Document Management System - A Case Study of Varaždin County

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Abstract - Most institutions, like academic, governmental and commercial institutions, need some sort of system to address questions related to tracking and the storing of documents to all kinds of the media. Document management system commonly provides solutions for the access, review, upload and download of documents and queering capabilities. The main requirement of the EDMS (Electronic Document Management System) is to convert paper documents into electronic form. The purpose of this paper is to report on the process and the results of document management system development and the implementation in Varaždin County. Development and implementation stages, problems occurred during implementation, employees' acceptance as well as improvements will be presented

I. INTRODUCTION

Recently many enterprises have transformed paper based document into electronic form to use and share information efficiently. This brings benefits to enterprises like far better control and management of documents, efficiency in maintaining, accessing and distributing documents [1]. Also, the first cause for this was to save on space where paper documents are stored. The primary focus should be on ways in which this can change business processes and make it more efficient. Document management system (DMS) generally cover services like manipulation with the documents, indexing, the storing and retrieving of documents, communication through the exchange of documents, collaboration around documents, and modeling and automating the flow of documents [2]. It gives answers to the question related with document storage and storage costs, document retrieval efficancy and time spent on document retrieval, document organization, readability of documents, document electronic and physical security, document creation, distribution and retention. DMS can bee seen as part of Enterprise Content Management (ECM) which is defined to enclose the technologies used to capture, manage, store, preserve, and deliver content and documents related to organizational processes [3]. Document management system have impact on business thru efficient document storage, retrieval and information access, but on odder hand have little or no impact on ways how individuals are using information from these documents [4]. The basic benefits of document management system are that a process is done more easily and measurable benefits could be summarized as benefits for users, benefits for organization and benefits for whole society. Benefits for users are: information available when required; greater quality, efficiency and effectiveness at work; less blame and dissention when looking for lost information; and evidence is available for what they were asked to do and what they did. Benefits for the organization are: work is done more quickly; completing a task requires less effort; quality of processes and their outcomes is improved; cash flow is improved; and compliance with laws and regulations is achieved and demonstrated. Benefits for the whole society are: organizational processes are open and can be understood and monitored; organizations comply with laws and regulations; quality of life is improved; and the historical record is accessible and reliable [5].

II. SYSTEM DESCRIPTION

In public administration institutions as well as in local government institutions documents circulate very intensively. Varaždin County gather, store, scan and disseminate to users large amount of data from County business areas like education, health, county and urban planning, economical development, transport and transport infrastructure [6]. The main document in public administration is an act. An act is every printed document which starts, adds, changes, stops or terminates some administration operation and covers documents like accounts, decisions, rules, declarations and regulations [7]. Document processing procedures generally include [8]:

1. document receive;
2. document input in information system;
3. transformation registration;
4. making new documents;
5. form making and managing.

Document receive involves classification, distribution and document linkage. Document input in information systems can be manual or automated through software for data input. Document transform registration maintain after data input from a single document. Based on input document new documents are constructed. To ease document input in information systems new forms are made for data input and output. In public administration this procedures are more complicated.

A. Grounds for electronic document management system implementation

Document processing procedures in public administration in particular in Varaždin County are omitted with Office work regulation that is old [7]. This regulation encompass act receive and review, act registry, act usage and editing, act delivery, distribution and archive. Most problems related to paper based document management was a result of act duplication and act losing. Document processing procedures are performed in the registry office. Acts can enter a system in several ways, via mail, via fax, via e-mail, or customers can personally bring an act or an act can be the result of governing body work. Acts which were brought by customers themselves must be promptly reviewed and registered. But that was not always the case because the registry office sometimes hadn't the information on document location, or was this document opened or not. Some acts were only marked with an entrance stamp and current date and were delivered to the governing body which was authorized for dealing with these acts. With acts that were received via fax, they were treated in the same way as paper based acts, but here occurred a problem with act duplication because these acts generally arrived via mail too. There were problems also with acts received via e-mail because they did not proceed through the registry office but delivered directly to a particular worker or governing body.

