APPLICATION OF SHAREPOINT PORTAL TECHNOLOGIES IN PUBLIC ENTERPRISES

Dragan Đokić,*

PE Post of Serbia, Takovska 2, 11000 Belgrade, Serbia, drdjokic@fon.bg.ac.rs

Marijana Despotović Zrakić,

Faculty of Organizational Sciences, University of Belgrade,
Jove Ilića 154, 11000 Belgrade, Serbia, maja@elab.rs

Zorica Bogdanović,

Faculty of Organizational Sciences, University of Belgrade,
Jove Ilića 154, 11000 Belgrade, Serbia, zorica@elab.rs

Aleksandra Labus

Faculty of Organizational Sciences, University of Belgrade,
Jove Ilića 154, 11000 Belgrade, Serbia, aleksandra@elab.rs

Abstract

Nowadays, systematic reforms are realized across many countries. One of the characteristics of these reforms is necessity for rationalization of expenses in governmental and public enterprises. Rationalization of expenses can be achieved by more extensive application of information and communication technologies based on internet technologies and cloud computing. These systems include huge number of services, applications, resources, users and roles. At the same time, concepts of scalability, availability, ubiquity and pervasiveness need to be applied.

This paper deals with application of portal technologies for enhanced content management, document management, and collaboration within public enterprises. The goal is to achieve efficient exchange of information on all hierarchical levels, as well as mechanisms of reporting and performance measurements, such as business intelligence and key performance indicators. The model is based on SharePoint portal technologies. A case study of application within the public enterprise Post of Serbia is described.

Key words: web portal, document management systems, intelligent document management, SharePoint.

1   Introduction

Nowadays, challenges such as great financial turbulences, business systems transformations, everyday struggle for market position, new means for lowering costs, etc. lead to necessity of higher usage of information and communication technologies (hereinafter ICT). This necessity is even more emphasized in large enterprises, both public and private. Redefined rules of doing business on the global market while competing on the local markets, imposes optimization of all aspects of business, including infrastructure, technology, and human resources. Application of new ICT leads to transformation of business processes, which leads to higher productivity, higher concurrency, lower expenses, and greater incomes. New technologies also bring new services, some of which include: business process automation, collaboration of employees, virtual working spaces, e-document and e-task management, business intelligence, and many others (Đokić, D., 2012).

The main research subject of this paper is exploring possibilities of application of SharePoint application like platform for development of portal for collaboration and intelligent management of e-documents using adaptive services. Integration is related to human resources, information, processes, and application components.

The primary goal is the development of model of adaptive web portal for intelligent management of e-documents based on the use of Microsoft SharePoint Server platform. Design and implementation of the portal are based on adaptation and personalization.

Main hypothesis is that by using the SharePoint Portal Technologies as a platform, it is possible to provide the development of a basic model of the adaptive web portal. It is possible to provide a high level of collaboration to users in large enterprises, by using the adaptive web portal based on SharePoint technologies. Application of this portal leads to integration of processes and information, fast search of documents in heterogeneous sources, and better decision making by using business intelligence.

2   Microsoft SharePoint portal technologies

Structured data are only a tip of an iceberg compared to the overall quantity of data in companies. Over 80% of data are unstructured. According to Gartner, there are 300 million Excel installations worldwide, 200 million PDF files on the web, around 100 million of new Office documents are generated daily. Does this affect the complexity? The answer is given by Massimo Pezzini, vice president and distinguished analyst, Application Integration & Middleware Strategies at Gartner, Inc. „For medium-to-large organizations, unstructured, semi-structured and complex-structured data has become prevalent in many service-oriented integration scenarios. At time complex transformation requirements go beyond the capabilities of many traditional integration solutions and instead must be coded by hand, which can impact up to 60-70 percent of an integration implementation budget.“

If we want to look the overall aspects of availability, quality and relationships between our data, we need to analyse three segments of integration:

1. Company integration - the integration within the company is considered as a traditional aspect of integration.
2. ON-demand integration, such as SaaS
3. B2B integration, which is characteristic for relations and data exchange among business partners.

ON-demand integration in case of On-demand companies (SaaS) and B2B integration of data in case of Partner Networks (B2B) make direct impact on the quality of data in an enterprise.

Relations between e-documents, databases, file shares, forms, and workflow - business processes are very complex. Each individual step involves lots of back and forth, document creation, presentations, negotiations, etc. Back-end systems don't define this process, they just assist the transaction. People are at the core of business processes – they capture, create and share information. Productivity is directly related to process and information – the less time someone looks for things, the quicker they have access to what they need. The more we can integrate and automate, the more productive we can be.

