EXAMINING CRITICAL SUCCESS FACTORS FOR SUSTAINABLE INFORMATION SOCIETY – LESSONS LEARNED FROM POLAND

Complete Research

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Abstract

The sustainable information society (SIS) is one of the most important topics of our time. ICTs play a key role in this society. Unfortunately, factors determining the successful ICTs adoption and consequently the SIS development are not sufficiently established. Therefore, the aim of this study is to answer the question about critical success factors for the SIS in Poland. These factors were identified based on a critical review of literature, the Delphi study, brainstorming, practical collaboration, logical deduction, survey questionnaire and statistical analysis. The paper continues as follows. Firstly, an explanation of the SIS is offered which implies understanding the role of ICTs as enablers of economic, socio-cultural, political and ecological sustainability. Secondly, a methodology of examining critical success factors for the SIS and a framework of critical success factors are presented. Thirdly, the factors for the SIS in Poland are identified followed by the discussion of the research findings. The study results show that economic, socio-cultural, technological and organisational fit have significant influence on the SIS. Moreover, the stakeholders' access to ICTs, their competences and ICTs usage are important for the SIS. This paper concludes with a presentation of the study's contribution and limitations, implications for the findings and the stream of future work.

Keywords: sustainable information society, critical success factors, ICT adoption, sustainably digital

1 Introduction

Since the end of the 20th century, societies all over the world are strongly changing influenced by information and ICTs. Employment of ubiquitous ICTs for creating, disseminating, and utilising information effectively in order to gain social and economic advantages has become a priority for many societies, countries and regions (EC, 2010; MAC, 2012; OECD, 2012; WSIS 2012, 2014). Researchers developed and refined the concept of "information society" over the past 50 years in a variety of contexts: economic, political, technological, and social (e.g. Castells, 1996, 1997, 1998; Goliński, 2011; Hassan, 2009; Mansel, 2009; Raban et al., 2011; Webster, 2002). Because changes in societies and ICTs are enduring, the alignment of ICTs with societies' objectives must not only be understood, but constantly renewed and adjusted (Guillemette and Paré, 2012). This is why researchers have more frequently called for a holistic, methodological and more systems approach to the development of information society, covering all dimensions of information society and a sustainable development imperative additionally (e.g. Berleur et al., 2010; Fuchs, 2009a, 2009b; Hilty, 2008, 2009; Schauer, 2003; Servaes and Carpentier, 2006; Ziemba, 2013).

The sustainable information society (SIS) entails a new phase of information society development. Since 2000 the world academia has become interested in the research on the information society in the context of the sustainable development. The key areas of this research include concepts and theories of the SIS (e.g. Fuchs, 2009a, 2009b, 2010; Hofkirchner, 2010; Schauer, 2003; Ziemba, 2013), the digital divide in developing countries (e.g. Berleur et al., 2010; Echeverri and Abels, 2008; Ferro et al., 2010), the SIS as a way for developing countries' welfare (e.g. Houghton, 2010), ethical aspects of the SIS (e.g. Burger et al., 2009; Som et al.,2009), ecological aspects of the SIS (e.g. Hilty and Aebischer,

2015; Houghton, 2010). A significant stream of research has focused on ICTs as enablers of the SIS (e.g. Avgerou, 2010; Berleur et al., 2010; Hilty and Hercheui, 2010).

The SIS development is an enormous effort for its main stakeholders (actors), i.e. people, enterprises and public administration. Especially, this effort relates to a successful ICTs adoption by these stakeholders and it occurs in various conditions and is connected with a substantial risk of failure. The considerations of ICTs adoption may be expressed as critical success factors (CSFs) (Rockart, 1979) that represent the limited number of areas of activity in which the achievement of satisfactory results will ensure the success for ICTs adoption by the main SIS stakeholders. CSFs are important and noteworthy because the SIS stakeholders need to be cognizant of the factors that will influence the ICTs projects in order to realize full benefits concerning the SIS.

However, existing research works on CSFs for ICTs adoption use various CSFs models that have different levels of generalisation and completeness, knowledge of CSFs for ICTs adoption in the context of the SIS is, nevertheless, fragmented and has not been properly integrated. Firstly, the existing literature mostly examines CSFs for enterprise system adoption (e.g. ERP and BI systems) and public administration systems adoption (e.g. ERP systems, systems for provision of government services). Secondly, the existing studies were rarely taken on, or never include, CSFs for ICTs adoption by people for their everyday life. Thirdly, the conducted research mostly builds on the experience of highly-developed countries and the discovered practices and approaches may not be directly applicable to other countries or cultures. This stresses the need for gathering and collecting data from other environments, which may be less developed and where the social, economic, cultural and technological characteristics differ.

Poland was an emerging country with an upper-middle-income by 2009 (WB, 2009). Since 2010 Poland has been classified as a high-income economy (WB, 2010) It is also a leader of a transition economy, i.e. an economy that undergoes changes from a central planned economy to a free market economy. Nevertheless, despite different experiences of ICTs projects in transition economies, research on ICTs adoption by people, enterprises and public administration in the context of the SIS seems to be particularly sparse and fragmented (e.g. Harindranath 2008; Ifinedo and Singh, 2011; Roztocki and Weistroffer 2011; Soja, 2010). Therefore, research conducted among Polish people, enterprises and government units should contribute to greater understanding of ICTs adoption considerations for the SIS development and should help fill the gap in the existing body of knowledge.

In the light of above limitations, the primary intent of this study is to examine CSFs for the adoption of ICTs, consequently for the SIS development in Poland. To reach this objective, an explanation of the SIS is offered which implies understanding the role of ICTs as enablers of economic, socio-cultural, political and ecological sustainability. Secondly, a methodology of examining critical success factors for the SIS and their framework are presented. Thirdly, the factors for the SIS in Poland are identified followed by the discussion on the research findings. This paper concludes with a presentation of the study's contribution and limitations, implications for the findings and the stream of future work.

2 Theoretical underpinnings

2.1 ICTs as vital nexus of sustainable information society

The background for identifying the term "sustainable information society" is constituted by the collocation "information society" developed and refined for over the past 50 years in a variety of contexts: economic, political, technological, and social (e.g. Bell 1973; Castells 1996, 1997, 1998; Drucker 1993; Masuda 1980a, 1980b; Machlup 1962; Mansel 2009; Raban et al. 2011; Toffler 1980; Webster 2002). The information society is – on the one hand – one of the most important contributions to economic growth and social welfare (e.g. ITU, 2013; WSIS, 2013). On the other hand, it can pose a threat of information and digital exclusion, new social divisions and social stratification, economic diversification, loss of privacy, information and computer crimes (Avgerou, 2010; Echeverri and Abels, 2008; Ferro et al., 2010).

