New perspectives on information society: The maturity of research on a sustainable information society

Ewa Ziemba, University of Economics in Katowice, ewa.ziemba@ue.katowice.pl

Tomasz Papaj, University of Economics in Katowice, tomasz.papaj@ue.katowice.pl

Rafał Żelazny, University of Economics in Katowice, rafal.zelazny@ue.katowice.pl

Abstract

In recent years, the vision of an information society has been undergoing intensive effectuation, also in the context of sustainable development. The concept of sustainable information society has been developed and refined for more than ten years. The aim of this paper is to explore the research on the sustainable information society. Firstly, the essence of the sustainable information society in the context of the information society concept is presented. Secondly, the status of research on the sustainable information society using a bibliometric and general qualitative literature analysis is diagnosed. The paper concludes with some academic recommendation about the road that lies ahead for the sustainable information society researchers.

Keywords: Sustainable information society; Information society; Bibliometric analysis; Sustainable; Sustainable development, Information and communication technology (ICT)

Introduction

The creation and development of modern society no longer primarily rely on material and financial resources. The sources of success or failure of society are more increasingly based on an intangible asset, which is information. Information co-determines on a par with material and financial resources, and the development of society. Competent and professional information gathering, information databases, information sharing, information analysis, and applying information have been perceived as crucial in "skipping" the next levels of society's development. The importance of information in modern society is adequately reflected by Bacon (1620) who stated that "*human knowledge and human power meet in one*"(p. 4), and the construction of the information society is not a matter of fashion or event. The information society was developed from the need to take care of development, the future, and prosperity. Thus, for many years in various forums (scientific, academic, & practitioners), research has been conducted on various aspects of the information society (Berleur, Hercheui, & Hilty, 2010; Castells, 1996, 1997, 1998; Hassan, 2008; Mansel, 2009b; Raban, Gordon, & Geifman, 2011; Webster, 2002; WSIS, 2003, 2012, 2012a).

Researchers and scholars distinguish and explore different dimensions of the information society such as technological, economic, occupational, spatial and cultural (Webster, 2002), and ecological and social (Hilty & Hercheui, 2010). Furthermore, information, information and communication technologies (ICTs) and information society development are some of the most important contributors to growth and sustainable development (Hilty, Seifert, & Treibert, 2005; Johnston, 2006). It is very important to explore how information and ICTs can be used to contribute to sustainable practices and processes in the contemporary societies, as well as support managerial methods and techniques which allow corporations, governments and societies to contribute to sustainable development (Berleur, Hercheui, & Hilty, 2010; Hilty & Hercheui, 2010; Houghton, 2010). Therefore, a holistic, methodological, and more systemic approach is needed to development of the information society, covering all dimensions of information society and a sustainable development. Johnston (2006) noted that this approach should include: (a) more extensive synergy between research and technological development, regulation and deployment actions; (b) greater investment in more effective public services, (c) most notably in education and administrations; and (d) more active promotion of "eco-efficient" technologies and their application. For this reason, researchers and scholars have been developing and refining the term "sustainable information society" (SIS) for more than 10 years. Researchers have been exploring conceptions, models, solutions, and recommendations which could contribute to a sustainable agenda for the future information society development (Bicknell, 2008; Burger, Daub, & Scherrer, 2009; Fuchs, 2008, 2009, 2009a, 2010; Hilty, 2008, 2009; Hilty et al., 2005a; Johnston, 2006; Servaes & Carpentier, 2006a; Willard & Halder, 2003).

This research study was a preliminary stage on designing a system approach to the development of sustainable information society. First, the publications contributing to theoretical and empirical knowledge on the sustainable information society were identified. Hence, the main objective of this research study was to identify the maturity level of research on the sustainable information society. The main research question that this study addressed is: what is the maturity level of research on sustainable information society? In order to answer the main research question, the research study focused on two specific research questions:

RQ1: What is the rate of occurrence of the term sustainable information society in scientific publications?

RQ2: What are the core research issues of the sustainable information society presented in scientific publications?

