

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.

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.

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 development. Dating back to 1940's early attempts to utilize machine for demanding 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

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, retrieval, 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 pharmaceutical 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 is 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 retrieval, enabling users to capture 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 through 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/retrieve 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.

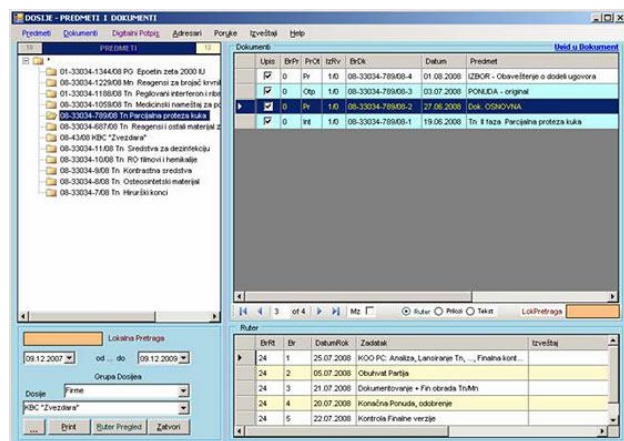


Figure 1. Cases-Files-Documents View

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 interdependent 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.

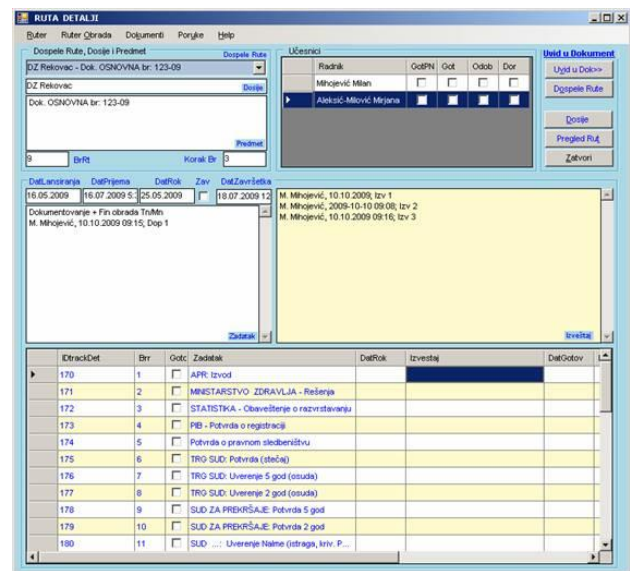


Figure 2. Document Routing

All documents in the system can be watermarked if needed. A watermark example is shown in Figure 3.

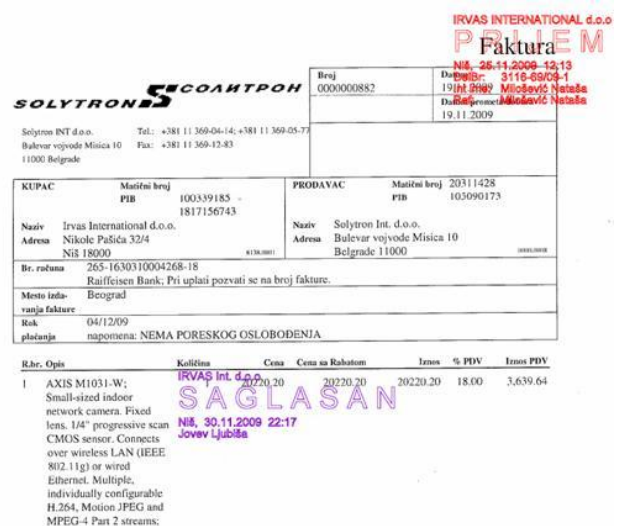


Figure 3. Watermarking Example

As a rule, the document is assigned with an ID watermark in order to denote its reception or sending. Watermark 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 storing are performed in a specific server domain, while document querying 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.