Therefore, it is very important to explore and formulate such approaches to the information society that will allow for ensuring sustainable development in social, economic, cultural and technological dimensions. Such research has been carried out and the concept of SIS has been explored for more than ten years (e.g. Berleur et al., 2010; Fuchs, 2009a, 2009b; Schauer, 2003). A significant stream of research has focused on exploring how we can use ICTs to contribute to sustainable development (e.g. Avgerou, 2010; Berleur et al., 2010; Elliot, 2011; Melville, 2010). ICTs are a key enabler of boosting the development of the SIS (Ziemba, 2013). They are significantly contributing to revolutionary changes in everyday life, business and public administration. They can transform the society and fuel the growth of economy. If the stakeholders of the SIS are unable to acquire the capabilities to use ICTs effectively, they will be increasingly disadvantaged or excluded from the benefits afforded by ICTs.

One of the first research works elaborating on the potential applications of ICTs to sustainable development was the study by Mansell and When (1998). The authors concentrated on the leading developments in the application of ICTs to support the provision of government services, achievement of productivity gains, improvement of people's life quality, alleviating poverty, enhancement of access to information and dissemination of information as well as facilitating knowledge sharing. In other research, Schauer (2003) discussed a comprehensive overview of the effects of ICTs on sustainable development. In contrast, Hilty et al. (2005) emphasised, that sustainable development in information society emerges as a new direction of research penetration, in which a technological dimension of information society in the context of sustainable development should be explored. In addition, Johnston (2006) referred to the role of ICTs in the development of SIS. He pointed out that the development of SIS requires a more systemic approach in which '...*investment in ICTs must be accompanied by investment in skills and organisational change*' (Johnston, 2006, p. 203). Similarly, Elliot (2011) and Melville (2010) identified sustainability as a multidimensional concept encompassing environmental, economic, human and social aspects, and information systems as potential enablers of such sustainable practices.

The potential of ICTs as key enablers of development was also firmly stressed at WSIS in 2013: '*ICTs, including broadband Internet, mobile technologies and relevant ICT applications, should be fully recognized as tools that can help empower people, enable wider exercise of human rights including freedom of expression, foster access to information, open up employment opportunities, expand access to learning, education, and basic services*' (WSIS, 2013, p. 108). Moreover, the European Commission delivered a clear message to EU decision-makers that '...*the transformational power of digital technologies will increasingly drive productivity, sustainable growth, innovation and employment throughout the European economy*' (DigitalEurope, 2010, p. 34).

A major contribution to studies on the SIS was made by Fuchs, who also coined the term 'sustainable information society' and stressed the role of ICTs for this society (2009a, 2009b, 2010). In Fuchs's definition, the SIS is a society that '*makes use of ICTs and knowledge for fostering a good life for all human beings of current and future generations by strengthening biological diversity, technological usability, economic wealth for all, political participation of all, and cultural wisdom*' (Fuchs, 2006, p. 79). Similarly, Ziemba (2013) discussed how ICTs shape the SIS. According to her, in the SIS, stakeholders (citizens, enterprises, and government units) continuously make an effective use of ICTs for learning and improving their competences. This will enable ICTs adaptation and development, revitalisation, reconstruction and reorientation according to emerging trends. This in turn will allow for building the welfare of present and future generations, ensuring economic growth, increasing participation in social life and building the wisdom of societies, and at the same time balancing the interests of diverse stakeholders as well as natural and socio-technical systems. Overall, the SIS is a multidimensional concept encompassing environmental, economic, human and social aspects, all of which could be strongly influenced by ICTs.

2.2 ICTs as enablers of economic, socio-cultural, political and ecological sustainability

As previously outlined, ICTs are fundamental enablers of the SIS. They play this role in several respects, mainly as enablers of economic, socio-cultural, political and environmental sustainability.

ICTs are crucial driving force in business performance improvement and productivity growth, and thereby in ensuring a stable and sustainable economic growth sustainability (Avgerou, 2010; Guillemette and Paré, 2012; Jorgenson and Vu, 2011; Khoung, 2014; Miller and Atkinson, 2014). Economic sustained growth is a result of more ubiquitous adoption of ICTs by all organisations, especially enterprises and government units. ICTs can improve efficiency and effectiveness of enterprises and public administration basically through the processing of information and knowledge. Moreover, new theories and models of business and public administration supported by ICTs became extraordinary powerful instruments for economic growth.

ICTs are bound to play an increasingly prominent role in enabling socio-cultural sustainability. A prerequisite for social development is economic growth driven by ICTs, and economic sustainability is a base for socio-cultural sustainability. ICTs are contributing to improving people's everyday lives (e.g. Partridge, 2007; WSIS, 2014). Moreover, they can increase employment, facilitate learning and doing shopping, promote culture and provide new forms of entertainment.

The design of socio-cultural and economic sustainability is heavily dependent on political sustainability which requires good governance supported by ICTs. Therefore, e-democracy and e-governance are starting to play an ever-greater role in the SIS. E-democracy refers to democratic structures, processes, and practices, in which ICTs are utilised to improve transparency, citizen's participation, and democratic decision making. Meanwhile, e-governance means cooperation, networking, and partnership relations between government agencies, citizens and business. As for more specific recommendations, e-government services are now recognised as one of the central elements of good governance.

ICTs may be used to a great effect to contribute to environmental sustainability; this can be achieved by dematerialising production and consumption resulting in a significantly lower use of natural resources (Schauer, 2003). In general, ICTs for environmental sustainability can be subdivided into: sustainability in ICTs and sustainability by ICTs (Hilty and Aebischer, 2015). The sustainability in ICTs refers to ICTs goods and services being more sustainable over their whole life cycle, which is achieved by the reduction of energy and material flows connected with them. Then, sustainability by ICT reflects creating, enabling, and encouraging sustainable patterns of production and consumption by means of ICTs.

2.3 Prior studies on critical success factors for sustainable information society

In the SIS, it is important on which ICTs to focus in a consistent and flexible manner, absorb, adapt and use them in various areas of social and economic life. It requires close cooperation between people and businesses, in conjunction with national, regional and local governments. In general, several factors contribute to the success in adopting ICTs for the SIS and so many matters can compete for attention that it is often difficult to obtain comprehensive view of a situation. Hence, a major challenge is to identify those factors and matters. That is where the theory of CSFs can help.

The theory of CSFs (Rockart, 1979) gives sound basis for stating what criteria should be followed during transition to the SIS, especially for a successful ICTs adoption. CSFs are directly related to the objectives of ICTs adoption projects. They are these areas of activities carried out by people, business and public administration that should require a primary focus in order to achieve the most satisfying results of ICTs adoption. They concentrate on the most important areas and delineate what is to be achieved and how it will be achieved. Their identification helps all stakeholders of the SIS to know exactly what is most important for a successful ICTs adoption. And this aids the SIS stakeholders in

taking more effective and strategic actions in the right context and so pull together towards the same overall aims.

