

R

Revija za  
Journal of

U

univerzalno  
Universal

O

odličnost  
Excellence

Marec 2015  
Letnik IV, številka 1  
ISSN 2232-5204



Fakulteta za  
organizacijske študije  
Faculty of organisation studies

ISSN 2232-5204.

**Izdajatelj:** Fakulteta za organizacijske študije v Novem mestu.

**Glavni in odgovorni urednik:** Boris Bukovec.

**Uredniški odbor:**

- Milan Ambrož - Fakulteta za organizacijske študije v Novem mestu, Slovenija.
- Anca-Olga Andronic - Spiru Haret University, Romunija.
- Razvan-Lucian Andronic - Spiru Haret University, Romunija.
- Janez Gabrijelčič - Združenje rastoče knjige sveta, Slovenija.
- Annmarie Gorenc Zoran - University of South Florida, ZDA.
- Davorin Kralj - Inštitut za kreativni management, Slovenija.
- Mirko Markič - Univerza na Primorskem, Slovenija.
- Matjaž Mulej - Univerza v Mariboru, Slovenija.
- Marija Ovsenik - Univerza v Ljubljani, Slovenija.

**Naslov uredništva:** Fakulteta za organizacijske študije v Novem mestu, Novi trg 5, 8000 Novo mesto.

Izid publikacije je finančno podprla ARRS iz naslova razpisa za sofinanciranje domačih znanstvenih periodičnih publikacij.

© Copyright Fakulteta za organizacijske študije v Novem mestu. Vse pravice zadržane.

## Kazalo

### **Lea-Marija Colarič-Jakše**

Connecting Social Actors in Developing Integrated Tourism Products 1

## Dodatek

### **Konstantin Simić, Marijana Despotović-Zrakić, Igor Đurić,**

#### **Aleksandar Milić, Nikola Bogdanović**

A Model of Smart Environment for E-learning Based on Crowdsourcing A1

### **Dragan Đokić, Marijana Despotović Zrakić, Zorica Bogdanović,**

#### **Aleksandra Labus**

Application of SharePoint Portal Technologies in Public Enterprises A11

### **Jelena Šuh, Vladimir Vujin, Dušan Barać, Zorica Bogdanović,**

#### **Božidar Radenković**

Designing Cloud Infrastructure for Big Data in E-government A26

### **Aleksandra Labus, Miloš Milutinović, Đorđe Stepanić,**

#### **Mladen Stevanović, Suzana Milinović**

Wearable Computing in E-education A39

### **Patrícia Kaplánová**

Transnational Democracy, Legitimacy and the European Union A52

## Connecting Social Actors in Developing Integrated Tourism Products

Lea-Marija Colarič-Jakše\*

Faculty of Organisation Studies Novo mesto, Novi trg 5, 8000 Novo mesto, Slovenia  
colaric-jakse@siol.net

### Abstract:

**Research Question:** Our base of the research was the social capital and its impact on the recognition of the opportunities to innovate the tourism products by invigorating the innovative culture of tourism structures in Slovenia and stimulating the collective cooperation of the tourism stakeholders on the global market.

**Purpose:** Our goal is to make clear the role of the civil society, private enterprises, and organizations from public sector and small entrepreneurs in the creating of social capital, which is the base for the innovation of joint tourism products. Our aim was to identify the factors that stimulate the collaborative networking.

**Method:** We investigated the cooperation networking between the tourism stakeholders with qualitative method of analysis. We conducted eight non structured interviews with tourism stakeholders and thirteen semi-structured interviews with the managers from various tourism organizations.

**Results:** The results show that the right organization of consortium activities has the real impact on the creating of new tourism products. The results also show that the collaborative networking in the form of consortium supports the innovative processes and enables the marketing of the integral tourism products.

**Organization:** The successful networking bases on the means of activation of the social capital, which enables the inclusion of the right stakeholders in the process of creation, translation, and implementing of the innovative ideas in the innovation process. Tourism structures in this process create various consortia form of collaboration and support in the process of acquisition of resources in the process of connecting the know-how, and in the process of the implementation of the same know-how to build the innovative tourism products.

**Society:** Collaborative networking creates innovative culture of the tourism structures and the other structures in the society. The outcomes of the research show that Slovenian tourism landscapes need different formal and informal structures of collaboration like various kind of consortia that empower social capital and enable the continuous generating of new innovative products in tourism sector.

**Originality:** Conditional paths that are in the core of the collaborative networking develop the new gaze on the innovative agency by replacing the rigid and static planning of collaboration in tourism. The model originally develops new ways of the coordination of the interests of tourism stakeholders that cooperate in the process of innovation of integral tourism products.

**Limitations/Future Research:** The limitation is the timing of the gathering of the data about the collaborative networking. We did not conduct the longitudinal research and the research results and findings cannot reflect the processes of the collaborative networking. Future research should include tourism stakeholders from other tourism landscapes, because tourism is distinctly international endeavour. The comparison between different tourism landscapes would show the differences and comparative advantages between tourism landscapes regarding collaborative networking and its effects.

**Keywords:** social capital, tourism, integration, tourism actors, integrated tourism products.

\* Correspondence author.

## **1 Introduction – Cooperation Among Stakeholders in Developing Integrated Tourism Products**

Tourism is an important economic activity in most countries of the European Union and a cornerstone of regional development. The rapid development of tourism has spurred competition between tourist destinations at regional and local levels. This in turn has strengthened the realisation that complex approaches for the development of tourism are needed as a means of enabling continuous development of tourism products.

The basis for the successful integration of stakeholders in tourism is social capital, which is created and utilised by the stakeholders when they engage in various forms of cooperation in developing tourism products.

Numerous authors raise the importance of the varied forms of social capital that make the foundation for the development of means of integration, networking and cooperation. Adler and Kwon (2000, pp. 89–115) note in particular the importance of social networks, social norms, trust, sharing of know-how and the formal institutions.

The aim of this study is to determine the nature of the connections among social actors, entities and organisations, and the incentives and barriers influencing stakeholders as they join forces on the market in order to develop integrated tourism products. Another aim is to determine the expectations and interests of the stakeholders related to their willingness to partake in the development of integrated tourism products.

Since all stakeholders have their own expectations about means for cooperation, the qualitative research sought to uncover deeper factors affecting integration of social actors and the development of integrated tourism products.

## **2 Theoretical underpinnings**

Social capital represents a form of social arrangement based on trust, social norms, networking and networks, which by means of promoting coordinated action from social actors and social structures contributes to a better functioning of society (Putnam, 1993, p. 167). This is particularly important in tourism due to the need for close cooperation in various social networks. Granowetter, (1973), Putnam (1993), Uslaner (2000) and Best and Krueger (2006) conclude that social connections on an individual and collective level are the core of social capital. Onyx and Bullen (2000) argue that social capital creates the following dimensions: networks, reciprocity, common norms and activities of a social actor. Woolcock and Narayan (2001) promote a similar definition of social capital, which they link to norms and networks that drive social action. Flora (1998) on the contrary maintains that only certain characteristics promote the development of social capital, namely the properties of diversity and prevalence of social networks.

According to Johannesson (2005), the Actor-Network Theory (ANT) is a suitable tool for interpreting the patterns of cooperation among stakeholders in tourism. ANT is a concept that helps us to transform and explain networking practices of various actors. ANT also incorporates various mutually connected classifications and enables us to bring different forms of tourism into a spatial analysis. The Actor-Network Theory presents a new, radical view of tourism and especially of tourist travel. Tourism is described critically by investigating the ontological conditions for cooperation in the sector (Duim et al., 2013). Literature dealing with networking in the tourism industry contains a large number of studies that highlight the importance of networking in the integration of tourism networks (d'Angello & Go, 2009). The research by Dimanche and others (2010) identifies how existing resources in tourism should be restructured and arranged in order to develop original and innovative tourism products.

Defining an integrated tourism product precisely is extremely difficult. Koutoulas (2004) defines it as a product that combines all tourism products to form a distinctive group, including tangible and intangible products. Koutoulas (2004, p. 4) believes that tourism products can be divided into complete and special tourism products. Güler and Crowther (2012) argue that overall satisfaction of tourists is based on the sum of all the attained standards of a tourism product in a single tourist destination. The role of social actors responsible for meeting the needs and desires of consumers is to understand the motivating forces and expectations of their target groups (Williams & Uysal, 2004). The conclusion is that stakeholders in tourism are continually trying to combine area, people and things in order to create and maintain networks and maintain their stability (Van der Duim 2008, p. 15). This integration is reflected in customer satisfaction, which holds a central role in tourism products.

We set out the following research questions:

- What is the nature of the mission and the inclusion of social actors in the development of integrated tourism products?
- Does social capital created by social actors and tourism entities strengthen the exchange of know-how and spur the development of new know-how for the creation of integrated tourism products?
- What are the means of cooperation between tourism entities and in what fields and tasks is the cooperation strongest?

### **3 Methodology**

We carried out the qualitative data analysis with unstructured and semi-structured interviews. Unstructured interviews with tourism entities in Slovenia were carried out in the period from 1 December 2014 to 5 January 2015. The unstructured interviews included 8 stakeholders from small businesses, tourism entities and organisations. Semi-structured interviews with managerial staff at a number of tourism entities in Slovenia were conducted in the period from 7 January 2015 to 23 January 2015. The semi-structured interview included 13 stakeholders from the following tourism entities: large tourism company – a spa operator, the regional development agency, an institution for transfer of know-how in tourism, the local community,

the institute for culture, sport, tourism and youth, a small tourism company, a travel agency, the centre for entrepreneurship and tourism, an association promoting tourism and sustainable development, a medium-sized tourism company – a hotel, the tourist information centre, and the public cultural heritage institute.

The responses from the semi-structured interviews were transcribed into a word editor, edited and encoded. We used the open coding method. The coding was tied to our observations from the unstructured interviews (Charmaz, 1983, p. 112; Creswell & Plano Clark, 2011, p. 89).

The qualitative analysis was implemented in three stages:

- Cyclically with a method of repetition and progression of thinking about the processes of developing integrated tourism products.
- By introducing new data to promote understanding of organisational innovation in the field of tourism.
- By using a comprehensive approach enabling each sub-step in the process to be separated as a whole and analysed independently (Seidel, 1992, p. 2).

For the data analysis we used a process developed by Creswell (2009, p. 175):

- collect data in a specific environment;
- collect data in a structured or non-structured way;
- collect data from different sources, organise it and sort it systematically;
- create and develop patterns, categories and themes bottom up – the inductive analysis;
- create a theoretical concept;
- interpret the observations – the researcher and the participants in the interviews; and
- develop an overall picture of the research problem.

## 4 Results of the Qualitative Analysis

### 4.1 The inclusion of social actors in the development of integrated tourism products

Tourism entities have a vision for creating and developing integrated tourism products and a shared vision for the overall development of tourism through the creation and development of integrated tourism products. Tourism entities also have a clearly defined vision for future creation and development of integrated tourism products. The links between tourism entities contribute to the development of the innovative potential. Tourism entities identify a connection between their objectives and common goals.

**The vision for creating and developing integrated tourism products:** Eight of the thirteen social actors have clear and definitive vision for the future development of integrated tourism products, which they share with potential stakeholders in tourism. Their visions for creating and developing integrated tourism products emphasise the principles of sustainable development. The implementation of an individual vision is directly connected with the determined long-term and short-term objectives of tourism entities and conditioned with the implementation of the primary activities of the social actor. Social actors believe that the

mission related to developing competitive advantages of tourism by identifying and developing appealing offerings and satisfying the needs of the target groups. Social actors recognise that innovative tourism products fail to reach the potential target groups and do not bring higher revenue for them when insufficient attention is paid to raising awareness, promoting and marketing these products. They make a point of concluding that all stakeholders involved in delivering integrated tourism products need to be included in efforts to raise awareness, promotion and marketing.

The social actors conclude that the implementation of a vision depends on meaningful and close cooperation between the entities in tourism. The medium-sized tourism company, travel agency, the entrepreneur in the tourism sector, the local community and the institution dealing with the transfer of know-how all recognise the importance of their own vision for successful future operations. The said entities are therefore in the stage of either drafting their own vision or have already included the importance of integrated tourism products in strategic documents that are in the process of being put into practice.

While the majority of the social actors have their own vision of developing integrated tourism products and share it with potential partners from the field, it is surprising that 10 respondents raised the lack of a common development vision. Among the factors obstructing the development of a *common* vision of developing integrated tourism products, the social actors raised the pursuit of partial short-term interests. As a result difficulties arise in reconciling the interests of the different stakeholders. The representative of the small tourism company cites an example of the diverging interests in that some stakeholders want to “...*offer a vineyard and wine, other galleries and art, so it is difficult to create integrated tourism products due to conflicts in supply which are difficult to reconcile*”. A desire to pursue their own interests is the second limiting factor, which the respondents identified as a factor of weakened cooperation among stakeholders in their locality. The representative from the institute of culture, sports, tourism and youth notes that “*presently everyone is looking for their own slice of the pie, without real integration*”. According to the travel agent, an organisation promoting cooperation would be needed (e.g. a regional destination organisation) as a centralising power that would be responsible for promoting integration among tourism entities in the local environment. In addition to diverse interests and lack of integration and cooperation among stakeholders, the third and fourth limiting factors in developing a common vision are funding and bureaucracy. Social actors note that public funding has been significantly reduced in recent years, leaving the majority of stakeholders to focus primarily on measures to stay afloat and activities set down in their mission or vision. They raise the importance of networking with stakeholders and providing assistance to the smaller entities. A declining financial situation has been coupled with extensive bureaucracy, whose complexity prevents tourism entities from carrying out their mission. In addition to the above causes for a lack of a common vision of developing integrated tourism products, the travel agent raises poor information literacy of stakeholders and underutilisation of IT technologies, given that many stakeholders in the industry do not have their own websites and are not present on social networks.

The tendencies of social actors to devise a common vision of development are similar to the tendencies in designing their own visions for developing integrated tourism products. These stem from the desire for general development in tourism and the development of integrated tourism products as well as the desire to enhance the competitive advantage and recognition of the local area and of its integrated tourism products. The motives for establishing a common vision of developing integrated tourism products depend also on the marketability of integrated tourism products and on the impact on revenues for the stakeholders, as well as on the promotion of integrated tourism products in cooperation with the media. Stakeholders indicated that a common vision of creating integrated tourism products was based on the desire to protect the local tourism potential, create jobs at local stakeholders and strengthen cooperation and integration.

The expectations of the stakeholders regarding a common vision of developing integrated tourism products are often unrealistic or too high. According to the entrepreneur in the tourism industry who was surveyed, the high expectations stem from these expectations being *"based on their professional thinking and understanding of the entities that significantly impact innovation developments. These are sometimes realistic, but often they expect too much or overestimate the impact of innovation on the market value of integrated tourism products which can be achieved"*. The representative of the tourist information centre said that expectations were *"high mostly when dealing with the anticipated impacts and benefits but less so when it comes to the input into integrated tourism products"*. The social actors conclude that a frequent misconception in the development of a common vision is that the connecting and creative role will be assumed by local, regional or national communities and political institutions. In their opinion, initiatives for crafting a common visions and integrated tourism products should come from the tourism entities, since they have an interest in promoting and marketing integrated tourism products. The role of local, regional or national communities is limited to establishing a suitable infrastructure framework for the development of tourism. Forming a common vision must be carried out in a "bottom up" approach rather than relying on methods of days gone by when local, regional or national communities defined models which stakeholders had to apply "top down".

**The main objectives in developing integrated tourism products:** In developing integrated tourism products, social actors in the tourism sector are guided by established and development-minded long-term objectives. The only exception in this was the medium-sized tourism company, the hotel, which assessed that its objectives regarding integration were of a short-term nature resulting from a lack of a clear vision for the development of cooperation between key stakeholders in its locality. The most common long-term objective raised by as many as nine respondents was the commitment to establishing connections between stakeholders and networking. The stakeholders respect the principles of participatory planning involving local entities in integrated tourism products and the principles of partnership. With their network connections, the partners in the development of integrated tourism products are also planning

joint marketing and innovative promotion activities through various channels and established networks.

The second most frequently raised objective in developing integrated tourism products raised by social actors is the branding of the tourist destination and its natural and cultural assets and unique tourism offerings. Branding is strengthened with the development of high-quality products that appeal to the potential visitors and customers, covering a wide range of regional goods and services and which are marketable. The development of high-quality integrated tourism products thereby helps increase the number of guests and the tourism revenues for the stakeholders.

Another long-term objective of developing integrated tourism products in the view of the respondents is concern for socially-responsible sustainable development of the local environment, and the broader region and the nation. The aim is to provide a quality tourist destination in concert with conditions for sustainable development of the stakeholders. The emphasis in this respect is on the development of local communities with a view to being more resistant to external impacts, such as those related economic crises, climate change, environmental factors, social ethics and ethical economics. The stakeholders strive to bolster sustainable development and pursue long-term goals designed to provide for local self-reliance based on building an effective system of self-sufficiency in food, energy, know-how and self-employment in tourism. According to the respondents, enabling self-employment and creating the means for independent business survival is possible by strengthening the opportunities afforded by networking with stakeholders.

Only four respondents noted a link between the objectives of integrated tourism products and the common objectives of tourism entities. The respondents believe that the creation of integrated tourism products should be organised in a way that allows tourism entities to recognise a link between the objectives of creating integrated tourism products and common goals. However, the tourism industry entrepreneur highlighted that *"the managers at the destination level have, save for a few products, not created the opportunities and possibilities in this respect due to a lack of formal and lasting connections that stem from subjective factors"*. The lack of a clear connection between the objectives is made worse by unreliable and opaque planning and development of integrated tourism products. The respondent from the tourist information centre believes this stems from a lack of trust. Another consequence in destinations where there is a lack of clarity among objectives is that stakeholders act at their own initiative in connecting with potential partners and developing integrated tourism products. The respondent from the small tourism company noted that often the objectives are not immediately apparent, but become so gradually based on the response obtained to a product, to which the stakeholders then adjust their cooperation. In cases where the connection between the objectives of creating integrated tourism products and the common goals are immediately apparent, the connections are formed at a multitude of levels in all entities seeking cooperation and integration. A clear link between the objectives of the various tourism entities was presented by the representative from the Centre for Entrepreneurship and Tourism: *"The purpose of*

*developing integrated tourism products is to preserve the authenticity, the welcoming nature and appeal of local tourism through packages containing a selected offering focused on healthy living, active outdoor leisure activities and events, culinary delights and Posavje wines. The common objective is for the destination to find its identity and build its image as a place of natural, cultural and culinary specialities and to promote itself under a single brand. The aim of the tourism entities is to provide the best quality service or product and to be included in the joint promotion activities under the single brand."*

#### **4.2 The exchange of know-how among social actors**

Social actors conclude that the development of new know-how in developing integrated tourism products is a foundation for all cooperation.

**Know-how for integrated tourism products:** Social actors from various tourism entities assessed that they have the required know-how for developing integrated tourism products. Some of them assessed that they have certain skills required for developing integrated tourism products. Moreover, some of the social actors viewed themselves as having practical experience in developing integrated tourism products. They are of the opinion that this know-how applies mostly to a specific range of tourism products such as those related to natural heritage, cultural heritage and supplementary tourism activities. They are also seeking to combine their know-how with products in the area of sports and recreation, health tourism and farm tourism. They also concluded that they have the know-how for developing integrated tourism products in gastronomy, wine and alternative tourism. Some of the social actors use systematic approaches to building know-how needed for developing a product, evolving an idea through debate and subsequent refinement. In this way the products are also prepared for coordination with other actors. They see it as essential that the potential for developing products is connected with other ideas and innovations in the local environment.

**Lack of know-how required for integrated tourism products:** On the other hand, some of the social actors identified a lack of adequate know-how required for developing tourism products. They said that their know-how in this area lacks the required depth to be applied successfully. They assessed that there was a general shortage of know-how in the sector. Even the know-how that entities possess becomes obsolete quickly. Some social actors at the local level went as far as to assess that they completely lack the required know-how. However, the travel agency noted that it had extensive experience with developing integrated tourism products.

**Transfer of know-how for integrated tourism products:** Social actors identified a limited transfer of know-how at some of the tourism entities involved. One of the tourism entities identified its expertise as an opportunity for integration with other entities. Social actors in some entities are strictly focused on transferring knowledge at entity level. However, this transfer of know-how is overly narrow and as such not particularly useful because it does not transcend to other tourism entities and other areas of local life. For the most part internal exchange of know-

how at the entities is based on dialogue, discussions, brainstorming and on proposals for developing new integrated tourism products.

Aside from geographical expanse, the diversity among the stakeholders in the transfer of know-how is even more evident in the forms of transfer. Considering time limitations, the respondents listed thematic workshops, thematic training events, advisory sessions, consultative meetings, fairs and joint presentations, seminars, fieldwork, specialised courses (for foreign languages and guides), forums and human resources mobility activities such as organised visits to organisations or youth and other exchanges as the most common forms of short-term transfer of know-how. The long-term forms of transfer included national and international projects and research work. Only one of the respondents recognised the internet as a useful instrument for learning and transferring know-how, while the other respondents raised the importance of direct interaction through communication, conversation and dialogue.