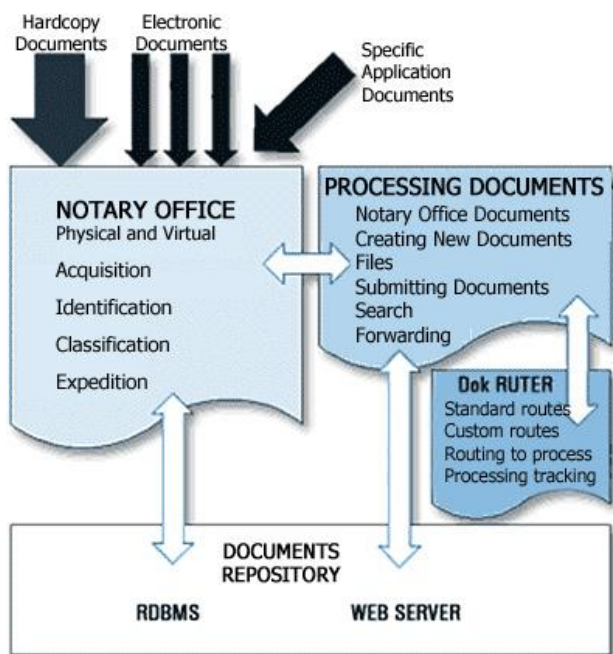


Figure 4. REXxDOCUMENTUM Logic Architecture

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.

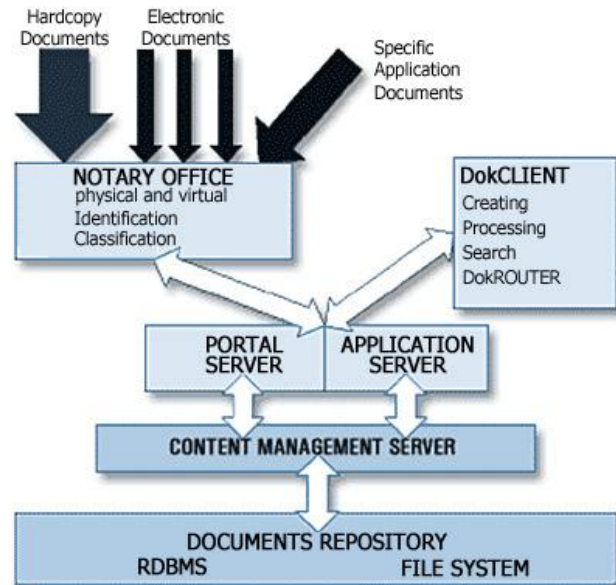


Figure 5. REXxDOCUMENTUM Application Architecture

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.

The screenshot displays the 'KARTICA RADNIKA' (Employee Card) form. It includes fields for personal data (Radnik, Prezime, Ime, Rodj Prez, Ime Oca, Dragisa), birth date (14.09.1975), date of hire (01.04.2002), and JMBG (140997510148). It also shows a list of positions (Radnik, Direktor, Direktor, Direktor, Direktor, Direktor, Direktor, Direktor, Direktor, Direktor) and a list of employees (Radnik, Jovanović Mina, Jovanović Nada, Jovanović Vojislav, Jurišić Verica, Kačavenda Nebojša, Katsounis Georgios, Kapor Ljiljana, Kelmar Zoran, Kondić Sanja, Krcević Božo, Krcević Sandra, Krcević Katarina, Lajnović Anja, Lazarević Branko, Lazarević Rade, Lukić Ilija, Lukić Vladimir, Lukić Miroslav). The form also includes a section for 'Osigurani' (Insured) and 'Prebivalište' (Residence).

