATIONS

The consequences of the appearance and massive use of the Internet in business purposes on modern business operations and marketing are enormous and almost incomprehensible. Traditionally marketing is the cluster of activities used in order to direct flows of products and services from producer to consumer (user, buyer, client). The essential forms of promotive activities are: commercial advertising, sales promotion, public relations, direct marketing and private (personal) sale. The Internet marketing comprises the web use, parallel with traditional marketing chanels, in order to develop positive and long – term relations with consumer. The use of contemporary ICT, creates substantial prerequisite for improvement of the quality of business decisions and the speed of their making. Nowadays it is impossible to imagine good business operations without marketing, because the essential marketing function is communication with market, and that comprises the process of gathering and analysis of data, and their transformation into information that can be used further. The Internet is an ideal setting for marketing on accounit of its own nature. The social networks on the Internet today represent contents very popular among the Internet users, especially among the youth. They present also a kind of trend, and it contributes to their popularity. As well as they bring new possibilities in communication, but also easier contacts and the use and exchange of different contents, and it makes them more attractive. The Internet has certainly achieved a revolution (in many aspects), and social networks caused their revolution within the Internet. Facebook, according to the last data, has about 400 million of users and now it is one of the most visiting sites worldwide. According to the study written by Adria Talk, Serbia is the region leader with more than 2 million Facebook users. E-mail marketing is an efficient and very inexpensive means for winning and withholding of users, so it is at the same time also personification of the marketing „1to1", fully apt for personalized and targeted relation with users.

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Use of Information Communication Technology in Local Government Through the Module Registry Office

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Abstract – Using information and communication technology,the local government collects and analyzes vast amounts of data resulting in better service to citizens.
In this paper there are the elements of the module development office, as part of an integrated information system of local governance, which covers an important part of local government operations. The findings, after using the module Registry, show that employees have improved automatic operation in order to execute its duties in serving citizens. It turned out that the number of parties who come into local government to resolve certain administrative matters ,was significantly reduced, the possibility of congestion and overload of employees was lower , greater citizen satisfaction with services that local government is trying to better meet the needs of its citizens.

I. INTRODUCTION

Application of advanced information and communication technology is the result of proper use of knowledge in the processes of research and development. There is a growing need for information, which condition, the greater complexity of a computer system is used as the primary means inevitably to work.

The information system is any system developed for the purpose of creating, gathering, storage, transmission, processing and interpreting information.

This work is aimed to explore the possibility of access to information and improving communication.

The Registry is an organizational unit that performs communication with people - legal and physical - that come into contact with local authorities and most importantly, that registers used document in the process of communication.

The main task of the module is to meet the needs and expectations of all stakeholders.

According to the Law on State Administration, the Regulation on office management of state administration shall defines the activities that include office operations, as follows:

" The Registry is an organizational unit where the following taskas are performed: receiving submissions from the parties, reception, opening, reviewing mail and scheduling, tracking of cases; pair acts, acts of submission of the case and the internal organizational units; mail forwarding, keeping to-do items, distributing objects and their archiving - storing, "[1]

The objectives of work are clearly and precisely defined, and that is to point to the improved interaction between users and software so that computers will make their work more appropriate and easier.

II. CURRENT PROBLEMS AND REQUIREMENTS FOR LOCAL GOVERNMENT

The information system enables a business module that shows current issues and developments in a particular environment.

The conclusion of the analysis of local government operations and modern information technology (modern media and communications), is that the administration fails to comply with IT trends, both in internal operations and in dealing with citizens.

In order to fulfill the needs of local people and local governments need to perform tasks that are defined to achieve specific functional requirements.

The classification, systematization, analysis and business process automation and implementation of software modules are necessary.

On this basis, should be done:

- analysis of existing hardware,
- analysis software with the existing documentation,
- defining job requirements,
- vocational education staff members,
- development of software modules,
- implementation of software solutions module registry office.

It is necessary to consider and determine the current state of equipment and usage and purpose.

Based on that information the exploitation is made on new network infrastructure.

It is necessary to perform the following:

- determine the number and dimensions of the network, as well as the redistribution of resources (observe the distribution of users in relation to physical and logical parts of the network),
- determine the connectivity of geographically distant locations (consider their availability for each location),
- identify needs related to the bandwidth of certain segments,
- for each organizational unit information system is necessary to establish requirements for performance, the requirements for availability and requirements for future expansion,
- analyze the data to be transmitted over the network,
- analysis of network services and the role of certain services as well as their responsibility,
- analysis of safety aspects.