The respondents indicated that the flow of information and transfer of know-how varied within individual organisations, which points to an internal transfer of know-how where the key actors are staff within the organisation. The answers from the respondents also indicated that know-how was shared between partner organisations, suggesting that external transfer is present. The key players in this are external professionals and the local population. The respondents also identified staff at public institutions and private institutions as well as companies as carriers of external transfer.

Most of the respondents believe that they have sufficient know-how for developing integrated tourism products. The positive self-assessment stems from extensive experience in tourism and the development of integrated tourism products and the presence of a highly-qualified workforce. Social players assume the role of providers of know-how to interested stakeholders in tourism. Considering themselves as providers of know-how were stakeholders from the local community, the institute for culture, sports, tourism and youth and the small tourism business. The stakeholder from the institute of culture, sports, tourism and youth explained the perceived lack of know-how by stating that *"knowledge is in short supply. We are constantly learning and seeking out new information. We believe that our know-how lacks sufficient insight into what integrated tourism products must contain, what is truly important and what are its essentials elements. It is also possible that we may possess the required knowledge, but simply do not know how to approach the development of integrated tourism product."* The stakeholder representing the small tourism business raised the modern-day problem of short lifespan of information, concluding that organisations need to self-evaluate their skills and compare them to best practices at other stakeholders.

The value of the know-how which a stakeholder can transfer internally and externally is related to the nature of its core business. Consequently, the most widely transferred know-how is related to sustainable development in local communities, preservation and development of natural and cultural heritage, and the development and promotion of integrated tourism products. The respondents also listed know-how related to human resource management and

project management. Key areas of know-how also relate to specific forms of tourism, namely sports, recreation and spa tourism, rural tourism, and culinary, wine and alternative tourism. The basic purpose of transferable know-how is the ability to deal with the intersection of the various fields that are present in new, innovative and high-quality integrated tourism products running all the way to practical implementation in the local environment. This also relates to the development of an innovative marketing approach for integrated tourism products and to the ability to identify modern guests.

The respondents also stated that the extent of involvement of stakeholders in the transfer of know-how is dependent on the needs stemming from the surrounding environment and the market for which the integrated tourism product is developed. Additionally, there is the role of the governing act which sets down the mission and strategic development plans for the stakeholders and their rationale for integration. Among the key factors for the transfer of know-how the respondents identified their own initiative and their individual benefits stemming from the development of integrated tourism products. Important initiatives for the transfer of know-how also arise from the potential for joint marketing of integrated tourism products and responding to the current needs of the environment with integrated tourism products.

**Importance and advantages of information systems:** The social actors stated that a modern information system is essential for exchange and transfer of know-how and that strong information technology support is required to develop integrated tourism products. Most of the respondents use an information system in performing their activities, although a greater issue is the level of satisfaction with the system itself. They noted that a constantly updated information system providing seamless access to key information is crucial. Its value lies mostly in the free and simple means for promoting and marketing integrated tourism products, but also in the support it allows for developing and refining products. In one of the regions the respondents highlighted that a common information system already exists at regional level. Here the tourism entities have access to the updated databases and the internet is used an important tool.

**Deficiencies of information systems and its use:** In certain tourism entities, the actors who participated in the qualitative study noted that the information system is not systematically managed and that it is inadequate for their work. Some of the stakeholders noted that they had no access to an information system, while others are not familiar with information systems that would help develop integrated tourism products. In cases where such a system exists, the question arises whether it is being properly utilised by the social actors. The actors are also faced with a range of problems that affect the effective use of the opportunities presented by information systems.

The social actors conclude that, on one hand, problems are related to the characteristics of the information system and are exhibited in the absence of systematic and transparent data which would be available to the users. Another problem is that data can be outdated given the short

lifespan of data and a lack of regular updates. However, another aspect is the lack of understanding of the possibilities offered by information systems to social actors.

### **4.3 Collaborative networking**

The majority of the respondents assessed that collaborative networking was weak and predominantly dependent on geographic proximity and on similarities in operations among the stakeholders. Involvement in collaborative networking is based foremost on individual expectations and the diverse interests of stakeholders.

From the participants in the qualitative study, the travel agency, tourist association, tourist information centre and medium-sized tourism company were involved in collaborative networking. These entities are the most suited to coordination of various stakeholders due to the nature of their activities. What is more, these entities work with various tourism stakeholders and tourists in performing their activities. As a result they are inclined to various forms of collaborative networking and in this way contribute to the development of integrated tourism products.

A lack of interest in collaborative networking is expressed by the local community, the cultural heritage institute, the entrepreneur and the hotel business. Their preferences are related to the way they conduct their business and their status in the collaborative network. These entities are not at the core of the network since they do not play a connecting role but are instead foremost concerned with providing tourism products and do not participate in collaboration as a means of developing integrated tourism products. From the responses we can conclude that collaborative networking is not adequately developed, since some entities are not actively involved in connecting the relevant tourism stakeholders.

**Needs of tourism entities in networking flows:** Most respondents highlighted a need for building consensus and the resolution of disputes among social actors. They noted that the process of developing suitable interaction is often a consequence of numerous unsuccessful and incomplete interactions. As a result, there is room for learning in this area. Collaborative networking in their eyes stems from a need to build ethical relationship among stakeholders and meaningful relationships with other players in tourism. The respondents believe that they are connecting with other social actors and developing common innovative tourism products in the Slovenian tourism industry. They highlighted as one of the keys elements of collaborative networking the need for all stakeholders in development of integrated tourism products to understand the needs and wishes of customers. Satisfying the needs of customers should involve the application of know-how and the involvement of customers in the development of tourism products. The opinions of customers of integrated tourism products directly influences the improvement of these products. Moreover, tourism entities understand that the know-how and skills of individuals, companies, organisations and entities in the tourism sector represent the underlying potential for the development integrated tourism products.

The stakeholders said they pay cooperation in joint tourism projects and expect that this will promote development of integrated tourism products. In the process of collaborative networking they noted as important the ability of all social actors to contribute their unique expertise to the development of integrated tourism products. Also of importance is that work and tasks are clearly distributed and that a project approach is applied as part of collaborative networking. They raised the importance of rewarding innovative actions as a means of motivating social actors and promoting the completion of individual projects leading to the development of tourism products. In doing so, the stakeholders highlighted a commitment to ethical and sustainable-minded activities in developing integrated tourism products. They also expressed a belief that failures present good basis for learning and crafting better ways of developing integrated tourism products.

**Causes for cooperation and integration:** Social actors mostly cooperate in the fields of education and transfer of know-how as well as in the development of integrated tourism products, their promotion and marketing. They are also involved in activities aimed at jointly penetrating domestic and foreign markets with integrated products and working on projects as developers or partners. As many as nine respondents stated that they are involved in individual projects led by other tourism entities aimed at developing integrated tourism products and in carrying out innovation processes. Their involvement extends to projects implemented at regional, national or international level and their assessment is that the cooperation between stakeholders is fair and beneficial. In the opinion of the representatives from the Association of Tourism and Sustainable Development, the organisation's work on projects involving other tourism entities is beneficial given that the experience obtained *"is by all means useful, and we are quick to apply it once the project is over both in terms of the know-how obtained and the social networks which we established"*. The respondent from the large tourism company pointed out that cooperation on projects must be based on trust, accountability and, at the end of the day, on the actual results. Participation in joint projects with other tourist structures is related to diverse interests. The representative from the regional development agency listed among common interests the desire to provide high quality products, the possibility of joint ventures and the establishment of an effective marketing system in all tourist entities. Cooperation on projects is also frequent because the stakeholders share a common interest in developing new integrated tourism products. The respondent from the local community highlighted that problems arise when the project is completed and the time comes for the product to be rolled out in the tourism sector. Collaboration often ends at this point. The respondent from the public cultural heritage institute meanwhile highlighted that the institution is guided in participating in joint projects due to the availability of project financing.

The causes of cooperation and integration in the development of integrated tourism products stems from the diverse interests and needs of stakeholders. They can be related to the desire for financial advancement, identification of opportunities for the development of appealing and diverse integrated tourism products or the upgrading of existing products. The respondents highlighted the link between the level of integration and the motive for integration that acts as

an incentive for cooperation. At the majority of respondents the level of integration with other stakeholders is weak, given that it is usually related to their immediate needs.

**Formal and informal forms of integration:** The findings of the qualitative research indicates that the inclination of tourism entities to collaborative networking depends on the possibilities for establishing formal connections, i.e. the forming of consortia. Consortia are a new form of integrated tourism product and foundation for bringing together various stakeholders in a given tourism destination. The stakeholders see their role in meeting the wishes and expectations of customers. This relies on utilising resources which must be developed with financial investments that individual tourism entities cannot secure due to financial constraints. The respondents believe that a strong and formal form of cooperation, such as a consortium, enables the tourism entities involved to be present in offering the integrated tourism product in the entire locality. They also highlight that it allows them to promote tourism products within an integrated product in the locale and broader, including internationally. This is seen as crucial for the success of a tourist destination.

The respondent from the local community concluded that at regional level there are at least two formal structures of integration in the form of consortia. He noted the consortium "Cviček PTP", which brings together producers of Cviček wine, and the consortium "Tourism v zidanicah" bringing together more than a hundred providers vineyard cottages.

From the viewpoint of the respondents a major advantage of informal structures of integration is a lower degree of commitment. This means that interactions between the stakeholders are less structured and predominantly ad hoc. The representative from the tourism and sustainable development association explained: *"We prefer to form working groups based on the content rather than holding boring meetings as part of some formal structure."* The respondent from the Centre for Entrepreneurship and Tourism explained that *"the joint working meetings are intended to reach agreement on which local organisation will take the charge. Each of the local partners implements forms integration with tourist entities at the local level"*. The tourism industry entrepreneur highlighted that informal connections are formed on the basis of interests and the existing trust between tourist entities. The representative from the medium-sized tourism company moreover added that informal structures of cooperation can be very effective due to a more lively exchange of know-how and information, which form the basis for innovative ideas.

The key characteristic of informal structures of integration, according to the entrepreneur, is that their longevity varies: *"Some last longer, but some fall apart quickly."*

## 5 Conclusions

The qualitative analysis has shown that social capital is a precondition for unleashing collaborative networking, which exhibits the local characteristics of the social and material environment. Without the prerequisite trust that is a basic component of social capital there can be no trust. The transfer of know-how which forms the basis for developing new integrated

tourism products sets off the processes of the transition of ideas and concepts into a varied range of integrated tourism products. These are continually morphing to meet the wishes, expectations and needs of customers in tourism. Consequently, the means of collaborative networking are also changing and with it the accumulation of social capital in the tourism industry. The theory of networking is a very relevant concept in our study, which helps to explain the way that players in a given tourism area activate themselves and arrange themselves in a way that enables the development of integrated tourism products.

The goal of integrating social actors in collaborative networking is to enhance the likelihood of satisfying the needs, wishes and expectations of tourists. It is also a means of influencing the interaction with tourists in the process of offering integrated tourism products. The study has highlighted the importance of a suitable organisation in the form of a consortium aimed at developing integrated tourism products. Without a firm structure, the pools of ideas, know-how and resources can be difficult and may not produce the desired results. We therefore conclude that the development of integration in the form of consortia is the right means of meeting the needs, wishes and expectations of customers in tourism by providing integrated tourism products.

## References

1. Ambrož, M., & Ambrož, D. (2014). Tourist friendly tourism information system. *Hotel and Tourism management*, 2(1), 73–83.
2. Ambrož, M., & Veljković, B. (2012). Effects of local governance on the sustainable local community development. In B. Krstić (ed.), *Improving the competitiveness of the public and private sector by networking competencies: [thematic collection of papers of international significance]* (pp. 53–72). Niš: Faculty of Economics.
3. Adler, S. P., & Kwon S. W. (2000). Social capital: The good, the bad, and the ugly. In E. Lesser (ed.), *Knowledge and social capital: Foundations and applications* (pp. 89–115). Boston: Butterworth.
4. Britton, S. (2001). Tourism, dependency and development: A mode of analysis. In Y. Apostolopoulos, S. Leivadi, & A. Yiannakis (2001), *The sociology of tourism: Theoretical and empirical investigations*. London. Routledge.
5. d'Angella, F., & Go, F. M. (2009). Tale of two cities' collaborative tourism marketing: Towards a theory of destination stakeholder assessment. *Tourism Management*, 30(3), 429–440.
6. Dimanche, F., Paget, E., & Mounet, J. P. (n.d.). A tourism innovation case: An actor-network approach. *Annals of Tourism Research*, 37(3), 828–847.
7. Flora, J. (1998). Social capital and communities of place. *Rural Sociology*, 63(4), 481–506.
8. Granowetter, M. S. (1973). The strength of weak ties. *American Journal of Psychology*, 78(6), 1360–1380.
9. Güler, A., & Crowther, D. (2012). *Business strategy and sustainability*. UK: Howard House, Emerald Group Publishing Limited.
10. Johannesson, G. T. (2005). Tourism translations: Actor-network theory and tourism research. *Tourist Studies*, 5(2), 133–150.
11. Koutoulas, D. (2004). *Understanding the tourism product*. Interim symposium of the research committee on international tourism (RC 50) of the International Sociological Association (ISA)

- on the topic, Understanding tourism – theoretical advances, Mytilini, Greece, University of Aegean.
12. Nagarjuna, G., & Kallarakal, T. K. (2014). Expectations of tourism industry on competencies and tourism education. *International Journal of Advanced Research*, 2(1), 738–745.
  13. Onyx, J., & Bullen, P. (2000). Measuring social capital in five communities. *Journal of Applied Behavioral Science*, 36(1), 23–42.
  14. Putnam, R. D. (1993). *Making democracy work: Civic traditions in modern Italy*. Princeton, NJ: Princeton University Press.
  15. Van der Duim, R., & Johannesson, Ren, C., G. T. (2013). *Ordering, materiality, and multiplicity: Enacting Actor–Network Theory in tourism. Tourist studies*.
  16. Williams, J. A., & Uysal, M. (2004). Current issues and development in hospitality and tourism satisfaction. *Journal of Quality Assurance in Hospitality & Tourism*, 4(3/4), 60–72.
  17. Woolcock, M., & Deepa, N. (2001). Social capital: Implications for development theory, research and policy. *World Bank Research Observer*, 15(2), 225–249.

\*\*\*

**Lea-Marija Colarič-Jakše** was graduated and master's at the University of Primorska, Faculty of Tourism Studies Portorož. She worked as a journalist and more than ten years as a consultant for business and tourism. Her areas of work relating to organizing, managing and implementing projects in the field of entrepreneurship and tourism, developing strategies, managing the Tourist Information Centre, so she has a lot of theoretical knowledge and also rich practical experience. She is a student of PhD studies of the Faculty for Organisation Studies of Novo mesto and she prepares a doctoral thesis The impact of social capital on innovations in tourism. She is employed at the Faculty of Tourism University of Maribor as Vice Dean for business cooperation and she is qualified lecturer for the subject area of tourism. She publishes professional and scientific articles in various magazines.

\*\*\*

## **Povezovanje socialnih akterjev pri razvoju integralnih turističnih proizvodov**

### **Povzetek:**

**Raziskovalno vprašanje:** Raziskali smo, ali inovacijska kultura turističnih struktur na področju Slovenije spodbuja zaznavo priložnosti za inoviranje integralnih turističnih proizvodov, ki omogočajo skupen nastop turističnih struktur na turističnem območju.

**Namen:** Naš namen je bil opredeliti vlogo civilne družbe, zasebnih organizacij, javnih organizacij v turizmu in malih podjetnikov pri ustvarjanju socialnega kapitala, ki je podlaga za razvoj skupnih inovacij na turističnem prostoru. Naš namen je bil tudi identificirati faktorje, ki spodbujajo sodelovalno mreženje.

**Metoda:** Kvalitativno analizo smo izvedli s pomočjo nestrukturiranih in pol-strukturiranih intervjujev. V nestrukturirani intervju smo vključili osem intervjuvancev, ki smo jih izbrali iz malih podjetnikov, turističnih struktur in organizacij. Pol-strukturirane intervjuje s trinajstimi vodstvenimi ljudmi v različnih turističnih strukturah smo izvedli na območju Slovenije.

**Rezultati:** Rezultati raziskave poudarjajo pomen prave organiziranosti v obliki konzorcija za nastanek integralnih turističnih proizvodov. Brez trdne strukture je povezovanje idej, znanja in virov težavno in običajno ne daje spodbudnih rezultatov. Iz rezultatov sklepamo, da je razvoj

povezovanja v obliki konzorcija pravi način za uresničevanje potreb, želja in pričakovanj turističnih odjemalcev v obliki integralnega turističnega proizvoda.

**Organizacija:** Uspešno povezovanje turističnih struktur temelji na načinu aktiviranja socialnega kapitala, ki omogoča vključevanje pravih turističnih deležnikov v proces ustvarjanja, prevajanja in udejanja idej o novih turističnih proizvodov v proces inoviranja. Turistične strukture v tem procesu ustvarjajo različne konzorcijske oblike povezovanja, ki jim dajejo podporo pri pridobivanju virov, pri povezovanju znanja in pri implementaciji tega znanja v proces inoviranja integralnih turističnih proizvodov in so učinkovita struktura za prevajanje inovativnih idej v proizvode.

**Družba:** Sodelovalno mreženje ustvarja inovacijsko kulturo, ki spodbuja potrebo po sodelovanju socialnih akterjev in družbenih struktur na vseh ravneh družbenega delovanja. Izidi kažejo, da Slovenija potrebuje različne formalne in manj formalne oblike združevanja, ki krepijo razvoj in uporabo inovacijskih potencialov na vseh področjih družbenega delovanja.

**Originalnost:** Pogojne poti, ki so bistvo sodelovalnega mreženja, so nov pristop k inovacijskemu delovanju na področju turizma, saj nadomeščajo togo in statično načrtovanje načina povezovanja v turizmu. Model izvirno predstavlja načine interesnega povezovanja, ker omogoča verodostojno in enakovredno sodelovanje vseh deležnikov v procesu inoviranja.

**Omejitve/nadaljnje raziskovanje:** Omejitev raziskave je čas raziskovanja delovanja socialnega kapitala, ker smo podatke zbrali v določenem kratkem časovnem obdobju in zajeli trenutno stanje sodelovalnega mreženja. V raziskavo smo vključili samo turistične strukture iz slovenskega turističnega prostora. Ker je turizem izrazito mednarodna dejavnost in ker kot proces zajema različne turistične prostore, je smiselno v raziskavo vključiti sosednje turistične prostore in destinacije.

**Ključne besede:** socialni kapital, turizem, povezovanje, turistične strukture, integralni turistični proizvodi.

\*\*\*

**Lea-Marija Colarič-Jakše** je diplomirala in magistrirala na Fakulteti za turistične študije Univerze na Primorskem. Delovala je kot novinarka in več kot deset let kot svetovalka za podjetništvo in turizem. Njena področja dela se nanašajo na organiziranje, vodenje in implementiranje projektov v podjetniška in turistična okolja, vodenje Turistično informacijskega centra, torej ima bogate teoretične in praktične izkušnje. Je doktorandka Fakultete za organizacijske študije Novo mesto in pripravlja doktorsko disertacijo z naslovom Vpliv dejavnikov socialnega kapitala na inovacije v turistični dejavnosti. Zaposlena je na Fakulteti za turizem Univerze v Mariboru kot prodekanka za sodelovanje z okoljem in je habilitirana predavateljica za predmetno področje turizem. Objavlja strokovne in znanstvene prispevke v različnih publikacijah.

# **A MODEL OF SMART ENVIRONMENT FOR E-LEARNING BASED ON CROWDSOURCING**

**Konstantin Simić\***

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

**Marijana Despotović-Zrakić**

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

**Igor Đurić**

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

**Aleksandar Milić**

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

**Nikola Bogdanović**

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 11000 Belgrade, Serbia  
nikola.bogdanovic@infostan.rs

## **Abstract**

This paper deals with the application of the concepts of Internet of Things and its application in creating smart environments. The specific goal is to design a smart environment for enhancing the teaching and learning processes at universities. The environment should integrate adequate concepts of smart buildings and smart classrooms with e-learning systems, in order to provide students with advanced e-learning services and services that improve the overall quality of students' experience. In addition, the model is based on the concept of crowdsourcing, where students actively participate in gathering the information, designing and implementing the e-services. Finally, the paper describes a prototype of the designed smart environment implemented at the Department for e-Business, at University of Belgrade.

**Keywords:** smart environment, internet of things, crowdsourcing.

## **1 Introduction**

E-learning and distance learning are terms which have existed over hundred years. The founder of e-learning was Sir Isaac Pitman (1813 – 1897) who organized the first shorthand course delivered by correspondence via postal system (Tait, 2003). E-learning can be defined

\* Correspondence author

as learning delivered on a digital device (i.e. computer, tablet, smart phone) (Clark & Mayer, 2011). Nowadays, using information and communication technologies in education becomes inevitable, especially at universities. In 2010, 31 percent of U.S. college students took at least one online course (Bell & Federman, 2013). New technologies allow personalization and customization of courses, according students' needs. Adaptive e-learning systems can be described as personalized systems which allow adaptive delivering of courses, interaction, collaboration and support, in spite of creating personalized content (De Bra et al., 2013).