There are already a number of studies on CSFs for information systems implementation in enterprises (e.g. Ramaprasad and Williams, 1998). Many researchers have examined and defined the CSFs that affect the implementation of Enterprise Resource Planning (ERP) systems in organisations (e.g. Liu, 2011; Ngai, Law and Wat, 2008; Soja, 2010). Furthermore, researchers have contributed to the investigation of the CSFs involved in implementing Business Intelligent (BI) systems (e.g. Mungree et al., 2013; Yeoh and Koronios, 2010). There are some studies on determinants and obstacles for the information systems implementation in public administration. They are related to ERP systems and e-government (e.g. Ifinedo and Singh, 2011; Nfuka and Rusu, 2011; Rana et al., 2013).

The review of extant literature, presented in this section, illustrates that research on CSFs for the SIS development faces challenges which relate the lack of general CSFs framework and underestimate the role of the SIS stakeholders and ICTs adoption by them. There are no complex studies on CSFs for ICTs (not only information systems, but also hardware, networks and telecommunications) adoption by enterprises in the context of the SIS. In addition the bulk of these studies concerns developed countries and only limited data is available on emerging and transition countries. Similarly, CSFs for e-government embracing the adoption ICTs for improving government processes, delivering government services and ensuring e-democracy and e-governance in the context of the SIS have not been fully explored. Moreover, some prior studies on e-government mostly apply to developed countries. Additionally, studies on CSFs for ICTs adoption by people are missing. All this portrays the need for collecting data on CSFs for ICTs adoption as enablers of the SIS. Arguably, collecting data from people, enterprises and public administration as the main stakeholders of the SIS should contribute to a greater understanding of factors for a successful development of the SIS. This study seeks to address the above mentioned shortcomings of prior research by conducting study in Poland, examining opinions of main SIS stakeholders, and proposing the CSFs framework and identifying CSFs.

3 Research methodology

The goal of this paper is to answer the following research question: What are the CSFs for the SIS in Poland?

In order to work out the CSFs framework for the SIS and identify the CSFs in Poland, a multi-step approach was applied. Figure 1 presents the main steps of the research methodology. The first five steps led to the final framework of CSFs for the SIS. The next four steps gave the CSFs for the SIS in Poland.

Step 1. Some CSFs for the SIS (for ICTs adoption by people, enterprises and public administration) were identified based on the review of the extant literature and prior studies. The search for the appropriate literature began with five bibliographic databases, that is: Ebsco, ProQuest, Emerald Management Plus, ISI Web of Knowledge, and Scopus. Moreover, open access papers and empirical studies were examined.

Step 2. The step 2 required the combination of theoretical knowledge and practical experience. Therefore, based on the literature review findings, action research, logical deduction, brainstorming session and creative thinking, the prototype framework of CSFs was defined.

Step 3. The prototype framework of CSFs was verified. For this, the framework was examined and verified through the means of the Delphi study. The experts were selected to combine knowledge and experience of scholars, researchers and practitioners. The group of experts was composed of managers of the local and state government, managers of enterprises, professors of Polish universities, and people who act for digital inclusion.

Step 4. In order to gain greater and deeper evaluation of the prototype framework of CSFs and to evaluate each of these factors of the framework, the last round of the Delphi study was conducted. The experts evaluated the strength of the influence of particular factors on the SIS. The experts had to an-

swer to the question: *Using a scale of 1 to 5, state to what extent do you agree that the following factors influence the ICTs adoption by you (as a learner, worker, consumer and citizen)/your enterprise/ your government unit?* A five-point Likert scale was used in the evaluation. The scale respectively represented: 1 – disagree strongly, 2 – disagree, 3 – neither agree nor disagree, 4 – agree, 5 – agree strongly. The experts marked the influence strength of each factor and some of them proposed some changes in the prototype factors. The collected data was statistically analysed at step 4. Statistical Package for Social Science (SPSS) for Windows and STATISTICA were utilised to show the descriptive statistics of CSFs. The following statistical measures for data analysis were employed: min, max, mean, standard deviation (σ), and coefficient of variation (V). To conduct reliability analysis, Cronbach's coefficient alpha (α) was used. The ranges of reliability suggested by Hinton et al. (2004) were adopted, i.e. the excellent range (0.90 and above), the high (0.70- 0.90), the high moderate (0.50-0.70) and the low (0.50 and below).
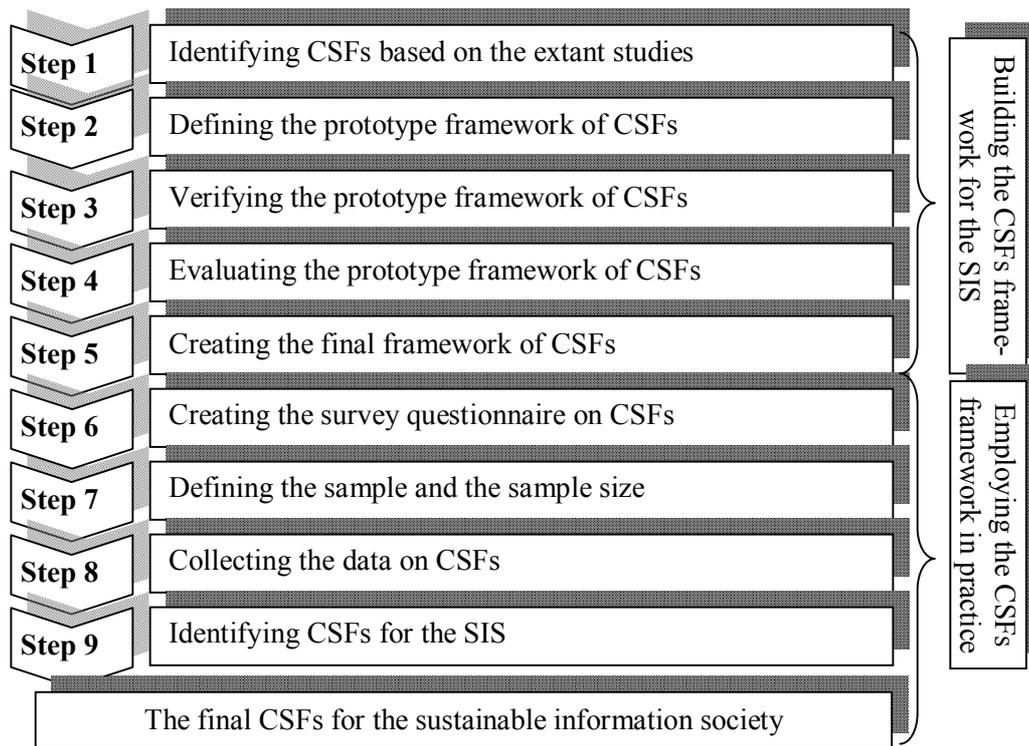
Step 1	Identifying CSFs based on the extant studies	Building the CSFs frame-work for the SIS
Step 2	Defining the prototype framework of CSFs	
Step 3	Verifying the prototype framework of CSFs	
Step 4	Evaluating the prototype framework of CSFs	
Step 5	Creating the final framework of CSFs	
Step 6	Creating the survey questionnaire on CSFs	Employing the CSFs framework in practice
Step 7	Defining the sample and the sample size	
Step 8	Collecting the data on CSFs	
Step 9	Identifying CSFs for the SIS	
	The final CSFs for the sustainable information society	

Figure 1.   The research methodology for examining CSFs for the SIS.