It is necessary to analyze the request for resources, since in the network, as follows:

- analysis of requirements for resources, applications used on workstations in the network,
- analysis of the protocol to be used on the network (some of the popular protocols may affect the degradation of performance in certain situations),
- analyze some of the negative aspects of networking protocols (to be taken into consideration in the early stages of design and according to them to choose the most appropriate technical solution),
- identify all network services (performed their analysis performance, availability, ...)
- analysis of TCP / IP infrastructure (addressed issues related to domain name registration, determine policies of awarding IP address),
- analysis of the organization of technical support (a component that affects the cost of maintaining the whole system),
- analysis tools and approach to the management network in operation (selection of tools for monitoring and analysis of the network in operation).

Network infrastructure must end user to provide the required conditions for working with information systems. You need to answer a few questions:

- Who needs what data?

- When they need them?

- Where data should be transferred?

Also, you need to know where the data is physically located, and where their customers are. This information can be used within the prescribed volume of traffic on the network.

Technical requirements are viewed through a group of conditions, including:

- human resources required for implementation,
- training of staff for the design and use of model administrative offices,
- defining the architecture of information system,
- computer network.

A number of staff required to implement the model and need training to use information technology are considered as human resource needs.

Besides the necessary computer equipment, communication and other related equipment, of the particular importance are the human resources. It is recommended that IT staff necessary for the management module of the following structures:

Table 1 - Outline for module

Job Title	No. executor
administrator	1
worker to receive items	1
senior officer responsible for AOP	1
head of Department	1
TOTAL	**4**

Particularly important role in the implementation of the module should have a continuous activity of education personnel, automation of their work, as well as adequate forms of functional organization.

Training of personnel is a key requirement in the implementation of the module. Existing levels of knowledge of staff and the development of informatics require continuous innovation of knowledge.

The training program for the module:

- completing the basic course of MS Office,

- seven-day training for application and use of software applications.

III. ACTIVITIES AND FUNCTION MODULES

Module Registry is to provide an efficient system of data collection and processing, effective use of information and coordination of mutual customers to achieve the set objectives:

- establish a uniform system of marking and classification in the registry office,
- provide better exercise the duties and tasks in business writing office,

- increased efficiency and better management office,
- increasing the efficiency and economy in the process of filing office,
- timely and quality reporting.

The intention is to achieve the following:

- streamlining administrative tasks,
- assist in the management and decision-making (local authority),
- achieving effective communication between business entities,
- provide conditions for better planning,
- an efficient service to citizens.

Based on records kept in the Registry at any given time there should be a place where information about a particular document, but are also capable of processing the document.

The Registry software module contains the basic functionality needed for contact and interaction with citizens and businesses.

Community portal module is integrated with information systems to monitor cases and their resolution. It is provide for the possibility of upgrades.

The following will describe the content and the way of work of this module.

The basic functionality of the:

Opening a new case

- input of basic data on the subject (with automatic or manual allocation of a single case), the applicant's case and forwarded the case on solving the appropriate authority,

View and select items

- review of cases by subscribing to various criteria,

Amendments to Item

- amendments to the subject (subsequently submitted for the course),

Data exchange on the subject

- allows easy access to the file and update your case and the applicant objects,

Code lists

- are essential to the functioning of the classification, the types of cases, the method of solving the case, a description (or areas) of the object, a means of settling complaints, location of the object and so on,

Acts subjects

- according to the classification label items should contain the data on acts that are attached to the subject,
- there is the ability to scan every document that is submitted to the case and their placement in the database,

Linking to objects

- allows you to create links between related objects (possibly an object causes another object),

Complaint

- records of complaints and update the item (the possibility of entering the method of solving complaints in the first and second degree),

List of documents

- the possibility of case management through the list of acts.

The Registry also provides:

- records of an object by authorities and delivery of items outside of municipal administration,
- allocation of cases to resolve the referent
- monitoring the status of cases,
- scanning of documents that are attached to the case and documents generated in the process of resolving cases,
- archiving and for delivery to the archive,
- searching and indexing of documents,
- printer cover objects (by the law office management), printing and shipping books daily cases by departments of municipal administration,
- print confirmation of receipt of the referral (according to the instruction office operations),
- reverse the records of cases,
- periodic report

  (for open cases by departments, according to the classifications, review non-archived documents, etc.).

