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Architecture Software Solution to Support and Document Management Quality System

Abstract: *One of the basis of a series of standards JUS ISO 9000 is quality system documentation. An architecture of the quality system documentation depends on the complexity of business system. An establishment of an efficient management documentation of system of quality is of a great importance for the business system, as well as in the phase of introducing the quality system and in further stages of its improvement. The study describes the architecture and capability of software solutions to support and manage the quality system documentation in accordance with the requirements of standards ISO 9001:2001, ISO 14001:2005 HACCP etc..*
Keywords: *documentation, quality system, case, study, software solution*

1. INTRODUCTION

One of the basis of a series of standards JUS ISO 9000 quality system is documentation. The complexity of the business system architecture depends on the quality system documents. The practical implementation of quality systems requires that all its elements (organization, processes, procedures and resources) are:

- prescribed (introduced),
- consistently implemented and
- confirmed (done in practice).

The importance of documents in the system of quality expressed through the two points of standard ISO 9001 is exclusively dedicated to the quality system documents (items 4.5 and 4.16).

An establishing effective quality management system documents, with the structure shown in Figure 1, is of a great importance for the business system, both at the stage of introduction of quality systems and later in the stage of its further improvement.
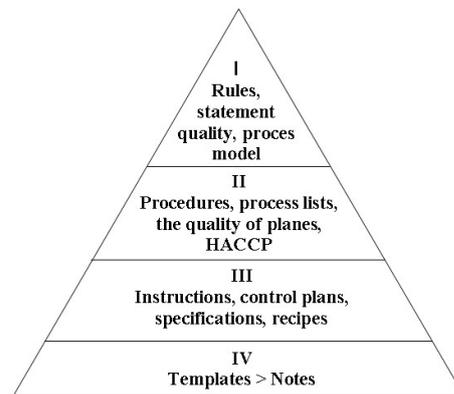

Figure 1. Pyramid of the quality system documentation

This is achieved by the following measures and activities:

- Manage documents on the basis of written procedures
- Ensuring that the valid document issues are on all necessary points in the business system
- Fast withdrawal invalid documents
- Review and approve changes
- Establishing of the main list-the register of valid documents (in order

to monitor all actions within documents)

- Re-issuance of documents after a certain number of changes
- Adequate storage and archive of documents.

Documents, that is streams of documents, are allowing connection of all activities and processes in the business system as well as organization parts, without which it is almost impossible to manage business system (Figure 2).
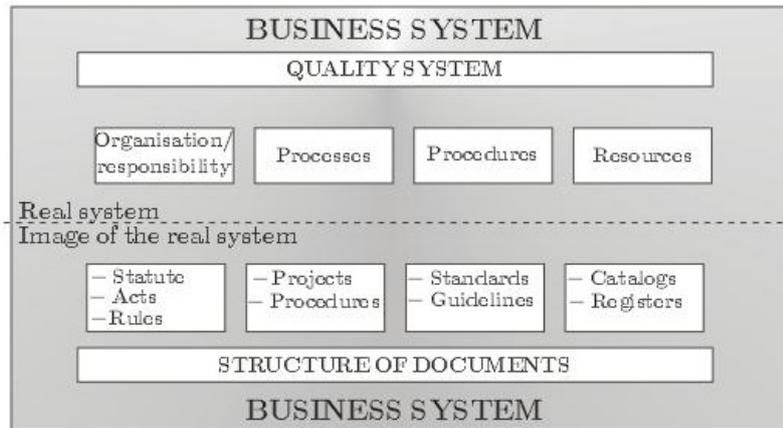

Figure 2. Overview of elements of quality system documents in the business system

As the documents are basic information, it is a form of information system where, through the development, implementation, verification and validity of documentation leads to a proper and fully documented business processes and activities. In this way the application has also the role of a pilot plant for the preparation and implementation of organization and subsequent permanent improvement and integrated information system of computers.