With e-government evolution, whose fundamental role is information and telecommunication technology usage, service quality that public administration provide to the citizens should be improved. Primary focus should be on document management with the help of electronic document management system. But the fact that document management system will not solve all problems should not be bypassed. Electronic document management system will solve problems regarding document digitalization, acts and document evidence and flow inside business system. Because business processes in public administration are specific, general and standard program solution can not be implemented. During the new document management system development SWOT analysis can be accomplished to define weaknesses of system adoption and to determine strengths which will eliminate weaknesses, to identify opportunities and use it for weaknesses effects decrease, and to predict possible threats. SWOT analysis is an efficient way of identifying strong and weak points and of examining the opportunities and threats of a certain area and can provide a good basis for successful strategy formulation. The SWOT analysis is widely recognized and it constitutes an important basis for learning about the situation and for designing future procedures which can be seen as necessary for thinking in a strategic way [9]. In Table 1. there are strengths, weaknesses, opportunities and threats of implementation document management system in Varaždin County.

TABLE 1. DOCUMENT MANAGEMENT SYSTEM SWOT ANALYSIS

STRENGTHS	**WEAKNESSES**
• document recording is maintain in unique repository, • there is opportunity to assign different attributes to documents (type, significance, urgency, status,…), • there is opportunity to track documents according to version and author, • there is opportunity to efficiently browse stored document • document workflow definition is supported • there is integrated system for document access authentification, • auditing of office books is automated	• possible resistance and unwillingness of governing bodies for document management system adoption, • possible employee resistance to education and document management system usage, • lack of financial resources for modernization and buying information equipment for document management system usage
OPPORTUNITIES	**THREATS**
• public administration is a business system that document management system can fully utilize and fit in information system, • permanency in information technology price decrease, • permanency in information technology modernization	• old Office work regulation, • possible change in governing body jurisdiction, • possible management incompetence, • possible law regulations change

B. System modules

Basic document management system modules in Varaždin County are: Central repository, Access control, Version management, Search and access to documents, Workflow management, Electronic office books and Internet technology.

Central repository

The basic document management system characteristics are the central repository, enabling documents identification and management (the documents can be in a written form, scanned or electronically created). It includes the operations of checking-in, defining attributions and key words of the document [10; 11].

Access control

The system of authorization enables access control and restricts access and document changes rights. Access control comprises a list of authorized users.

Version management

The system is able to fully monitor multiple document versions, version relationships, documents which a certain version has been generated from, and changes. The users

perform the operations of checking-out the repository, make changes and then report the new version to the repository. Only one version is valid at any point.

Searching and accessing documents

Access to documents is enabled by meta-data search. Meta-data are data on documents and their versions, authors, times, creation dates and changes, individually created and stored by the data management system. The system enables access to documents via meta-data search.

A different way to Document Access can be made through attribute and key word search. This feature enables users to find documents by informing certain words connected by logical operators, which can then be connected by meta-data. List of words (attributes) may be predefined and expanded [11].

Workflow Management

Workflow management (Figure 3) comprises of defining all allowed document paths in the system in advance and activities to be performed there on [10].

Electronic office books

Establishment of electronic office books – Entry Register, First Degree Register of Administrative Procedure, Internal Delivery Book, Register of Received Mail, Delivery Book for the Site, Delivery Book for Mail, and access to the acts through the stated books.

Internet Technology

Internet technologies enable all users to access information regardless of the platform. No additional client applications are necessary and neither are standard working environments within the system.

The EDMS is realized by the following program modules:

1. Server;
2. Access control;
3. Data search and access;
4. Creation, input and upgrading of documents;
5. Workflow management.
6. Repository;
7. Electronic office books.

Figure 1 shows DMS and connections of its program modules. The users access all document management modules through the client application. The access control module verifies the user's rights and restrictions to execute any action within the system. The acts are created, changed and upgraded in other applications (Word, Excel, etc.) and then stored in a common repository together with the belonging attributions and keywords (Figure 2). The repository automatically saves the meta-data on acts, acts versions and authors. The system of relation database management with object-oriented components attributed to it represents the basis of the repository.