The basic advantages of an integrated information system are:

- unique computer and communications networks,
- a single unified application software,
- integrated database,
- the existence of electronic documents,
- quality and efficient preparation and decision making,

- effective internal and external communication,
- improving service quality,
- effective monitoring of the total cost.

Steps towards an integrated information system are:

- purchase of computer, networking and communications equipment - the server computer local area networks and PCs newest generation of laser printers, devices, and connectors for computer networking, security at power failure ...
- connect computer equipment to a local computer network - made the cabling and connectivity in the office of the municipal building,
- improvement of the operating system for all PCs - the operating system and Microsoft Office (Word, Excel, Access, Adobe Reader, Outlook).

IV. RESEARCH RESULTS

For a long time there's a strong need for citizens, small and medium enterprises by the municipal administration, the newer type of services that would reduce the noticeable slowness and inefficiency, a logical step toward meeting the needs of citizens through the application of information system modules Registry.

The case study was based on the starting point - the establishment of service center where the work is included in the Registry module, which is the basis of information system that provides a basis for further development and improvement of citizens' relations with the local government.

A sample survey in the management of local government and municipal government employees and citizens who applied within the module Registry Information System Local.

For all activities during the survey are included the municipal government in cooperation with professional staff.

Using the *method of content analysis* (a combination of observation and questioning techniques) that is based on the collection of data on a variety of amenities, social communication with citizens, to keep the information flowing freely between administrative authorities and citizens better access to services with lower costs.

The *method of modeling* is a research procedure, and it is used as a method of modeling analysis, education, engineering and service center and information system implementation where the implementation process in the use of the software module registry.

The experimental method is practical - theoretical knowledge, and it is organized behavior and observation groups.

During the research the following is done:

1. study problems with other organs of administration,
2. analysis of hardware requirements for the need to establish the center,
3. software requirements analysis for troubleshooting,
4. design and production plan for implementation,
5. staff training,
6. implementation modules.

When research is discussed:

- analysis of the use of computer literacy of employees,
- analysis on the implementation of the tasks,
- analysis of hardware support,
- analysis using software solutions,
- analysis of the willingness of management and employees to accept a new way to work,
- defining software solutions.

The following table provides an overview of responses to various questions.

TABLE 1
"DO YOU USE COMPUTERS FOR PERFORMANS OF WORK OBLIGATIONS?“

Answer	**Yes, surely**		**It should**		**No**	
employees	35	68,63%	11	21,57%	5	9,80%
elected persons	15	60%	3	12%	7	28%
total	50	65,79%	14	18,42%	12	15,79%

Modernising local government is a radical change in the traditional way of performing administrative tasks, which means that citizens no longer need to go from one counter to a request submitted. It is important to communicate with citizens and of the especially importance is the use of modern communication technologies in their work.

TABLE 2
"ARE YOU FOR MODERNIZATION OF MUNICIPAL SERVICES?"

Answer	**Yes**		**Shall**		**It should not be**	
employees	30	57,69%	16	30,77%	6	11,54%
citizens	25	49,01%	21	41,18%	5	9,80%
total	55	53,40%	37	35,92%	11	10,68%

Based on research results we can make a conclusion that information technology facilitate the rapid implementation of ICT solutions. It is necessary to use ICT for communication and services because this way allows the efficiency and transparency in the collaboration.

TABLE 3
"DOES MODERNIZATION OF CITIZENS CAN IMPROVE RELATIONS WITH THE LOCAL GOVERNMENT?"

Answer	Yes, it can		Probably		Do not know	
employees	32	62,74%	17	33,33%	2	3,92%
citizens	29	53,70%	20	37,03%	5	9,26%
total	61	58,09%	37	35,24%	7	6,67%

Modernization requires planning and execution of many activities that will enable the development of better organization of the administrative authority. The introduction of information systems increases the quality of services and improve efficiency, accountability and effectiveness of government.

TABLE 4
"WHETHER THE LEADDERSHIP AND STAFF ARE READY TO ACCEPT MORE MODERN MODE?"