Step 5. Based on the statistical analysis, the final framework of CSFs was established. In addition, some changes proposed by experts at step 4 were taken into account. In order to make a decision about adding new factors to the framework, deleting some existing factors or replacing some factors by other factors, the opinions of each expert were transferred to the other experts. By doing this, anonymity was ensured for every expert to eliminate possible unfairness that might arise due to the positions held and experience acquired.

Step 6. After establishing the final framework of CSFs for the SIS, a survey questionnaire was developed. Applying the CAWI (Computer-Assisted Web Interview) method and employing the Survey Monkey platform, the survey questionnaire was uploaded to the website. Then, a pilot study was conducted to verify the web survey questionnaire. In the pilot study, some of respondents who participated in step 4 examined this web survey questionnaire. The finishing touches were put into it, especially formal and technical. No substantive amendments were required.

Step 7. After creating the final survey questionnaire, the next step was to decide about a respondents' group who will participate in the study sample. The sample group should consist of the group of the

SIS stakeholders: people, enterprises and government units. The actual research sample was composed of: (1) 3,500 people, comprising people at a different age, of different gender, with different educational background and living in different regions in Poland (2) 2,000 enterprises, comprising enterprises of different sizes and line of business, and operating in regions in Poland; and (3) 2,711 government units, comprising about 81% of the whole local and state government units in Poland.

Step 8. The data was collected over a four-month period of intense work. In the group of government units, the data collection occurred between 22 December 2013 and 15 April 2014. In the groups of people and enterprises the data was gathered between 22 December 2013 and 30 April 2014. Finally, the data was obtained: (1) a set of 751 correct and complete responses (response rate – 21.46%) from people, (2) a set of 322 correct and complete responses (response rate – 16.10%) from enterprises, and (3) a set of 636 correct and complete responses (response rate – 23.45%) from government units. The data was stored in two data formats: Statistical Package for Social Science (SPSS) and Microsoft Excel software.

Step 9. As the process of collecting data was completed and before passing to detailed statistical analyses, Cronbach's coefficient alpha was calculated to examine the internal consistency among items on the scale. After that, the statistical measures for data analysis used in step 4 were employed to identify the CSF for the SIS in Poland.

4 Research findings

4.1 Framework of critical success factors for sustainable information society

Consistent with the research findings, the framework of CSFs for the SIS is presented in Figure 2. The factors are related to the ICTs adoption for achieving economic, socio-cultural, political and environmental sustainability.
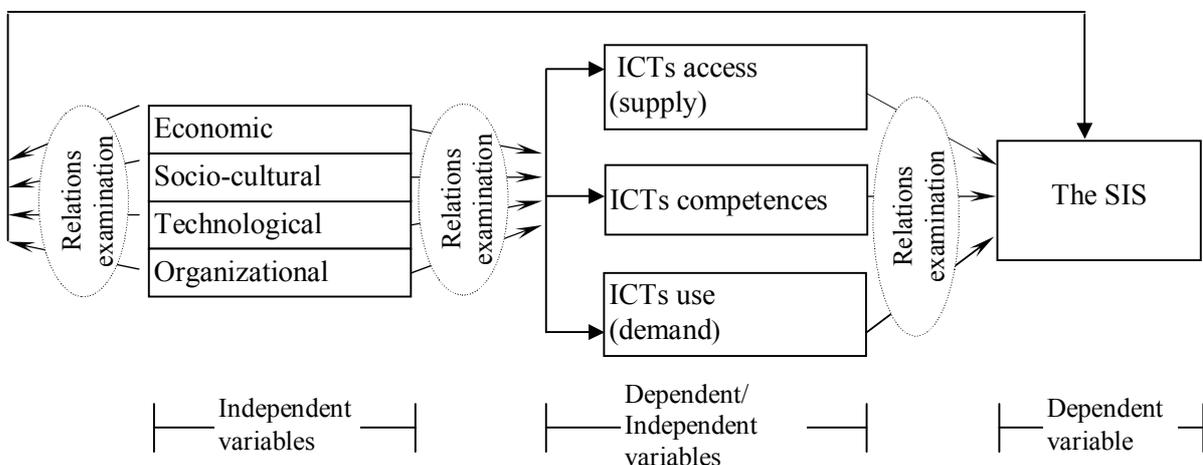

Figure 2.   The framework of CSFs for the sustainable information society.

All the factors are considered necessary for the stakeholders of the SIS, i.e. people, enterprises and government. In the SIS there are imperatives relating to those stakeholders:

- the transition to the e-government, which means the ICTs usage for improving government processes, providing government services electronically, improving democratic decision making, and developing cooperation and partnerships between government stakeholders;

- the transition to the growing role of ICTs sector and ICTs used by enterprises to effectively achieve their strategic business goals and improve effectiveness, productivity, innovation, creativity, competences and competitiveness; and

- the transition to the growing use of ICTs by citizens to effectively achieve high quality of life and successfully fulfill personal goals in the area of work, study, entertainment, etc.

Overall, the final framework of CSFs include: 41 factors for people, 52 factors for enterprises, 55 factors for government.

Moreover, within the framework, the factors are classified into four main dimensions: economic, social-cultural, technological and organisational. Firstly, there is a relationship between economic factors and the SIS. The economic factors are related to the national wealth, economic well-being of nation, financial situation of government stakeholders, availability of economic endowments as well as economic benefits. Secondly, socio-cultural factors influence building the SIS, e.g. the mentality and awareness of stakeholders, digital divide, information culture, digital culture. Thirdly, technological factors influence the building of the SIS, e.g. ICTs innovations, innovative e-services and their maturity, open source software licenses, integration of front-office and back-office information systems, user-friendly information systems, ICTs standardization, competitive ICTs professionals, and quality of ICTs. Fourthly, building the SIS depends on organizational factors, such as leadership, rule of law, managerial innovation, and management of ICTs.