Modern learning systems require permanent innovations and also tracking information about students' preferences, affinities, abilities and preferences. Internet of Things improves teaching and learning processes by introducing sensors, actuators and other smart devices to a smart learning environment. The best known smart environments are smart classrooms.

Crowdsourcing is a paradigm which becomes essential nowadays in many fields, especially in computer science, informatics and education. It is online and distributed problem solving model which includes a large number ("crowd") of people as participants (Brabham, 2008).

This paper presents an approach of introducing Internet of Things concepts and technologies together with crowdsourcing concepts to a higher education institution.

## **2 Smart Environments**

The main objective of smart environments as a part of broader term, Internet of Things, is to make everyday life easier. For example, when people drive cars, they want to be able to get the latest information about the road conditions, traffic congestions, to change the radio stations they are listening to etc. With a help of modern sensors, actuators and smart devices which combine all of this, only with their voices, people can check weather on the Internet, see the traffic accidents near them and know which roads are the best to go with a least traffic (Husnjak, Perakovic, & Jovovic, 2014).

Smart environment include smart houses, smart classrooms, smart offices and other smart areas (Lucke, Constantinescu, & Westkämper, 2008). Today's number of smart devices and environments is expected to increasingly grow due the recent advances of smart energy distribution usage in the form of smart grid (Farhangi, 2010; McDaniel & McLaughlin, 2009) Mark Weiser's vision of smart environments is that, one day, in everyday life, smart devices and smart environments will be available for everyone to help performing any task needed (Weiser, 1991).

Three main goals in Smart environment are to learn, to reason and to predict. In other words, smart environments need to learn how their environment works and thinks and to know exactly how to react when some action or signal happens. A smart environment (also known as SE) can be described "as one that is able to acquire and apply knowledge about the

environment and its inhabitants in order to improve their experience in that environment” (Fernandez-Montes, Ortega, Alvarez, & Gonzalez-Abril, 2009).

Talking about algorithms and protocols used within the smart environments and with Internet of Things (IoT), there are a lot of protocols which goals are to balance energy consumption, make systems work faster and make them more reliable (Zhang, Zhu, Zhao, & Dai, 2012).

Some of protocols that are common in smart environments are ZigBee, DECT, IEEE 1451 and others.

ZigBee protocol has become one of the most used home wireless protocols because it is a great solution for devices with low data rate and for devices which need a long battery life which is very popular in home network applications. One of major problems of ZigBee is because it introduces coexistence problems, sometimes falling to fulfil the response time required by the home network applications. This problem can be overcome with controlling the WLAN when the ZigBee transmission is ongoing (Hong, Lee, & Lee, 2014).

DECT is a protocol with low power consumption characteristics and integrated support for direct conversation terminal architecture. DECT is basically a radio access technology (Drosos, Dre, Metafas, Soudris, & Blionas, 2004).

IEEE 1451 standard improves scalability of electronic devices and reduces the cost of network transducers. These groups of standards give us an open platform for the development of network electronic modules using different physical links. These standards make connectivity of sensors and actuators be very easy and fast. Also IEEE 1451 offers some plug and play benefits for a lot of sensors and actuators (Barrero, Toral, Vargas, & Becerra, 2012).

### **3 Smart Classrooms**

Modern technologies, information and communication systems have made a great changes for teachers and for students. As well as 50 years ago, nowadays teaching and learning in classrooms are totally different processes for everyone. New technologies allow students to learn faster and achieve better knowledge and help teacher to easily teach students (Kubiatko & Haláková, 2009).

Great thing about smart classrooms is that they allow teachers to see how students actually want to learn and smart classrooms allow teacher to give the knowledge to students on the way students want it. It makes both benefits for teachers and students. Another important thing about smart classrooms is that they allow students to see a real purpose for using technology and everyone easier learn when they see a true purpose of some technology (Firmin & Genesi, 2013).

Thanks to Internet, laptops and smart devices students can get any information in few seconds. But this is not enough. Next step will be to get information about the students before they clicked the button and typed how they are feeling. With a help of modern sensors and actuators this will be possible to perform in smart classrooms (Santana-Mancilla, Echeverría, Santos, Castellanos, & Díaz, 2013).

With smart classrooms where smart things as cameras, microphones and many other sensors, which can measure how students are satisfied with the things they are learning about term, can be found, classroom management becomes very simple and easier to understand than without smart devices. Term “classroom management” represents a way how a teacher achieves order in his/her classroom. With a help of smart devices teacher can know when to take a break, when to talk louder and when the concentration of students is falling down (Rytivaara, 2012).

Some examples of sensors and actuators which can be used in smart classrooms are temperature sensors, sensors for walking in front of table which check if teacher is present in classroom and if is, some actuator turns on projector, some noise sensors which show how students are talking and so on. With some cheap sensors and a lot of imagination, powerful and interesting smart classroom could be built, which can really help students to learn easier and through fun (Santana-Mancilla et al., 2013).

#### **4 Using Crowdsourcing in Learning Environments**

Over the years, the Internet has evolved into a network which is present in each sphere of the modern society – from personal to professional activities of people. In early 2000s, the Internet entered into a new phase, better known as “web 2.0”. Before web 2.0, the Internet was a presentation platform. The interaction process between sites and visitors was limited (Venkatesh, Croteau, & Rabah, 2014). By introducing web 2.0, this has been changed. The visitors became active participants, able to post different kinds of informations, photos, videos and other content. Web 2.0 is a precursor of a new concept, crowdsourcing, which is significant in many different areas.

Traditional Internet philosophy defines the Internet as a medium where a relatively small group of people creates contents and the majority of people consumes it. Recently, a reverse paradigm was invented, where millions of people are involved into creating different contents for an organization. This phenomenon is known as crowdsourcing. Crowdsourcing involves a group of people who try to provide common goods for communities. In e-learning, common goods can be videos, music or encyclopedic knowledge which are freely available to everyone (Brabham, 2008; Yuen, King, & Leung, 2011).

The term “crowdsourcing” was firstly used by Jeff Howe and Mark Robinson in 2006. They defined crowdsourcing as a business act where the functions of employees and IT outsourcing

are moved to undefined and large network of people in a form of an open invitation. One of main benefits of crowdsourcing is including a possibility to collect a large number of solutions and a lot of information with relatively small costs (Howe, 2006; Rosen, 2011).

Crowdsourcing systems can be used for archiving different assignments. For example, people from the “crowd” can be invited for developing some new technology, designing new products (which is known as distributed participatory design), executing algorithm phases, systematization or analyzing big data.

Crowdsourcing is dependent on the Internet. Features of the Internet, such as its speed, anonymity, opportunity for asynchronous involvement in projects and various types of media contribute to the realization of the crowdsourcing concept.

Crowdsourcing models rely on collective intelligence. Pierre Lévy defines collective intelligence as a form of universally distributed intelligence, permanently improved, coordinated in the real time and leading to effective mobilization of skills (Lévy, 1994).

In education, the primary use of crowdsourcing used to be limited to logistics, rather than learning and teaching processes (Bradley, Lancashire, Lang, & Williams, 2009). However, using crowdsourcing in learning and teaching processes can lead to pedagogical innovations and to improve learning skills and professional abilities of students. In educational point of view, crowdsourcing includes following aspects: groups of people (students, teachers, administrators) who represent information sources, rather to be just passive listeners of authorial figures; team work which is focused on all team members who can contribute with their knowledge; tools which can be used for managing ideas where all members of the team can contribute with their own ideas.

There are three main phases in deploying crowdsourcing to educational systems: collecting, processing and implementation (“Crowdsourcing Class,” 2014). In the first phase, ideas and different points of view are collected from team members. In the second phase, a panel discussion about possible solutions is performed. In the final phase, each idea is given a priority and funding and resources are assigned.

Crowdsourcing cannot entirely replace the traditional learning but it can improve learning and teaching process in e-education and make them more transparent. It also adds more innovations and testing quite different ideas by students.

## **5 A Model of Smart Environment for e-Learning Based on Crowdsourcing**

For improving learning and teaching processes, several parameters regarding students’ needs, abilities, preferences and knowledge should be collected. These parameters can be subjective and objective. When students fill out surveys about different aspects of education processes,

subjective parameters are collected. Objective parameters represent some physical measurements, such as temperature, pressure, voltage etc. and they can be collected by using different sensors.

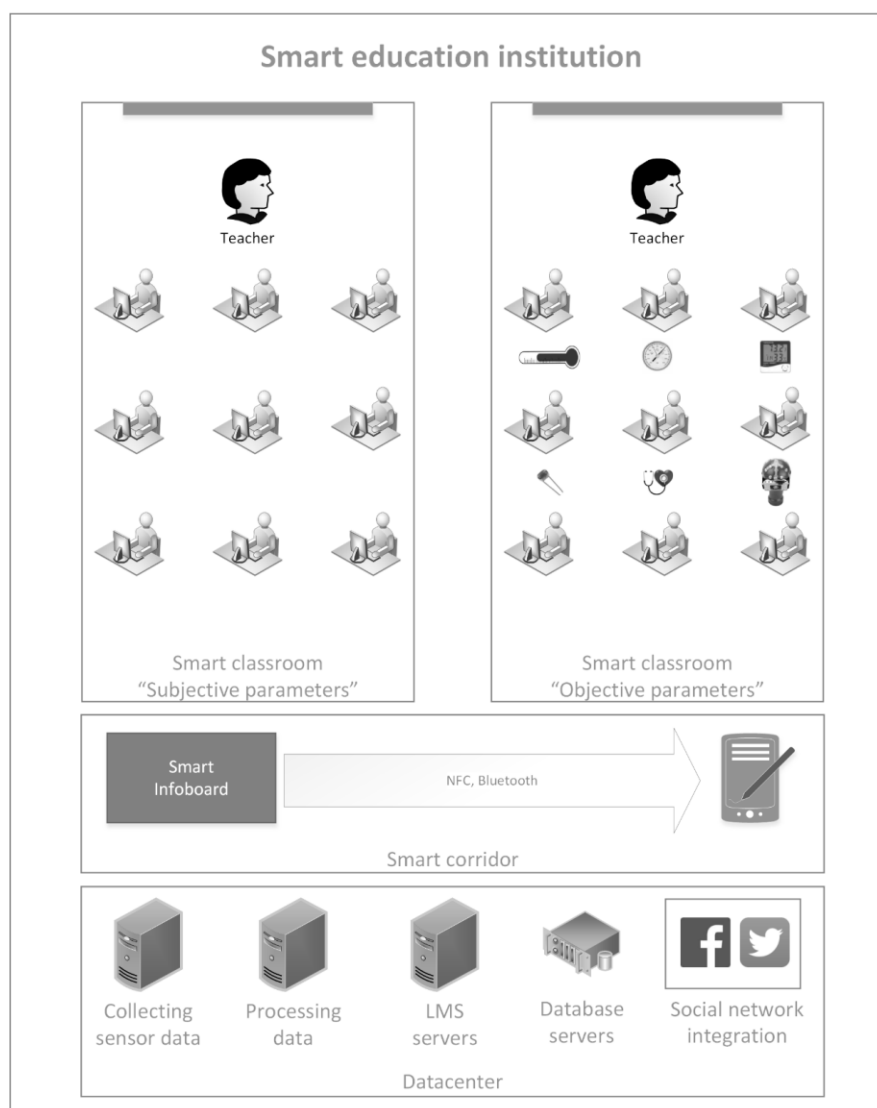
In the Figure 1, a model of smart education institution is shown. Improving the overall learning environment and customizing it to students' needs are the objectives of the model. A typical smart education institution consists of several different components. The main components of smart education institutions are unambiguously smart classrooms which represent learning and teaching cores of institutions. Two smart classrooms shown in the Figure 1 use different approaches. One classroom uses students' subjective parameters and the other one uses objective parameters.

Students take surveys about their current lectures in classrooms which use the subjective approach. Each student can evaluate the quality, interestingness and content of classes. If they are not satisfied with any of these aspects, students can give their suggestions to improve classes. Crowdsourcing concept can be used by allowing other students to rate these suggestions. By using crowdsourcing, teachers are not the only persons who are involved in the teaching process. It also encourages students to participate in creating teaching materials.

Objective parameters which can be measured in classrooms are useful for analyzing the correlation between environmental factors and students' satisfaction. Different sensors, such as temperature sensor, humidity sensor, heartbeat sensor, photo sensor, can be used. Crowdsourcing can be used for collecting data about optimal values of temperature, humidity or brightness. For example, if the most students prefer temperature of 23 degrees, air conditioning or heating can be turned on to reach that value. Heartbeat sensor can be used for measuring student's stress level during the exam. If a heart rate value is higher than hundred beats, student is nervous.

Smart corridors can be equipped with info boards. Students can connect their smart phones or tablet computers to info boards using wireless technologies, such as NFC or Bluetooth to get the latest information about studies, classes and exams.

Finally, all collected data are processed in datacenters. Datacenters are equipped with several different servers which collect and process data from sensors. Also, servers for learning management systems and database servers are located in datacenters. All collected data can be processed and results can be posted to social networks.



*Figure 1. A model of smart education institution*

## 6 Conclusion

Crowdsourcing is a relatively new concept which is not widely used in education. Using smart devices and crowdsourcing can improve learning and teaching processes. The model proposed in this paper uses previously mentioned concepts and technologies for creating a smart education environment. This model can be improved after thorough testing and evaluation.

The proposed model is important to students, as well as to teachers and to the broader community. It contains innovative approaches for improving education processes which is useful for e-learning systems as components of broader term – e-government.

## Acknowledgment

The authors are thankful to Ministry of Education, Science and Technological Development of Republic of Serbia for financial support grant number 174031.

## References

1. Barrero, F., Toral, S. L., Vargas, M., & Becerra, J. (2012). Networked Electronic Equipments Using the IEEE 1451 Standard—VisioWay: A Case Study in the ITS Area. *International Journal of Distributed Sensor Networks*, 2012, 1–12. doi:10.1155/2012/467124
2. Bell, B. S., & Federman, J. E. (2013). E-learning in Postsecondary Education. *The Future of Children*, 23(1), 165–185. doi:10.1353/foc.2013.0007
3. Brabham, D. C. (2008). Crowdsourcing as a Model for Problem Solving. *The International Journal of Research into New Media Technologies*, 14(1), 75–90. doi:10.1177/1354856507084420
4. Bradley, J.-C., Lancashire, R. J., Lang, A. S. I. D., & Williams, A. J. (2009). The Spectral Game: leveraging Open Data and crowdsourcing for education. *Journal of Cheminformatics*, 1(1), 1–10.
5. Clark, R. C., & Mayer, R. E. (2011). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*. John Wiley & Sons.
6. Crowdsourcing Class. (2014). Retrieved May 20, 2014, from <http://crowdsourcing-class.org/syllabus.html>
7. De Bra, P., Smits, D., van der Sluijs, K., Cristea, A. I., Foss, J., Glahn, C., & Steiner, C. M. (2013). GRAPPLE: Learning management systems meet adaptive learning environments. In *Intelligent and Adaptive Educational-Learning Systems* (pp. 133–160). Springer.
8. Drosos, C., Dre, C., Metafas, D., Soudris, D., & Blionas, S. (2004). The low power analogue and digital baseband processing parts of a novel multimode DECT/GSM/DCS1800 terminal. *Microelectronics Journal*, 35(7), 609–620. doi:10.1016/j.mejo.2004.02.002
9. Farhangi, H. (2010). The path of the smart grid. *IEEE Power and Energy Magazine*, 8(1), 18–28. doi:10.1109/MPE.2009.934876
10. Fernandez-Montes, A., Ortega, J. A., Alvarez, J. A., & Gonzalez-Abril, L. (2009). Smart Environment Software Reference Architecture. In *INC, IMS and IDC, 2009. NCM '09. Fifth International Joint Conference on* (pp. 397–403). doi:10.1109/NCM.2009.115
11. Firmin, M. W., & Genesi, D. J. (2013). History and Implementation of Classroom Technology. *Procedia - Social and Behavioral Sciences*, 93, 1603–1617. doi:10.1016/j.sbspro.2013.10.089
12. Hong, K., Lee, S., & Lee, K. (2014). Performance improvement in ZigBee-based home networks with coexisting WLANs. *Pervasive and Mobile Computing*. doi:10.1016/j.pmcj.2014.03.002

13. Howe, J. (2006). The rise of crowdsourcing. *Wired Magazine*, 14(6), 1–4.
14. Husnjak, S., Perakovic, D., & Jovovic, I. (2014). Possibilities of Using Speech Recognition Systems of Smart Terminal Devices in Traffic Environment. *Procedia Engineering*, 69, 778–787. doi:10.1016/j.proeng.2014.03.054
15. Kubiátko, M., & Haláková, Z. (2009). Slovak high school students' attitudes to ICT using in biology lesson. *Computers in Human Behavior*, 25(3). Retrieved from <https://is.muni.cz/publication/855592?lang=en>
16. Lévy, P. (1994). *L'intelligence collective: pour une anthropologie du cyberspace* (Vol. 11). La Découverte Paris.
17. Lucke, D., Constantinescu, C., & Westkämper, E. (2008). Smart Factory - A Step towards the Next Generation of Manufacturing. In M. Mitsuishi, K. Ueda, & F. Kimura (Eds.), *Manufacturing Systems and Technologies for the New Frontier* (pp. 115–118). London, UK: Springer. doi:10.1007/978-1-84800-267-8\_23
18. McDaniel, P., & McLaughlin, S. (2009). Security and Privacy Challenges in the Smart Grid. *Security Privacy, IEEE*, 7(3), 75–77. doi:10.1109/MSP.2009.76
19. Rosen, P. A. (2011). Crowdsourcing Lessons for Organizations. *Journal of Decision Systems*, 20(3), 309–324.
20. Rytivaara, A. (2012). Collaborative classroom management in a co-taught primary school classroom. *International Journal of Educational Research*, 53, 182–191. doi:10.1016/j.ijer.2012.03.008
21. Santana-Mancilla, P. C., Echeverría, M. A. M., Santos, J. C. R., Castellanos, J. A. N., & Díaz, A. P. S. (2013). Towards Smart Education: Ambient Intelligence in the Mexican Classrooms. *Procedia - Social and Behavioral Sciences*, 106, 3141–3148. doi:10.1016/j.sbspro.2013.12.363
22. Tait, A. (2003). Reflections on Student Support in Open and Distance Learning. *The International Review of Research in Open and Distance Learning*, 4(1), 1–9.
23. Venkatesh, V., Croteau, A.-M., & Rabah, J. (2014). Perceptions of Effectiveness of Instructional Uses of Technology in Higher Education in an Era of Web 2.0. In *System Sciences (HICSS), 2014 47th Hawaii International Conference on* (pp. 110–119). doi:10.1109/HICSS.2014.22
24. Weiser, M. (1991). The computer for the 21st century. *Scientific American*, 265(3), 94–104.
25. Yuen, M.-C., King, I., & Leung, K.-S. (2011). A Survey of Crowdsourcing Systems. In *Privacy, security, risk and trust (passat), 2011 ieee third international conference on and 2011 ieee third international conference on social computing (socialcom)* (pp. 766–773). doi:10.1109/PASSAT/SocialCom.2011.203
26. Zhang, D., Zhu, Y., Zhao, C., & Dai, W. (2012). A new constructing approach for a weighted topology of wireless sensor networks based on local-world theory for the Internet of Things (IOT). *Computers & Mathematics with Applications*, 64(5), 1044–1055. doi:10.1016/j.camwa.2012.03.023

\*\*\*

**Simić Konstantin** is a PhD student at the Faculty of Organizational Sciences, University of Belgrade. As teaching associate he is involved in teaching courses covering the area of E-business, Internet technologies, Internet marketing, Internet of things, M-business, and Concurrent programming. As a PhD student he receives scholarship from the Ministry of Science and Technological Development, the Republic of Serbia. His current professional interests include Internet technologies, Internet of things, cloud computing, e-business, e-education, digital identities, e-government, and social media. He can be reached at: [kosta@elab.rs](mailto:kosta@elab.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, and a vicechair of IEEE Computer Society Chapter CO-16. She can be reached at [maja@elab.rs](mailto:maja@elab.rs)

**Igor Đurić** is an undergraduate student of Faculty of Organizational Sciences, University of Belgrade. As student associate he is involved in teaching courses covering the area of E-business, Internet technologies, Internet marketing and Internet of things. His current professional interests include Internet of Things, e-business, Internet technologies, .net programming, e-education and Internet technologies. He can be reached at: [igor@elab.rs](mailto:igor@elab.rs)

**Milić Aleksandar** is a teaching associate and PhD student at the Faculty of Organizational Sciences, University of Belgrade. He is involved in teaching courses covering the area of E-business, Mobile business, Internet technologies, Internet marketing, Simulation and simulation languages, and Risk management in information systems. His current professional interests include Internet technologies, e-education, e-business, mobile business, cloud computing, and Internet marketing. He can be reached at: [milic@elab.rs](mailto:milic@elab.rs)

**Nikola Bogdanović** is a student of master studies at the Faculty of Organizational Sciences, University of Belgrade. He holds the position of system engineer at public utility company „Infostan“. His current professional interests include Internet technologies, e-business, cloud computing, and Internet of things. He can be reached at: [nikola.bogdanovic@infostan.rs](mailto:nikola.bogdanovic@infostan.rs)

## 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.

\*Correspondence author

## **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 realized 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.