Uncoordinated processes can't easily solve the problem of the unstructured work world. On one hand, you are expected to navigate through the various interfaces and processes – enterprise apps, multiple locations across the network and PC for documents and information, structured data and forms in both paper and digital format, and various processes such as content and document lifecycle management, enterprise project management, etc. On the other hand, most of your day-to-day work routine also involves unstructured processes – creating documents, collaborating with colleagues, performing ad hoc tasks and workflows where there is no IT support, and searching for content in various repositories.

The result is that the individual worker becomes the point of integration for all these different investments. In other words, people become the middleware. People who were hired for their talent and expertise instead spend their time gathering information, coordinating meetings and facilitating processes. This often results in diminished productivity. And ironically, the more organizations invest in IT solutions to address different facets of this problem, the more complex the information environment can become.

Microsoft SharePoint is a platform for integration of web applications, developed to integrate a large number of applications and services. It is commonly related to the functions of document management and content management. It supports intranet and extranet web site management; document management; collaboration; social interaction and networking; search; business intelligence; integration of processes and information. The main advantage is that all intranet, extranet and web applications can be integrated in a single platform.

For each business level in an enterprise MS SharePoint has a site template, such as: My sites, Team sites, Collaborationists, etc. Using SharePoint-a as an extranet solution gives

possibilities for multiple collaboration modules with business partners, government entities, and customers.

3 Development of a model of portal for intelligent management of e-documents and collaborations

3.1 The integration of the components of the portal for the intelligent management of e-documents

Designing a system for adaptive management of e-documents includes implementation of a DMS, integration of Internet services within intranet network, and a business information system. (Despotović, M., Savić, A. & Bogdanović, Z., 2006). Integration is realizes on multiple levels:

- People integration - users can access system or communicate between themselves from any location. Each user accesses their own personalized set of resources. User data are stored in Active directory, so they can easily be integrated with other components.

- Information integration - the system enables collecting of various, non-structured data, whereas the users can access the structured information through portal. This is achieved by use of the "content management" service. Also, the users can obtain various kinds of reports, analyses, data interpretation, etc.

- Process integration - existing business processes are integrated by use of XML Web services. Each user is assigned with a set of tools that correspond their business role.

- Application Platform - applications are realized by use of various technologies, so that the integration must be carried out at the application level, as well.

Each of these components includes additional components shown in the Figure 1.
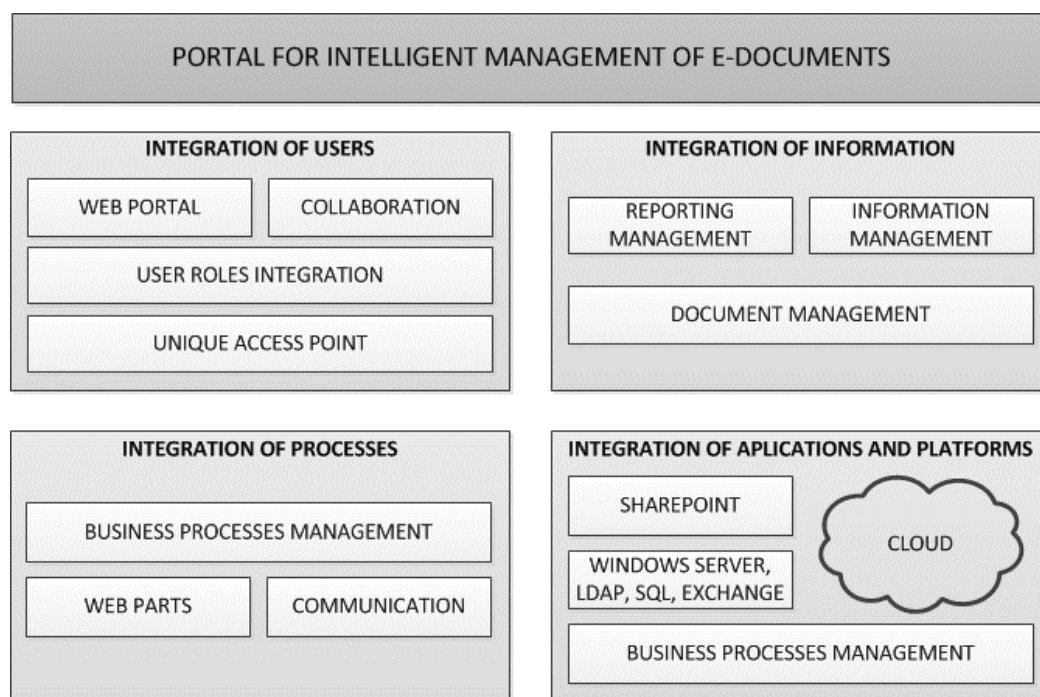
Figure 1: The integration of the components of the portal for the intelligent management of e-documents