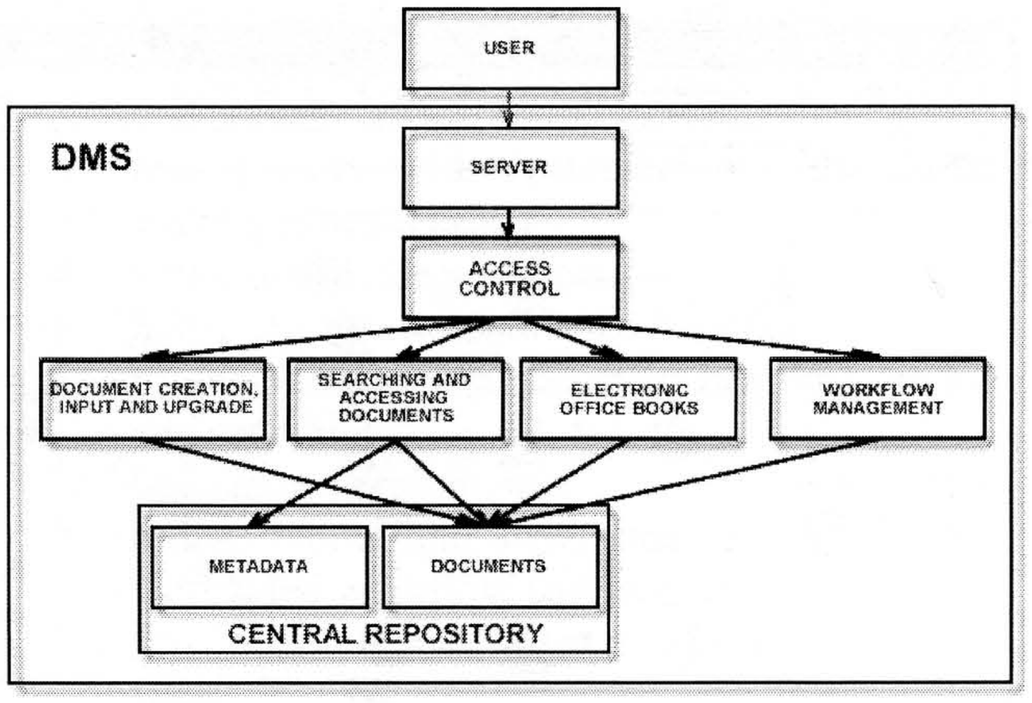

FIGURE 1. DMS and its application modules

The search of and access to acts module has the possibility to search and have access to acts via meta-data, keywords and attributes and their combinations. The electronic office books module enables recording and input of acts data in compliance with legislation procedures. It also registers data on who is currently performing the processing and what the document status is. Last but not the least characteristic of this module is searching and accessing acts according to their classification numbers, creator's numerical markings and acts receivers. The workflow management program module defines the acts paths in advance and enables their later changes.