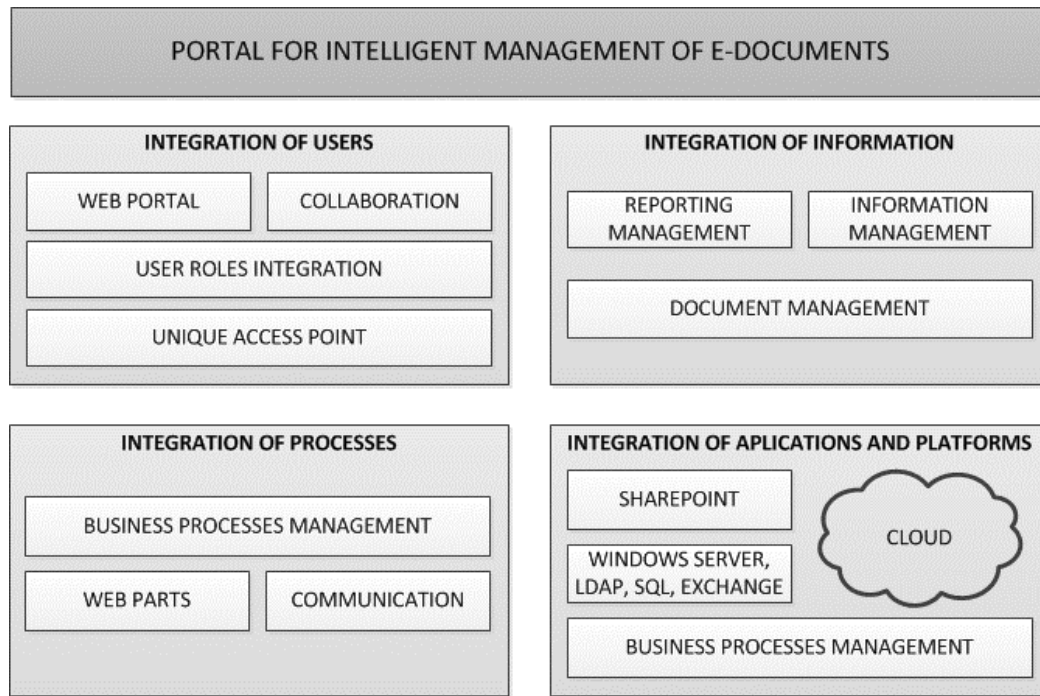


Figure 1: The integration of the components of the portal for the intelligent management of e-documents

### 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).

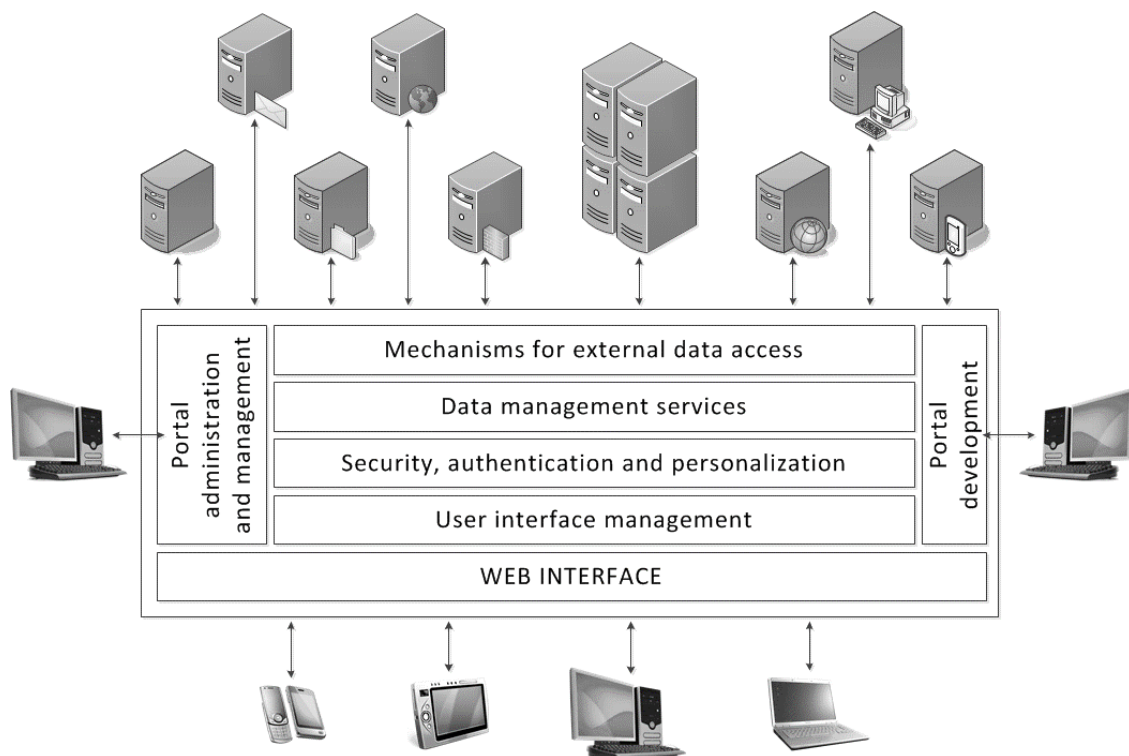


Figure 2: Typical web portal architecture

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).

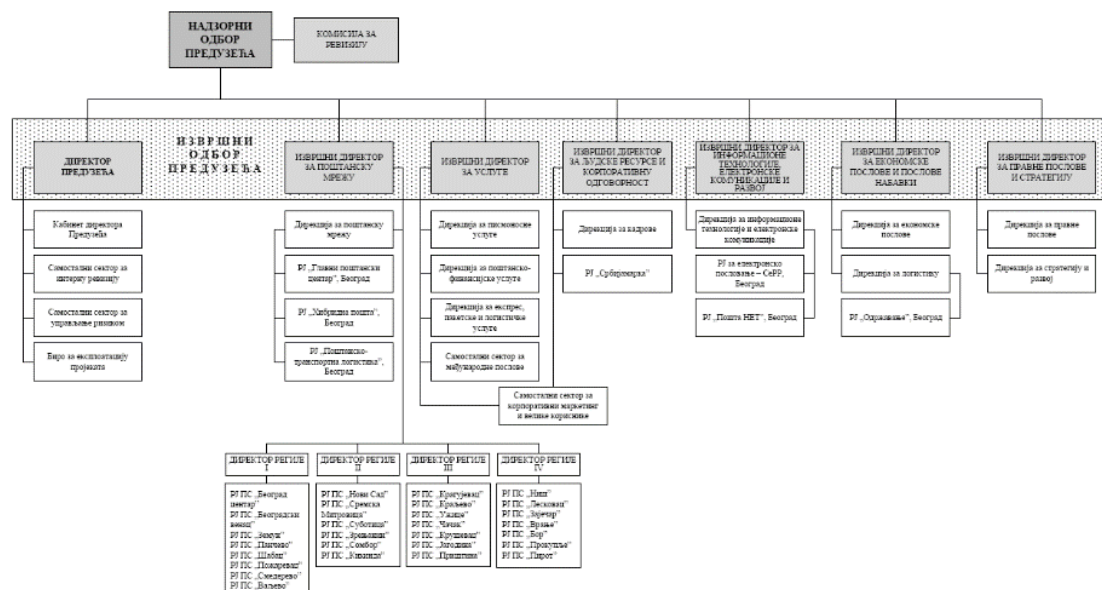


Figure 3: Organizational structure of the Public Enterprise of Post Serbia

## 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 units at different levels of hierarchy with horizontal and vertical e-documents flow. (Đokić, D., 2012).

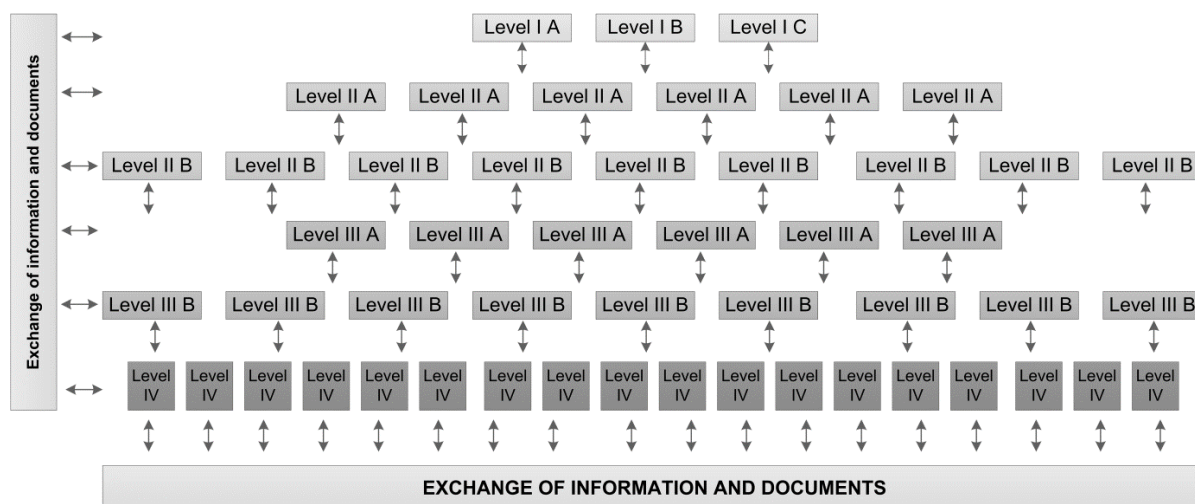


Figure 4: Model of exchange of information and document between organizational units

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.

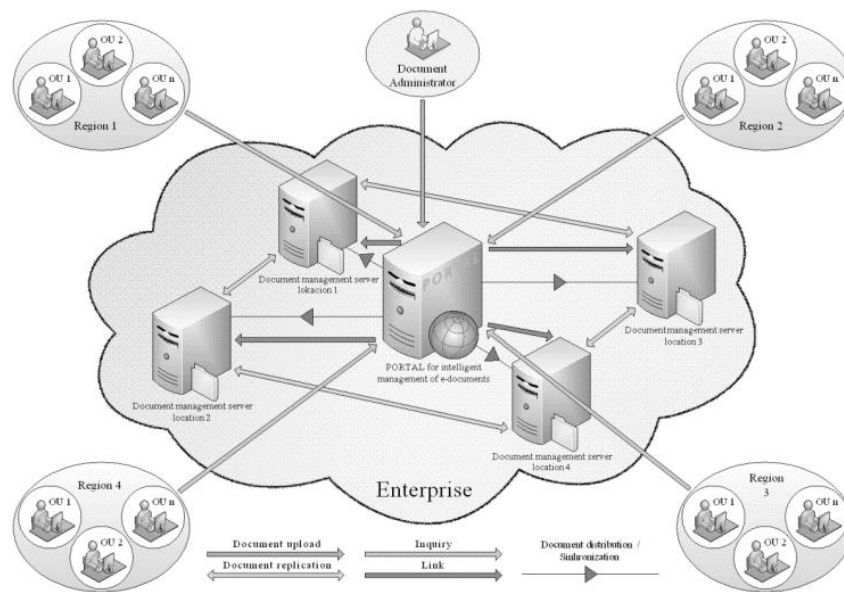


Figure 5: Services for the geographical location of users

#### 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.

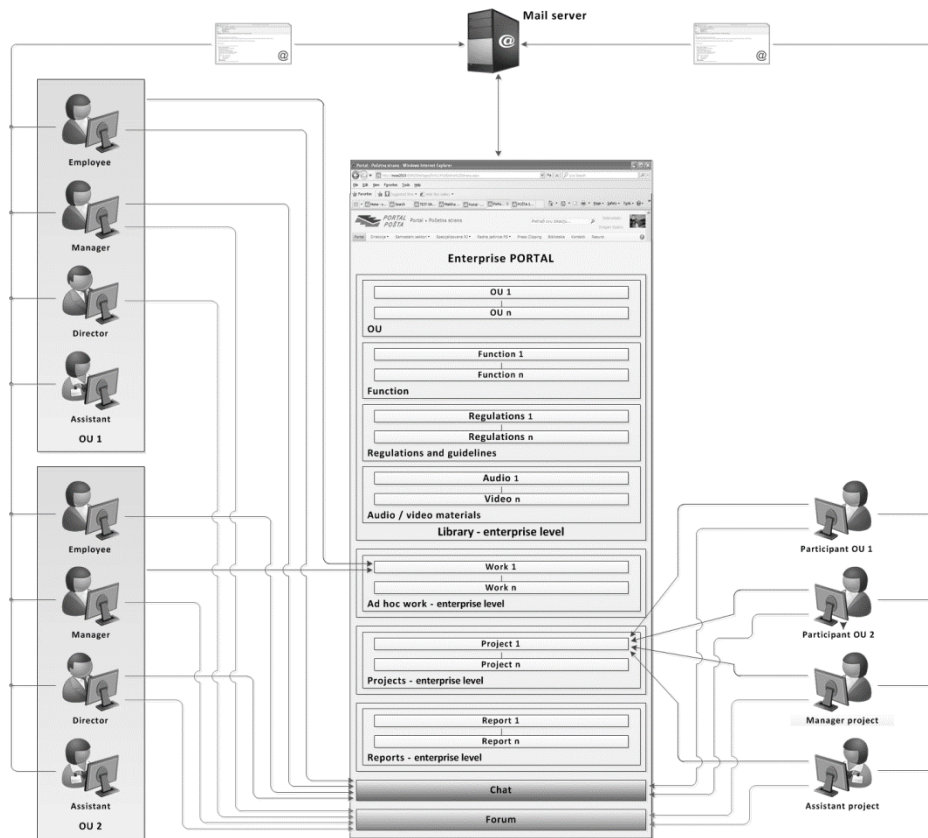


Figure 6: Collaboration within the portal for intelligent e-document management

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 be 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 unit responsible for the project, therefore, the project web site includes 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 realized, 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<br>Avg. Disk sec/Write<br>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 convenient ?     | > 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 of 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. telecommunication 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](mailto: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](mailto: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](mailto: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](mailto:aleksandra@elab.rs).

## DESIGNING CLOUD INFRASTRUCTURE FOR BIG DATA IN E-GOVERNMENT

Jelena Šuh\*

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 110000 Belgrade, Serbia  
jelena.suh@gmail.com

Vladimir Vujin

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 110000 Belgrade, Serbia  
vujin@elab.rs

Dušan Barać

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 110000 Belgrade, Serbia  
dusan@elab.rs

Zorica Bogdanović

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 110000 Belgrade, Serbia  
zorica@elab.rs

Božidar Radenković

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 110000 Belgrade, Serbia  
boza@elab.rs

### Abstract

The development of new information services and technologies, especially in domains of mobile communications, Internet of things, and social media, has led to appearance of the large quantities of unstructured data. The pervasive computing also affects the e-government systems, where big data emerges and cannot be processed and analyzed in a traditional manner due to its complexity, heterogeneity and size. The subject of this paper is the design of the cloud infrastructure for big data storage and processing in e-government. The goal is to analyze the potential of cloud computing for big data infrastructure, and propose a model for effective storing, processing and analyzing big data in e-government. The paper provides an overview of current relevant concepts related to cloud infrastructure design that should provide support for big data. The second part of the paper gives a model of the cloud infrastructure based on the concepts of software defined networks and multi-tenancy. The final goal is to support projects in the field of big data in e-government.

**Keywords:** big data, cloud computing, e-government.

\*Correspondence author

## 1 Introduction

The development of information and communication services has great impact on the occurrence of large amounts of data, but also the need to access that data and perform analysis in real time. For this reason there is a need to create a simple network infrastructure, which will also meet the requirements in terms of scalability, security and availability.

There are systems in e-government where big data emerges and cannot be processed and analyzed in a traditional manner due to its complexity, heterogeneity and size. Taking into account the fact that this data has different structure and formats, and are often time-sensitive, special attention is paid to new technologies for storing and processing big data, and tools for big data analysis. Big data is one of the new trends in IT that on the technical side gives the possibility for these data to be used for real time analysis. In order to implement big data in e-government network infrastructure needs to be redesigned.

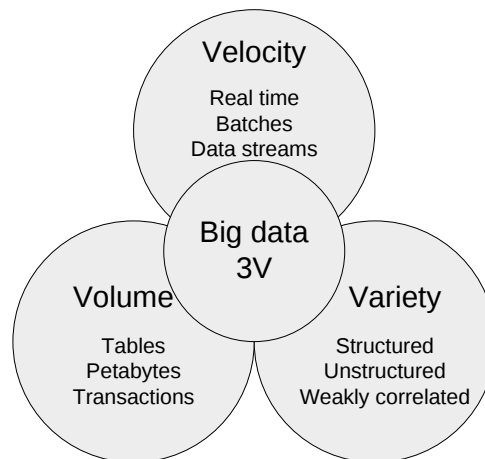
Main subject of this paper is the design of the cloud infrastructure for big data storage and processing in e-government. The goal is to analyze the potential of cloud computing for big data infrastructure and benefits that this approach can bring to e-government services. We present a network infrastructure model for processing and analyzing big data in e-government.

This paper points out the importance of the research in the field of big data and finding solutions to handle large amounts of data since e-government currently does not make sufficient use of big data technologies. The basic concepts of big data are first described. Then Hadoop framework for distributed processing of large amounts of data, as well as Map Reduce principle for big data search is presented. Having introduced big data concepts, the remainder of the paper is organized as follows. In the next section we provide an overview of principles and technologies for cloud infrastructure design. Software-defined networks and Savanna project, which aims to facilitate the integration of Hadoop and OpenStack technology, are described. We then review and discuss application of big data technologies in e-government. Next section represents a model of the cloud infrastructure for big data in e-government based on the concepts of software-defined networks. Last section represents conclusion with a discussion of key observations and implications for future research.

## 2 Big data definition and concepts

Big data is a term which refers to a large amount of data which cannot be processed and analyzed in a traditional manner, due to their complexity (Liu, 2013). For a big data description 3V model (Gartner Says Solving 'Big Data' Challenge Involves More Than Just Managing Volumes of Data, 2011) is often used. This model points out three characteristics: the amount of data (volume), processing speed (velocity) and a variety of data types (variety). The amount of data in big data is measured in terabytes, and that is the reason why special

attention should be given to data storage. Another important big data characteristic is fluctuations in the amount of data (Zikopoulos, Eaton, deRoos, Deutsch, & Lapis, 2012). An additional requirement is the data processing speed, since the data is often time-sensitive and require rapid transfer and analysis. A particular problem is the fact that the data are not structured and that they are in different formats: text, audio, video, log files, etc. A newer definition adds the necessity of applying new ways of data processing in order to improve decision-making and optimization process (Beyer & Laney, 2012).



*Figure 1. 3V big data definition*

Bearing in mind the fact that big data are mainly unstructured data, it is necessary to apply new principles of data storing, which are different from the traditional, which use relational databases. The concept, which has become indispensable when it comes to big data, is NoSQL (Strozzi).

It should be noted that the amount of digital data in 2011th amounted to about 1.8 ZBy (1.8 trillion GBy) (Bakshi, 2012), and it is clear that there is a need for further research of big data.

### **3 Review of technologies**

#### **3.1 Cloud computing**

Cloud computing is an area of computer science in which highly scalable IT capacity is provided in the form of services delivered via the Internet to numerous external users (Sultan, 2010). It is a model for enabling on-demand network access to shared computing resources (servers, storage, applications etc.) that can be rapidly provisioned and released with minimal management effort (Mell & Grance, 2011).

The advantages of using cloud computing are multiple (Watson, 2009): cost reduction and efficient use of resources have positive impact on development. At the same time cloud computing allows IT to focus on delivering IT services.

Main disadvantages are related to privacy and security issues and lack of legal regulative in this area.

This cloud model is composed of three service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a service (SaaS). There are four cloud deployment models (Jin, et al., 2010):

- Private cloud – internal cloud; network architecture within company or organization
- Public cloud – external cloud; on-demand resources are allocated and delivered via web services using Internet
- Hybrid cloud – combination of private and public cloud
- Community cloud – cloud infrastructure is shared among multiple organizations or companies

One of the main challenges in cloud computing environment is network infrastructure management. OpenStack is an open-source management tool for IaaS cloud computing infrastructure (OpenStack). OpenStack project is a collaboration of a large number of developers and companies whose goal is to create an open standard cloud computing platform for public and private cloud environments. This technology consists of many related projects which control different network resources via control panel (dashboard), a command line or a RESTful API (Fifield, et al., 2014).

Neutron or OpenStack Networking is one of OpenStack projects that have the task to provide the Network-as-a-Service (Neutron's Developer Documentation). The goal is to design virtual networks in a simple way without knowledge about complete underlying network infrastructure.