3.2 Web portal architecture

There is no standard architecture of corporate portals. However, most of corporate portals share a set of functionalities that need to be included (Jevremović, S., Vujin, V., Bogdanović, Z., Đokić, D. & Barać, D., 2012).
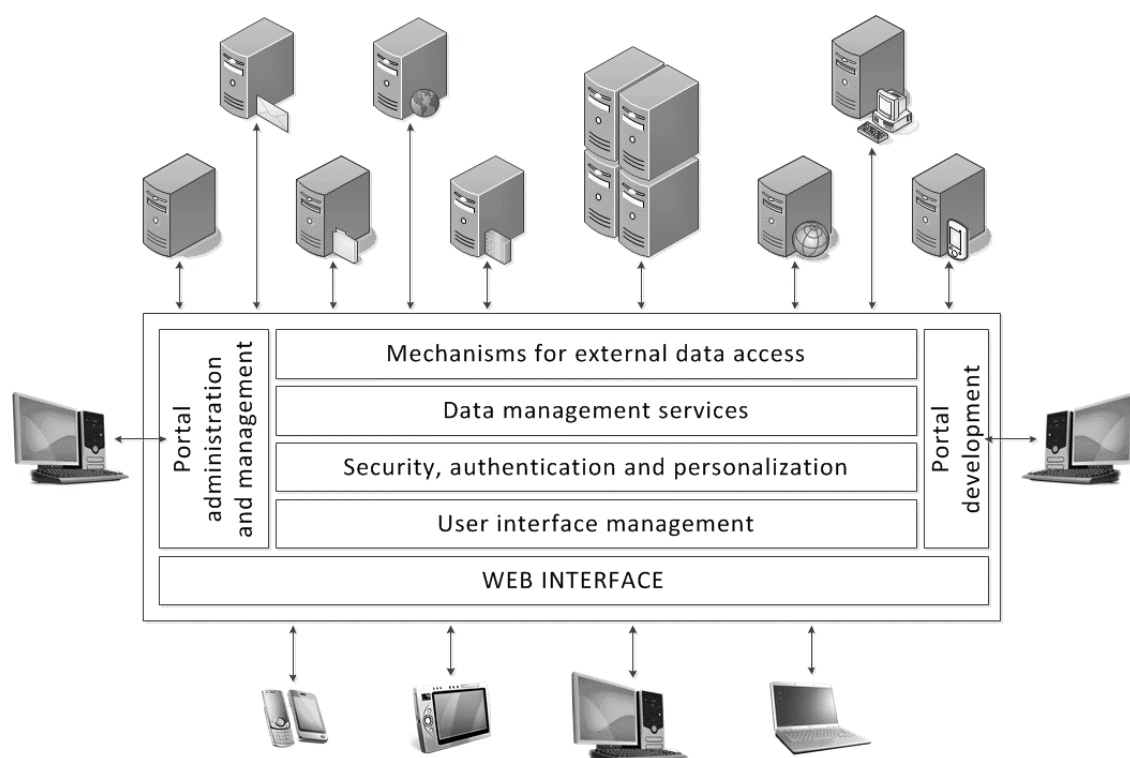

Figure 2: Typical web portal architecture

Figure 2 shows a model of a typical web portal that includes: data sources, access to external data, services for data management, security, authentication and personalization, user interface management, web interface for interaction with users. Monitoring, management and development are permanent processes realized by IT staff.

Functions such as aggregation, search, collaboration, document management, business intelligence, activity management, can be systematically incorporated into data management services. Additionally, web interfaces can be extended with protocols such as SOAP, WSDL and UDDI. Flexibility and extendibility are key features of many modern portal solutions (Đokić, D., 2012; Đokić, D., Despotović-Zrakić, M., Barać, D. & Simić, K., 2012; Đokić, D., Despotović-Zrakić, M., Labus, A., 2013)

Basic components of a web portal based on SharePoint are: application services, administration services, basic services, Windows SharePoint services 3.0, database, as well as additional servers such as Office Project Server and Office Forms Server. The most important development tool is Visual Studio .NET (Barać, D., Bogdanović, Z., & Damjanović, 2008; Bogdanović, Z., 2011; Jevremović, S., Vujin, V., Bogdanović, Z., Đokić, D. & Barać, D., 2012).

3.3   Web portal metrics

It goes with saying "if you can't measure it you can't manage it". This is not always so easy on SharePoint from a business user perspective. When determining metrics, you'll need to demonstrate that your site / project is meeting and supporting business objectives. In addition, metrics need to be defined for IT SharePoint Administrators and for SharePoint Business Users.

Metrics for IT SharePoint Administrators include Basics of performance monitoring, and Key performance metrics, where the main goal is to keep users happy and productive. There are two aspects to take into consideration, quantitative (numeric information), and qualitative (non numeric information). In other words, the number of clients that have visited your site (quantitative), and their current happiness level by the survey they completed (qualitative).