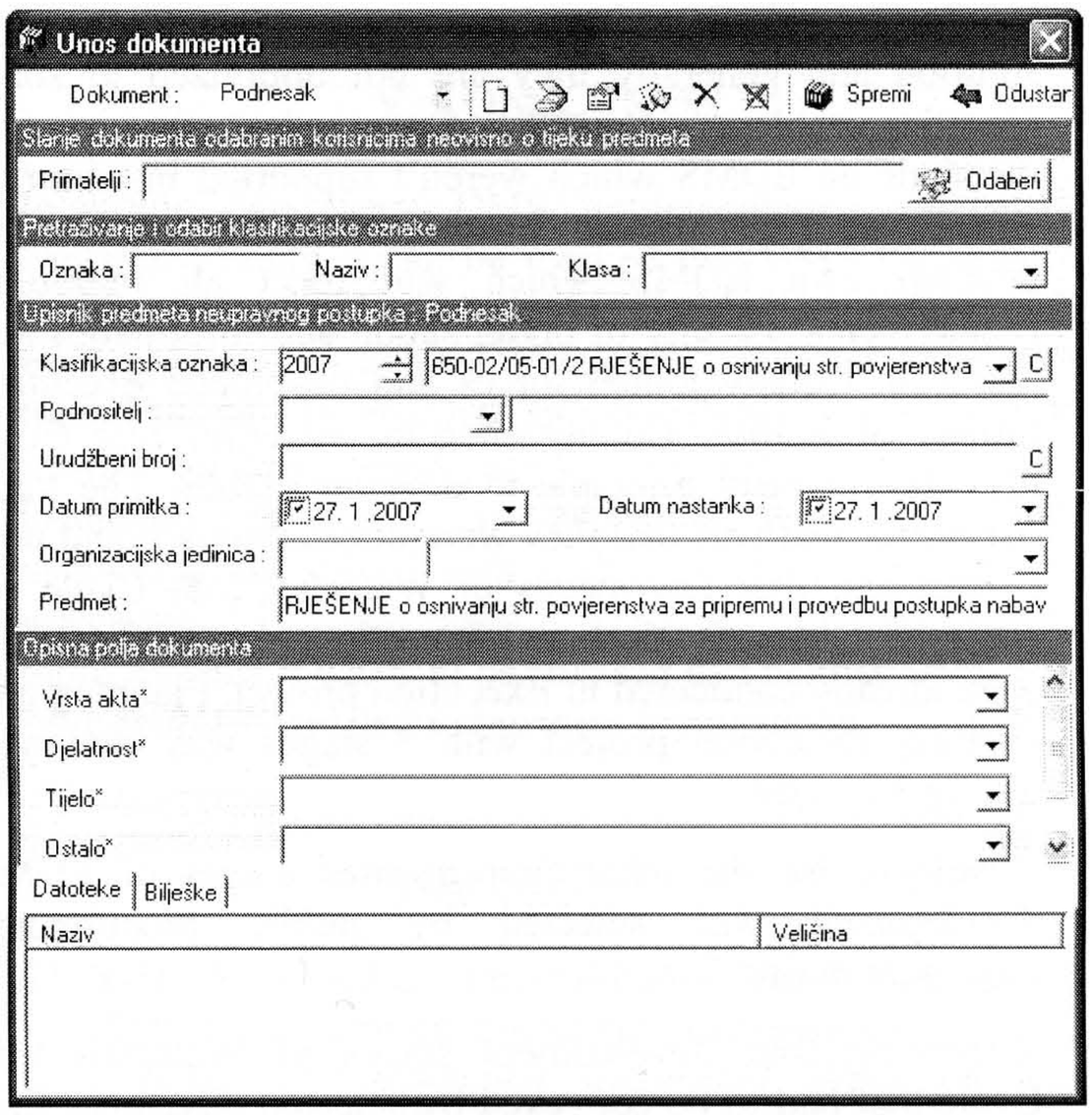

FIGURE 2. Creation, input and upgrading of documents

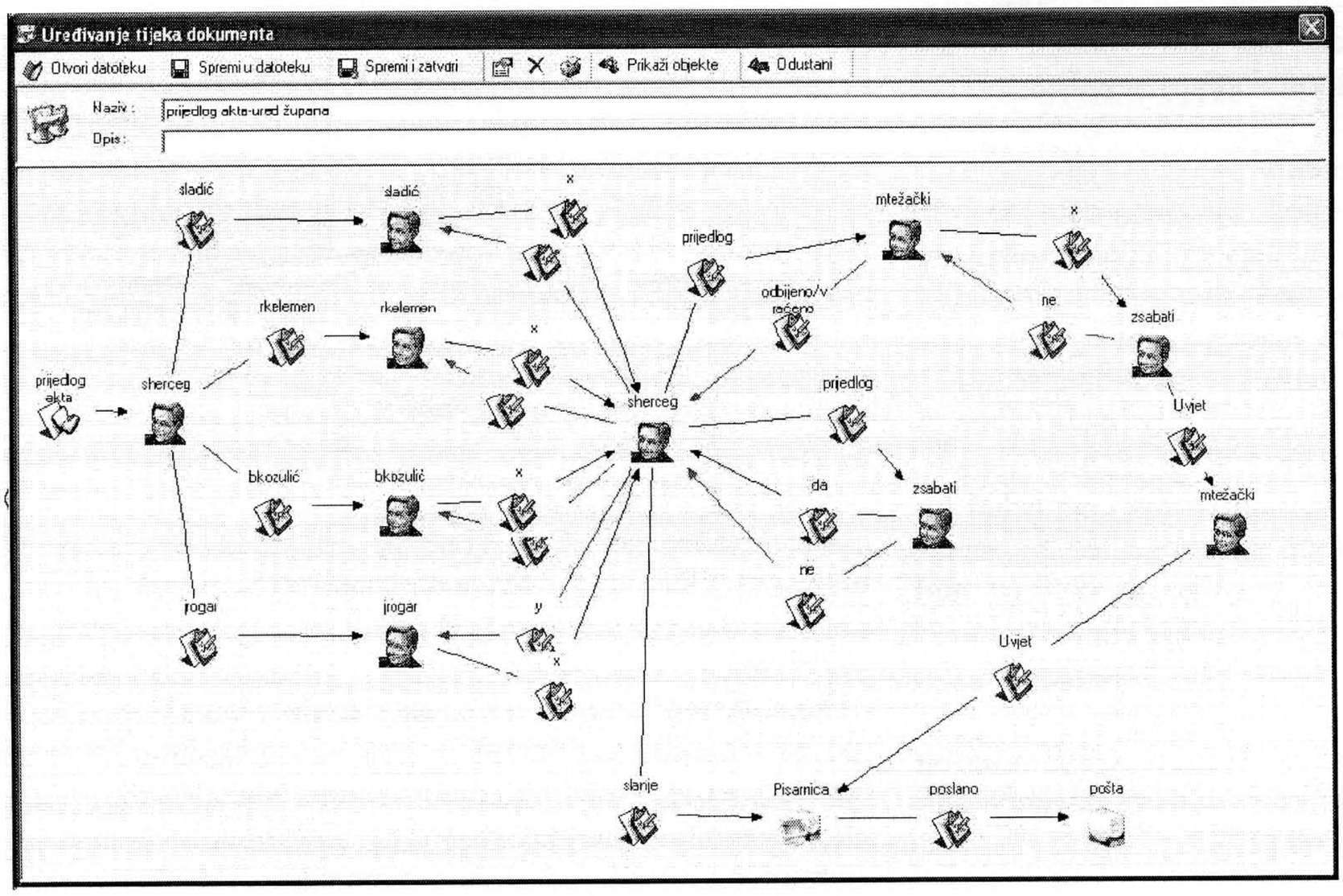

FIGURE 3. Workflow Management

III. IMPLEMENTATION

There are many different ways to implement an EDMS. The simplest way is to adopt system which is on the market and try to incorporate it with business needs. But, the fact is that EDMS on free market have the general solution and generally they are not optimized to solve specific problems. Varaždin County had the specific demands on EDMS which weren't supported in common EDMS on free market. Therefore County decided to develop own EDMS which will meet all important requirements. Faculty of organization and informatics and Varaždin County joined forces and developed execution project of EDMS. County chooses *Waterfall Life Cycle* [12] development principle to develop EDMS. The main reason for that was that they were developing a brand new system and first few stages of Waterfall Life Cycle (1. analysis, 2. specifications and 3. preliminary development) were already conducted in Execution project. Planning and creating Execution project with 3 stages was conveyed during 3 months.

Developer for the other four planned stages of EDMS development was selected by public procurement procedure during 1 month.

Remaining four development stages of Waterfall Life Cycle that had to be conveyed by selected developer firm were:

1. Detailed development, encoding, testing and integration of application;
2. Data preparation procedures and transfer in new database;
3. New system implementation and user education;
4. System checking, performing corrections and new development.

Those stages include activities [13]:

A) Detailed development, encoding, testing and the integration of application are tasks for developing and encoding an entire system. When the ICT was chosen, the developer must plan a database in detail, user interfaces, code structure and algorithms, communication procedures and safety procedures. Every single code fragment was written and tested alone, joined in application and tested in the working environment. That stage took 4 months.

B) Data preparation procedures and transfer in new database were the next important steps in introducing new DMS. That was not only adjusting the system parameters of application, but also business procedures defining based on the whole business domain. The whole business system worked with a large amount of documentation therefore data transfer from the old to the new system wasn't just technical procedure. Data validity and consistency must be checked; consolidation and corrections carried out, and then transfer of data into the new central database with new logical connections in relational model execute. Activities of this stage were performed in 1 month.