Simple implementation, scalability, and a range of additional features contribute to the popularity of OpenStack project that can be used in a number of networks. Multi-tenancy concept is one of the most important features because several tenants can use the same cloud infrastructure and share network resources. They can create completely isolated end-to-end network topologies based on specific requirements. Tenants can be administrators, citizens, but also e-government services and applications. In order to implement Network-as-a-Service with custom forwarding rules it is necessary to introduce the concept of software-defined networks.

### **3.2 Software-defined networks**

Software-defined networks (SDN) have a central position in the process of design of big data network infrastructure as they are the transport medium for the transmission of large amounts of data. It is a new concept in computer networks, which allows network and service management abstracting the lower layers of the network infrastructure (Open Network Foundation) (Nadeau & Pan, 2011). Main characteristics of SDN networks are centralized management, and a complete separation from network elements, using open standard

interfaces for communication. OpenFlow protocol, a first interface for communication between the control and traffic forwarding layers, is an important factor in the development of SDN concept (McKeown, et al., 2008).

SDN architecture defines three layers: infrastructure, management and application (Software-Defined Networking: The New Norm for Networks, ONF White Paper, 2013). Traffic forwarding is realized at the infrastructure layer using different network elements and devices. Network control and monitoring is a function of the control layer and user applications are placed at the application layer.

SDN networks are based on the following principles (Muglia, 2013):

- Clear separation of network software in 4 layers (plain): management, services, control and forwarding.
- Centralization of certain aspects of the management, and control plane services in order to achieve simplicity of network design and reduce costs.
- The application of cloud computing to achieve flexibility.
- Creating a platform for network applications and services and integration with management systems.
- Standardized protocols in order to achieve interoperability and support for multi-vendor environments.
- Applicability of SDN principles to all networks and network services.

SDN concept is a good solution for big data infrastructure because it provides scalability, great flexibility and support for different APIs so many different services can be implemented.

### 3.3 Map Reduce

Google has developed a framework, Map Reduce, for processing large amounts of data using a large number of processors (Dean & Ghemawat, 2004). The processing is divided into two phases: map and reduce, where each stage has input and output parameters in the form of key/value pairs. User defines map function, and as a result of processing a number of key/value pairs are received. Reduce function is then applied to the resulting key/value pairs and extracts all the values with the same key.

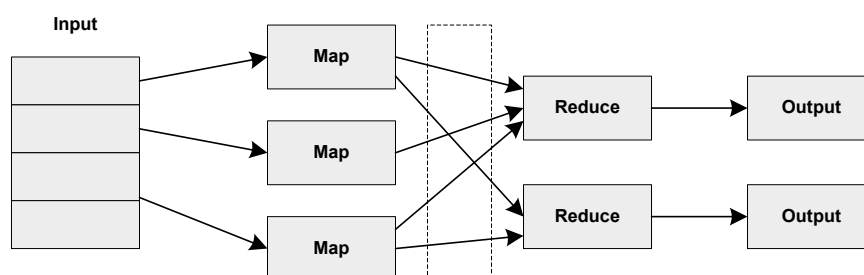


Figure 2. Map Reduce

An important feature of this method of data processing is that map and reduce functions can be executed in parallel, which enables simple implementation in the cluster.

### **3.4 Hadoop**

Apache Hadoop is an open-source software framework for big data storage and processing in a cluster-based infrastructure (Hadoop, 2014). Hadoop uses Map Reduce approach.

Hadoop framework modules (Hadoop Project Description, 2014):

- Hadoop Common – libraries and functions that support the other Hadoop modules
- Hadoop Distributed File System (HDFS) – distributed file system
- Hadoop YARN – job scheduling and cluster resource management
- Hadoop MapReduce – system for big data parallel processing

Hadoop Map Reduce framework has master/slave architecture. There is one master server or jobtracker and more slaves or tasktrackers. Communication between users and framework is achieved through a jobtracker. Jobtracker receives map/reduce requests which are then processed on first-come/first-served basis. He is also responsible for the allocation of map/reduce tasks to tasktracker nodes.

Apache has created several Hadoop-related projects:

- Ambari - web-based tool for provisioning, managing, and monitoring Apache Hadoop clusters
- Hbase - scalable, distributed database that supports structured data storage for large tables
- Hive - data warehouse infrastructure that provides data summarization and ad hoc querying
- Pig - high-level data-flow language and execution framework for parallel computation

Thanks to its features, such as scalability and flexibility, Hadoop project is supported by a large number of companies (Amazon Elastic MapReduce).

### **3.5 Big data analytics**

Big data analytics is a term which refers to process of big data examination in order to discover and extract meaningful business value and to turn big data into actionable insights. Getting value out of big data is a complex process since huge volumes of data cannot be analyzed in a traditional manner. High-performance analytics must be used for faster and more accurate decision making. High-performance data mining, text mining, predictive analytics, forecasting and optimization on big data can be used. Historical data analysis is important but real-time processing as well. Final goal is to publish different reports depending on user requests and to visualize big data.

Big data analytics enables quicker response to market trends and mass customization of services. It can provide solution to different problems in domain of video analytics, click stream analytics, social media analysis, financial analytics, fraud detection etc.

### **3.6 OpenStack and big data**

Sahara project was launched with the idea to implement Hadoop clusters in the cloud environment based on OpenStack technology (Sahara, 2014). The aim is to enable users to easily create a Hadoop cluster by defining a few parameters, such as Hadoop version, cluster topology, hardware characteristics of nodes and so on. Management is accomplished via REST API, and there is a user interface within the OpenStack dashboard.

Sahara supports the concept of templates to simplify the configuration process. In order to make easier the process of implementation of certain versions of Hadoop, or distribution in different network topologies and with support for a variety of tools for monitoring and control, Sahara supports the concept of plug-ins.

## **4 Big data in e-government**

E-government systems are complex and have many services for citizens and enterprise. The data volume in these systems is measured in terabytes so we can speak about big data. In order to provide better services and support for future applications for citizens and business users e-government must consider implementation of big data technologies.

There are several big data projects successfully implemented in big companies such as Amazon, Yahoo, Facebook, Adobe etc. (Hadoop Wiki PoweredBy, 2014). Many of these use cases can be implemented in e-government. Big data and Hadoop, as most significant big data framework, has already applied in the following areas (Hadoop Use Cases and Case Studies): data storage, health care, education, retail, energy, logistics, image/video processing, travel, financial services, and politics.

There are several big data use cases especially significant for e-government. Social network analysis is very important bearing in mind social network popularity. Advanced analytic tool can analyze unstructured data from social media and determine user sentiment related to particular issue. In order to determine the effectiveness of different marketing campaigns big data can be used to improve accuracy of analysis.

Health care is another area where big data can make significant improvements. Beside storing and processing medical records big data analytics can help hospitals to further personalize patient care (Groves, Kayyali, Knott, & Van Kuiken, 2013).

Smart city concept is based on intelligent management and integrated ICTs and requires active citizen participation. It is becoming more and more popular and implies usage of large

number of different sensors. Many biological and industrial sensors generate large volumes of data so sensor data analysis is domain where big data must be used.

Intelligent transportation systems are applications whose main task is to provide services related to traffic management. Another important characteristic is simplification of traffic information placement towards citizens (The Case for Smarter Transportation - IBM Whitepaper, 2010). Auto-navigation, e-payment, smart parking and smart crossroad are just some of the examples where large amount of data are present so big data technologies can make significant improvements. Public safety services can use big data analysis for image/video processing for video surveillance which is very important for transportation systems.

Big data technologies can also help in fraud detection analyzing users' behavior, historical and transactional data. Goal is threat prediction and prevention looking for patterns and anomalous activity. In health care domain this can ensure that eligible citizens receive benefits. General security can be significantly improved using big data analytics for crime prediction and prevention and in emergency situations this approach can refine disaster response and information-collecting mechanisms.

Implementation of big data technologies can contribute to overall e-government effectiveness. One significant aspect is cost reduction, but equally important is better interaction between citizens and business users and government.

## **5 Cloud infrastructure model for big data in e-government**

E-government systems are complex and special attention should be given to network infrastructure design since it is necessary to create scalable and secure environment as a base for numbered e-government services. The cloud computing infrastructure is the solution that can adequately fulfill these requirements. In order to provide certain network programmability SDN concepts must be used too. Different e-government services require access to large amounts of data, so big data technologies must be implemented.

The main requirement that the network infrastructure must meet is the dynamic configuration of network resources based on user-defined requirements, which will vary depending on the nature of the service or application in use. In addition to basic network services for communication it is necessary to provide integration with external institutions and support for big data. Guidelines for network infrastructure design are: support for all available e-government services, on-demand resource reservation and big data support. Equally important are simple network management and new services and applications development without complex knowledge of underlying network.

Figure 3 shows conceptual model of the big data infrastructure. Citizens or enterprise users use certain service via e-government portal. Users' requests are sent to big data infrastructure in order to be processed. Big data infrastructure has databases which are not centralized. Integration with databases of different ministries, government agencies and local authorities is realized. After big data processing and analysis user gets adequate response and data visualization via e-government portal.

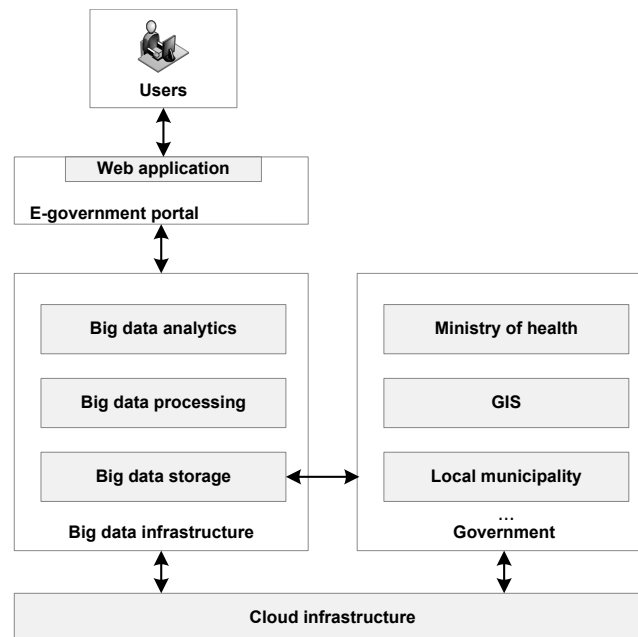


Figure 3. Conceptual model of the big data infrastructure

The big data infrastructure is based on cloud computing and SDN concepts. Hadoop framework is used for big data storage and processing. Integration with OpenStack cloud is realized using Sahara controller and HDP plug-in. The cloud-based model of the big data infrastructure is shown in Figure 4. The advantage of this model is the use of open-source software so implementation costs for this solution are significantly reduced.

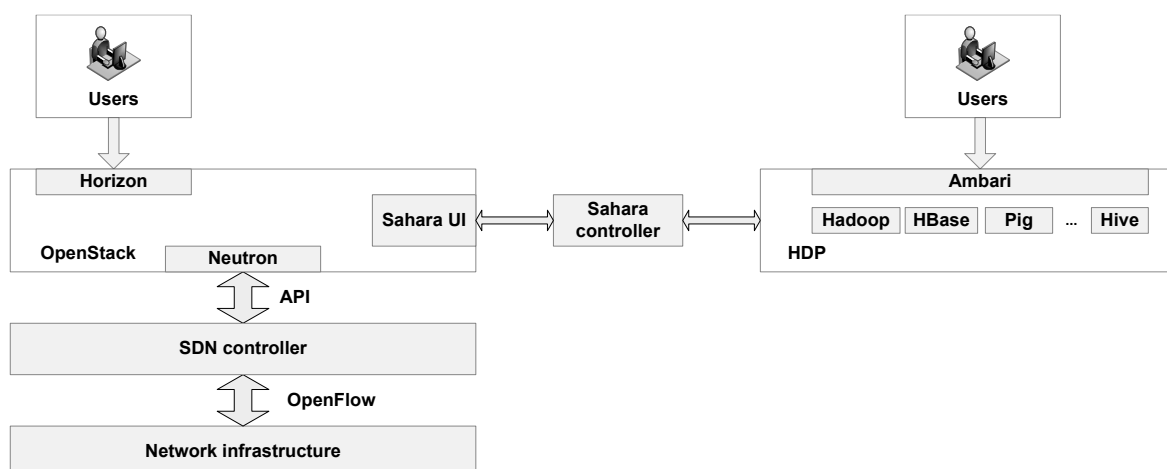


Figure 4. The model of the big data infrastructure for cloud-based e-government

Users send requests to the network using an appropriate interface. The request is then forwarded to SDN controller, which is a central place in the architecture. SDN controller has the task to configure network infrastructure and define the rules for traffic forwarding based on the specific service. Mentioned phases are shown in the Figure 5.

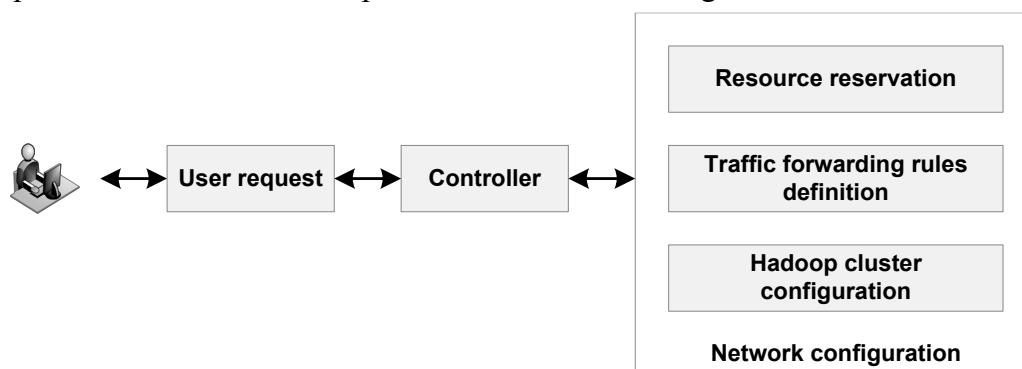


Figure 5. User's interaction phases

For the evaluation of the model the big data infrastructure prototype in e-learning is developed in Laboratory for E-business at the Faculty of Organizational Sciences in Belgrade. This network infrastructure can provide on-demand big data infrastructure for different users (students, teachers, laboratories, etc.). The analysis of data from Moodle LMS (students' data, their activities, logs etc.) is implemented within the Hadoop infrastructure in order to increase efficiency and improve the quality of teaching. Figure 6 shows conceptual diagram for developed infrastructure prototype in e-learning.

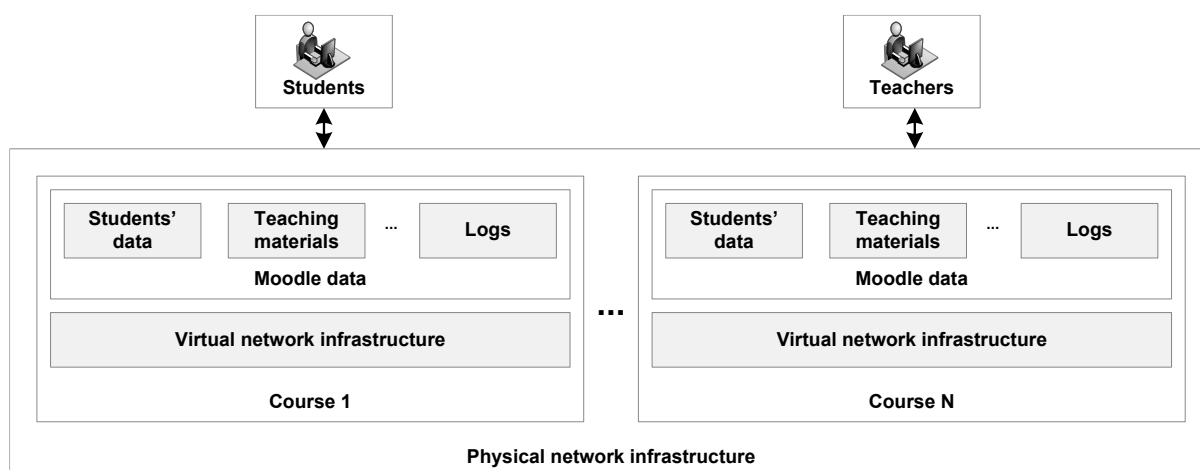


Figure 6. Conceptual diagram for infrastructure prototype in Laboratory for E-business

Following the example of the prototype the same model can be applied to any e-government segment where big data resources can be provided as a service to users and institutions depending on organizational policies and all that using common network infrastructure. This model is based on open-source technologies so main advantages of the proposed model are efficiency and cost-effectiveness. This relatively simple network infrastructure can fulfill different requirements and final goal is to improve the usage of existing data. General issues

such as privacy and data protection are present here too, so future research should be devoted to these problems.

## 6 Conclusion

The development of new information services and technologies, especially in domains of mobile communications, Internet of things, and social media, has led to appearance of the large quantities of unstructured data. Analysis of these data is of great importance not only in the internal business processes, but also in science, government, education, and all of society (Bryant, Katz, & Lazovska, 2008). E-government systems have large amounts of data that cannot be processed and analyzed in a traditional manner. The basis for the development of software solutions and tools for the big data analysis is a network infrastructure, which should provide a scalable, reliable and secure environment for storing and processing data.

In this paper, we presented main concepts of big data and principles and technologies for cloud infrastructure design. We developed a model for big data infrastructure in e-government based on cloud computing and SDN concepts. This model can significantly improve efficiency in e-government for citizens and enterprise users. Future research should be focused on improving current model, exploring possibilities for mobile services support and QoS implementation.

## Acknowledgment

The authors are thankful to Ministry of Education, Science and Technological Development of Republic of Serbia for financial support grant number 174031.

## References

1. *Amazon Elastic MapReduce*. Retrieved from <http://aws.amazon.com/elasticmapreduce/>
2. Bakshi, K. (2012). Considerations for big data: Architecture and approach. *IEEE Aerospace Conference*. Big Sky, MT.
3. Beyer, M. A., & Laney, D. (2012). *The Importance of 'Big Data': A Definition*. Gartner.
4. Bryant, R. E., Katz, R. H., & Lazovska, E. D. (2008). *Big-Data Computing: Creating revolutionary breakthroughs in commerce, science, and society*. Retrieved from [http://www.cra.org/cce/files/docs/init/Big\\_Data.pdf](http://www.cra.org/cce/files/docs/init/Big_Data.pdf)
5. Dean, J., & Ghemawat, S. (2004). MapReduce: Simplified Data Processing on Large Clusters. *OSDI*.
6. Fifield, T., Fleming, D., Gentle, A., Hochstein, L., Proulx, J., Toews, E., & Topjian, J. (2014). *OpenStack Operations Guide*. O'Reilly Media.
7. *Gartner Says Solving 'Big Data' Challenge Involves More Than Just Managing Volumes of Data*. (2011). Retrieved from <http://www.gartner.com/newsroom/id/1731916/>
8. Groves, P., Kayyali, B., Knott, D., & Van Kuiken, S. (2013). *The big data revolution in healthcare*. Retrieved from

- [http://www.google.rs/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&sqi=2&ved=0CDAQFjAB&url=http%3A%2F%2Fwww.mckinsey.com%2F~%2Fmedia%2Fmckinsey%2Fdotcom%2Fclient\\_service%2Fhealthcare%2520systems%2520and%2520services%2Fpdfs%2Fthe\\_big\\_data\\_revolution\\_in\\_healthcare.ashx&ei=pbxzU7CLCubygPgh4CABw&usg=AFQjCNFIpUfpqQQcDlpSXHWco5atclHrag&bvm=bv.66699033,d.bGQ](http://www.google.rs/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&sqi=2&ved=0CDAQFjAB&url=http%3A%2F%2Fwww.mckinsey.com%2F~%2Fmedia%2Fmckinsey%2Fdotcom%2Fclient_service%2Fhealthcare%2520systems%2520and%2520services%2Fpdfs%2Fthe_big_data_revolution_in_healthcare.ashx&ei=pbxzU7CLCubygPgh4CABw&usg=AFQjCNFIpUfpqQQcDlpSXHWco5atclHrag&bvm=bv.66699033,d.bGQ)
9. *Hadoop*. Retrieved from <http://hadoop.apache.org/>
  10. *Hadoop Wiki PoweredBy*. Retrieved from <http://wiki.apache.org/hadoop/PoweredBy/>
  11. *Hadoop Project Description*. Retrieved from <http://wiki.apache.org/hadoop/ProjectDescription/>
  12. *Hadoop Use Cases*. Retrieved from [http://hadoopilluminated.com/hadoop\\_book/Hadoop\\_Use\\_Cases.html](http://hadoopilluminated.com/hadoop_book/Hadoop_Use_Cases.html)
  13. Jin, H., Ibrahim, S., Bell, T., Gao, W., Huang, D., & Wu, S. (2010). Cloud Types and Services. In *Handbook of Cloud Computing* (pp. 335-355). Springer.
  14. Liu, L. (2013). Computing infrastructure for big data processing. *Front. Comput. Sci.*, 7(2), pp. 165-170.
  15. McKeown, N., Anderson, T., Balakrishnan, H., Parulkar, G., Peterson, L., Rexford, J., . . . Turner, J. (2008). OpenFlow: Enabling Innovation in Campus Networks. *ACM SIGCOMM Computer Communication Review*, 38(2), pp. 69-74.
  16. Mell, P., & Grance, T. (2011). *The NIST Definition of Cloud Computing*. National Institute of Standards and Technology, Special Publication 800-145.
  17. Muglia, B. (2013). *Decoding SDN*. Retrieved from <http://forums.juniper.net/t5/The-New-Network/Decoding-SDN/ba-p/174651/>
  18. Nadeau, T., & Pan, P. (2011). Software Driven Networks Problem Statement. *IETF Internet-Draft*.
  19. *Neutron's Developer Documentation*. Retrieved from <http://docs.openstack.org/developer/neutron/>
  20. *Open Network Foundation*. Retrieved from <https://www.opennetworking.org/sdn-resources/sdn-definition>
  21. *OpenStack*. Retrieved from <http://www.openstack.org/>
  22. *Sahara*. Retrieved from <http://savanna.readthedocs.org/en/latest/>
  23. *Software-Defined Networking: The New Norm for Networks, ONF White Paper*. (2013). Retrieved from <https://www.opennetworking.org/images/stories/downloads/sdn-resources/white-papers/wp-sdn-newnorm.pdf>
  24. Strozzi, C. *NoSQL*. Retrieved from [http://www.strozzi.it/cgi-bin/CSA/tw7/I/en\\_US/NoSQL/Home%20Page/](http://www.strozzi.it/cgi-bin/CSA/tw7/I/en_US/NoSQL/Home%20Page/)
  25. Sultan, N. (2010). Cloud Computing for education: A new dawn? *International Journal of Information Management*, 30(2), pp. 101-182.
  26. *The Case for Smarter Transportation - IBM Whitepaper*. (2010). Retrieved from [http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype=PM&subtype=XB&appname=SNDE\\_TT\\_TT\\_USEN&htmlfid=TTE03001USEN&attachment=TTE03001USEN.PDF](http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype=PM&subtype=XB&appname=SNDE_TT_TT_USEN&htmlfid=TTE03001USEN&attachment=TTE03001USEN.PDF)

27. Watson, D. L. (2009). *Hey - Get Off My Cloud! 5th International Conference on Global Security, Safety and Sustainability*. London, UK.
28. Zikopoulos, P. C., Eaton, C., deRoos, D., Deutsch, T., & Lapis, G. (2012). *Understanding big data*. New York: McGraw Hill.