That doesn't mean much to business decision makers, however: "I used to send email to 15 team members, than have to collate their responses and publish the results to management. I now send one email and the responses are captured by the team members themselves in a custom list saving me 3 hours of work per week. At my current rate of R100 per hour, I effectively save the company R15600 per year on this task alone". These are metrics management can understand and appreciate.

First you need to identify your business issues, analyse your "as is" situation, decide and document the ideal world scenario, think about how departments get information from each other, how well teams collaborate willingly and how information is found. How are you planning on retrieving your information a year-plus from now?

A large number of performance measurement indicators can be used for business users' metrics. KPI used to measure the performance are:

- Web-sites without visits - This SharePoint report shows list of the web-sites which were not visited in specified period of time.
- Visits trend - this report shows the dynamics of visits and intensity of visits for a period of time on a site or site collection. The SharePoint report displays detailed data concerning visits (quantity of visits, total number of pages viewed, average number of pages viewed per visit, average length of visit).
- Depth of visits - Visit depth is how many pages each visitor views during a visit.
- Visits - This report shows detailed information about each visit on SharePoint site (time, length of visit, number of pages viewed, and entry page).
- Page views - this report shows detailed information about each page view (time of hit, page opened by the user, IP of the user).
- Navigation details - the report shows the visitors' paths: entries, following pages, exits.
- Users activity - The report allows evaluation of user activity on a site or site collection (quantity of visits and visitors, quantity of returning visitors, total number of pages viewed, average number of pages viewed per visit, average length of visit)
- Visits by role - the report shows the summary of visits and visitors activity by roles.
- Visits by Share-Point department - The report shows the summary of visits and visitors activity by SharePoint departments.
- Visits by Active Directory department - the report shows the summary of visits and visitors activity by Active Directory departments.
- Browsers - What browsers visitors are using when visiting the site or site collection.
- Platforms - What operating systems are being used by visitors to the site or site collection?
- Site collection summary - The SharePoint report displays the summary statistics by the visits and visitors activity of site collections.
- Mobile Devices - List of mobile devices and number of visits by device.

4 Implementation and application development of a model of portal for intelligent management of e-documents and collaborations

4.1 Public Enterprise of Post Serbia

Public Enterprise of Post Serbia is the oldest transportation infrastructure system of the Republic of Serbia and one of the oldest organized systems of transmission of postal items in Europe (Public Enterprise of Post Serbia, 2014). It is a large and geographically distributed organization, with approximately fifteen thousands of employees in professional services, major postal centres, specialized work units, work units, postal services and 1,500 automated post offices. The organizational structure of the Public Enterprise of Post Serbia presents

complexity of the organization and was utilized for structuring web pages of the portal for intelligent management of e-documents (Figure 3) (Public Enterprise of Post Serbia, 2014).
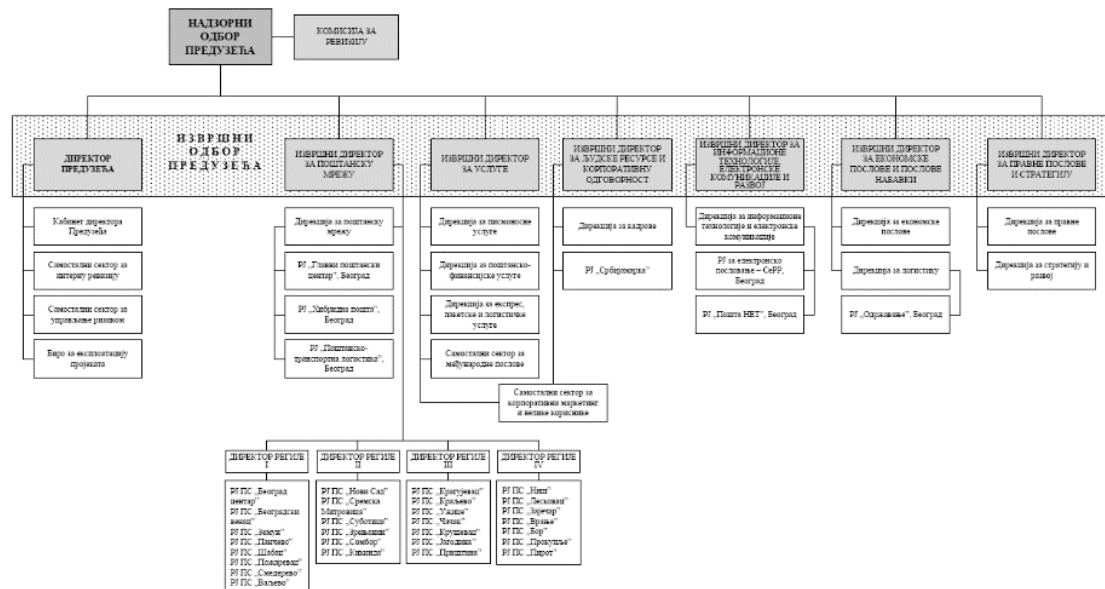