2. APPLICATIONS FOR DOCUMENT MANAGEMENT - QDOC

2.1. The aim and purpose of the application

The aim of document management applications (QDoc) is to enable effective monitoring and document management system and quality standards of technical processing of documents.

T he application is designed to work in a network environment (there is a single-user version of the application), which allows the establishment of internal standards in the organization for the development of quality system documents. The data required for the application QDoc is:

- Data quality system documents (level of documents, published documents, the status of the document),
- Staff data (responsible, professional qualification , jobs, ...)
- Information of units of the organization,
- Points of standard ISO 9001,
- information on the responsibilities of the quality system,
- Data on consumer applications for the technical documents processing (Word, WordViewer, ...) and
- Data that depend on the specific request of a user application QDoc

On the basis of input data management application documentation QDoc generates the appropriate output

information in the form of views and reports. Viewing the output information is displayed on the screen (monitor display). From the review it is possible to perform appropriate actions in the application (for example, select a document from the list given in the examination and enter into its content). Views are not printed. The report presents information from the output that is not possible to do further action in the application except for printing.

List of output information:

1. Index of the quality system documents
2. List of documents distributed by units of organization:
   - for all units of organization
   - for the selected unit organization
3. List of users documents:
   - all users for all documents
   - all users for the selected document
4. List of amendments on documents:
   - For all documents
   - For selected document
5. List of documents by:
   - Status of documents
   - point of standard
   - level of documents
6. List of persons responsible for the documents by units of organization

7. Matrix of responsibility:
   - By units of organization
   - by points per standard
8. Telephone directory of responsible people.
   It is envisaged by that during implementation, and according to the specific requirements of users can:
   - change all existing reports
   - add a new (specific reports).

2.2 Setting a logical application

QDoc application is designed to represent the image of the real system in the area of monitoring and managing quality system documents. QDoc application is divided into two logical units:

- Adm. – Administrator of Documentation Center,
- Core - users of the quality system documents Show romanization

As in the real system, monitoring and document management quality system is central. Writing and use of documents, that is the application is distributed.

An administrator of information about the quality system documents can only enter, delete and update data in the database.
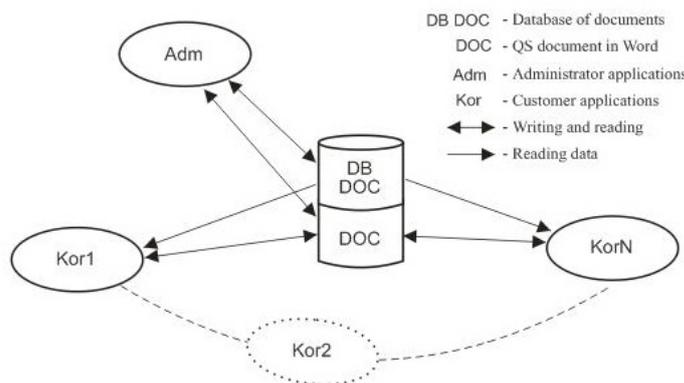

DB DOC - Database of documents
DOC - QS document in Word
Adm - Administrator applications
Kor - Customer applications
↔ - Writing and reading
→ - Reading data

Figure 3 Schematic diagram of the variations of network

User applications contain only summaries and reports from the database. Logical architecture (Figure 3) is based on central data (databases and documents), which provide consistency of data in distributed applications, which is reflecting the use of documents in the real system.

2.2.1 Administrator mode applications

Application for administration and management of documents is provided for that function in a company that is responsible for document management. If such a function before the introduction of quality systems did not exist, then the quality assurance function is to perform such tasks.

Administrator performs data entry and update your records in the system. This ensures the unique data management documents. The administrator is the one who follows the life cycle of documents through information about them.

Administrator determines the location on your computer and saves the current quality system documents so that the other users can read from your computer but not change. He is responsible for all data in the application as well as for updating the quality system documents at the central disk.

His duties and responsibilities are:
- Initiation of the application,
- Saved data,
- Defining the location of the quality system documents on the disk for network environment,
- Monitoring the status and content of the quality system document (as far as technology is considered),
- Distribution of quality system documents
- Archive of documents and data about them production and store the backup database and current and withdrawn documents.