To examine the research questions, this research study employed bibliometric techniques and a general qualitative literature analysis to review the current status of research on the sustainable information society. The remainder of this paper is organized to first explore the highly regarded definitions of sustainable information society in the context of information society essence along with the research issues of the sustainable information society. Second, present bibliometric indicators of research on the sustainable information society. Third, present the research study findings and an evaluation of the maturity level of research on the sustainable information society will be presented. Last, present recommendations and future research for SIS researchers. The achieved research findings will contribute to the creation and development of the research

on the sustainable information society. Moreover, the findings can be useful while undertaking empirical activities aimed at the SIS development.

Literature Review

Historical Background

The background for identifying the term "sustainable information society" is constituted by the collocation "information society". Sustainable information society has been developed and refined for over the past 50 years in a variety of contexts such as economic, political, technological, and social (Raban, Gordon, & Geifman, 2011; Mansel, 2009a, 2009b). The term "information society" first emerged in Japanese social science in the early 1960's during a conversation between Kurokawa and Umesao (Karvalics, 2007). Whereas Masuda and Kohyma (1968) as well as Hayashi (1969) were the first to devote their books to the information society (Karvalics, 2007). According to Masuda (1980a, 1980b), the information society is a new type of society in which the possession of information (rather than material resources) is the driving force behind the development and transformation, and its development foundations are ICTs. Furthermore, the U.S. researchers have contributed to the development of information society. For example, Machlup (1962) introduced the concept of "knowledge economy". Machlup (1962) characterized the information industries, such as education, law, media, computer industry, and estimated their impact on economic transformation and development of the economy. Bell (1973), an American sociologist, established the concept of post-industrial society. According to Bell (1973), the information society is a society in which knowledge and ICTs form the basis for innovation and change management as well as decision-making and social policy. In the 1980s, Toffler (1980) introduced the concept of "third wave" civilization in which information is the primary resource, and ICTs determine changes in the economy as well as society. Toffler (1980) forecasts were in line with Drucker's (1993) suggestions a dozen years later. The author of the post-capitalist society connotation stated that capital, natural resources and manpower are no longer basic economic resources, but knowledge accumulated in a person who is able to allocate it and use it productively (Drucker, 1993). The contribution by Castells (1996, 1997, 1998) cannot be overlooked in considerations on the information society. In Castells (1996, 1997, 1998) trilogy, the social and economic dynamics of change associated with the technological revolution is analyzed and a systematic theory of information society is created, which draws attention to the growing impact of ICT on transformation of society . Approaches such as economic/production, consumption, technological, critical, and multidimensional have been used to define and explore the information society (Steinfield & Salavagio, 1989). The multidimensional approach has been widely used to demonstrate that the information society is multidimensional and requires consideration of technological, economic, occupational, spatial and cultural (Webster, 2002), ecological and social (Hilty & Hercheui, 2010) as well as psychological, legal and political issues (aspects) (Raban, Gordon, & Geifman, 2011). At the World Summit on the Information Society (WSIS) Forum in December 2003, the participants defined the information society as:

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Our common desire and commitment to build a people-centred, inclusive and development-oriented Information Society, where everyone can create, access, utilize and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life, premised on the purposes and principles of the Charter of the United Nations and respecting fully and upholding the Universal Declaration of Human Rights (WSIS, 2003, p. 1).

In summary, the definition of the information society evolved from a narrow observation and assessment to a more holistic approach. In order to cover the variety of approaches, the information society is defined as a society which has access and is able to use ICTs and information and knowledge to achieve collective and individual goals in an efficient and effective manner, in economic, social and cultural dimensions.

Development of Research

On one hand, the development of information society is one of the most important contributions to growth and sustainable development (Houghton, 2010; Hilty, & Hercheui, 2010; Johnston, 2006; Servaes, & Carpentier, 2006). On the other hand, it can be a threat and source of information and digital exclusion, new social divisions and social stratification, economic diversification, loss of privacy, information and computer crimes (Association, 2009; Echeverri & Abels, 2008; Ferro, Dwivedi, Gil-Garcia & Williams, 2010; Mansel & When, 1998). Hence, it is very important to explore how information and ICTs can be used to contribute to sustainable practices and processes in the contemporary societies as well as support managerial methods and techniques, which allow corporations, governments, people and societies to contribute to a sustainable development (Berleur, Hercheui, & Hilty, 2010; Hilty, 2008; Hilty & Hercheui, 2010; Houghton, 2010). It is necessary to create approaches to the information society for achieving sustainable development. Therefore, researchers and scholars have been developing and refining the term "sustainable information society" for over ten years.