Figure 3: Organizational structure of the Public Enterprise of Post Serbia

4.2   Relations among users and dataflow

In large enterprises, thousands of users permanently exchanges huge number of documents. Figure 4 shows relations among organizational unites at different levels of hierarchy with horizontal and vertical e-documents flow. (Đokić, D., 2012).
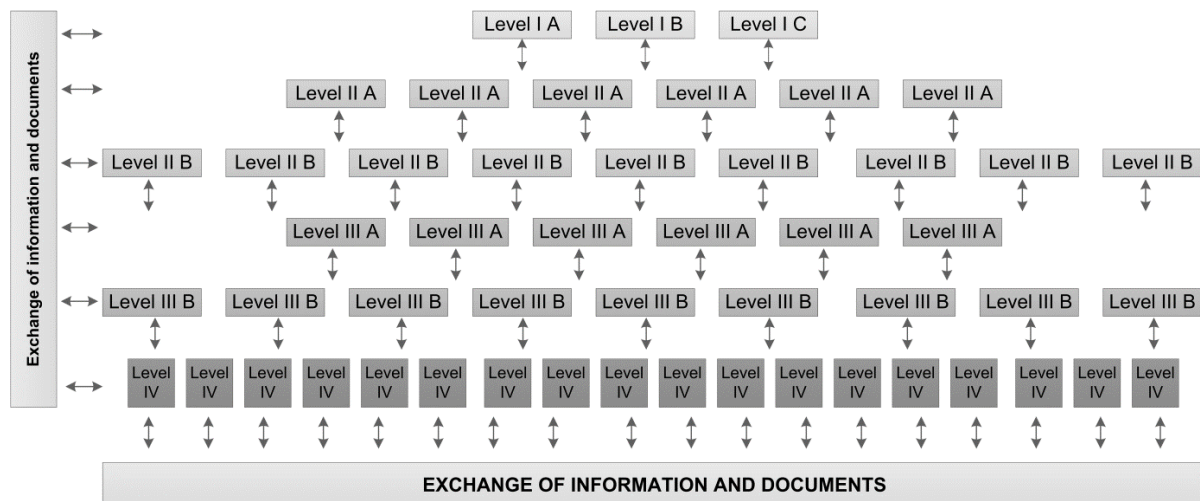

Figure 4: Model of exchange of information and document between organizational units

Collecting and researching users' data in the portal for intelligent management of e-documents can be managed from:

- questionnaires;
- different databases;

- different log files;
- Interview.

Information about the documents, user groups, business processes, projects and applications are stored in:

- Document database: types of documents, document metadata.
- Groups on AD and SP: structure and group names; authorization at the groups level.
- Database of business processes: specification of business processes.
- Project database: specification of projects in the phase of realization.
- Application database: specification of internally developed applications; specification of external application.
- Log files of the operating system: the number of access locations, the number of documents per location; commonly accessed sites; most users accessing the portal and other.

4.3   Web services of a portal for intelligent e-document management

The most frequently used services can be grouped into the following groups (Đokić, D., 2012):

- Presentation services (*Portal Presentation Services*) that provide personalized pages through content aggregation. The content of a page can be created through numerous databases and applications. Presentation is simplified through defining the structure of pages and using portlets. (Bogdanović, Z., 2011).
- *Single Sign-On* (SSO). SSO is an option that provides user to authenticate once and then seamlessly access all the available services and data. This option differentiates portals from web services, where user has the separate credentials for each service. SSO is complex for implementation, since many portlets can be shared among portals or pages within the same portal. Also, portlets can communicate with business applications, so the problems of security, identity and authentication rise.
- Directory services. Directories are databases that support frequent requests and queries for the stored documents. Directories contain mainly static data, and do not support transactions. Data in directories is stored in tree-like structures. Usually, directories are used to store users credentials, usually using *Lightweight Directory Access Protocol (LDAP)*.