Figure 6. REXXKADROVI HRM Support

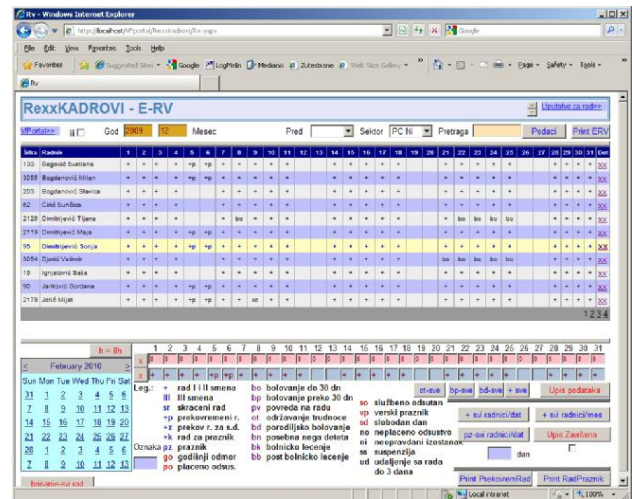


Figure 7. REXXRadnoVREME Working Hours View

The screenshot displays the 'RexxEDU OBRAZOVANJE' (Education) interface. It shows a list of employees (Radnik, Jovanović Mina, Jovanović Nada, Jovanović Vojislav, Jurišić Verica, Kačavenda Nebojša, Katsounis Georgios, Kapor Ljiljana, Kelmar Zoran, Kondić Sanja, Krcević Božo, Krcević Sandra, Krcević Katarina, Lajnović Anja, Lazarević Branko, Lazarević Rade, Lukić Ilija, Lukić Vladimir, Lukić Miroslav) and a list of training details (Plan, Kurs, Radnik, Prezime, Ime, Rodj Prez, Ime Oca, Dragisa). The interface also includes a section for 'Osigurani' (Insured) and 'Prebivalište' (Residence).

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).

ID	Ime	Proizvođač	Doziranje	Jedinica	Cena	Ukupno
1	123456 SINKUM TEL 20X4 MG	SI Jugoremedija	ACENOKUMAROL TEL 1X4MG	KOM	SC 400,00	5,06
2	234567 ACICLOVIR TEL 25X200	AC Zdravlje aktivi	ACICLOVIR TEL 1X200 MG	KOM	SC 250,00	23,40
3	345678 ACTRAPID NOVIOLET SX	AC Novo nordisk	ACTRAPID NOVIOLET 1X3ML(100LT)	PEN	SC 50,00	466,66
4	456789 ADRENALIN HCL 1% AM	AD Jugoremedija	ADRENALIN HCL 1% MG/ML	KOM	SC 150,00	36,32
5	567890 ALPHA D3 CAPS 50X0,25	AL Zdravlje aktivi	ALFAKALCIDOL KAPS 1X0,25 MG	KOM	SC 100,00	8,67
6	678901 HEMOMYON CAPS 6X25	HE Hemofarm	AZITROMICIN CAPS 1X250MG	KOM	SC 500,00	90,13
7	789012 KISALOL TEL 30X0,25 MG	KS Galenika a.d.h	ALFRAZOLAM TEL 1X0,25 MG	KOM	SC 60,00	1,94
8	890123 KISALOL TEL 30X0,5 MG	KS Galenika a.d.h	ALFRAZOLAM TEL 1X0,5MG	KOM	SC 300,00	2,59
9	901234 GASTAL TEL 24 KOM	G Piva s.p.o.	ALUMINIUM HYDROXID CAPS 1X40	KOM	SC 100,00	4,59
10	10145 AMKACIN AMP 1X500M	A Galenika farm	AMKACIN AMP 1X500 MG	KOM	SC 100,00	186,56
11	113122 LOMETAZOL TEL	LO Galenika farm	AMLODIPIN + METILOLIZOL	KOM	SC 2.000,00	3,93
12	120844 AMNOCIFILIN AMP 50	A Jugoremedija	AMNOCIFILIN AMP 1X10MG	KOM	SC 8.500,00	11,77
13	120712 AMNOCIFILIN RET TEL 20	A Jugoremedija	AMNOCIFILIN R 1X350 MG	KOM	SC 10.000,00	6,42
14	121920 SEDACORON AMP 5X15	SE Ebeve	AMODARON 1X150MG/ML	KOM	SC 25,00	116,50
15	120653 AMODARON TEL 80X20	A Zdravlje aktivi	AMODARON TEL 1X200MG	KOM	SC 1.500,00	11,80
16	128882 AMLODIPIN TEL 20X10 M	A Halbfarm	AMLODIPIN TEL 1X10 MG	KOM	SC 1.500,00	16,97
17	128881 AMLODIPIN TEL 20X5 M	A Halbfarm	AMLODIPIN TEL 1X5MG	KOM	SC 2.500,00	11,20
18	11573 AMOKSICILIN CAPS 16X	A Parfarma	AMOKSICILIN CAPS 1X500MG	KOM	SC 3.000,00	7,20
19	112674 PANILAV TEL 20X625 M	PA Parfarma	AMOKSICILIN-HLAV TEL 1X625 MG	KOM	SC 2.500,00	33,92

Figure 9. REXXTENDERI Public Purchase 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. CONCLUSION

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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