Furthermore, the SIS requires: (1) technical and economic accessibilities of ICTs – ICTs access (supply) stage; (2) competences and awareness related to the use of ICTs – ICTs competence stage; and (3) usage of ICTs by, people, enterprises and government units – ICTs use (demand) stage. Therefore, the factors are classified into three stages in the framework.

Generally, the unique character of the framework appears through its multi-dimensionality. The CSFs are considered holistically. They are related to the stakeholders of the SIS. In addition, they are reflected as economic, social-cultural, technological and organisational issues. Moreover, the CSFs are respondent to the three stages: ICTs access, ICTs competences, and ICTs use.

4.2 Critical success factors for sustainable information society in Poland

4.2.1 Critical success factors for ICTs adoption by people

The final framework of CSFs for people includes 41 factors. The overall scale and the subscale of internal consistency were estimated using Cronbach's alpha. The Cronbach's alpha values for all the research items, research dimensions and stages do not have values lower than 0.70. Generally, the removal of some items would lead to the improvement of internal consistency among items on the scale. Overall, the original alpha scores with all 41 items, four dimensions and three stages show a strong internal consistency and reliability of scales in use.

After examination of the internal consistency among items on the scale and the variability of items, the mean, median, standard deviation and coefficient of variation were used to demonstrate the construct validity of 41 factors. The calculated means for 41 factors are in the range from 3.33 to 4.49, using a five point Likert scale. 19 factors have values exceeding 4. For 5 factors the medians exceed the highest value (namely 5) and the means for those factors are higher than the means for the other factors (namely in the range from 4.37 to 4.49). Table 1 shows the rank of 10 factors with the highest means and medians.

Critical success factor	No. of resp.	Mean	Median	Min	Max	σ	V
ICTs technological availability	750	4.49	5	1	5	0.71	15.90%
Need to make people's lives easier	748	4.47	5	1	5	0.77	17.24%
Financial situation of people	751	4.41	5	1	5	0.80	18.14%
People's satisfaction with e-products, e-services and e-government services	750	4.39	5	1	5	0.76	17.27%
ICTs costs	750	4.37	5	1	5	0.83	19.12%
ICTs competences of people	745	4.29	4	1	5	0.77	17.96%
ICTs awareness of people	747	4.28	4	1	5	0.77	18.01%
Open source software licenses	749	4.22	4	1	5	0.87	20.62%
Economic benefits for people arising from ICTs adoption	748	4.21	4	1	5	0.81	19.22%
ICTs security	747	4.20	4	1	5	0.84	20.00%

Table 1.   CSFs for ICTs adoption by people.

4.2.2   Critical success factors for ICTs adoption by enterprises

The final CSFs framework for enterprises includes 52 factors. The overall scale and the subscale of internal consistency were estimated using Cronbach's alpha. The Cronbach's alpha values for all the research items, research dimensions and stages do not have values lower than 0.80. Generally, the removal of some items would lead to the improvement of internal consistency among items on the scale. Overall, the original alpha scores with all 52 items, four dimensions and three stages show a strong internal consistency and reliability of scales in use.

After examination of the internal consistency among items on the scale and the variability of items, the mean, median, standard deviation and coefficient of variation were used to demonstrate the construct validity of 41 factors. The calculated means for 52 factors are in the range from 3.43 to 4.38, using a five point Likert scale. 19 factors have values exceeding 4. For one factor the median exceeds the highest value (namely 5) and the means for this factor are higher than the means for the other factors (namely 4.38). Table 2 shows the rank of 10 factors with the highest means and medians.

Critical success factor	No. of resp.	Mean	Median	Min	Max	σ	V
Economic benefits for enterprises arising from ICTs adoption	320	4.38	5	2	5	0.71	16.24%
Financial situation of enterprises	321	4.27	4	2	5	0.82	19.12%
Costumers' satisfaction with e-products and e-services delivered by enterprises	319	4.25	4	1	5	0.82	19.30%
Quality of front-office and back-office information systems	320	4.25	4	1	5	0.78	18.44%
ICTs competences of enterprises' employees	318	4.25	4	2	5	0.74	17.41%
Information security in enterprises	321	4.22	4	1	5	0.93	21.97%
Integration of front-office and back-office information systems	317	4.20	4	1	5	0.78	18.48%
Management personnel awareness of ICTs	321	4.19	4	2	5	0.78	18.57%
Top management support	322	4.18	4	1	5	0.77	18.50%
Competition on ICTs market	319	4.18	4	1	5	0.82	19.59%

Table 2.   CSFs for ICTs adoption by enterprises.

4.2.3   Critical success factors for ICTs adoption by public administration

The final framework CSFs for public administration includes 55 factors (Ziemba et al., 2015). The overall scale and the subscale of internal consistency were estimated using Cronbach's alpha. The Cronbach's alpha values for all the research items, research dimensions and stages do not have values lower than 0.80. Generally, the removal of some items would lead to the improvement of internal consistency among items on the scale. Overall, the original alpha scores with all 55 items, four dimensions and three stages show a strong internal consistency and reliability of scales in use.

After examination of the internal consistency among items on the scale and the variability of items, the mean, median, standard deviation and coefficient of variation were used to demonstrate the construct validity of 55 factors. The calculated means for 55 factors are in the range from 3.32 to 4.53, using a five point Likert scale. 30 factors have values exceeding 4. For 8 factors the medians exceed the highest value (namely 5) and the means for those factors are higher than the means for the other factors (namely in the range from 4.34 to 4.53). Table 3 shows the rank of 10 factors with the highest means and medians.

Critical success factor	No. of resp.	Mean	Median	Min	Max	σ	V
Financial situation of government units	634	4.53	5	2	5	0.72	15.88%
Public subsidies on hardware, networks and tele-communications	635	4.51	5	1	5	0.70	15.46%
Integration of front-office and back-office information systems	633	4.45	5	2	5	0.68	15.24%
Electronic communication between government units	628	4.40	5	1	5	0.70	16.00%
Top management support	633	4.38	5	1	5	0.77	17.54%
ICTs competences of government employees	633	4.37	5	2	5	0.67	15.28%
State standardization of solutions for e-government	634	4.35	5	1	5	0.81	18.69%
Information security in government units	634	4.34	5	1	5	0.79	18.09%
Quality of front-office and back-office information systems	634	4.27	4	1	5	0.79	18.45%
Information culture in government units conducive to the use of ICTs	634	4.22	4	1	5	0.73	17.37%

Table 3.   CSFs for ICTs adoption by public administration

4.3   Discussion of findings

This study contributes to the SIS research in two ways. Firstly, it made an attempt at developing the framework of CSFs for the SIS. Secondly, it showed practical application of this framework and indicated CSFs for the SIS in Poland. Additionally, the methodology of CSFs for the SIS is presented.