Answer	Yes		Probably		Not entirely be	
employed	23	65,7%	11	31,43%	1	2,86%
management	19	51,3%	14	37,84%	4	10,81%
total	42	58,3%	25	34,72%	5	6,94%

The results have an impact on the modernization of municipal services which in turn will affect the efficiency of performing delegated tasks, including:

- the possibility of solving the problems of the modern handling,
- connectivity services in the work which improves the efficiency and timeliness,
- improve business relations with citizens,
- improvement in work - a very high level of citizen satisfaction,
- increasing the number of actual services - essentially part-time service delivery,
- saving the cost of services.

TABLE 5
"DID SOLVING SOFTWARE MAKES IT EASIER FOR YOUR REQUIREMENT?"

Answer	Yes		Probably		Not entirely be	
employed	35	68,63%	11	21,57%	5	9.80%
management	15	60%	3	12%	7	28%
total	50	65,79%	14	18,42%	12	15,79%

The proposed research stems from the need to service the state administration system adapts to the needs of contemporary society and reduced to the level of modern technologies and their applications.

V. CONCLUSION

Modern information and communication infrastructure that allows uninterrupted information flows between government and citizens, it serves the citizens better access to services at lower cost.

Information and communications technology has enormous possibilities in terms of modernization of local government and improve services provided to citizens.

Community portal module enables the creation of the main modules of the municipal administration.

The introduction of modern information systems increases the quality of services and improve efficiency, transparency, accountability and effectiveness of local government.

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Legal Protection for Software in Serbian Law

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Abstract- It is a great economic importance of software on the global market. Therefore, the need for the appropriate legal norms of software is one of the imperatives not only for our, but also for the globally observed modern society. However, there are still many doubts in the United States, as the representative of the software industry, and in the European Union concerning the legal framework where the legal protection is possible. In the legal practice, at the moment, currently are accepted a copyright and a patent way of protection. The question arises whether in this way is created a legal uncertainty or unequal legal solutions which are the result of different conceptions of the patent ability or the authorship. Therefore, in this work the author has tried to define the concept of software, through the analysis of the relevant sources of our laws and stating the source from the European Union laws, as there is a tendency for belonging to the European concept of software protection, and highlight the current situation regarding the legal .

I. INTRODUCTION

The development of software dated back in the late 20th century when it was launched on the market as an independent good completely separated from the computing device for which it was designed. However, nowadays everybody fully grasps the economic significance of software for without it advanced technological and technical tools do not have any utility.

Software companies, particularly in the United States of America as a cradle of software industry, gained a large profit even in the first years of the designing of software. As the legal protection of software was not provided, one of the main goals was to establish adequate legal framework for the exploitation of software whose market value was very high. It became a worldwide problem so the debate between the advocates of patent law and those of copyright law was lively in the realm of intellectual property law. Although numerous legal acts were passed nationally and internationally, there seemed to be no uniformity of legal protection.

The complexity of software issue caused the debate about the appropriate legal protection of this good to drag out for decades. Since the growing significance of electronic commerce and information technology on society based on the Internet indicates that the real expansion of software designing and use is to come, the problem of the adequate legal protection on European continent is still regarded as unsettled. Moreover, the economic impact of software industry of the United States of America and its considerable effort that software should have the legal protection as a patent have raised to some extents the doubts about the effectiveness of the concept of copyright protection.

Once source code (when it is written in a programming language) has been available to public, it can be used to design another software program in a simple way without copying it directly resulting in copyright infringement. Furthermore, in this field are technological constraints of intellectual creativity for there is no endless number of ways how to develop the same idea as it is the case in the other creative work. By that fact alone, it is extremely difficult in a certain case to tell apart whether the software is a plagiarism of the other one or the original creation of the author. Besides, thanks to developed computer technology, software program has become an easily accessible product whose copies are made at minimal costs.

On the other hand, the complex characteristics of software raise the question of patent protection. Source and object codes as forms of expressions are under copyright protection. However, software activation gives technical result, which not seldom has its industrial application. With the respect to this fact, legal theory and practice to some extent call into question the concept of copyright protection. There are numerous works which seriously deal with the dilemma between copyright and patent protection both in our and foreign literature. They all provide the starting point for a comprehensive analysis of the problem but in our work we will present only the current normative acts in our law, noting what is the legal protection of software in the European Union, primarily, due to the aspirations of our country towards the European and global integration, and the commitment to the European concept of software protection. Regarding all aspects, we feel it necessary to depict our legislation as *de lege lata* and *de lege ferenda*. In the last part of the paper, we will briefly explain the relation between copyright and patent protection of software co-existing in our practice.