The first publications on the sustainable information society emerged at the turn of the twentieth century. One of the first characterizations of the sustainable information society came from Mansel and Wehn (1998). Mansel and When (1998) elaborated on the potential application of ICTs to create a sustainable development. In addition, Mansel and When (1998) concentrated on the leading developments in the application of ICTs to foster the provision of public services, achievement of productivity gains, improvement of citizens' life quality, enhancement of access to information, and dissemination of information as well as facilitating knowledge sharing. Moreover, the need for creative approaches to apply ICTs to alleviate poverty and sustainable development are highlighted.

Schauer (2003) illustrated a comprehensive overview of the effects of ICTs on sustainable development. Schauer (2003) explored both the general definition of sustainable development in ecological, social, economic and cultural dimensions, as well as a vision for the achievement of sustainability in each of the dimensions in the context of the information society. Furthermore, the approach to the SIS development is proposed and consists of three steps: developing a vision of the sustainable information society, analyzing critical trends, and drawing conclusions for future research needs. Hilty et al. (2005a) emphasized that "*sustainability in the information*

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society is a more recent field of research, which concentrates on the consequences of ICTs for the objective of sustainable development" (p. 38). Hilty et al. (2005a) also explored technological and ethical dimensions of the SIS.

WSIS (2012a) forum participants expressed their opinion that the challenge of sustainable development and the significance of ICTs should become a cornerstone of a new evolutionary process. WSIS (2012a) identified four important areas for implementing and using ICT: (a) ICT for sustainable economic growth, (b) ICT for effective public service, (c) ICT for protecting infrastructure and environment, and (d) ICT for building a booming ICT sector. Leveraging ICTs to enhance government services, enrich businesses and empower individuals was indicated as the key element for transforming society into the sustainable information society. Additionally, it is vital to provide the most convenient opportunities for fostering advancement in ICT as a basis for reaching "inclusive and sustainable development". At the WSIS (2012) Forum the platform was provided for governments, corporations, non-governmental organizations, international organizations and individuals to learn and benefit from each other's varied experiences of applying ICT as a tool for sustainable development.

Johnston (2006) noted that the study of the SIS cannot limit itself to ICTs, but should also include other aspects and problems. For example, Johnston (2006) stated that:

> Investment in ICTs must be accompanied by investment in skills and organisational change. We therefore need a more systemic approach to development of a sustainable information society: greater synergy between RTD, regulation and deployment actions; greater investment in more effective public services, notably for health care and education, as well as for administrations; and more active promotion of eco-efficient' technologies and their use.. (p. 203)

Previous research studies have explored the areas of information society, sustainable development, and sustainable information society as well as the relationship between them, but did not provide an explicit definition of the sustainable information society. Fuchs (2006, 2008, 2010), a sociologist coined the term sustainable information society. According to Fuchs (2008):

> A sustainable information society 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. (p. 291)

According to Fuchs (2008), discussion on the sustainable information society should be very much focused on a holistic approach, including ecological, technological, economic, political, and cultural issues.

Overall, the definition of the sustainable information society, just like the definition of the information society, evolved from a narrow observation and assessment to a more holistic approach taking into account the information and its contribution to society and sustainable development. The study of the sustainable information society should encompass multidisciplinary views including sustainable development, information, management, economics, ICT, social, cultural and psychological aspects, as well as legal and political issues. Therefore, it is necessary to intensify research on the development of the sustainable information

society, and its coalescence with the practical activities. Further research and scientific discussions over different types of methodological and design premises seem to be crucial. These premises become the fundament to formulate the theories describing the sustainable information society.