2.2.2. User-mode applications

Authors / users have the opportunity to make a draft document of the quality system by themselves with unique templates that are built into the application. The features that give information about the ISO 9000 standards as well as sketches for drafting procedures and guidelines of quality are of a great help. Due to an application designed for network operation, all users see the same information and documents at any time directly from the application to choose the paper quality system and to read its content.

Author / user is provided by: Developing of draft documents and running them for the system administrator document.
- Write and edit the document for which he is charged by the administrator.
- Controls and approves the document, for which is in charge the administration.
- Accept the distributed documents
- Perform Review
  - of documents in the design,
  - of valid documents
  - and documents of the quality system in the archive
- Perform data from the document
- Print the reports and the documentation
- Viewing and fill in the existing forms-forms that are distributed to him (viewing and creating records)
- Has an access to the standards that are documented

3. ALGORITHM OF THE USING OF THE APPLICATION

Administrator setup and initialization is done by defining the application and

M. Erić, V. Nedić, M. Stefanović, M. Djukić

entering the code lists.

The user with a help of the template forms (framework) of the draft document on a network drive (Figures 4 and 5), in a location that is reserved for the user under the name of the document which he proposed.

Based on the Quality Plan in which are defined quality system documents, the administrator performs data entry on the documents which are the necessary, and which are not run as a draft document.

Administrator forms the temple with "framework" for the recorded document on a network drive, the location and under the name of the document that is entered into the database. "Framework" of the document can be essentially empty or with the contents of the user's draft from which is created.
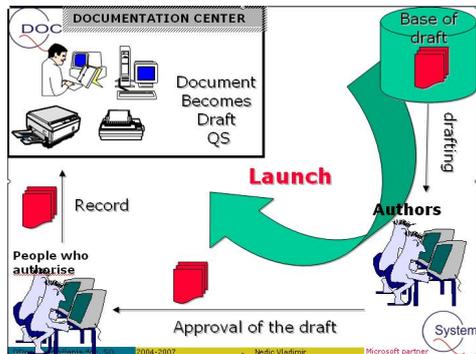

Figure 4 Schematic view of its drafting and for the candidate document QS

The user who is tasked to draft a document can now through application joins the "framework" of the document and introduces the essential content of a document or edit the initial proposal - draft.

The User translates the document ready for review, which gives a signal that he has completed form and put the document to be controlled.

Controller shall review the document and translate the document, allowing signals that document control is finished and put forward for approval.

The person who gives authorization shall approve the document and translate the document, which is the signal that he completed approval of the document and put forward to the administrator for the distribution.
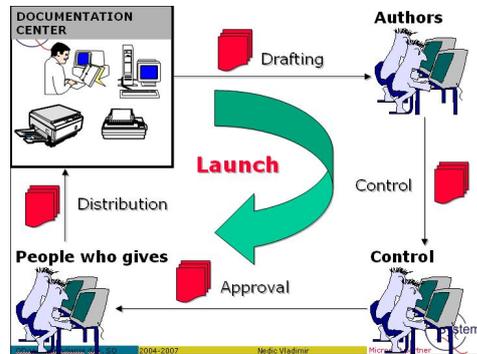

Figure 5 Schematic diagram of the workflow of the document QS

Administrator reviews the technical accuracy of the document and distributes the documents (Figure 6).
During the activities in the process of making and using the application document is created automatically by sending electronic messages. In this way, by the e-mail communication channel information are submitted as an initial trigger of the next activity in the process to the actors.
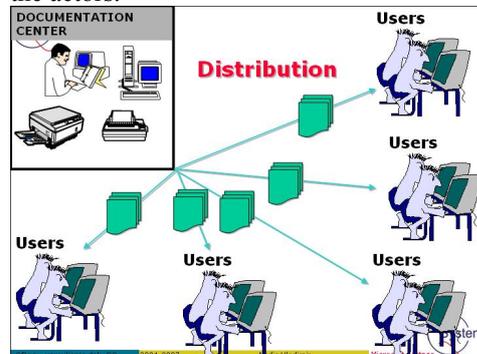