\*\*\*

**Jelena Šuh** is a PhD student at the Faculty of Organizational Sciences, University of Belgrade. From 2008 she is employed as IP/MPLS engineer at Telekom Serbia. As a Cisco instructor at Cisco Networking Academy Telekom Educational Initiative, she is involved in teaching CCNA course, covering the area of computer networks. Her current professional interests include computer networks, network management, e-business, Internet technologies and e-government. She can be reached at: jelena.suh@gmail.com.

**Vujin Vladimir** is research associate at Department for e-business and senior system administrator at Department for distance learning at the Faculty of Organizational Sciences, University of Belgrade. His current professional interests include e-business, computer networks, network management, Internet technologies, cloud computing and e-education. He can be reached at: vujin@elab.rs.

**Barać Dušan** is an assistant professor at Faculty of Organizational Sciences, University of Belgrade. He is involved in teaching courses covering the area of e-business, mobile business, Internet technologies, Internet marketing, Simulation and simulation languages, and Risk management in information systems. His current professional interests include internet technologies, mobile technologies, e-business, cloud computing and e-education. He can be reached at: dusan@elab.rs.

**Bogdanović Zorica** is an assistant professor at Faculty of Organizational Sciences, University of Belgrade. 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. She is a secretary of IEEE Computer Society Chapter CO-16. She can be reached at: zorica@elab.rs.

**Radenković Božidar** a full professor at the Faculty of Organizational Sciences, University of Belgrade. He 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. His current professional and scientific interests include e-business, internet technologies, computer networks, cloud computing, mobile business and Internet of things. He a president of IEEE Computer Society Chapter CO-16, and a full member of the following professional organizations: IEEE, ACM, SCS, YU-INFO, DOPIS, and UNESCO. He can be reached at boza@elab.rs.

## WEARABLE COMPUTING IN E-EDUCATION

Aleksandra Labus\*

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 110000 Belgrade, Serbia  
aleksandra@elab.rs

Miloš Milutinović

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 110000 Belgrade, Serbia  
milosm@elab.rs

Đorđe Stepanić

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 110000 Belgrade, Serbia  
djordje@elab.rs

Mladen Stevanović

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 110000 Belgrade, Serbia  
mladen@elab.rs

Suzana Milinović

Faculty of Organizational Sciences Belgrade, Jove Ilića 154, 110000 Belgrade, Serbia  
suzi.milinovic@gmail.com

### Abstract

Emerging technologies such as mobile computing, sensors and sensor networks, and augmented reality have led to innovations in the field of wearable computing. Devices such as smart watches and smart glasses allow users to interact with devices worn under, with, or on top of clothing. This paper analyzes the possibilities of application of wearable computing in e-education. The focus is on integration of wearables into e-learning systems, in order to support ubiquitous learning, interaction and collaborative work. We present a model for integration of wearable technology in an e-education system and discuss technical, pedagogical and social aspects.

**Keywords:** computing, e-education, e-learning, cloud computing, learning management system

### 1 Introduction

Computer technologies are consistently getting more powerful and encroaching into all areas of human activity. Wearable computing is only the last example of technology getting

\*Correspondence author

Received: 18 November; revised: 11 March; accepted: 30 March.

smaller, more powerful, and more integrated. As such, it is only starting to make its impact on communication, human perception and socialization, and its potential is still mostly undiscovered. It can be very important for application in business and education.

Currently, most educational institutions use Learning Management Systems (LMS) to facilitate learning processes (Graf & Kinshuk, 2008). These solutions provide various features that enable management of online courses, e-learning activities and resources, collaboration, etc. Learning services constantly evolve, following the more general trends of technology (Anderson, 2004).

Wearable computing considers the use of miniature computing devices in order to support various human activities. Such devices can be utilized similarly to a more established application of mobile learning in order to enable learning independently of temporal and spatial constraints (Holzinger, Nischelwitzer, Friedl, & Hu, 2010). Although some learning management systems can support mobile learning through the use of adaptive themes or custom learning activities, wearable computing introduces many new variables into the mix, and learning management systems are not equipped to support such devices.

The main aim of this paper is to analyze the possibilities for improving the existing e-education systems and processes using modern wearable computing devices and approaches. Existing technologies and applications of wearable computing in general are overviewed, followed by examples of application in education. A model for integration of wearable gadgets and e-learning services of a higher educational institution is given. Some ethical and social aspects of using wearable technologies are also considered, especially for students with disabilities.

## **2 Wearable computing**

The second half of the 20th century introduces a new way of thinking about computer technologies, supported by miniaturization and increasing prevalence in the everyday environment. Computers are becoming ubiquitous, and a natural term “ubiquitous computing” describes “computers everywhere”, apparatus which is in wide set of locations, flexible and mobile, small in size and available for communication with other similar devices (Weiser, 1991). Eventually, this has led to the concept of placing computer devices directly on a human body, and allowing them to communicate between themselves and with other systems that exist in the environment.

The wearable paradigm generally assumes the existence of a device that interacts with the human in some way. The wearable computer can, therefore, be described as a device that is always connected to its user, while the user using it and wearing it in a comfortable way (Toh, 2013). Wearable computing can also be understood as having devices worn in the same way

as clothing, that are always available for usage and able to perform various kinds of computing (Mann, 1997b).

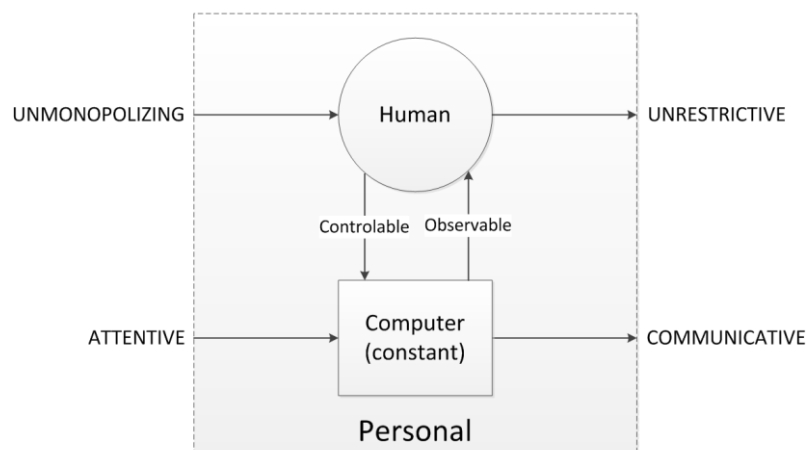
The idea of wearable computing has existed in some form since the creation of the first analogue watch; however, the first electrical wearable device based upon the digital signal transmission is Edward Thorp's and Claude Shannon's roulette result simulator (Thorp, 1998). One of the main developments in this area was the development of a wearable battery-operated personal imaging system by Steve Mann in 1981 (Mann, 1997b). Evolution from analog, through digital, single function, multi-function, to always connected smart or analog wearables are shown in figure 1.



*Figure 1.* The evolution of wearables

Wearable computing in general covers broad range of devices and possible usages. It is necessarily that wearable computing architecture fulfils the requirements of persistence and constancy in order to be accepted as such (Witt, 2008). Furthermore, wearable devices should be stable in sense of power supply (Mann, 1997a) and context sensitivity (Billinghurst & Starner, 1999). Nowadays, implementations of wearable computing are limited and depend on developers' creativity and contribution.

There are three basic operational modes defined by Mann (Mann, 1998): constancy of wearable computer, augmentation of senses and mediation with physical reality. These three defined modes in cohesion make basic view of wearable computing paradigm which is nowadays widely accepted.



*Figure 2.* Comprehensive view of wearable computing (Mann, 1998)

### 3 Wearable computing in e-education

Unlike traditional education, e-education is an area where new technological possibilities are quickly explored and adopted. E-education is significantly improved by new learning theories and ideas. Modern visualization techniques help the students in exploring available educational resources and discovering new information (Dadzie & Rowe, 2011). Innovative methods of presenting information, imaginative interaction patterns and edutainment concept make the learning material more accessible to less motivated learners (Arnone, Small, Chauncey, & McKenna, 2011).

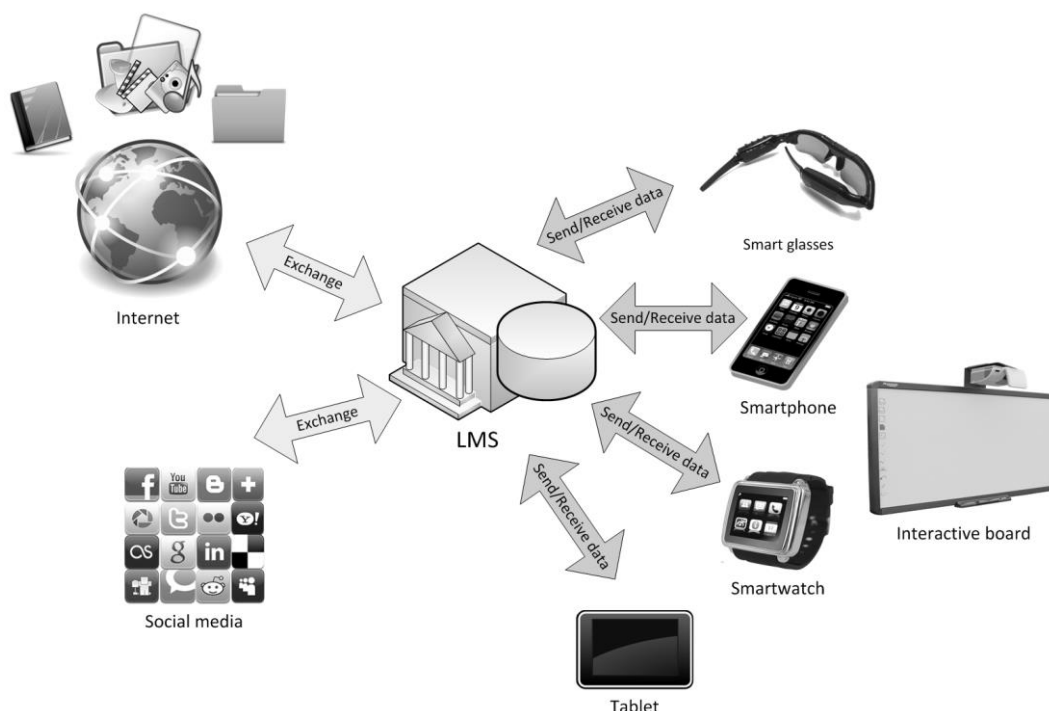
It is difficult to restrict which of the widespread technologies and devices are involved in e-learning, but it is certain that Internet is the basis of the modern educational framework. A number of technologies like learning management systems, multimedia technologies, wireless technologies, etc. are used for implementation of e-learning (Anderson, 2004). Technology concepts that are becoming dominant in e-education include Web 2.0, social media and mobile technologies (Labus, Simić, Vulić, Despotović-Zrakić, & Bogdanović, 2012).

With the increase of smart mobile devices in use among the student populations, learning management systems need to be flexible enough to provide appropriate services to appropriate devices types. A number of works deal with the use of mobile devices in e-learning and their integration with other modern technologies. An example of an environment for language learning where the formal classroom learning is combined with informal learning is given in (Wong & Looi, 2010). Mobile learning is often performed on the move, and mobile devices offer unique opportunities for delivering learning content in authentic learning situations. Modern devices and platforms have built-in GPS, cameras, sensors, accelerometers, and compasses that are valuable sources of context information (Godwin-Jones, 2011). Context information can be used in advanced adaptation scenarios, where

content is organized according to some learner context parameter like location (Jong, Specht, & Koper, 2009).

Wearable computing shares many constraints and features with mobile learning, and even completely overlaps with it in some areas. Most conclusions given for mobile learning are applicable for use of wearable computing in education. However, wearable computing assumes a wider range of devices, with some of them being substantially different from the main staple of mobile learning - mobile telephones. Some devices might not even possess any type of visual display, while others can be specialized for performing a single task or function. This implies that the range of their capabilities is wider, in total, but individually the devices might be more limited. It is important for any learning system to properly recognize these capabilities in order to be capable of producing adequate learning materials.

A general overview of a learning management system that can support mobile/wearable devices is shown in figure 3. The learning management system needs to support inputs from various devices (mainly user activity and learning context), and deliver appropriate learning materials from a local database or an external source. Learning materials need to be prepared in some way in order to allow automated selection and delivery, and this can be performed in several ways, all of them relying on metadata. The educational content can be distributed into learning objects - small, context-free, metadata-annotated units containing learning materials (McGreal, 2004). If the institution possesses a large amount of materials, some form of automated analysis and annotation of resources might be more suitable (Bogdanović, Despotović-Zrakić, Milutinović, Anđelić, & Milinović, 2013). Finally (and not exclusive with other two approaches), an ontology can be used to describe all educational resources, their relations and characteristics (Milutinović, Stojiljković, & Lazarević, 2014). Social networks can additionally be utilized as sources of information about the learners, further enriching the learning context, as well as a platform for delivery of learning materials.



*Figure 3. Wearable computing in e-education*

Currently, there is a lack of research papers dealing with the topic of wearable computing in e-education, and there are even less examples of implementation. In order for such systems to become useful to students, interesting and effective applications need to be developed. A relevant approach to advancing the use of wearable computing in e-education is by developing engineering courses for development of wearable computing applications. One such example is given by (Ngai, Chan, Cheung, & Lau, 2010), where a special t-shirt was used as a “breadboard” for development, and where development tools were selected in such a way to allow students less proficient with electrical engineering and programming to still be able to design and implement their ideas. By introducing the students to wearable technologies in such a way, a gradual move forward can be made - each generation of students can develop applications that the next generation will improve on, and the students can suggest ideas that will actually be of help to them in the process of education.

A topic that is important for wearable computing in general, and especially important for educational applications, is the interface for use of wearable devices. If wearable devices are utilized directly in the process of learning, the methods of interaction with them need to be simple and intuitive, in order to lessen the cognitive load on learners and allow them to concentrate on the task at hand. In the context of wearable computing, visual interfaces (such as those on smart glasses) can be environment dependent and independent, and can be based around the concept of augmented reality, where the interface overlaps/augments actual, tangible objects from the environment (Zhou, Xu, David, & Chalon, 2013).

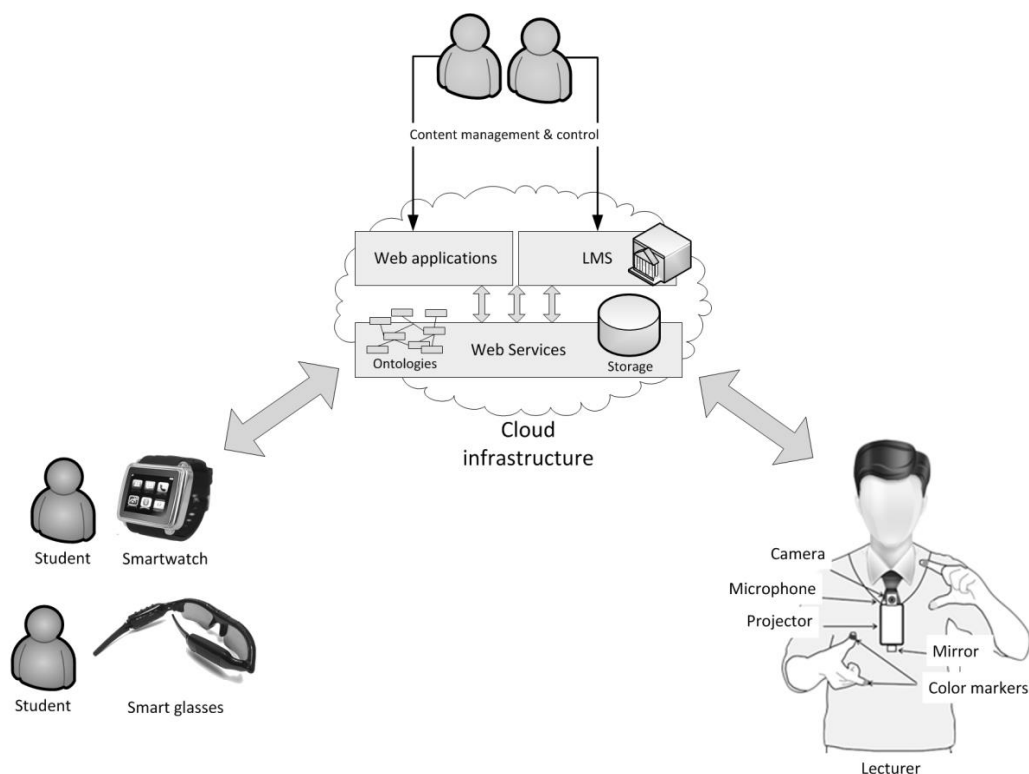
Besides of use in a institutional setting, wearable technologies are especially valuable as tools that enable lifelong learning (Sharples, 2000). Similarly to more traditional mobile learning, wearable devices allow learners to bridge formal learning sessions or learn completely independently, at any place or any time they wish. A review of characteristics, advantages and challenges of new forms of learning, including the wearable computing, is given in (Yordanova, 2007).

#### **4 Model for applying wearable computing in e-education**

The model for applying wearable computing in e-education was developed within the Laboratory for E-business (Elab), at the Faculty of Organizational Sciences, University of Belgrade. Components of the model are described, and some actual wearable devices are suggested for use. Some implementation remarks considering the integration with existing educational infrastructure are given.

The proposed model consists of cloud computing infrastructure, wearable computing devices and software (Figure 4). Wearables and software are different for the students and for the professors.

Cloud infrastructure is a mediator between students and professor in the classroom. The infrastructure consists out of web services, storage/ontologies, a learning management system, and management interfaces. The main purpose of this part of the model is to gather data from the students and teachers, and to deliver specialized learning materials to individual devices. It also authenticates the users and authorizes them to access a learning session/course. This allows the teachers to directly control the experience of students taking their lectures.



*Figure 4. Model for applying wearable computing in e-education*

In order to support various types of devices produced by different manufacturers and programmed using different languages and software components, the communication is performed using web services with standardized interfaces. If possible, the applications can be developed to use such interfaces, and several web services can be developed, if some devices are not flexible enough to allow the use of a single universal interface.

The educational content is stored within the cloud infrastructure. In the proposed model, this content takes the form of learning objects. Several standards exist for learning objects, but the most supported standard among learning management systems is SCORM (McKinney, 2003). SCORM is, however, tightly tied to the use of web technologies (HTML, CSS, JavaScript), which makes any adaptation to nonstandard user interfaces difficult. For this reason, we recommend a more clean separation, with learning objects carrying only the core educational content in textual form, with links to multimedia components, and the actual devices making a decision which form of presentation will they adopt. Such objects can also be described using an ontology, and an example of this can be found in our earlier work (Milutinović et al., 2014).