Research Methodology

In order to examine the research questions, a bibliometric analysis was used (Raban, Gordon, & Geifman, 2011; Koehler, 2001; Wallin, 2005) as well as a critical qualitative analysis of scientific publications concerning the sustainable information society. The bibliometric analysis allowed for identification of publications containing the term SIS, whereas the critical qualitative analysis of literature permitted to conduct the analysis of their content. The bibliometric analysis was carried out utilizing the resources of six bibliographic databases: Ebsco, Elsevier, ICM Web of Knowledge, OECD, ProQuest and Scopus. The analysis represents data from May 30, 2012. Forty scientific publications containing the term sustainable information society were identified in the studied bibliographic databases: Ebsco – 9, Elsevier – 7, ICM Web of Knowledge – 8, OECD – 0, ProQuest – 8, Scopus – 8. After verification of repetitive publications in bibliographic databases, 27 publications were classified for further analysis (Table 1). It should be emphasized that in the publications listed in the tested bibliographic databases, issues concerning the information society are very often presented in the context of the sustainable development, but the term sustainable information society could not be located. Therefore, such publications were excluded from the bibliographic analysis. The publications listed in Table 1 were analyzed using the following bibliometric indicators: authors, language of publication, type of publication, source of publication (a journal), and key words. In addition, the bibliometric analysis used a tag cloud for key words of publications. A tag cloud is a visual representation for text data, typically used to depict keyword. This way the effective search for distinctive key words and their alphabetical arrangement in order to determine the relative prominence is dealt with. The data visualization tools from IBM, Many Eyes (Many, 2012), were used to develop the tag cloud.

Table 1. List of publications containing the term SIS

No.	Author (s)	Title	Journal	Year
1	Adams McCormick, R.	Adams keynotes at ASIS '87 on effects of info on society	*Library Journal*, 112(5), 21	1987
2	Anonymous	Book notes	*Journal of Consumer Policy*, 27(1), 115	2004
3	Arachchige Don, S.N., Masrour, A., Mohebi, M., Hori, Y., Padovani, C., McCue, S.,	Forum: Information society paradox: reflections and actions Crossing the digital divide: what's next? Globalization and local identity as demonstrated at the ICT4D platform Three questions about WSIS. A civil society	*Information Technologies & International Development*, 2(1), 101-119	2004

	Selian, A., & Cukier, K. N.	perspective from within Toward Tunis: suggested next steps by Sarah McCue The world vs. the web: the UN's politicization of the information society report on the World Summit on the Information Society		
4	Arpad, R.	Environmental informatics and the vision of a sustainable information society	*Informacios Tarsadalom,* 9(3), 32-49	2009
5	Bicknell, D.	A Reviews of: "Towards a Sustainable Information Society: Deconstructing WSIS"	*Information Society, 24(3),* 191-193	2008
6	Burger, P., Daub, C.H., & Scherrer, Y.M.	New perspectives on sustainable business (Editorial)	*Journal of Business Ethics,* 85, 479-481	2009
7	Curtois, J.P.	Corporate citizenship - a learning journey	*European Business Forum,* Winter 2003, pp. 22-24	2003
8	Fuchs, Ch.	Sustainable information society as ideology (part I)	*Informacios Tarsadalom,* 9(2), 7-19	2009
9	Fuchs, Ch.	Sustainable information society as ideology (part II)	*Informacios Tarsadalom,* 9(3), 27-52	2009
10	Fuchs, Ch.	The implications of new information and communication technologies for sustainability	*Environment, Development and Sustainability,* 10(3), 291-309	2008
11	Fuchs, Ch.	Theoretical foundations of defining the participatory, co-operative, sustainable information society	*Communication & Society,* 13(1), 23-47	2010
12	Fuchs, Ch.	Sustainability and the information society	IFIP International Federation for Information Processing, Vol. 223, pp. 219-230	2006
13	Fuchs, Ch., & Horak, E.	Africa and the digital divide	*Telematics and Informatics,* 25(2), 99-116	2008
14	Fuchs, Ch., & Obrist, M.	HCI and society: towards a typology of universal design principles	*International Journal of Human - Computer Interaction,* 26(6), 638-656	2010
15	Grossmann, W. D.	Realising sustainable development with the information society – the holistic Double Gain-Link approach	*Landscape and Urban Planning,* 50(1-3), 179-193	2000
16	Heinonen, S., Jokinen, P., & Kaivo-oja, J.	The ecological transparency of the information society	*Futures,* 33(3-4), 319-337	2001
17	Hilty, L.M.	Environmental informatics and the vision of a sustainable information society	*Informacios Tarsadalom,* 9(3), 6-15	2009