Figure 6. Diagram of the distribution of documents QS

QDoc algorithm of using a phased life cycle of the document shown in Figure 7
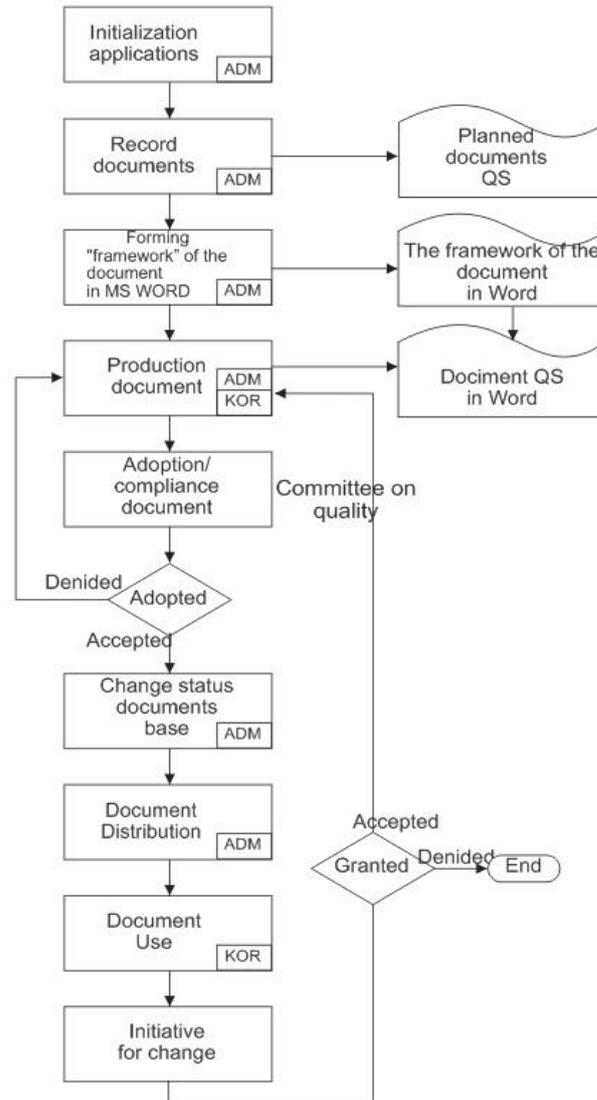
Figure 7. Algorithm of using the application QDoc

4. QDOC APPLICATION OF PLATFORM DEVELOPMENT

The concept of decision and action plan for implementation of the following requirements imposed the choice of technology for implementation:

- Small office platform level-because it is a small working group of active users

- RAD (rapid application development) tool to facilitate the implementation cycle and enable flexible and adaptable solution to go

- Language program and DBMS (data base managament system) that are members of QDoc team has trained and experienced in its implementation, and whose

436   *M. Erić, V. Nedić, M. Stefanović, M. Djukić*

licenses do not represent a heavy burden for the user.

When the operating system is considered, there was a dilemma between the initial Linux and MSWindows, but it is outdated facts that:

- Microsoft Windows family operation systems are the most present in Serbia and it's surrounding.
- that the team is trained to work under Linux
- that the MS Office platform development is only fully integrated with MS Windows operating system.

After defining such clear criteria ,we very easily come to the proper development platform. For the language program was chosen Microsoft VB6 and VBA in the form of Office 2003 with the following components:

- MS Access as the platform for the development of application solution
- MS JET 6.0 or MS SQL as DBMS which are naturally based Access (for small working groups provided the jet, and for multiple users, while SQL is the decision of two DBMS's pick will be decided by creating a logical data model)
- MS Word and MS Excel as generators of necessary documents and complex patterns that exceed the capabilities of design reports in Access.