The developed portal includes a large number of services:

- Services for the geographical location of users
- Services for synchronization
- Service to automatically download information (RSS Feed)
- Services for the selection of content
- Services for communication and collaboration

- Services for the management of e-documents
- Services for managing user accounts
- Services for reporting

Geolocation services enable optimization of network resource usage, by redirecting users towards nearest server with the requested resource. Users often require access to locations with large quantities of data of different formats, such as e-books, video clips, etc. One of the portal services enables geolocation of users and automatic redirection to the nearest location with the desired content (figure 5). In this way, the speed of download is increased, and savings are made regarding the network traffic. Precondition for this approach is that the document is updated on the master server, and then replicated to slave servers on multiple locations. Replication is performed in periods of low network traffic, i.e. by night. This approach may be used when update of documents is not time sensitive and time update is not requested. The nearest location is defined with respect to username that corresponds to an organizational unit located on a specific geographical location, or IP address of the computer used for access.
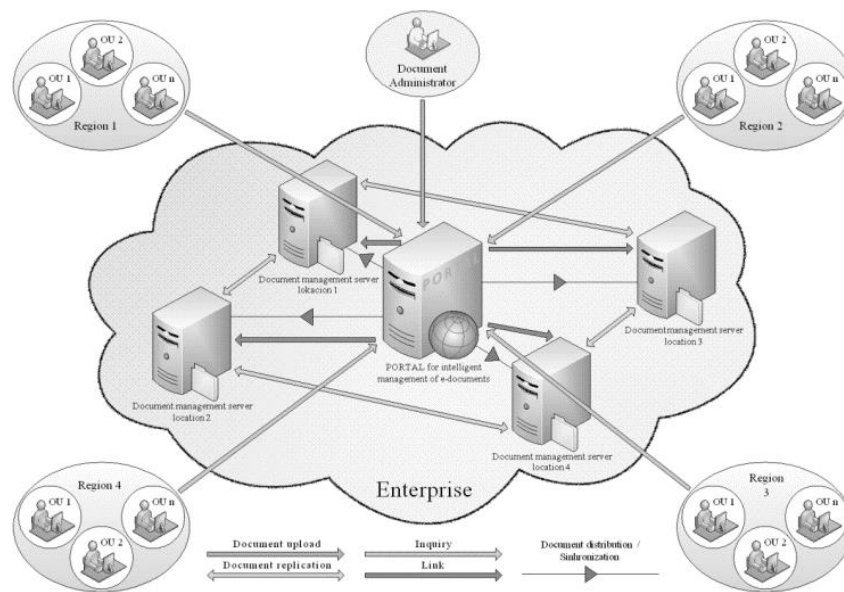
Figure 5: Services for the geographical location of users

4.4   Collaboration

The implemented portal for intelligent e-document management includes a number of services for collaborative work on e-documents. In addition, multiple models of collaboration are supported. Figure 6 shows the collaboration of users that work together on ad hoc tasks or collaborate on projects. Portal represents the central workspace for all tasks.
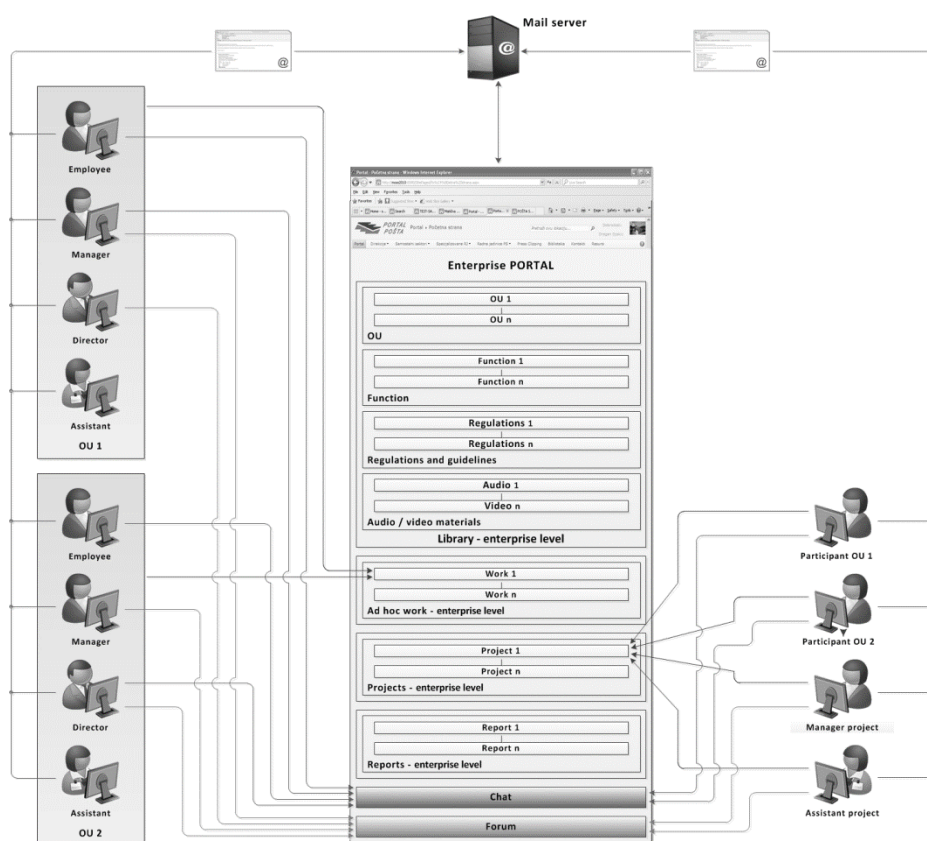
Figure 6: Collaboration within the portal for intelligent e-document management

Electronic collaboration can be performed through parallel work on e-documents (black line), using email (green line), chat (blue line), or forum (red line). Left side of the figure illustrated the participation of employees of ad hoc tasks, while the right side shows project team members. When e-document needs to provided to users outside the teams, they can be published in the portal library.