18	Hofkirchner, W.	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	2010
19	Kamppinen, M., Malaska, P., & Wilenius, M.	Citizenship and ecological modernization in the information society	*Futures*, 33(3-4), 219-223	2001
20	Kiskis, M., & Petrauskas, R.	Lessig's implications for intellectual property law and beyond them	*International Review of Law, Computers & Technology*, 19(3), 305-316.	2005
21	Kovacic, A., & Erker, R.S.	Od koncepta trajnosti k eko-socialnemu modelu trznega gospodarstva in merjenje njegovega uresnicevanija/From the sustainability concept to the eco-social market economy model and measuring its performance	*Nase Gospodarstvo: NG (Our Economy)*, 52(3-4), 98-109	2006
22	Kovacic, A., & Erker, R. S.	Z informacijsko druzbo k hitrejsemu trajnostnemu razvoju?/More rapid sustainable development through an information society?	*Nase Gospodarstvo: NG (Our Economy)*, 51(1-2), 62-79	2005
23	Mutula, S.M.	Paradigms shifts in information environment: prospects and challenges African libraries	*African Libraries Library Hi Tech*, 25(3), 396-408	2007
24	Som C., Hilty, L. M., & Köhler, A. R.	The Precautionary Principle as a Framework for a Sustainable Information Society	*Journal of Business Ethics*, 85(3), 493-505	2009
25	Thapisa, A.P.N., & Birabwa, E.	Mapping Africa's initiative at building an information and communications infrastructure	*Internet Research*, 8(1), 49-58	1998
26	Tochtermann, K.	Greening the super highway: Practical steps to sustainability in the information society	*Foresight*, 3(2), 113-121	2001
27	Wilikens, M.	Confidence and confidentiality: Stimulating e-commerce in Europe	*Foresight,* 3(2), 135-139	2001

On the basis of 20 full-text available publications, we conducted the bibliometric analysis for the term sustainable information society. The publications in Table 1 that are not highlighted in gray represent the 20 publications used for the analysis. The publications highlighted in gray indicated that the publications were not available in full version in the bibliographic databases. The term sustainable information society was analyzed according to its occurrence in the title of the publication, keywords, abstract, text, and cited literature (references). A qualitative analysis of the publications that concerned the research problems tackled in the publications within the framework of the sustainable information society was also conducted.

Results

Bibliometric and Critical Qualitative Analysis of Scientific Publications

The results of the bibliometric analysis, addressed the first research question: what is the rate of occurrence of the term sustainable information society in scientific publications? The results enabled identification of the frequency of issues related to the sustainable information society and the use of the term sustainable information society by researchers and scientists. The analysis demonstrated that the number of publications abstracted and indexed in the bibliographic databases and containing the term SIS is relatively small (Figure 1). However, since 2008, growth has been noticed in the interest in the term sustainable information society. Such an increase was also recorded in four publications in 2001.Next, the authors undertaking the SIS issue in their studies and using the term sustainable information society were considered as another criterion for the analysis of the publications. The most active in terms of the number of publications relating to the SIS is Fuchs (2006, 2008, 2010), who has been dealing with the issue since 2006. Fuchs (2006, 2008, 2010) is an author of four publications and a co-author of two publications

A considerable variety of keywords has been determined in 27 publications containing the term SIS. The identification of these words helped to define the context in which the authors explored (studied) the sustainable information society. In order to present a clear graphical illustration of keywords occurrence in alphabetical order and according to the degree of occurrence (popularity) the tag cloud was developed for them. The most common keyword is the term sustainability (11), then the information society (5), globalization, ICT and social theory (3 each) and environmental informatics, ethics, ideology, ideology critique, initiatives, studies (2 each). Most of the publications containing the term SIS are journal articles in English (20). The term SIS is also included in: a conference paper, an editorial material, a feature, and miscellaneous, general information and two reviews. Four publications are in Hungarian, two in the Slovenian language, and one in German.