C) New system implementation and user education is a very important stage for every complicated system. It includes activities like: writing organizational guides for business processes, writing user guides for applications, defining distribution of guides through intranet, users education and training, applications installing, user access control defining, system testing, parallel work with the old system as well as organizing a help desk. Those activities were finished in 4 months.

D) System checking, performing corrections and new development is a stage with two activities: new system checking performance and continued development that are in discontinued interaction. Those activities are performed continuously.

Today, it can be marked that the implementation of DMS in Varaždin County was successful because it was planned very well, had good support from top management and good will and patience of all other EDMS users. The whole process of planning and implementing was conveyed during a period of 13 months.

IV. DMS application

The new DMS is better than the old one as the performance of the new system is better than the performance of old one. Classical indicators like "economics" and "rate of investment recovery" can just partly reveal the effects of new DMS. In most cases those indicators don't show positive or economical relevant results. Today, it is believed that just a small amount of indicators can be measured with classical methods, and for the majority of new DMS effects new indicators and methods for measuring must be revealed. That stands in particularly for non profit organizations, like Varaždin County. Effects of the new DMS should be measured through the enhancement of performance of the whole DMS, which can be expressed through four different perspectives: financial success, relationship with users, business processes and learning quality and finally, growth and development. It must be stressed that DMS performance will be measured through discovering new perspectives and indicators, building new metrics that will be connected with those indicators in balanced scorecard (BSC) system. Evaluation of indicators must be conducted continuously, through the whole DMS life cycle.