For the final version of the software solution are discussed the key features of client server architecture (Fig. 9) and file server architecture (Figure 10) shown in Table 1
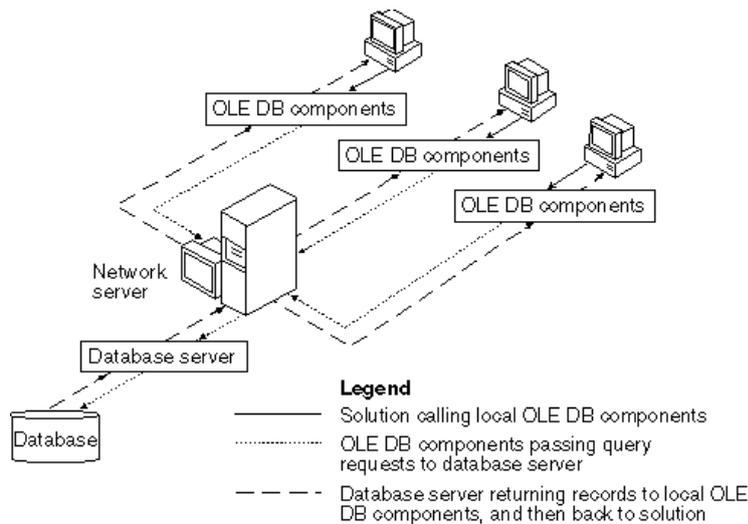

Figure 8. Client server architecture

The client server model is based on the distribution of functions between the two types of independent and autonomous processes: server and client. The client is any process that requires specific services from server process. The server is a process that provides services to clients.
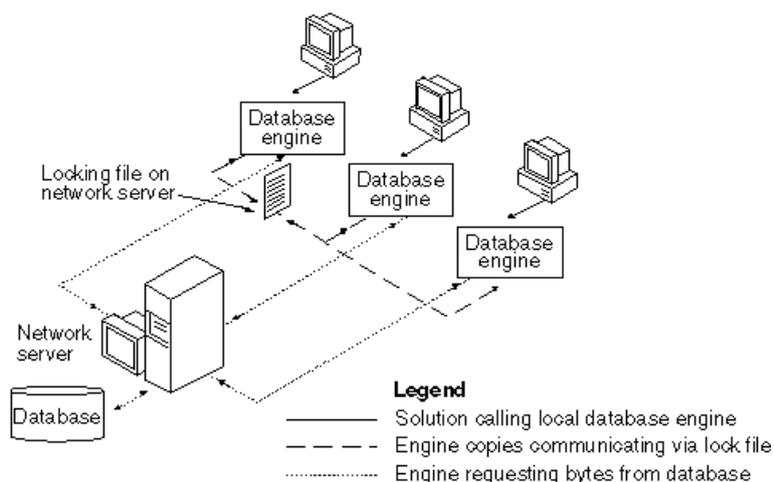
Figure 9 File Server Architecture

Unlike the client server, file server is based on the complete data processing on the client side and server has the role of managing storage manipulations with shared files that contain data. Virtually every customer is a DBMS for themselves, and the processes of data processing are performed partially on each client computer.

Table 1 Analysis of the client and the file sever architecture

Characteristic	Client server	File server
Availability of technology	Available, such as MS SQL server that exists in the free version for small working groups, but is required installation and configuration	Available with presence of Windows OS and MS Office
Develop tools	It is Possible the development of MS Acces, but also other development tools	Primarily developed in MS Access through VBA and the VB.
Human resources	IT professionals are needed in the DBMS, application development and network technology.	The primary need is only IT professionals in the field of MS Office systems
Scalability (expansion of the number of users)	Virtually unlimited scalable	Very little scalability (max. about 15 competing users)
Security and reliability	Wide range of levels of security, very reliable	The low level of security and reliability, which decreases proportionally to the number of beneficiaries. After 15 concurrent users rapidly decreases reliability.