The proposed methodology of CSFs for the SIS consists of nine steps: (1) Identifying CSFs based on the extant studies, (2) Defining the prototype framework of CSFs; (3) Verifying the prototype framework of CSFs; (4) Evaluating the prototype framework of CSFs; (5) Creating the final framework of CSFs; (6) Creating the survey questionnaire on CSFs; (7) Defining the sample and the sample size; (8) Collecting the data on CSFs; and (9) Identifying CSFs for the SIS.

The first five steps led to the final framework of CSFs for the SIS. The unique character of the framework appears through its multi-dimensionality. In the framework, all the factors are considered in relation to the SIS stakeholders. Moreover, the factors are classified into four main dimensions: economic,

social-cultural, technological and organisational. Furthermore, the factors reflect the three stages: ICTs access, ICTs competences, ICTs usage. The next four steps gave the CSFs influencing the SIS in Poland. These factors are presented in Figure 3.
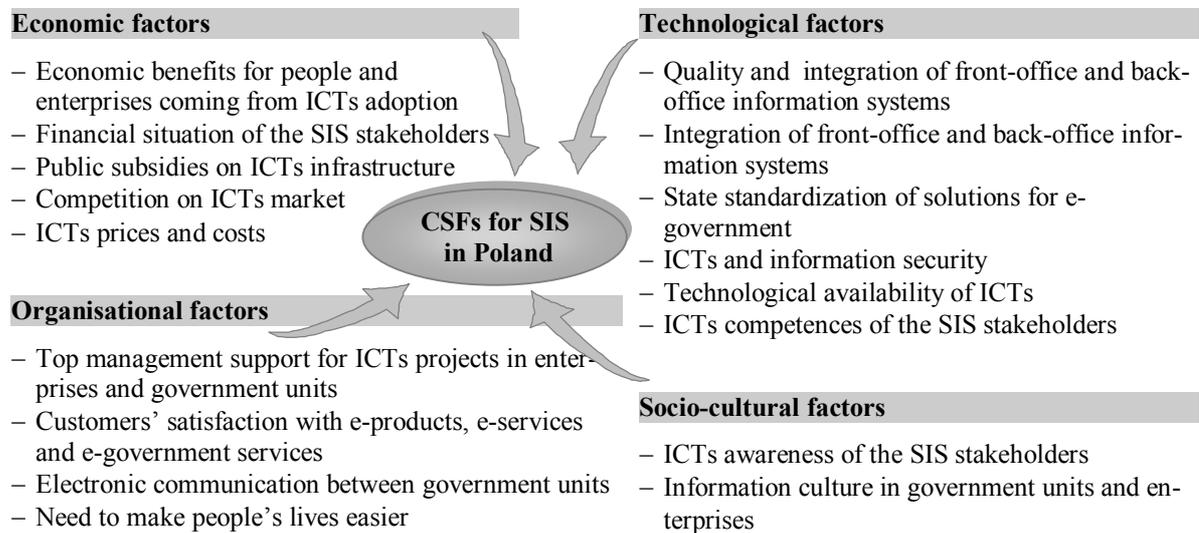

Economic factors

– Economic benefits for people and enterprises coming from ICTs adoption
– Financial situation of the SIS stakeholders
– Public subsidies on ICTs infrastructure
– Competition on ICTs market
– ICTs prices and costs

Organisational factors

– Top management support for ICTs projects in enterprises and government units
– Customers' satisfaction with e-products, e-services and e-government services
– Electronic communication between government units
– Need to make people's lives easier

CSFs for SIS in Poland

Technological factors

– Quality and integration of front-office and back-office information systems
– Integration of front-office and back-office information systems
– State standardization of solutions for e-government
– ICTs and information security
– Technological availability of ICTs
– ICTs competences of the SIS stakeholders

Socio-cultural factors

– ICTs awareness of the SIS stakeholders
– Information culture in government units and enterprises

Figure 3.   CSFs for the SIS in Poland.

CSFs are important and noteworthy because they give a good basis for stating which determinants should be followed and which barriers removed for the SIS development. The identified CSFs show the strategic areas of the SIS on which stakeholders' activities should be focused primarily in order to achieve the most satisfying results of ICTs adoption, and consequently the SIS development.

5   Conclusion and implications

5.1   Research contribution

The SIS and CSFs for the SIS development in particular are important topics for today's societies. This research contributes to understanding how CSFs theory should be employed to identify factors for successful development of the SIS. The theoretical contribution of this research is that it analyses and synthesises CSFs for the SIS in order to enhance knowledge of them from various perspectives. The methodological contribution of this research is that the framework of CSFs is developed and described to enhance knowledge and skills of using CSFs for the SIS. The practical contribution of this research is employing this framework to identify CSFs for the SIS in Poland to show areas in which satisfactory results will ensure the successful SIS.

This paper attempts to provide a new line of thinking and further scope for researchers and practitioners in areas of CSFs for the SIS. Such a comprehensive study has not been performed earlier. Unlike prior studies that relied on methodologies and examinations of CSFs for adopting information systems (e.g. ERP, BI and e-government), this study proposes a comprehensive methodology of identifying CSFs for the SIS and identifies CSFs for the SIS in Poland based on this methodology. The implications for research and practice are discussed below, followed by limitations and recommendations for future research.

5.2   Implications for research

This study makes two main contributions to the literature. Firstly, it provides the nine-step research methodology for examining CSFs for the SIS. This approach is appropriate given the nature of the SIS

which implies that the adoption of ICTs by people, enterprises and public administration is necessary for the SIS adoption. Moreover, researchers may develop, verify and improve this methodology and implement it to identify factors influencing the SIS in other countries. Secondly, this study identifies and describes critical factors influencing the successful ICTs adoption by the SIS stakeholders in Poland. Researchers may evaluate the strength of the influence of these factors on the SIS in other countries and make some comparisons between various countries.

5.3   Implications for practice

The findings of this study also have important implications for practitioners. Firstly, the SIS stakeholders could find answers to the important question: Which areas and operations of the SIS stakeholders should require a primary focus in order to achieve the most satisfying results of transition to the SIS? Secondly, the framework and the CSFs are useful for practitioners while undertaking empirical activities aimed at developing the SIS successfully and effectively, especially programming and implementing ICTs initiatives and projects. Moreover, the replication of this study in emerging and developing countries will be useful to improve their knowledge related to the factors bearing an impact on the SIS (or lack thereof) in such contexts. In particular, this research can be largely useful for the Central and Eastern European countries. Knowledge about identified CSFs would help the SIS stakeholders in developing a sound ICTs adoption plans, receiving funding from the European Union, and ultimately reaping benefits from these initiatives. This is because the countries are similar with regard to analogous geopolitical situation, their joint history, traditions, culture and values, the quality of ICT infrastructure, as well as, building democratic state structures and a free-market economy, and participating in the European integration process.