Taking into account the source of publication, in which the publications containing the term SIS appeared, the most popular was the quarterly *Informacios Tarsadalom* (Quarterly, ISSN: 1587-8694, Infonia, Muegyetem Emelet RKP 9 II 210, Budapest 1111, Hungary). The Informacios Tarsadalom journal is indexed and abstracted in the ISI Master Journal List, created and updated by Institute for Scientific Information. Four of the 27 publications listed in Table 1 publications were published in the Informacios Tarsadalom. Whereas two publications each have appeared in the following:

- *Journal of Business Ethics* (Biweekly, ISSN: 0167-4544 Springer, van Godewijckstraat 30, 3311 GZ Dordrecht, Netherlands), indexed and abstracted in the ISI Master Journal List (Social Science Citation Index), the Scopus and many other bibliographic databases;
- *Nase Gospodarstwo* (ISSN: 05,473,101, Ekonomsko-Poslovna Faculty / Faculty of Business and Economics, Maribor, Slovenia);
- *Foresight* (ISSN: 1463-6689, Emerald Group Publishing Ltd.) indexed and abstracted in the Scopus and other bibliographic databases.

In the examined 20 publications (which content was accessible for this study), the term SIS has been identified with varying frequency given the title of the publication, keywords, abstract text and the cited literature (references) (Table 2). The term SIS most often occurs in the majority of studied publications. In the publication by Heinonen, Jokinen and Kaivo-oja (2001), the term SIS was used 21 times which was the most often. As Table 2 shows, some publications can be identified (e.g., M. Kiskis: *Lessig's implications for intellectual property law and beyond them*; A. Kovacic, R.S. Erker: *From informacijsko družbo k hitrejšemu trajnostnemu razvoju? More rapid sustainable development through an information society?*) where the term SIS occurs only once and, moreover, not in the text of the publication, but in its summary or keywords.

Table 2. The frequency of the term SIS in 20 publications

No	Author (s)	Frequency of the term SIS occurrence					Total
		Title	Key words	Abstract	Text	References	
2	Anonymous				1		1
3	Arachchige, Don, S.N., Masrour, A., Mohebi, M., Hori, Y., Padovani, C., McCue, S., Selian, A., & Cukier, K. N.			1			1
5	Bicknell, D.	1			1		2
6	Burger, P., Daub, C. H., & Scherrer, Y. M.				1		1
9	Fuchs, Ch.		1	3	11	2	17
11	Fuchs, Ch.		1	2	7		10
12	Fuchs, Ch., & Horak, E.				6	1	7
13	Fuchs, Ch., & Obrist, M.			2	5	1	8
14	Grossmann, W. D.				1		1
15	Heinonen, S., Jokinen, P., & Kaivo-oja, J.				21		21
17	Hofkirchner, W.		1	1	7		9
18	Kamppinen, M., Malaska P., & Wilenius, M.				6		6
19	Kiskis, M., & Petrauskas, R.			1			1
20	Kovacic, A., & Erker, R. S.				1		1
21	Kovacic, A., & Erker, R. S.		1				1
22	Mutula, S.M.				1		1
23	Som, C., Hilty, L. M., & Köhler, A. R.	1		1	5		7
24	Thapisa, A.P.N., & Birabwa, E.				1		1
25	Tochtermann, K.			1	8	1	10

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26	Wilikens, M.			1	2	1	4
Total		**2**	**4**	**13**	**85**	**6**	**110**

The last stage of the research was the qualitative analysis of the publications, which addressed the second research question: what are the core research issues of the sustainable information society presented in scientific publications? Twenty publications available for this research study were examined through the means of qualitative analysis. As a result, the most frequently undertaken research problems on the sustainable information society were identified as follows:

- Concepts and theories of the sustainable information society, the global sustainable information society as well as the participatory, cooperative, sustainable information society (Fuchs & Horak, 2008; Tochtermann, 2001; Fuchs & Obrist, 2010; Hofkirchner, 2010; Fuchs, 2006; Fuchs, 2008);
- Dimensions of the sustainable information society, e.g. social, ethical, technological, economical;
- The sustainable information society measurement (Hofkirchner, 2010; Fuchs, 2008; Heinonen, Jokinen, & Kaivo-oja, 2001; Fuchs, 2006);
- The digital divide in developing countries and the sustainable information society as a way for developing countries' welfare (Arachchige et al., 2004; Thapisa & Birabwa, 1998; Mutula, 2007; Bicknell, 2008; Kovacic & Erker, 2005);
- Ethical aspects of the sustainable information society, corporate social responsibilities as well as corporate citizenship and corporate sustainability (Wilikens, 2001; Hofkirchner, 2010; Kiskis & Petrauskas, 2005; Burger, Daub, & Scherrer, 2009; Som , Hilty, & Köhler, 2009);
- Global consensus to achieve worldwide sustainable information society (Bicknell, 2008; Arachchige et al., 2004; Tochtermann, 2001; Kovacic & Erker, 2006);
- Sustainable development and ecology in the sustainable information society Kamppinen, Malaska, & Wilenius, 2001; Kovacic & Erker, 2006; Grossmann, 2000; Fuchs, 2008; Fuchs, 2006; Heinonen, Jokinen, & Kaivo-oja, 2001);
- ICTs in the sustainable information society (Kamppinen, Malaska, & Wilenius, 2001; Kovacic & Erker, 2006; Grossmann, 2000; Fuchs, 2008; Fuchs, 2006; Heinonen, Jokinen, & Kaivo-oja, 2001).

Discussions and Conclusions

On the basis of the bibliometric analysis, it can be concluded that the occurrence rate of the term sustainable information society in the abstracted and indexed publications is low in the examined six bibliographic databases (EBSCO, Elsevier, ICM Web of Knowledge, OECD, ProQuest, Scopus). A set of 27 publications was identified in which the authors use the term sustainable information society. For the first time, this term occurred incidentally in 1987, and again in 1998. An increased interest in the term occurred in 2001, which was probably caused by the dot-com boom. Another increase in the interest in the term SIS occurred after 2004. The assumption is that one of the determinants of this growth was undertaking the issue of the SIS during the session of the WSIS (2012) Forums, held in Geneva (2003) and Tunis (2005), and the general focus of research from various disciplines on issues of sustainability. Almost all publications, in

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which the authors use the term sustainable information society, are in English, and most of them are scientific articles.

The analysis of the literature, which formed the foundation for the section literature review, indicated that the term sustainable information society is also present in the publications (articles, books, conference papers), which are not abstracted and indexed in the six analyzed bibliographic databases: EBSCO, Elsevier, ICM Web of Knowledge, OECD, ProQuest, Scopus. It is also worth noting that in the indexed publications and non-indexed publications in these databases, after 2000 the research on the information society in the context of sustainability very often has been presented, but the authors neither created nor developed the term sustainable information society. However, the issues discussed, concentrated on various aspects of the sustainable information society (Alakeson, Aldrich, Goodman, & Jorgensen, 2003; Ducatel, 2001; Dumas, 2012; Grossmann, 2000; Hilty & Ruddy, 2000; Hilty, Seifert, & Treibert, 2005; MacLean, Andjelkovic, & Vetter, 2007; Nolin, 2010; Willard & Halder, 2003; Ziemba & Olszak, 2012).

Fuchs (2006, 2008, 2010), Hilty (2001, 2005, 2008, 2009, 2010), Schauer (2003), Servaes and Carpentier (2006) have made a major contribution to the creation of the term sustainable information society and development of concepts, as well as theories of the sustainable information society. Contributions by Kovacic and Erker (2005, 2006) , on the sustainable information society can be found in the abstracted and indexed journals in the ISI Master Journal List, the Scopus and other bibliographic databases.

The tag cloud for key words, the critical qualitative analysis of scientific publications abstracted and indexed in the researched bibliographic databases and the critical qualitative analysis of the aforementioned publications have enabled the identification of the most frequently and occasionally undertaken research angles on the sustainable information society. The most frequently undertaken and developed (penetrated, explored) research angles include:

- Visions and trends in the ecological, social, political, economic, technological and cultural dimensions of sustainability in the information society;
- Concepts and theories of the sustainable information society;
- Technological aspects of the sustainable information society (ICTs and information systems for the SIS creation and development);
- Human aspects of the sustainable information society (individuals of current and future generations in the SIS);
- The sustainable information society as a way for developing countries' welfare.

However, the issues of research on the sustainable information society which were taken rarely or never include:

- Methodologies of the sustainable information society development;
- Methodologies and indicators of the sustainable information society measurement.