M. Erić, V. Nedić, M. Stefanović, M. Djukić

Characteristic	Client server	File server
Speed response	Managed resources in virtually unlimited scope	Slowing down the number of users, can be accelerated but hardware resources to the limit of about 15 competing users, when the speed of response is rapidly decreasing. Under 15 users speed is approximate and as well as the SQL solutions.
System Maintenance	Need professionally trained administrator	The user maintains a system

Comparative analysis has shown that technology is acceptable and file server technology is widely issued for the specific project that was developed as a small office problem.
Shown in Figure 10 is an integral logical data model for creating, monitoring and document quality system management, where you can see all the entities and their attributes as well as all types of connections between entities.
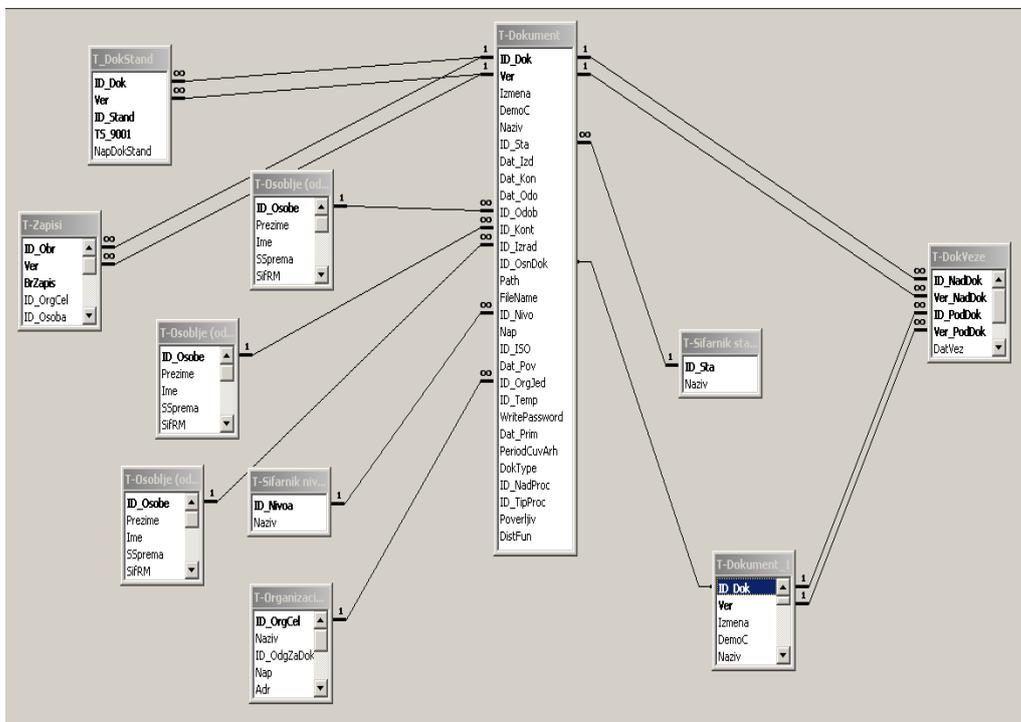

Figure 10 The logical data model applications QDoc

In addition to data model ,the model was made in the menu that users access to certain parts of the application. Separation of logical part of the database is done by embedded development platform tools (MS Access database splitter), but at the file server, which is a technology that allows for 15 concurrent network users.

5. TCO APPLICATIONS ANALYSIS OF QDOC

TCO (Total Cost of Ownership) is an addition to the cost of software (software license), and the cost of hardware, maintenance, implementation and staff training. Knowledge of a TCO allows optimal planning and implementation and consolidation of system architecture and components of optimal merging of different scenarios and their integration into a single physical business environment.