II. LEGAL PROTECTION FOR SOFTWARE IN OUR LAW

A. The Term and Types of Software

There is a need for precise definition of the term of software as the object of legal protection that the work will deal with in the following parts. The term "software" denotes "computer program and procedures, associated documentation and data relating to the functioning of the computer system."[1]We have to distinguish this term from the other closely resembling term-computer program- since their meanings are not identical. We will indicate what it means since it is a narrower term. A computer program includes "an arranged sequence of instructions that are attached to the material carrier and with the help of a computer performs a specific function or achieves a particular result."[2]Yet, in legal literature the usage of both terms are equally justified for computer programs are often marketed in the form of software. In practice, however, the term software is prevailing, which has influenced us to choose this term in our work even though there are the cases of solely computer programs. Although we have opted for language consistency, we will necessarily use the term computer program as well in order not to reduce the credibility of an information source.

Otherwise, according to its implementation software is frequently divided into two groups: system and application software but in terms of legal protection, this division has no special significance. Existing differences between them may affect the certain issues in the legal transactions. For example, system software includes a translation program (from programming language into machine one). utility program (including services, help) as well as a protocol and managing program (drivers) [3]. An operating system is the part of system software and it consists of programs that are the basis of application software for it coordinates the work of different operating units: processors, printers, keyboards, and other related devices[4]. In fact, an operating system is a combination of hardware, on the one hand, and a user and application software, on the other hand. The largest number of personal computers today has Windows operating systems of the big sofware manufacturers Microsoft Corporation, but in addition to it, there are a great number of other operating systems, which cannot be all mentioned here. A particular type of operating software, which has been increasingly popular recently, is free software or open source software of which Linux is the most widely used one. The characteristic of this system is that it is available in its source code to a user, so he can freely use, edit, improve and redistribute it.

On the market the most significant application software is intended for end users "to solve business, scientific and industrial problems,"[3] and whose performance depends on the operating system and utility program. This software is extremely versatile since it is adapted to wide use of computers in modern society and diverse needs of end users. It consists of programs for data processing, word processing and spreadsheet programs. [4] It can be divided into two groups, individual and standard.

B. Legal Protection for Software in Serbian Law

Digital technology has become an inevitable part of everyday life globally and in Serbia as well. This statement refers to the large economic importance of software and the key issue of determining its adequate legal protection.

In our legal system, the basic form of protection for software is copyright. According to the provisions of the European Communities Council Directive on the legal protection of computer programs (Directive 91/250) [5] which is the primary act regulating the issue of protection of computer programs in the EU, member states protect computer programs as literary works by copyright within the meaning of Berne Convention for the Protection of Literary and Artistic Works. It is important to note that the term "computer program" according to the Directive "shall include their preparatory design material". The protection applies to the expression in any form of a computer program. Ideas and principles which underlie any element of a computer program, including ideas and principles which underlie its interfaces, are not subject of copyright protection.[1] [6] In fact, the form of software includes source code (when expressed in some of the programming languages), objective code (in the form of binary numbers, i.e. In machine language) and executable code (electronic digital readout on the physical medium: magnetic tape, a chip, CD). [1]

However, neither judicial nor administrative practice in EU member states and the European Patent Office ignores the current trends of American precedents when making decisions. It has been proven by the data which show that the national authorities in the European Patent Office has granted thousands of patents applicable to computer inventions.[7] With this in mind, there is still the question of whether copyright and patent protection exist in a parallel way or complement each other.

In our legal system, the software was firstly recognized copyright protection by the Law on Amendments and Supplements to Copyright of 1990. Copyright and Related Rights Act of 1998 that followed took the same concept explicitly adding software to the list of works of authorship.[2]

Act of 2004 did not make any substantial changes, but seeking to formally comply with international regulations, the software was classified as a written work.[3] It provides for the existing Law on Copyright and Related Rights .[4] However, given the

[1] Art. 1(1) and Art..(2) Directive 91/250.

[2] Art. 2(2)(10). Copyriht and Related Rights Act in1998, Oficial journal n 24/ 98.