The review of the concept 'sustainable information society' in the literature raised a question concerning the maturity level of research on the SIS. This research study analyzed the scientific literature as indications of the maturity and direction of this field of studies. The research results on the sustainable information society development do not present a thorough answer, but demonstrates one way of looking at the dominant status. Unfortunately, the breadth and depth of

the study, as well as the data acquisition, imposed some constrains on the bibliometric analysis study. For example, important journals and books on the sustainable information society were excluded because they were not included in the researched bibliographic databases.

Based upon the research findings, the concept of sustainable information society is at an initial stage of evolving penetration research, and the beginning of research in this area dates back to the first years of the twenty-first century. Nonetheless, the conducted studies allow for conclusion that it is a very important and permanently developing area of research. Studies and discussions on the sustainable information society were conducted by researchers and practitioners in academic centers, scientific conferences and a variety of organizations, even the United Nations. The presented findings do not provide a comprehensive answer to the question about the maturity of research on the sustainable information society. Rather, they provide one way of analyzing the current status. This bibliometric study is naturally limited by the breadth and depth of the sources and the searches used to obtain the data. For example, important journals for the sustainable information society were excluded because they were not covered by the studied bibliographic databases. Moreover, it is certain that some books and conference proceedings on the sustainable information society have been omitted. To overcome those limitations, future research could start with a depth critical review of literature.

Recommendations and Future Research

In summary, the purpose of the bibliometric and qualitative analyses has been to provide readers with a retrospective view of the research contributions that form the fundamental knowledge in the field of sustainable information society. Major streams of research based on theoretical and empirical issues were identified. Researchers present different approaches and issues that underlie the research in the field of sustainable information society today. Much of the published work informs readers about the central issues associated with the sustainable information society development.

These research findings justify that the sustainable information society is a new and a more enlightened phase of the information society. Moreover, the current status of this research is in the early stages. Therefore, exploration of the sustainable information society is important for information science and neighboring research disciplines, such as economics, management, government, sociology and social studies. Hence the sustainable information society should constitute an important field of research within these disciplines. It may be expected that future SIS research will continue to be developed from the conceptual stage to the more applicative stage of empirical research, including:

- The formation of business and government strategies which can contribute to the sustainable of information society development;
- The use of ICTs to create unique capabilities for business, government and citizens which can contribute to the sustainable of information society development;
- The configuration of critical success factors for the sustainable information society development;
- The creation of methodology for the sustainable information society development;
- The creation of methodology for the sustainable information society measurement.

In order to meet these above-mentioned challenges, a three-year scientific project in designing a system approach to sustainable development of the information society is in progress. The unique character of the system approach to the development of the information society appears through its multi-dimensional, methodological character and sustainability imperative. Instead of one-dimensional analysis of the information society development presented in the scientific literature, this development will be considered holistically as an economic, social, technological, organizational and cultural process. The aforementioned dimensions will be reflected in the designed methodological planning, creating, and developing of the information society. Moreover, the paradigm of the information society will be extended to the sustainability imperative. Sustainability has been defined as the society's ability to the continuous process of learning, adaptation, development, revitalization, reconstruction, and re-orientation, which aims to obtain multi-dimensional benefits. The research results will be a scientific fundament for programming, building, and developing the sustainable information society in different regions. The result of this research was to propound the conceptual model of a sustainable information society (Ziemba, 2013). Currently, a study of formulating the recommendations and critical success factors contributing to successful development of the sustainable information society is being conducted.

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Acknowledgments

Biographies

Ewa Ziemba is an associate Professor of Economics at the University of Economics in Katowice, Poland. She received her Post Ph.D. in management with the specialization in management information systems. Her principal research areas are focused on information society, e-business and e-government, ICT in knowledge-based economy.

Tomasz Papaj, Ph.D., Poland, University of Economics in Katowice, Department of Quality Management. His principal research areas are focused on public management (e.g. public governance, e-government), quality management, and international quality standards.

Rafał Żelazny, Ph.D, Poland, University of Economics in Katowice, Department of Economics. His principal research areas are focused on knowledge-based economy, information society, economics of information and knowledge.