5.4   Limitations and future research

Although the developed framework of CSFs for the SIS and its practical implementation are generic and comprehensive ones, there are some limitations of this study. Firstly, this study gathered data from only one county, Poland. Further research is needed in order to confirm the generalisability of achieved results with respect to other countries. Secondly, this study employed the basic statistical measures. The future research is related to robust statistical analyses. For example, it is important to identify differences between success factors for successful ICTs adoption by the SIS stakeholders in the context of their profiles, e.g. enterprises' size and economy sector, government units' size and government level, etc. Moreover, factor analysis should identify groupings to allow to select one factor to represent many other factors. It may be stated that the argument on CSFs and SIS would be much better supported by these analyses. Thirdly, this study employed a snapshot research approach. Further research needs to consider a longitudinal approach, based on data collected across several time periods.

Acknowledgements

References

Avgerou, C. (2010). "Discourses on ICT and development." *Information Technologies and International Development* 6(3), 1–18.
Bell, D. (1979). "The social framework of the information society." In *The Computer Age: A 20 Year View.* Ed. by M. L., Dertoozos and J. Moses. Cambridge: MIT Press, pp. 500–549.

Berleur, J., M. D. Hercheui and L. M. Hilty (eds.) (2010). "What kind of information society? Governance, virtuality, surveillance, sustainability, resilience." In: *Proceedings of 9th IFIP TC 9 International Conference, HCC9, and 1st IFIP TC 11 International Conference, CIP 2010 Held as Part of WCC 2010, IFIP*. Brisbane: Springer, pp. 3–12.

Burger, P., C. H., Daub and Y. M. Scherrer (eds.) (2009). "New perspectives on sustainable business." *Journal of Business Ethics* 85, 479–481.

Castells, M. (1996). *The Information Age: Economy, Society and Culture. The Rise of Network Society*. Vol. 1. Oxford: Blackwell Publishers.

Castells, M. (1997). *The Information Age: Economy, Society and Culture. The Rise of Network Society*. Vol. 2. Oxford: Blackwell Publishers.

Castells, M. (1998). *The Information Age: Economy, Society and Culture. The Rise of Network Society*. Vol. 3. Oxford: Blackwell Publishers.

DigitalEurope. 2010. *A Transformational Agenda for the Digital Age. DIGITALEUROPE's Vision 2020*. URL: http://www.kigeit.org.pl/userfiles/file/dae/DE%20V2020%20Full%20EN.pdf (visited on 10/30/2014).

Drucker, P. F. (1993). *Post-Capitalist Society*. New York: Harper Business.

EC (2010). *Digital Agenda for Europe. A Europe 2020 Initiative*. COM(2010)245. Brussels: European Commission. URL: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52010DC0245R%2801%29&from=EN (visited on 26/10/2014).

Echeverri, M. and E. G. Abels (2008). "Opportunities and obstacles to narrow the digital divide: Sharing scientific knowledge on the Internet." In: *Building the Knowledge Society on the Internet. Sharing and Exchanging Knowledge in Networked Environments*. Ed. by E. Bolisani. Hershey: IGI Global, pp. 146–171.

Elliot, S. (2011). "Transdisciplinary perspectives on environmental sustainability: a resource base and framework for IT - enabled business transformation." *MIS Quarterly* 35(1), 197–236.

Ferro, E., Y. K. Dwivedi, J. R. Gil-Garcia and M. D. Williams (eds.) (2010). *Handbook of Research on Overcoming Digital Dvides: Constructing an Equitable and Competitive Information Society*. Hershey: IGI Global.

Fuchs, Ch. (2006). "Towards a global sustainable information society (GSIS)?." *tripleC* 4(1), 40–99.

Fuchs, Ch. (2009a). "Sustainable information society as ideology. Part I." *Informacion Tarsadalom* 9(2), 7–19.

Fuchs, Ch. (2009b). "Sustainable information society as ideology. Part II." *Informacion Tarsadalom* 9(3), 27–52.

Fuchs, Ch. (2010). "Theoretical foundations of defining the participatory, co-operative, sustainable information society." *Communication & Society* 13(1), 23–47.

Goliński, M. (2011). *Społeczeństwo informacyjne. Geneza koncepcji i problematyka pomiaru*. Warszawa: Oficyna Wydawnicza Szkoły Głównej Handlowej.

Guillemette, M.G. ang G. Paré (2012). "Toward a new theory of the contribution of the IT function in organizations." *MIS Quarterly* 36(2), 529–551.

Harindranath, G. (2008). "ICT in a transition economy: The case of Hungary." *Journal of Global Information Technology Management* 11(4), 33–55.

Hassan, R. (2008). *The Information Society*. Cambridge: Polity Press.

Heinonen, S., P. Jokinen and J. Kaivo-oja (2001). "The ecological transparency of the information society." *Futures*, 33(3-4), 319–337.

Hilty, L. M. (2008). *Information Technology and Sustainability: Essays on the Relationship Between Information Technology and Sustainable Development*. Norderstedt: Empa.

Hilty, L. M., (2009). "Environmental informatics and the vision of a sustainable information society." *Informacios Tarsadalom* 9(3), 6–15.

Hilty, L. M., and M. D. Hercheui (2010). "ICT and sustainable development. What kind of information society?" In *What Kind of Information Society? Governance, Virtuality, Surveillance, Sustainability, Resilience.* Ed. by J. Berleur, M. D. Hercheui and L. M. Hilty. Brisbane: Springer, pp. 227–235

Hilty, L. M., E. K. Seifert and R. Treibert (eds.) (2005). *Information Systems for Sustainable Development*. Hershey: Idea Group Publishing.

Hilty, L. M., W. Lohmann and E. M. Huang (2011). "Sustainability and ICT – An overview of the field." *notizie di POLITEIA*, XXVII, 104, 13–28.

Hilty, L.M. and B. Aebischer (2015). "ICT for sustainability: An emerging research field." In: *ICT Innovations for Sustainability. Advances in Intelligent Systems and Computing*, Volume 310. Ed. by L.M. Hilty and B. Aebischer. Zurich: Springer, pp. 3–36.

Hinton, P. R., C. Brownlow, I. McMurvay and B. Cozens (2004). *SPSS Explained*. East Sussex: Routledge.

Hofkirchner, W. (2010). "How to design the infosphere: the fourth revolution, the management of the life cycle of information, and information ethics as a macroethics," *Knowledge, Technology & Policy* 23(1-2) 177–192.