Project workspace in the portal is actually a web page that includes links to all project websites. Each project has its own website and user roles are defined separately for each project. Structure of the project website is determined by the organizational unite responsible for the project, therefore, the project web site include contents specific for the organizational unit. For example, project *POST-SAP* link leads to the website designed for the project that deals with SAP implementation.

If ad hoc tasks need to be realizes, a special category is defined for collaborative work on shared documents. Usually, this type of task is performed by members of multiple organizational units. Then, subcategories are defined for each subtask.

Collaboration of users is realized using the category titled "collaboration". This category groups features that enable collaboration of users, and includes features such as discussion, forum, chat, meetings, etc.

4.5   KPI for IT SharePoint Administrators

Table 1 shows key performance indicators for administrators of SharePoint portal. Rows show the analysed segments of the web portal, while columns contain referent values:

- Column "Good" shows normal ranges for segment of the web portal, such as processor load, memory load, hard disk usage, network traffic, etc. Values in these ranges indicate that the portal works properly.
- Column "Not good" shows ranges of negative values. If indicators are in these ranges, the system is critical; and corrective actions need to be taken.
- Column "Attention" shows ranges that show that the system still operates normally, but the special attention of administrators is required, since "not good" values may occur.

Table 1: KPI for IT SharePoint Administrators (example)

	Good	Attention	Not good
CPU Usage	< 60%	60-90%	> 90%
Memory Free %	> 50% free	10-50% free	< 10% free
Disk Read/Writes/sec	< 15 ms	15 – 25 ms	> 25 ms
Avg. Disk sec/Read Avg. Disk sec/Write Avg. Disk sec/Transfer	< 15 ms	15 -20 ms	> 20 ms
Network bandwidth – bytes total	< 40%	40-65%	> 65%
Network Latency – output queue length	0	1-2	> 2

4.6   KPI for IT SharePoint Business Users (example)

These reports for SharePoint show one of the most important aspects of web-site functioning and represent a key stone for understanding how the web-site works and which things may be improved. Site summary report displays the summary SharePoint statistics by every single site from the current site collection.

Table 2 shows example of key performance indicators for business users of SharePoint portal. Rows show the analysed segments of the web portal, while columns contain ranges of values:

- Column "Good" shows the range of positive values for each segment of the portal, such as number of users that access the segment, number of downloads, number of duplicate files, etc.
- Column "Not good" shows the range of negative values for each analysed segment. If values are in this range, it can be concluded that the segment is critical, and corrective actions need to be taken urgently.
- Column "Attention" shows ranges of values that are considered medium. Values in this range suggest that no corrective action is necessary, but the portal segment needs to be permanently monitored, and some actions may be done to move values to

"Good" ranges.

Table 2: KPI for SharePoint Business Users (example)

	Good	Attention	Not good
Number of duplicate files	< 10%	10-20%	> 20%
Number of files that are often accessed in a specified period	> 80%	30-80%	< 30%
Number of files has not been accessed in a given period	< 30%	30-80%	> 80%
Display the number of hits in a given period	>20.000	12.000-20.000	< 12.000
Number of downloads in a given period	> 50%	20-50%	< 20%
A number of different users who accessed SP in a given period	> 70%	30-70%	< 30%

5   Results

Data have been collected from multiple sources: databases, questionnaires, log files, interview and others.

Contributions of application of MS SharePoint platform for realization of an adaptive portal for intelligent e-document management in public enterprises are:

- Business process transformation
- Higher business efficiency
- Faster information flow both horizontally and vertically
- Decision support
- Rationalization of expenses
- Better training for employees
- Improvement of organizational culture
- Support for telework.

Results show the KPI values shown in the table 3. For example, we can see that almost 80 percent of users use the portal at least once a day.

Table 3: KPI for SharePoint Business Users

	Yes	Other	No	
Is the structure of the portal conveniant ?	> 60%	30-60%	< 30%	
Are the informations at the portal up to date ?	> 60%	30-60%	< 30%	
Is it needed the help service at the portal ?	> 60%	30-60%	< 30%	
Do you use the search service at the portal ?	> 60%	30-60%	< 30%	
Do you use the forum service at the portal ?	> 60%	30-60%	< 30%	
Do you use the chat service at the portal ?	> 60%	30-60%	< 30%	

When analysing the obtained results, it is necessary to keep in mind that the research was conducted in laboratory environment, in a relatively short period, and with only basic training.