A. Implementation results in Varaždin County

Varaždin County doesn't have an integrated information system, so they don't have the necessary infrastructure which can measure the designated check points and can't use a balanced scorecard system, yet. BSC principle will be incorporated in all new improvements of the integrated information system. In our case we can use measures like "average time of processing cases" and "rate of active and passive time of case processing". In table 2. are shown DMS implementation results in Varaždin County. It has to be mentioned that according to Office work regulation [7] case can be active for two years. Therefore the real results of unsolved cases for 2005 and 2006 year will be proved in year 2007 and 2008.

TABLE 2: IMPLEMENTATION RESULTS IN VARAŽDIN COUNTY

	Year	
	2005	2006
No. cases	2049	1722
No. solved cases	1619	797
No. unsolved cases	430	925
Average time of case processing (days)	158	84

B Advantages and disadvantages

Varaždin County has been using DMS for two years. After this period of time some DMS advantages and disadvantages can be specified.
DMS advantages are shown in:

1. faster document distribution and retrieval;
2. centralization of archiving; accessibility, security and control;
3. makes work with customers and the decision-making process easier;
4. better distribution of work;
5. better electronic documents handling;
6. no time-consuming document handling, archiving and searching;
7. less space for archiving;
8. reduce labour and streamline processing through automated workflow features;
9. provide more convenient and faster access to case files;
10. eliminate lost and misplaced files.

Specified disadvantages are:

1. dependence on Microsoft technologies;
2. rejection of individuals;
3. lack of IT skills;
4. other institutions don't use DMS and they are not connected with our system;
5. significant costs;
6. impossible to cover all business procedures.

All systems have more or less advantages and disadvantages; but management must accept certain risk and decide whether they'll accept some problems and costs in implementing DMS. In the long term view, their business will benefit from the DMS advantages.

V. CONCLUSION

Regarding two years DMS implementation results in Varaždin County it can be marked that DMS has greatly facilitated case and act creation, distribution, control and retrieval processes as well as internal communication. Act digitalization has enabled simultaneously access to act content all authorised users. Duplication and losing documents problems, as problems with documents positioning are solved with DMS. Average time of case processing is decreased. Despite all mentioned improvements it needs to be stressed that neither DMS will solve problems related to business organization.

REFERENCES

[1] Y-H. Yao, A.J.C. Trappey, P-S. Ho, "XML-based ISO9000 electronic document management system", *Robotics and Computer Integrated Manufacturing*, vol. 19, pp. 355-370, 2003.

[2] H. Zantout and F. Marir, "Document management systems from current capabilities towards intelligent information retrieval:an overview", *International Journal of Information Management*, vol. 19, pp. 471-484, 1999.

[3] B. Duhon, J. Patel, R. Tucker, "What is ECM? ", *AIIM - The ECM Association*, <http://www.aiim.org/about-ecm.asp>, (accessed 17.01.2007.)

[4] M. Raynes, "Document management: is the time right now? ", *Work study*, vol. 51, no. 6, pp. 303-308, 2002.

[5] G. P. Johnston and D. V. Bowen, "The benefits of electronic records management systems A general review of published and some unpublished cases", *Records Management Journal*, vol. 15, no. 3, pp. 131-140, 2005.
[6] Z. Sabati and R. Kelemen, "Document management system in local (regional) government", *14th International Conference on Information and Intelligent Systems*, September 24-26, FOI, Varaždin, pp. 165-175, 2003.
[7] ***, *Uredba o uredskom poslovanju*, Narodne novine No. 38/87, 1987 (in Croatian)
[8] V. Srića, A. Kliment, B. Knežević, *Office work, Strategy and concepts of office automation*, Sinergija, Zagreb, 2003. (in Croatian)
[9] M. Lozano and L. Wallés, "An analysis of the implementation of an environmental management system in a local public administration", *Journal of Environmental Management*, Vol. 82, Issue 4, pp. 495-511, 2007.
[10] N. Vrček, D. Kermek, "Sustavi za upravljanje dokumentacijom u javnoj upravi", *Case 15*, Opatija, 2003. (in Croatian)
[11] T. Arnold-Moore, M. Fuller, R. Ron Sacks-Davis,: "Approaches for Structured Document Management", http://www.mds.rmit.edu.au/~msf/papers/MT99.html# SIM-WEB, 1999. (accessed 01.06.2003.)
[12] V Strahonja, M. Varga, M. Pavlić, *Projektiranje informacijskih sustava (Metodološki priručnik),* Zavod za informatičku djelatnost i Ina-Info, Zagreb, 1992, (in Croatian)
[13] J. Brumec, V. Dušak, N. Vrček, "Framework for Strategic Planning of Information Systems", *Seventh Americas Conference on Information Systems*, 2001.