This removal of presentation concern from learning objects, however, does not eliminate the need for selection of appropriate content and the amount of content that will be served to a device. A device based reasoning approach can be used for this purpose, combined with a standard user model, a technically and educationally appropriate selection of learning objects

can be served to learners (Chorfi, Sevkli, & Bousbahi, 2012). In order to facilitate device-based reasoning, device features need to be known for every device using the learning system. Projects like WURFL, OpenDDR, and Apache DeviceMap attempt to maintain databases of all device features for purposes of capability detection (Power, 2012).

Web services and accompanying educational content and ontologies represent the core of the system. These services can be used internally, in order to provide interaction between student/teacher devices, as well as externally, by other applications and systems. In this case, the learning management system (Moodle, used at the laboratory) and various interfaces for management of users, devices, and learning materials are considered as “external”.

All these components are set up on a cloud computing infrastructure, providing scalability and easy management of a multitude of educational and other services needed for supporting the learning processes. An overview of benefits stemming from cloud computing application in educational institutions is given in (Ercan, 2010). Cloud infrastructures are also well-suited for supporting a large number of devices with less processing power, as means of offloading and speeding up the processing of data.

Students’ devices can interact among themselves and with the professor’s device, through the supporting cloud infrastructure. Since the core infrastructure is web service-based, users’ devices can connect through Wi-Fi, mobile network, or any other past, present or future technology that provides internet connectivity.

The use of several types of devices was envisioned with the presented model. For instance, smart watches can allow students to sign in into the class with their digital signature, and this information can be submitted over the cloud infrastructure to professor so he can access information about list of present and absentee students. Some applications can be used to read textual documents and convert them to speech and make classes and lectures easy to follow. The core functionality of smart watches - time, can be used to notify students about the time that they have left to complete their tests or other class-defined chores.

Smart glasses also have an important role in the model. They provide visual contact and communication with available resources that are provided by professor and the learning management system. They can communicate with other devices in the classroom, like smart watches or professor’s Sixth Sense technology wearable computing device, described below. Currently, various types of glasses can be found on the market, such as Vuzix Smart Glasses which can run both on Android and iOS, Google Glasses (Android OS), or Golden-i headsets which are intended for Windows CE OS.

A device based on Sixth Sense technology enables professor to take photographs, recognize objects, and bring the information from real to virtual world. Furthermore, the professor can

easily use resources from cloud and communicate with students. In this way they are able to participate in classroom activities, get access to their work and have full control of the lecture course. In this way, activities can be made and conducted more interactively, and student performance can be constantly monitored.

Pranav Mistry, author and pioneer in this technology, defines Sixth Sense as: “wearable gestural interface that augments the physical world around us with digital information and lets us use natural hand gestures to interact with that information” (Mistry, 2010). The main components of this device (shown in figure 4) are the projector, used to project light on objects (paper, wall, table, hand, etc.), and a camera that detects and recognizes user’s movements, especially those of color markers worn on user’s fingers. These movements are later interpreted as actions or commands on mobile computing device, while the both projector and camera are connected to it.

The use of wearable computing can improve the learning process in many ways. The wearable devices can present relevant information quickly, dependant on the context, and personalized according to the user. The educational content can be adapted and a multimodal presentation utilizing sound, pictures, video, text, and possibly some other forms can be used. Wearable devices can also be of help to students with disabilities, allowing the students with bad sight to display the information on their glasses in size and form that is comfortable to them, allowing blind students to use audio-playing devices to read them the content of a lesson, or deaf students to have all of the teacher’s words displayed on their glasses.

The implementation of the presented model needs to be cheap and as simple as possible in order not to disrupt existing learning processes. An institution can utilize its existing cloud infrastructure, or lease cloud resources from another institution. Regular computer infrastructure can also be utilized, if cloud infrastructure is not present, however, sufficient computing resources need to be provided, or such implementation can potentially slow down other systems used to support learning processes. Some wearable devices can be expensive, but with the increase of manufacturers and models, cheaper alternatives can be found. Most modern devices are capable of connecting to the internet, and the institution only needs to be covered with wireless networks in order to support them, which is a commonality in this day and age. The development of applications for wearable devices is often done using similar methods to those of mobile programming, and comparable SDK’s, API’s and libraries can be utilized even by students. Smart environments to complement the wearable devices can also be set up cheaply, using simple sensors and devices like Arduino microcontrollers and Raspberry Pi microcomputers.

## 5 Conclusion

Wearable computing is only starting to get accepted in various areas of human activity, and applying it in education can provide long-term benefits. By introducing the students to wearable computing, the quality of the learning process can be improved, and even future development of wearable systems can be performed by students.

For the students with disabilities, implementation of wearable computing in e-education can bring many advantages and make learning process easier. By using wearables students with disabilities are able to compensate their handicap. For examples, students with vision or attention issues are able to participate in class undisturbed, or using bone conduction together with smart glass device could help students with hearing loss.

Model for applying wearable computing in e-education described in this paper represents one of potential implementations of wearable computing in existing e-education process and environment based on different software solutions and platforms.

## References

1. Anderson, T. (2004). Toward a Theory of Online Learning. In T. Anderson & F. Elloumi (Eds.), *Theory and practice of online learning* (2nd ed., Vol. 36, pp. 33–60). Athabasca, Canada: Athabasca University. doi:10.1111/j.1467-8535.2005.00445\_1.x
2. Arnone, M. P., Small, R. V., Chauncey, S. A., & McKenna, H. P. (2011). Curiosity, interest and engagement in technology-pervasive learning environments: a new research agenda. *Educational Technology Research and Development*, 59(2), 181–198. doi:10.1007/s11423-011-9190-9
3. Billinghamurst, M., & Starner, T. (1999). Wearable devices: new ways to manage information. *Computer*, 32(1), 57–64. doi:10.1109/2.738305
4. Bogdanović, Z., Despotović-Zrakić, M., Milutinović, M., Anđelić, M., & Milinović, S. (2013). Model for Enhanced Data Management, Visualization, and Adaptation in e-learning. *Management - Journal for Theory and Practice of Management*, 18(69), 5–14. doi:10.7595/management.fon.2013.0030
5. Chorfi, H. O., Sevkli, A. Z., & Bousbahi, F. (2012). Mobile Learning Adaption through a Device Based Reasoning. *Procedia - Social and Behavioral Sciences*, 47, 1707–1712. doi:10.1016/j.sbspro.2012.06.887
6. Dadzie, A.-S., & Rowe, M. (2011). Approaches to Visualising Linked Data: a Survey. *Semantic Web*, 2(2), 89–124. doi:10.3233/SW-2011-0037
7. Ercan, T. (2010). Effective use of cloud computing in educational institutions. *Procedia - Social and Behavioral Sciences*, 2(2), 938–942. doi:http://dx.doi.org/10.1016/j.sbspro.2010.03.130
8. Godwin-Jones, R. (2011). Emerging technologies: Mobile apps for language learning. *Language Learning & Technology*, 15(2), 2–11. Retrieved from <http://www.llt.msu.edu/issues/june2011/emerging.pdf>
9. Graf, S., & Kinshuk. (2008). Analysing the Behaviour of Students in Learning Management Systems with Respect to Learning Styles. In M. Wallace, M. C. Angelides, & P. Mylonas (Eds.), *Advances in Semantic Media Adaptation and Personalization* (pp. 53–73). Springer Berlin Heidelberg. doi:10.1007/978-3-540-76361\_3

10. Holzinger, A., Nischelwitzer, A., Friedl, S., & Hu, B. (2010). Towards Life Long Learning: Three Models for Ubiquitous Applications. *Wireless Communications and Mobile Computing*, 10(10), 1350–1365.
11. Jong, T. De, Specht, M., & Koper, R. (2009). A study of contextualised mobile information delivery for language learning. *Educational Technology & Society*, 13(3), 110–125. Retrieved from [http://www.ifets.info/journals/13\\_3/11.pdf](http://www.ifets.info/journals/13_3/11.pdf)
12. Labus, A., Simić, K., Vulić, M., Despotović-Zrakić, M., & Bogdanović, Z. (2012). Application of Social Media in eLearning 2.0. In *25th Bled eConference eDependability: Reliable and Trustworthy eStructures, eProcesses, eOperations and eServices for the Future* (pp. 557–572).
13. Mann, S. (1997a). An historical account of the “WearComp” and “WearCam” inventions developed for applications in “personal imaging.” In *Digest of Papers. First International Symposium on Wearable Computers* (pp. 66–73). IEEE Comput. Soc. doi:10.1109/ISWC.1997.629921
14. Mann, S. (1997b). Wearable computing: a first step toward personal imaging. *Computer*, 30(2), 25–32. doi:10.1109/2.566147
15. Mann, S. (1998). Wearable Computing as means for Personal Empowerment. In *Proc. 3rd Int. Conf. on Wearable Computing (ICWC)* (pp. 1–8). Retrieved from [http://www.acsu.buffalo.edu/~erikconr/courses/sewing\\_circuits/readings/Mann\\_Keynote\\_1998\\_ISWC.pdf](http://www.acsu.buffalo.edu/~erikconr/courses/sewing_circuits/readings/Mann_Keynote_1998_ISWC.pdf)
16. McGreal, R. (2004). Learning objects: A practical definition. *The International Journal of Instruction Technology & Distance Learning*, 1(9), 21–32. Retrieved from [http://www.itdl.org/journal/sep\\_04/article02.htm](http://www.itdl.org/journal/sep_04/article02.htm)
17. McKinney, J. (2003, December). Shareable Content Objects (SCORM): Whole Course Design and Implementation Issues. *Learning Solutions Magazine*. Retrieved from <http://www.learningsolutionsmag.com/articles/319/shareable-content-objects-scorp-whole-course-design-and-implementation-issues>
18. Milutinović, M., Stojiljković, V., & Lazarević, S. (2014). Ontology-Based Multimodal Language Learning. In M. Despotović-Zrakić, V. Milutinović, & A. Belić (Eds.), *Handbook of Research on High Performance and Cloud Computing in Scientific Research and Education* (pp. 195–212). IGI Global, Hershey, PA, USA. doi:10.4018/978-1-4666-5784-7.ch008
19. Mistry, P. (2010). SixthSense - integrating information with the real world. Retrieved from <http://www.pranavmistry.com/projects/sixthsense/>
20. Ngai, G., Chan, S. C. F., Cheung, J. C. Y., & Lau, W. W. Y. (2010). Deploying a Wearable Computing Platform for Computing Education. *IEEE Transactions on Learning Technologies*, 3(1), 45–55. doi:10.1109/TLT.2009.49
21. Power, M. (2012). *Delivering Web to Mobile* (pp. 1–23). Bath, United Kingdom. Retrieved from <http://blog.observatory.jisc.ac.uk/techwatch-reports/delivering-web-to-mobile/>
22. Sharples, M. (2000). The design of personal mobile technologies for lifelong learning. *Computers & Education*, 34(3-4), 177–193. doi:10.1016/S0360-1315(99)00044-5
23. Thorp, E. O. (1998). The invention of the first wearable computer. In *Digest of Papers. Second International Symposium on Wearable Computers (Cat. No.98EX215)* (pp. 4–8). Pittsburgh, PA, USA: IEEE Comput. Soc. doi:10.1109/ISWC.1998.729523
24. Toh, P. K. (2013). The New Age of Consumer Wearables: Internet of Smart Things (Wearable Computers). CreateSpace Independent Publishing Platform.
25. Weiser, M. (1991). The Computer for the 21st Century. *Scientific American*. doi:10.1038/scientificamerican0991-94

26. Witt, H. (2008). *User Interfaces for Wearable Computers*. Wiesbaden: Vieweg+Teubner. doi:10.1007/978-3-8351-9232-4
27. Wong, L.-H., & Looi, C.-K. (2010). Vocabulary learning by mobile-assisted authentic content creation and social meaning-making: two case studies. *Journal of Computer Assisted Learning*, 26(5), 421–433. doi:10.1111/j.1365-2729.2010.00357.x
28. Yordanova, K. (2007). Mobile learning and integration of advanced technologies in education. *Proceedings of the 2007 International Conference on Computer Systems and Technologies - CompSysTech '07*, 1. doi:10.1145/1330598.1330695
29. Zhou, Y., Xu, T., David, B., & Chalon, R. (2013). Innovative wearable interfaces: an exploratory analysis of paper-based interfaces with camera-glasses device unit. *Personal and Ubiquitous Computing*, 18(4), 835–849. doi:10.1007/s00779-013-0697-4

\*\*\*

**Aleksandra Labus** is an assistant professor at the Faculty of Organizational Sciences, University of Belgrade. She is involved in teaching courses covering the area of E-business, Internet marketing, Internet technologies, Internet of things, M-business, Simulation and simulation languages, Risk management in information systems and E-education. Her current professional interests include e-education, edutainment, Internet of things, cloud computing, e-government, social media, and student relationship management. She is treasurer of IEEE Computer Society Chapter CO-16. She can be reached at: [aleksandra@elab.rs](mailto:aleksandra@elab.rs)

**Miloš Milutinović** is a PhD student at the Faculty of Organizational Sciences, University of Belgrade. As teaching associate he is involved in teaching courses covering the area of E-business, Internet technologies, Internet marketing, Internet of things, M-business, and Concurrent programming. As a PhD student he receives scholarship from the Ministry of Science and Technological Development, the Republic of Serbia. His current professional interests include e-business, m-business, e-education, Internet technologies, Internet of things, cloud computing, e-government, and digital identities. He can be reached at: [milosm@elab.rs](mailto:milosm@elab.rs)

**Dorđe Stepanić** is an undergraduate student of Faculty of Organizational Sciences, University of Belgrade. As student associate he is involved in teaching courses covering the area of E-business, Internet technologies, Internet marketing and Internet of things. His current professional interests include E-business, Internet of things, Internet technologies, cloud computing and wearable computing. He can be reached at: [djordje@elab.rs](mailto:djordje@elab.rs)

**Mladen Stevanović** is an undergraduate student of Faculty of Organizational Sciences, University of Belgrade. As student associate he is involved in teaching courses covering the area of E-business, Internet technologies, Internet marketing and Internet of things. His current interests include Internet technologies, e-business, web programming, Internet of things, wearable and mobile computing. He can be reached at: [mladen@elab.rs](mailto:mladen@elab.rs)

**Suzana Milinović** received her MSc. degree at the Faculty of Organizational Sciences, University of Belgrade. She is currently working as a general manager for „Falc East“, a factory manufacturing Italian footwear. Her current professional interests include e-business, m-business, Internet technologies. She can be reached at: [suzi.milinovic@gmail.com](mailto:suzi.milinovic@gmail.com)

# TRANSNATIONAL DEMOCRACY, LEGITIMACY AND THE EUROPEAN UNION

Patrícia Kaplánová\*

Faculty of Social Sciences at St. Cyril and Methodius University in Trnava, Nám. J. Herdu 2,  
917 01 Trnava, Slovak Republic  
patricia.kaplanova@ucm.sk

## Abstract

Nowadays the ongoing global crisis has triggered an issue how to set up a theoretical framework of global governance. The integration to a supranational level of governance has been a contemporary process of democratization in recent decades. To analyze the institutionalization of global governance means to recognize a normative idea of democracy. The theory of international relations demonstrates that there are four normative models of democracy at the supranational level of governance. In my opinion, a crucial difference of the institutionalization is a concept of legitimacy of global democratic regime. Because of a divided understanding of legitimacy at the transnational level of governance is difficult to find a consensus in which way should be a transnational democracy framed. A dual legitimacy in a supranational organization like the European Union also triggers a specific democratic deficit. My point of view corresponds with the division of transnational orders in normative way and its correspondence to legitimacy. Clarifying the duality of legitimacy can help us not only to solve all globalizing problems but of course to decide in which way we want to make the supranational organizations work.

**Key words:** models of a transnational democracy, dual legitimacy, European Union.

## 1. Introduction

Democracy is a predominant political system in the modern world. The democratic political order has already crossed the borders of a national state. Also the ongoing process of globalization has shaped a global world order to a democratic legal framework. The theoretical debate about a global world order requires a simultaneous understanding of the legitimacy as a basis for such an intervention. Why it is so important to talk about legitimacy of supranational order? According to Sartori (1987), each democratic political system relies on a principle of legitimacy. If a system loses its legitimacy, a democracy will be in a crisis. Without any support of the public view on the political order, the crisis of democracy may trigger a spill-over effect on the whole system of society, also leads to the violent form of

\*Correspondence author

organization. A new world order, which has been developing since the end of the Cold War, requires more and more transparent governance. The international organizations are either seen as a guarantee of global stability or as a natural way how to integrate nations to one global village. The two dimensions how ensure a global security and a global economy should be based on the consensus of all nations in question. In this perspective, political scientists should try to develop appropriate supranational political order, based on the essential ideas of democracy. The discussion about the global governance is not new. The development of the idea of the global governance can be understood as a tool for recognition of different types of democracy. Finding the legitimacy of supranational organizations should be in the scope of a clarifying and a classification of functions their normative systems. In order to understand the problem of legitimacy of supranational organizations, one shall apply the structuralist approach (Habermas 1996). The structuralist tradition understands global governance as a deepening process of modernization, internationalization, globalization and regionalization etc. The structural preconditions of the stability and efficiency of the democratic order have been studied intensively for the last decades (e.g. Lipset, 1988, Rustow, 1970, Moore, 1966, Huntington, 1968/1991, Inglehart, 1997, Dalton, 2000). Therefore the globalization and modernization have changed the view on the democracy at the supranational level.

Nowadays a multilevel governance in the world order needs to reflect the movements of a structuralist determination. New models of global governance, which are the consequences of the third transformation of democracy (Dahl, 1989, Held, 2006), will legalize the world order. Because of the different ways how democracy is constituted, we have already recognized several modalities of global governance. In preference of these models of global governance, there are two basic recognitions of legitimacy of global order. Firstly there is a liberal approach which relies on the understanding of a legal/positive/procedural legitimacy (Scharpf, 1999, Bodansky, 1999, Nanz, 2006). The global order is substantially based on the input legitimacy of the rule of law and also the output legitimacy of a common interest and consent. On the other hand, there is a substantive/normative legitimacy which is based on the output legitimacy of the desirable outcomes by a demos (Scharpf, 1999, Schimmelpfening, 1996). This type of legitimacy supports the democratic ideas such as equality, justice and the efficiency of the order in the favour of the common good. The European Union as a regional and transnational political system has emphasized an example of the divided recognition of legitimacy. We can argue that the European Union is a relevant example, on which we can demonstrate movements of a democratic transformation, and also recognize a multidimensional model of legitimacy in its unique type of government.

## **2. Transnational democracy as a crisis of democracy?**

A comparison of social theories, discussing the postmodern processes of globalization, invokes question how the system of governance can be renewed. The normative theories of modern democracy are confused about this issue, as well as the discussion about legitimacy of

this kind of systems is not clear. Theories of modern societies share a point of view that states are avoiding the anarchy by means of legitimacy. Weberian (1958) thoughts on legitimacy, which analyse the categorization of authority, impose a need for political power divided into few categories. The most notable category is legal-rational authority, established by election. A liberal theory of democracy, which deals with the representation of citizens, has emerged during the last decades and especially after the collapse of Soviet union in 1989. Francis Fukuyama (1992) argued that the liberal democracy was the winner among the ideologies. This misconceived triumphalism has spread the fascination about the discourse of modern democracy beyond the traditional nations. The idea of democracy above the national level has evoked the need to advocate a more democratic supranational order. Tony McGrew called this moment as a „transnational turn“ (McGrew, 2003, p. 500) where possible models of transnational democracy can be discussed. One can argue that the theories of supranational democracy are the third transformation of normative democracy as Robert Dahl assumed (1989). If we recognize the specific transnational systems, we will see the similarity with an additional appearance of global international actors. In this respect, we can answer the question on a multidimensionality of legitimacy at multinational level.