TCO software solution is much more than its purchase price and refers to the sum of all costs related to the use of the solution. In the case of software QDoc it makes sense to analyze the TCO, but as a small-scale project (can be shown as business but not as complex solution types ERP (Enterprise Resource Planning) solution), does not require consideration of the detailed list of costs, but only determines the type and cost trends in certain phases of the project.
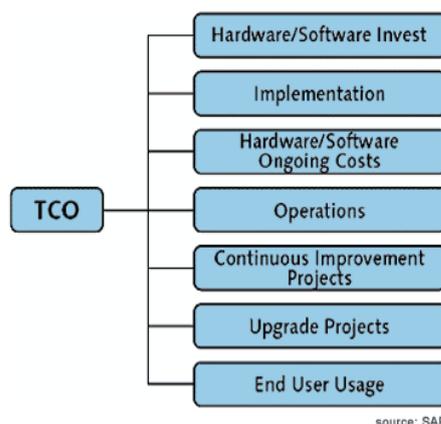

Figure 11. TCO model

Figure 11 shows the TCO model elements set out in chronological sequence based on which Table 2 was performed descriptively where are given the costs and their trends in the implementation and operational use QDoc solutions.

Table 2 TCO analysis software QDoc

Characteristic	Description of Cost	Cost/Trend
The investment in hardware/software	In most cases this is an existing hardware and software (MS Windows and MS Office).	Peaks: The cost of adaptation Qdoc due to a change in OS and Office versions
Implementation	Defined and usually included in the price solution , the small risk of breaking the cost	Fixed during the implementation
Current cost of hardware/software	In most cases it is a cost to maintain existing licenses OS and Office	No cost
Operational costs of the project	Calculated in price during the implementation of solutions defined as the cost consultant / day in the later use	Fixed in the implementation, ranging from operational problems, but do not exceed 20% of the cost solutions. Downward trend.
Continuous improvement	Technologically possible to take the staff client and usually calculated in operating costs.	Internal cost or cost consultant / day. Downward trend.

M. Erić, V. Nedić, M. Stefanović, M. Djukić

Characteristic	Description of Cost	Cost/Trend
Upgrade project	Upgrade to be a custom for each user and is often related to the OS upgrade on the Office platform.	Varies from 30-50% of the cost of the initial solution. Fixed cost.
Cost of use of end-users	Initial training and training in the price are calculated in solutions, and additional training is calculated in operating costs. It is Possible to take over IT staff client.	Fixed during implementation. About 20% of the cost solutions as well as additional cost is added to the downward trend.

The table shows little variation QDoc solution costs and their downward trend in operational use. We also have a small indirect costs (costs not included in the price decision by the implementers of the project). However, there are substantial potential indirect costs caused by changing business versions of MS Windows and MS Office as a platform on which is based QDoc solution, and that can be very little impact.

The final conclusion is that the TCO project QDoc can be sufficiently measured in the planning phase and is within the limits allowed for small scale projects.

6. CONCLUSION

By implementation and operational management of document quality system use as the framework application of quality systems in the foundations for further development of the company is controlled both in terms of increasing the scope of application of information and communication technology and in terms of increasing the ability to improve business systems and adapt to the demands of the environment.

On the basis of this conceived solution of documents it is possible to do the further development of information systems without the risk that there will be disruption of existing elements of the system.

REFERENCES:

[1] Documents management guide for Office SharePoint Server 2007, http://go.microsoft.com/fwlink/?LinkId=92720, July 2008
[2] Records management guide for Office SharePoint Server 2007, http://go.microsoft.com/fwlink/?LinkID=92638, December 2008
[3] S.A.Becker - Effective Databases For Text And Document Management 2003 by IRM Press
[4] Alfresco – A Fresh Approach to Content Management, Copyright © 2005 Alfresco, Inc.
[5] Managing Alfresco Content from within Microsoft Office, Copyright © 2005 Alfresco, Inc.
[6] http://www.iso.org
[7] http://www.evrocert.co.yu/
[8] http://www.qualityaustria.com/
[9] J. Jovanovic, Z. Krivokapic ,Model Of Improving Environmental Management System By Multi - Software, International Journal for Quality Research, Volume 3, Number 1, 2009, pp 37 - 51

M. Erić, V. Nedić, M. Stefanović, M. Djukić