[3] Art. 2(2)(1). Copyriht and Related Rights Act in 2004 Oficial journal SCG, n. 61/ 2004.

[4] Copyriht and Related Rights Act in 2004 Oficial journal RS 104/09.

specificity of software as intellectual property, consistent application of the provisions of the copyright in works of literature is not justified. Therefore, our law as well as international legislation has provided a number of provisions, which recognize the need for special regulation of the software, which we will deal with in particular.

According to the current Law on Copyright and Related Rights, the author of the computer program has the exclusive right to permit or prohibit the rental of copies of his work. The term 'rental` means making a copy available for use to the other by a public institutions without direct or indirect commercial advantage.[5] This legal provision was not the part of Law on Copyright and Related Rights of 1988. In accordance with Article 40 of existing Law on Copyright and Related Rights which has been taken along with the previous Article 24 of the Directive on rental and serve, in the case of the serve of copies of works of authorship by a person whose business is registered, the author has the right to claim compensation. [5] The different legal treatment in terms of this power stems from the highly technical characteristics of software, which makes its reproduction very simple procedu. Therefore, the legislator considered it necessary to provide the author with the exclusive authority to be able to achieve the higher degree of control over the use of his work.

The software copyright suspension is strictly regulated. The legislator has provided that a person who has lawfully obtained a copy of a computer program may, for their own use of the usual special-purpose programs: accommodate a program in computer memory and run it, remove bugs and make other necessary changes to it which are consistent with its purpose, unless otherwise agreed, make a backup copy of the program on a tangible carrier, made compilation of the program exclusively in order to obtain the necessary information to achieve interoperability of the program with other independently created software or specific hardware, if that information is not available in any other way and the decompilation of the program is done in only a portion of which is necessary to achieve interoperability.[6]

Program storage in computer memory and its running are, in fact, acts of reproduction which are exclusively within the power of the author.[7] However, these actions are necessary to the person who has legally obtained a copy of the software, to use it. Therefore, it was necessary to suspend the specified powers of the author.

The technical nature of software means that the design and use of software requires the use of machines (computers), so software bugs often occur. Any unauthorized intervention would represent a treatment of the work, and thus a violation of the exclusive non-proprietary rights to make changes. First of all, because of the undisturbed use of the program, the legislature has given the holder the legal authority to remove bugs and to make other necessary changes to the program. However, by the agreement between him and the right holder the application of this provision may be excluded. The similar purpose has legal authority of the holder of the copy of the software to make copies of the software on a durable physical medium, since the working copy during the use can be damaged or destroyed. [1]

The theory states that decompilation, which under these conditions is also included in the suspension, means the conversion of object code into source code, [1]allowing software to work on some computer equipment, or with another program, when necessary. The only requirement is that the data obtained in this way must not be disclosed to others or used for other purposes, except as provided by law.[8]

Given the extraordinary economic importance of software, the legislature has provided specific provisions in the Law of Treaties, and for the copyright work created in employment, which may be waived only if it is provided in the contract.

If the subject matter is the order of the software, the customer acquires the publishing rights and all proprietary rights, which are consistent with the purpose of concluding such an agreement. When creating other works of authorship, in addition to contracting authorities to publish them he only acquires the power to put the works into circulation.[9]

Finally, it must be emphasized that the employer is the permanent holder of all exclusive proprietary powers to the software employed. When it comes to the other works created in employment, the employer is the holder of the proprietary powers for a limited period of five years from the completion of the work.[10]

III. THE COEXISTENCE OF COPYRIGHT AND PATENT LAW

If we bear in mind that the basic form of the protection for software is copyright, we should not ignore the fact that copyright protection for software, which has already been widely accepted, includes any form of expression, that is, both source and object code. On the other hand, considering the cases of recognition of patents for software, one of the key issues which has been raised is whether the copyright and patent protection coexist in a parallel way or complement each other. The answer to this question is the subject of the consideration in this section.

As stated above, according to Directive 91/250, TRIPS and the WIPO Copyright Treaty[11], software along

[5] Art. 24. Copyriht and Related Rights Act.

[6] Art. 47 (1). Copyriht and Related Rights Act.

[7] Art. 20 (4). Copyriht and Related Rights Act.

[8] Art. 47(2). Copyriht and Related Rights Act.

[9] Art. 95. Copyriht and Related Rights Act.