### **3. Four models of transnational democracy**

Anthony McGrew (2003) recognizes four models of transnational democracy – liberal internationalism, radical democratic pluralism, cosmopolitan democracy and deliberative democracy (McGrew 2003, p. 500). Typologies of transnational democracy help us not only to define the possibility of global governance but also to provide a mapping of a complexity of global integration. Copying the historical evolution of democracy and modernization theories, a liberal internationalism is based on the rule of law and economic neo-liberalism. Global economic actors in this case are integrated into the international economic interdependence among nations. Additionally, this concept supports the ideas of transparent, responsive and accountable international governance (Falk in McGrew 2003, p.501). On the other hand, the liberal internationalism limits a transparency, the concept of classical pluralism, as a principle of equal electoral politics. Also the rule of law and also representativeness are based on a consensus of interested actors. The collective decisions are legitimated only through a negotiation of elites, nominated by the national representatives. This decision-making process is called the top-down method of creating the democracy. Question is if we can in this way talk about this kind of democracy of shared competences at supranational level? Global governance has adapted a technocratic view of transnational democracy (Falk in McGrew 2003, p.501). The lack of pluralism and free access to the mechanism of transnational democracy advocates that the transparency and accountability of the decision-making are still insufficient. It is obvious that the liberal internationalism can not ensure more effective representation of people in the world but it could even create the inequality of participation in the global political processes. On the other hand, the theory of radical pluralism tries to overcome the problem of an unequal access. The reforms of liberal

internationalism cooperates with the ideas of the forms of direct democracy and self-governance, alongside with the creation of global governance on the local level (Hutchings 1999, p.166). Direct democracy in small communities would empower the globalizing political power and representatives. The radical pluralism has adopted the methodology of bottom-up democratization by postmodernism, Marxist and civic republican democratic theories (Hutchings 1999, p. 167). This type of democratic legitimacy, which is territorially grounded, is concerned with a subsidiarity principle. Consequently, in the theories of integration, the subsidiarity means that the multi-level governance avoids the centralized structure of authority (Moravcsik, 1993/1995, Milward, 2000). Besides McGrew could not imagine the principle of global governance with the rejecting the sovereignty of global order and the rule of law. He argues that the rule of law and sovereignty make the democracy possible, even on the transnational level (McGrew 2003, p.502). The third type of transnational democracy is a cosmopolitan democracy discussed by David Held (1995), Anthony McGrew (1999) or Daniele Archibugi (2004). Cosmopolitan democracy reacts to a hierarchy of political authority at multi-level governance by designing a political order of democratic associations, cities and nations as well as of regions and global networks (Held 1995, p.234). The rule of law is constructed on the principle of a “double democratization” and constituted on a heterarchical arrangement of confederalism (McGrew 2003, p.503). So the cosmopolitan theory tries to exceed the concept of pluralism of heterogeneous societies or the concept of global civic society by globally divided authority. The subordination of regional, national and local sovereignties to a legal framework is resolved by the authorities on the diverse levels (Held 1995, p.234). The division of multinational majorities still lacks the principle of legitimacy. The creation of many global authorities and their cooperation does not address the question of the full legitimation despite cosmopolitanism, as a tradition of a liberal view of integration, takes a prism of universalism for granted. Adopting the concept of global society by moral idealism and public philosophy generates the tendency to establish a new model of imperialism. The loss of identity of cultures and societies in the world would be a challenge for the long lasting conflicts on the ethnics, cultural and national bases. The last model of transnational democracy, which has developed in political and international discourse, is a paradigm of deliberative democracy. The deliberative (or discursive) democracy overlaps essentially both the cosmopolitan and radical pluralistic theories. Rather than constructing the new model of global governance the deliberative democracy stands on the basis of the process of deliberation. The sustainability of the global order, according to the rule of law, can be democratized by the international public sphere of deliberation. As John Dryzek argues, the realization of transnational democracy depends on the essence of democratic legitimacy is not founded in the election or representation but rather in deliberation (Dryzek in McGrew 2003, p.504). From the Habermasian perspective, deliberative democracy imposes several conditions to address the common good on the national/international level. The theory is based on the public sphere where the decision-making process is creating by the participation of informed and rational actors (Held 2006, p.232). Additionally the paradigm of demos is overcome by the global public sphere of active elites and is understood in matters in which they are interested. The opportunities to

participate in deliberation are indeed vulnerable and the access to process incorporates a fundamental problem. The decision is made by the interested elites but in a missing common place and language of deliberation. The next part is dedicated to issues and typologies of legitimacy of the paradigm of transnational democracy.

#### **4. Legitimacy in the global world order as a multidimensional concept**

A normative evolution of democracy and the typologies of transnational democracy clarify a legitimacy in the global order. In my opinion this discourse addresses the core problems and challenges that should be solved before theorizing the possibility of global governance. In one side we have an ongoing globalization and structural post-materialism but on the opposite side we should cope with the problem how to legalised the processes and react institutionally to these challenges. Furthermore a legitimacy is a contemporary concept of democracy which is still accurate to be solved. The development of democracy in the national and supranational level puts up the main thesis of legitimacy. In my point of view the first option how to look at the legitimacy of global order is to spill-over the three types of functions of nation-states – political, economic and socio-cultural. Concept of common good and good will depend on the effectiveness and efficiency of government. This type is conceptualized as a substantive legitimacy (Scharpf 1999). On the other hand there is a procedural/legal legitimacy which insist on the authority legitimized by the rule of law and collective identity (Nanz 2006, p.65). On the basis of the evolution of democracy and the recognition of transnational democracies I assume that we are the witness of the achievement of both types of legitimacy in the global world order. So I shall explain the transnational democratization as a process of a dual legitimacy.

First assumption of arguing the legitimacy at transnational level, Robert Dahl (1999) puts a question if international organizations can be democratic. His criticism is strict because according to him they can not be (Dahl, 1999, p.19). The historical institutionalism of democracy which he constructed at the late of eighties proposed the third transformation of democracy to the transnational level. But in his later point of view he demonstrated that we are not overcoming the national level of democracy. According to him the democracy is not the only form of governance but it is a complex and multidimensional concept. Further, democracy is understood as a popular control over policies through elections and also democracy is a system of fundamental rights to ensure freedoms, liberties and opportunities (Dahl, 1999, p. 20). So we have an ideal criteria and normative thoughts that recognize a democracy. Moreover the democracy is actually a process of delegation of powers and sovereignty to political authority. This delegation is in Dahl view exclusive because citizens vote their interest personified in political elites. To sum up these preconditions, Dahl estimates that at the international level the democracy as we understand, is not possible and can not be imagined. My point of view is to overcome his prism by showing that the institutional narration is not enough. Theorizing about legitimacy beyond national boundaries

still matter when we consider the postmodernism with structural and globalizing changes in the world. So what should be noticed when we are talking about legitimacy of transnational governance? Legitimacy means that people legalize their relationship with the state by delegation of their powers to political elites. A legalization of the authority ensures the effectiveness and efficiency of governance (Easton, 1965). In this way the government and administrative bureaucracy have to maintain and act according to the common good and good will. In my opinion this process of legitimacy even protects the society and system from coercion, tyranny and violence which can lead to revolutions and transition to other non-democratic regimes. Furthermore Patrizia Nanz (2006) proposed the six objects of legitimacy and mechanism of legitimization. The main objects of legitimacy are: political decision, political actors, public institutions, political order/regime, regime principles (democratic or non-democratic) and political community - demos (Nanz 2006, p. 62). The mutual relationships among these objects determine the discourse and problems of legitimacy. In this recognition there are several mechanisms of legitimacy such as a delegation of powers, democratic rules, output democratic process, responsiveness, transparency, accountability, consensus, consent in deliberation and constitutionalism. The sources of legitimacy should not be considered in democratic view but either in legal and functional framework (Nanz, 2006, p.65).

In order to dual legitimacy the first assumption is that the democratic legitimacy is based on the substantive form. This means that normative ideas of democracy are reflected by citizens and by the outputs of their actions how is legitimacy established. The political authority is then justified only in the sense of the expectations of outcomes. Clearly the government passes the bills and decide on behalf of the common good of society. Lena Schneller (2010) recognizes this type of legitimacy as a legitimacy with three measures – pluralist accountability, stakeholder participation and transparency (Schneller 2010, p.7). Her division actually demonstrates that the view on this type of legitimacy is connected with the theories of radical pluralism and deliberative democracy at supranational level. Pluralist horizontal accountability deals with an operation of control of decision makers on multinational organizations. According to Keohane and Nye the accountability mechanism can operate in multiple manners, and “accountability is not ensured through elections alone” but is a “multidimensional phenomenon” (Keohane and Nye in Schneller 2010, p. 8). Clarifying their thoughts about the multilevel governance, which was proposed by Moravcsik (2004), should be transparent and the whole system should empower the system of policy making. The division of three levels of decision-making strengthens each other parallelly. Keohane also argues that the public sphere, in which public can deliberate, enhances the transnational legitimacy. On behalf of it, the international non-government organizations and media may support the creation of public sphere through „professional norms and transnational networks“ (Nye 2001). Remarkable example is the deliberative concept of transnational democracy which encourages this kind of process of deliberation, criticism and discussion (Keohane and Nye 2001, p. 285). Stakeholder participation is directly derived from the deliberative view. “Habermasian” tradition has called for the effective participation of the

interested actors and for every democracy it is a key concept. The political parties, interest groups and social movements play an important role in deliberate conceptions to improve the common discourse and engage citizens in political education (Moravcsik 2004, p. 342). The third transparency measure of procedural legitimacy demands for a transparency. The transparency means that the political decision-making is understandable for citizens and the control of the government is arranged by the fair, free and equal elections. Further the democratic system should be transparent if citizens are fully informed about politics and representatives decisions. In my opinion in the sense of democratic/output/substantive legitimacy we assume that the main precondition for it is a normative meaning of democracy. Firstly, this considers that the democracy should be spread to the every nation-state as a normative requirement. Consequently if we appeal to the normative democracy we should not avoid the concept of demos. Demos is the paradigm which is a substantive and fundamental condition for democracy. It means not only a political culture of democracy but also the structural adoption of democratic norms in society. For Robert Dahl this concept is crucial because the international organization can not be democratized by the heterogeneity of the global citizenship (Dahl 1999, p. 20). Democracy may not exist without demos - a society which has been adopting the normative ideas for decades. And how it is possible to establish one global village and one global civic society if we take for granted the Dahl third transformation of democracy? James Bohman (2007) offers the answer by conceptualizing democracy not on demos principle but on the principle of *demos* (Bohman, 2007). This transformation demonstrates a realistic fundamental transition from a singular to a plural subject, from *demos* to *demos*. Democracy must not only change its institutional form, it must also rethink its political subject (Bohman, 2007, p.21). In my view the radical pluralism, which includes the pluralism of actors and deliberative democracy, are the proper theories which can explain the *demos* in detail. In order to overcoming the spacial gap between resolution of demos problem and participation.

The second comprehension of transnational legitimacy copies the tradition of Weberian legal-rational authority. This functional legitimacy insists on the rule of law and input legitimacy (Scharpf 1999), which can be achieved only by the existence of a collective identity. Legal legitimacy of transnational organizations generates the hierarchical division of power. Such as a case of World Trade Organization or the European Union, the mutual delegation the state powers to the international organizations and subside their sovereignty asserts the more effective and efficiency model of global governance. Which kind of global actors can insist on this model? The negative integration of European Union is driving by economic and financial sustainability so the legal and input legitimacy have been reacting to the increasing globalized economy for many years. The economic globalization with liberal internationalism is in this case certainly a top-down project. To achieve the supranational constitutionalism, which should enhance an efficiency of global economy, is necessary to adjust the legitimacy of public support. The view consists on the sense of global community because of the phenomenon of an increasing responsiveness at the international level. Cosmopolitan democracy (Held 1995) could empower this theory by addressing the scheme of a confederation. Hierarchical global system based on the legal conception of legitimacy, could

have a capacity of rule to pull those to whom it is addressed towards a consensual compliance (Franck in Schneller 2010, p.5). In order to transnational legitimacy, Franck named the four indicators that inherent this norm – determinancy, symbolic validation, coherence and adherence. Referring to determinancy, Franck assumes that the transparent rule is better it will communicate its content to those who are addressed by it and the more it will exhibit legitimacy and pull towards compliance. A second condition is its symbolic validation. According to Franck a rule is symbolically validated „when it has attributes, often in the form of cues, which signal its significant part in the overall system of social order“ (Franck in Schneller 2010, p.5). My viewpoint, that inhibited international rule and authority can be more acceptable and legitimate. The conservative point to this theory is nowadays, according to me, very dangerous to insist on. In order to changing socio-economic structure in general, inter/national governance needs to react comprehensively to these challenges. The next indicator is a coherence. The coherence means that a rule needs to be applicable equally to everybody and that likes are treated alike otherwise it can not be perceived as legitimate (Schneller, 2010, p.5). In this notion there is no space for the conservative and sustainable institutions. Finally the legitimate rule needs to be adherent. Adherence depends on the hierarchical decision-making which is established in a constitution. For example this principle of subsidiarity of laws is adopted by the supranational organization as European Union that correlates with the national constitutionalism.

To sum up the concept of transnational legitimacy, recognized by its multidimensionality, stands on the principle of a dualism. The dualism encompasses the models of transnational democracy and various meanings of legitimacy. Democratic legitimacy from my view has both methodologies: normative and empirical. Without normative categorization may not be the positivist and conversely. The dual legitimacy, which I analyzed, reflects the gradualist and transformational approach of democracy. My point of view is that this duality is a divided but a unique process. Moreover the specification is that the political science is still arranging the perfect democratic regime on the national level and the ongoing process of globalization transforms the theory to the supranational level. Finally I assume that we need to take for granted this transformation and cope with it not by the best theory but better.

## **5. European Union: a case study of dealing with „the legitimacy trap“**

Referring to the transnational democracy my last part of article will try to achieve an application of models of transnational democracy and legitimacy. The importance of my choice depends on the numerous studies of European integration. In the last decades the political theory has faced a normative turn in the conceptualizing of integration (Bellamy 2000). In this case the discourse was aimed not simply to the process of economic integration but it has turned to the normative oriented studies. Nowadays European Union is not only an object of the theory of international relations but also a democratic, sociological and political methods. Economic integration flow naturally to the political unification and to the European Union as a space to share common ideas, norms, values and visions. The questions which arose had circulated around whether is the European Union an international organization or

a specific political unity. Legal-rational authority means the arrangement of the European Union as a regional organisation with its own rules and values. On the other hand a communitarian and cosmopolitan terms have changed the view on this organization and a shared collective identity in Europe has created the normative sense of this type of polity. A major challenge is to solve the legitimacy of the European Union. According to Richard Bellamy (2000), a fundamental issue is the relationship between the constitutional order and society as a whole, also between the authorisation (the nature and forms of the constituent power) and legitimacy in both social (acceptance and consent) and normative sense (underlying values, recognition of interests, opinions and identities) (Bellamy and Castiglione, 2000, p.3). On these bases, the European Union has been facing the specific three types of deficit for years. The first deficit is a democratic deficit which focuses on the democratic accountability and representation. It means that there is a lack in the process of the control and influence from citizens to the bureaucratic system. Second is a federal deficit that arises from a problem of the distribution of sovereignty. The ambiguous relationship among the central European institutions and national parliaments needs to be qualified even after the Lisbon Treaty. And the third deficit is a constitutional deficit which addresses the lack of normative and popular legitimacy of European political institutions (Bellamy and Castiglione, 2000, p.5). To the accordance to my thesis of dual legitimacy of transnational order I will introduce the three strategies of constitutionalisation of the European Union.

First perspective of a European legitimacy is a positivist approach of instrumentalism. The European Union is seen as a problem-solving entity of the economic integration (Eriksen and Fossum, 2004, p.439). Nations are internationalized by a legal-rational globalization. The legacy of the European Union depends on its effectiveness, efficiency and sustainability of its institutions. Moravcsik (2004) conceptualized the theory of liberal intergovernmentalism which can be appropriate to this type of legitimacy. Furthermore the European Union is viewed as a platform for the cooperation of states from which derives the concept of legitimacy. A negative integration is actually the economic regionalization at supranational level and the mechanism is based on the liberal internationalism or cosmopolitanism (the principle of confederalism). The decision-making is on the behalf of the consensus of the main institutions – The Council of the European Union, The European Commission, The European Parliament and The European Court of Justice. The effectiveness of these institutions beyond the national level does not demand a creation of the European public sphere, European society, European demos or the civic society. The European institutionalisation can also work separately in favour of the European public will. Moreover we can not distinguish what the effectiveness at the transnational level of governance really means. On the other hand the effectiveness of this viewpoint does not mean that one day the economic crisis will spill-over to the political crisis. In my opinion we have been facing the political crisis also in recent years. The input and legal-rational legitimacy is not the only choice how to make the transnational democracy work. The legitimization of democratic political power needs to be also a bottom-up process.

The second comprehension of European legitimacy is achieved by a value-based communitarism (Eriksen and Fossum, 2004, p.441). It is an exactly the same what Bellamy (2000) means as a normative and social sense of integration. The concept requires the existence of the European identity arranged by common public sphere, history, values. The communitarians (Habermas 1998) argue that every democratic system can work in the framework of shared strong moral norms. Regarding the European Union to be legitimate, a common identity is needed for securing a trust. It is required to enable actors to cooperate and to let their differences be settled by neutral procedures. „Every political order presupposes some kind of cultural substrate to foster allegiance and respect for laws. Even if the European Union is something less than a state, it requires identity due to its ability to make collective decisions, that is, in order for the subjects of collective decision-making, to comply with common norms. A value-based strategy may also contribute to consolidate the Member States at the present level of institution building.“ (Eriksen and Fossum 2004, p.442) This process of bottom up creation of identity could be seen as a natural Europeanization. Further the cosmopolitan democracy of the transnational arrangement of European Union can be conceived as a constitutional patriotism (Habermas in Eriksen and Fossum, 2004, p. 446). Also Hix (1999) advocated that the European Union is going toward the gradual constitutionalism. After the Lisbon Treaty which cancelled the pillar division of Maastricht Treaty (1992) we can assume that by a strengthening the role of the European Parliament, national parliaments and by a simplifying of a decision-making process, the European Union is going to be more transparent (confederation) democracy than ever.

Showing the main perspectives of legitimacy in the European Union I consider the thesis that the European Union has not had the one specific strategy of legitimacy yet. Unless the European Union deals with the divided approaches of integration and democratic process, in my point of view, there will be always the tendencies to democratic deficits. Moreover the existence of European public sphere is still missing. Also a valuation of dual legitimacy advocates the reality of divided comprehension of the future of the European Community.

## 6. Conclusion

The finding the appropriate model of transnational democracy is formed from the point of view of political science and international relations and has been the never ending process. My paper discussed the achievement of contemporary theories of transnational democracy. I identified the transformation of democratic theory in the accordance to the postmodern challenges such as globalization and transformation of society. My argument demonstrates that the assumption of the legitimacy on the supranational level copies mostly the models of trans/national democracy. Moreover the legitimacy and the viewpoint on this paradigm depends on the structural connotations. The appropriate example is the integration process of European Union. In the normative and positivistic way there is still the distinction of the dual legitimacy. The first arrangement consists of the legal-rational/input legitimacy, which is understood from the liberal internationalism and cosmopolitan democracy. Additionally it

addresses the possibility of global governance to provide the rule of law, representation, accountability etc. On the other hand there is the democratic/output legitimacy which cooperates with the terms like a global civic society, demos/demoi, global justice etc. The case of the European Union helped me to demonstrate that the dual legitimacy coexists parallel in the various models of transnational democracy. Moreover the main reason is that the global socio-structural changes which have been already unsolved by the global order have long-term impact to the everyday lives of citizens.

## REFERENCES

1. Bellamy, R., Castiglione, D. (2000). *The Normative Turn in European Union Studies: Legitimacy, Identity and Democracy*. University of Exeter Department of Politics. RUSEL Working Paper No. 38.
2. Bohman, J. (2007). *Democracy across Borders*. London. The MIT Press
3. Dahl, R. (1995). *Demokracie a její kritici*. Praha. Victoria Publishing
4. Dahl, R. (1999). *Can International Organizations be Democratic? A Sceptic's View*. In *Democracy's Edges*, edited by I. Shapiro and C. Hacker-Cordon, 19-36. Cambridge. Cambridge University Press.
5. Eriksen, E.O. and Fossum, J.E. (2004). *Europe in Search of Legitimacy: Strategies of Legitimation Assessed*. International Political Science Review, Vol. 25, No. 4, 435–459
6. Habermas, Jürgen (1975). *Legitimation Crisis*. Boston. Beacon Press
7. Habermas, J. (1996). *Three Normative Models of Democracy*. In *Democracy and Difference*, edited by S. Benhabib, 21-30. Princeton. Princeton University Press.
8. Held, D. (1995). *Democracy and the Global Order: From the Modern State to Cosmopolitan Governance*. Cambridge. Polity Press.
9. Held, D. and McGrew, A. ed. (2003). *The Global Transformation Reader, An Introduction to the Globalization Debate*, 2nd ed., Cambridge: Polity Press
10. Held, D. (2006). *Models of Democracy*. Cambridge. Polity Press
11. Hutchings, K. (1999). *International Political Theory*. London. Sage
12. Keohane, R. O., Nye, S., J. (2001). *The Club Model of Multilateral Cooperation and Problems of Democratic Legitimacy in Efficiency, Equity, and Legitimacy: Multilateral Trading System at the Millennium*, edited by R. B. Porter *et al.*, 264-294. Washington (D.C.). Brookings Institution Press.
13. Moravcsik, A. (2004). *Is There a "Democratic Deficit" in World Politics? A Framework for Analysis*. Government and Opposition 39 (2): 336-363
14. Nanz, Patrizia. (2006). *Democratic Legitimacy and Constitutionalisation of Transnational Trade Governance: A View from Political Theory*. In *Constitutionalism, Multilevel Trade Governance and Social Regulation*, Studies in International Trade Law 9, edited by C. Joerges and E.-U. Petersmann, 59-82. Oxford. Hart Publishing.
15. Sartori, G. (1993). *Teória demokracie*. Bratislava. Archa Publishing

16. Schneller, L. (2010). *Conceptions of Democratic Legitimate Governance in the Multilateral Realm: The Case of the WTO*. *Living Reviews in Democracy*, 1-18.

\*\*\*

**Patricia Kaplánová** is a PhD student and assistant at Faculty of Social Sciences at St. Cyril and Methodius University in Trnava, Slovakia. She can be reached at [patricia.kaplanova@ucm.sk](mailto:patricia.kaplanova@ucm.sk)