Results point out the segments of portal that need to analysed and adapted adequately with respect to business needs and user preferences.

6 Conclusion

This research has dealt with application of MS SharePoint technologies as platform for adaptive web portal for large enterprises. The results of analysis show that application of ICT necessarily leads to transformation of business processes that are based on flow of paper documents. In addition, application if ICT leads to standardization, changes in organization structure, and change management.

The studies problem is multidisciplinary, and includes the areas of ICT, management, human resources, communications, and others. The focus is specifically on collaboration between employees, design of virtual workspaces, e-task management, business intelligence, and decision support.

Further research will be directed towards designing new services, integrating business applications, and providing a higher level of personalization.

References

1. Barać, D., Bogdanović, Z. &Damjanović S., 2008. Implementacija personalizovanog sistema elektronskog učenja, U: Društvo za telekomunikacije-DT, Beograd, Elektrotehnički fakultet Univerziteta u Beogradu i IEEE Serbia&Montenegro COM Chapter. 16. telecomunication forum Telfor 2008. Belgrade, 25-27 november 2008. TELFOR:Beograd.
2. Bogdanović, Z., 2011. Poslovna inteligencija u adaptivnom elektronskom obrazovanju. PhD Dissertation, Faculty of Organizational Sciences, University of Belgrade.
3. Despotović, M., Savić, A. & Bogdanović, Z. 2006. Content management in E-Education. Journal For Management Theory And Practice, 11(42), str. 55-61.

4. Đokić, Dragan (2012): Model portala za inteligentno upravljanje elektronskim dokumentima. PhD Dissertation, Faculty of Organizational Sciences, University of Belgrade.

5. Đokić, Dragan, Despotović-Zrakić, Marijana, Barać, Dušan & Simić, Konstantin (2012): Document management system for e-government. In Uroš Pinterič, Lea Prijon (Ed.), Selected issues of modern democracy, Ljubljana: Založba Vega (pp.: 277-292).

6. Đokić, Dragan, Despotović-Zrakić, Marijana, Labus, Aleksandra (2013): A model of intelligent management of e-documents in public enterprises. In Uroš Pinterič, Lea Prijon(Ed.), Selected issues of modern democracy, Ljubljana: Založba Vega (pp.: 277-292).

7. PE Post of Serbia, (2014): Corporative profile. Available at: http://www.posta.rs/struktura/eng/o-nama/korporativni-profil.asp, (April 2014)

8. PE Post of Serbia, (2014): Organizational Structure. Available at: http://www.posta.rs/struktura/eng/o-nama/organizaciona-struktura.asp, (April 2014)

9. Jevremović, S., Vujin, V., Bogdanović, Z., Đokić D. & Barać, D., 2012. Designing adaptive e-learning courses through cloud computing. Metalurgia international, 17(10), str. 213-221.

10. Microsoft Corporation, (2014): Microsoft SharePoint 2010. Available at: http://sharepoint.microsoft.com/en-us/Pages/default.aspx, (September 2013)

**

Dragan Djokić, PhD, is director of IT Support Sector at PE Post of Serbia. His current professional and scientific interests include document management, internet technologies, Portal technologies, e-business and e-government. He can be reached at drdjokic@fon.bg.ac.rs.

Marijana Despotović-Zrakić, PhD, is an associate professor and Head of Department for e-business and system management at the Faculty of Organizational Sciences, University of Belgrade. She teaches several courses in the fields of E-business, Internet technologies, E-education, Simulation and simulation languages, Internet marketing, Risk management in information systems, M-business, Internet of things. Her current professional and scientific interests include e-business, internet technologies, internet marketing, e-education. She is a member of IEEE and ACM. She can be reached at maja@elab.rs.

Zorica Bogdanović is an assistant professor at the Faculty of Organizational Sciences, she is involved in teaching courses covering the area of E-business, Mobile business, Simulation and simulation languages, Internet technologies, Internet marketing, E-education, E-government, E-health, and Risk management in information systems. Her current professional interests include: e-business, m-business, Internet technologies, e-government and e-education. Zorica Bogdanović is member of IEEE Computer Society. She can be reached at: zorica@elab.rs.

Aleksandra Labus, PhD, is a teaching associate at the Faculty of Organizational Sciences, University of Belgrade. She is involved in teaching courses covering the areas of E-business, Internet marketing, Internet of things, and Simulation and simulation languages. She received scholarship from the Ministry of education, Science and Technological Development, the Republic of Serbia. Her current professional interests include e-education, edutainment, e-government and social media. She can be reached at aleksandra@elab.rs.