Houghton, J. W. (2010). "ICT and the environment in developing countries: A Review of Opportunities and Developments." In *What Kind of Information Society? Governance, Virtuality, Surveillance, Sustainability, Resilience*. Ed. by J. Berleur, M. D. Hercheui and L. M. Hilty. Brisbane: Springer, pp. 236–247.

Ifinedo, P. and M. Singh (2011). "Determinants of eGovernment maturity in the transition economies of Central and Eastern Europe." *Electronic Journal of e-Government* 9(2), 166–182.

ITU (2013). *Measuring the Information Society*. Geneva: International Telecommunication Union. URL: http://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2013/MIS2013_without_Annex_4.pdf (visited on 2910/2014).

Johnston, P. (2006). "Towards a knowledge society and sustainable development: deconstructing the WSIS in the European policy context." In: *Towards a Sustainable Information Society. Deconstructing WSIS*. Ed. by J. Servaes and N. Carpentier. Portland: Intellect, pp. 203–206.

Jorgenson, D. and K. Vu (2011). "The rise of developing Asia and the new economic order." *Journal of Policy Modeling* 33 (5), 698–716.

Khoung, V. M. 2014. *Information and Communication Technology (ICT) and Singapore's Economic Growth*. Singapore: National University of Singapore

MAC (2012). *Strategia Sprawne Państwo 2020*. Warsaw: Ministry of Administration and Digitization.

Machlup, F. B. (1962). *The Production and Distribution of Knowledge in the US Economy*. New York: Princeton University Press.

Mansel, R. (ed.) (2009). *The Information Society. Critical Concepts in Sociology*. London: Routledge.

Mansel, R. and U. When (eds.) (1998). *Knowledge Societies: Information Technology for Sustainable Development*. Oxford: Oxford University Press.

Marche, S. and J. D. McNiven (2003). "E-government and e-governance: the future isn't what it used to be." *Canadian Journal of Administrative Science* 20(1), 74–86.

Masuda, Y. (1980a)."Computopia: rebirth of theological synergism." In *The Information Society as Post-Industrial Society*. Ed. by Y. Masuda. Tokyo: Institute for the Information Society, pp. 146–154.

Masuda, Y. (1980b). "Emerging information society in Japan," in In *The Information Society as Post-Industrial Society*. Ed. by Y. Masuda. Tokyo: Institute for the Information Society, pp. 3–22.

Melville, N. (2010). "Information systems innovation for environmental sustainability." *MIS Quarterly* 34(1), 1–21.

Miller, B. and R. D. Atkinson (2014). "Raising European productivity growth through ICT." *The Information Technology and Innovation Foundation*, June, 1–43.

Mungree, D., A. Rudra and D. Morien (2013). "A framework for understanding the critical success factors of enterprise Business Intelligence implementation." In *Proceedings of the Nineteenth Americas Conference on Information Systems*. Chicago: AMCIS, pp. 1–9.

Nfuka, E. N. and L. Rusu (2011). "The effect of critical success factors on IT governance performance." *Industrial Management & Data Systems* 111(9), 1418–1448.

Ngai, E. W. T., C. C. H. Law and F. K. T. Wat (2008). "Examining the critical success factors in the adoption of enterprise resource planning." *Computers in Industry* 59, 548–564.

OECD (2012). *Internet Economy. Outlook 2012*. OECD Publishing. URL: http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/oecd-interneteconomy-outlook-2012_9789264086463-en#page3 (visited on 22/10/2014).

Partridge, H. (2007). *Establishing the Human Perspective of the Information Society*. Brisbane: Queensland University of Technology.

Raban, D. R., A. Gordon and D. Geifman (2011). "The information society. The development of a scientific specialty." *Information, Communication & Society* 14(3), 375–399.

Ramaprasad, A. and J. Williams (1998). "The utilization of critical success factors: a profile." In *Proceeding of the 29th Annual Meeting of the Decision Sciences Institute*. LasVegas.

Rana, N. P., Y. K. Dwivedi and M. D. Williams (2013). "Analysing challenges, barriers and CSF of egov adoption." *Transforming Government: People, Process and Policy* 7(2), 177–198.

Rockart, J. F. (1979). "Chief executives define their own data needs." *Harvard Business Review* 57(2), 81–93.

Roztocki, N. and H.R. Weistroffer (2011). Information technology success factors and models in developing and emerging Economies." *Information Technology for Development* 17 (3), 163–167.

Schauer, T. (2003). *The Sustainable Information Society – Vision and Risks*. Vienna: The Club of Rome – European Support Centre.

Servaes, J. and N. Carpentier (eds.) (2006). *Towards a Sustainable Information Society. Deconstructing WSIS*. Portland: Intellect.

Soja, P. (2010). "Understanding determinants of enterprise system adoption success: Lessons learned from full-scope projects in manufacturing companies." *Production Planning & Control* 21(8), 736–750.

Som, C., L.M. Hilty and A. R. Köhler (2009). "The precautionary principle as a framework for a sustainable information society." *Journal of Business Ethics*, 85(3), 493–505.

Toffler, A. (1980). *The Third Wave*. New York: Bantam Books.

WB (2009). *World Bank Country Classification*. URL: http://www.iqla.org/joining/WorldBank_Classification-List_2009.pdf (visited on 25/10/2014).

WB (2010). *World Bank Country Classifications*. URL: http://www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/Annexes/GAR%2011%20Anne%201%20World%20Bank%20country%20classification.pdf (visited on 25/10/2014).

Webster, F. (2002). *Theories of the Information Society*. New York: Routledge.

WSIS (2012). *The World Summit on the Information Society*. Geneva: International Telecommunication Union. URL: http://www.itu.int/wsis/index.html (visited on 07/10/2014).

WSIS (2013). *Report on the World Summit on the Information Society Stocktaking*. Geneva: International Telecommunication. URL: http://www.itu.int/dms_pub/itu-s/opb/pol/S-POL-WSIS.REP2013-E07-PDF-E.pdf (visited on 29/10/2014).

WSIS (2014). *WSIS Stocktaking Success Stories*. Geneva: International Telecommunication Union. URL: http://www.itu.int/wsis/index.html (visited on 22/10/2014).

Yeoh, W. and A. Koronios (2010). "Critical success factors for Business Intelligence systems." *Journal of Computer Information Systems* 50(3), 23–32.

Ziemba E. 2013. "The holistic and systems approach to a sustainable information society." *Journal of Computer Information Systems* 54(1), 106–116.

Ziemba, E. 2014. "Discussion on the sustainable information society." *Business Informatics* 1(31), 13–25.

Ziemba, E., T. Papaj, R. Żelazny and M. Jadamus-Hacura (2015). "Factors influencing the success of e-government." *Journal of Computer Information Systems* (in print).