[10] Art . 98. Copyriht and Related Rights Act.

[11] 4 WIPO Copyright Treaty.

with its source code and object code is protected as literary work in terms of the Berne Convention. [12] [8]Given the legal significance of these acts, the legislation of European countries is, in this regard, largely harmonized. However, the field of the application of software in the information era spreads and covers those areas that are traditionally protected by industrial property rights, i.e. by patent law. This fact causes differences in software protection.

In this regard, and by the analysis of current legal practice, it can be concluded that the software under certain conditions, may be subject to patent protection. Interpreting the relevant provisions of the European Patent Convention, the standpoint of the European Patent Office is that software, when you start or store it in a computer, produces or has the ability to produce a further technical effect which goes beyond the normal physical interaction between software and computers (hardware) by which the program is run.

This means that the software can be patentable. The basic requirement for the patentability of software is to make a technical contribution. The similar determination of patentability exists in the legal system of the United States, because a patent can be assigned for the procedure, device or product that are new and useful. Patent protection can be given to the promotion of procedures, devices and products, provided that such promotion satisfies required conditions.

We can conclude that the uneven level of the protection for software, in those situations when it can be considered an invention in terms of patent law, brings a different view of patentability. Given the above facts that the United States recognizes inventions patent protection under somewhat different conditions than it is the case in the European Union and most national legislations in Europe, it is possible that certain software is protected under Patent Law in the United States, but under Copyright Law on European continent. In this way, however, it does not call the primacy of the worldwide concept of copyright law into question. In addition, it is necessary to emphasize that despite the increasingly common practice of patenting software, in the legal system of the United States the primary form of protection is copyright.

Doubtlessly, some legal and economic uncertainty on the market of software brings software in some cases, depending on the territory of a country, under the protection of both patented invention and the work of authorship. In this regard, it is not unlikely that in the same country, under certain conditions, software as a work of authorship may also meet the requirements of patentability.

[12] Art.1(1) and (2) Directive 91/ 250 and 10(1)TRIPS-a.

IV. THE RELATIONSHIP BETWEEN COPYRIGHT AND PATENT LAW

Based on previous exposure it is evident that in practice copyright and patent protection of software co-exist. Given this fact, we will present briefly what is their relationship.

On the one hand, the patent provides protection for an invention within the patent claims. On this basis, the legal owner of the patent for computer applicable invention has the right to prohibit any third party the use of a patented invention, within the limits specified in the patent application. [9]

On the other hand, copyright protects the software expressed in any form. Ideas and principles which underlie any element of software, including ideas and principles which underlie its interfaces, are not covered by the protection of copyright.[13] Therefore, the software will enjoy copyright protection only if it is genuine, if it is the author's own intellectual creation. [14] Thus, copyright protects the right holder against direct copying of source and object code, but this protection does not extend to those cases that represent different ways of expressing the same ideas or principles.

The theory states, however, that the right holders can refer to the patent infringement even when the computer applicable invention, whose source or object code are different, has the same effect, although according to copyright law that created independent program also was the object of protection.

Based on this we can conclude that these two types of protection can complement each other so that copyright protects the **form** in which the software expresses, and the patent protects the **idea** on which it is based, provided it meets the requirements of patentability.

V. CONLUSION

Digital technology has become an inevitable part of everyday life globally and in Serbia as well. This statement refers to the large economic importance of software and the key issue of determining its adequate legal protection.

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Act of 2004 did not make any substantial changes, but seeking to formally comply with international regulations, the software was classified as a written work. It provides for the existing Law on Copyright and Related Rights. However, given the

[13] Art.1(2) Directive 91/ 250.

[14] Art.1(3) Directive 91/ 250.

specificity of software as intellectual property, consistent application of the provisions of the copyright in works of literature is not justified. Therefore, our law as well as international legislation has provided a number of provisions, which recognize the need for special regulation of the software, which we will deal with in particular.

However, the field of the application of software in the information era spreads and covers those areas that are traditionally protected by industrial property rights, i.e. by patent law. This fact causes differences in software protection.

In this regard, and by the analysis of current legal practice, it can be concluded that the software under certain conditions, may be subject to patent protection. The basic requirement for the patentability of software is to make a technical contribution. In this way, however, it does not call the primacy of the worldwide concept of copyright law into question.

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