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Sustainable Development of Information Society: towards an Ecology of Information

Sustainable development refers to the fulfilment of human needs through simultaneous socio-economic and technological process and conservation of the earth's natural ecosystems. To achieve this, careful attention must be paid to preservation of the information as a kind of natural resources.

1. Information Society

The fast development of information and telecommunication technologies, as well as the increasing significance of knowledge has led to many revolutionary changes in the lifestyle and human communication in the last decade of the 20th century. A new socio-economic formation is developing currently. Its is called information society to emphasise the role of information in the present-day society. Information is considered one of the most important factors of socio-economic development [7].

Since the beginning of the 1990s, the term "information society" has been used to describe the many and varied challenges and opportunities which have been created by the rapid development of modern information and communication technologies. Knitting together of digitally stored data, texts, sounds and images (multimedia) has led to widespread use of modern telecommunication systems, personal computers and electronic information services as well as a quantitative growth in the traditional media. The Internet, a world-wide data network, has established itself as a global communication platform creating opportunities for information exchange on the global scale which can be used for the development of cooperation aimed at effective prevention of negative changes in natural environment, e.g. green house effect, ozone layer depletion, acidification.

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Now this term is especially useful for describing the social changes caused by the accelerated circulation of information and implementation of computer technologies. What does the term “information society” mean then. There are many definitions. I have chosen the definition of Juliusz L. Kulikowski from Polish Academy of Sciences. It is the following: “The information society is the society in which the whole structure and legislation is set to satisfy, to the largest possible degree, the general access to information and to information dissemination, using all modern technological means, with the observation of those necessary regulations which must limit the right to information” [17].

1.1. The Foundations of the Information Society

In Europe, the strategically important moment in the creation of the information society was the preparation of the Bangemann Group Report in 1993 [10].

The Report is significant because:

- it introduced the concept of information society to Europe;
- it introduced the information society issues to the area of direct interests of leadership bodies in the European Union and its member states;
- it specified various challenges facing Europe at the turn of centuries experiencing a fast development of information technologies;
- it gave proposals as to the methods of operation and directions of development of the European Union to meet such challenges and use the emerging information society for the acceleration of economic growth and improvement of the quality of life.

In Bangemann’s Report, the following can be found: “By joining together the resources which have been traditionally separated and distant from each other, the information infrastructure will release an unlimited potential of knowledge, innovation and creativity.” Some types of services, whose essence consists in information processing are suitable for telework (work from a distance, e.g. at home). In other words, Bangemann’s Report caused that the issues of the information society started to dominate in the social consciousness of the European Union, becoming by the same an element of thinking about the future. In view of the consideration of social aspects, in addition to technological and economic ones, Bangemann’s Report became a starting point for the origin of the European concept of information society as a broader and intellectually deepened vision of the global information infrastructure in comparison to that presented in the U.S.A. and associated with the initiative of former U.S. Vice President Al Gore. What is worth adding here, in the area of sustainable development protection of ecosystems and environmental health in relation to information society and its goals, the European Union has some priorities in so called common action.

The information revolution is primarily a communication revolution, i.e. the revolution in the area of information exchange methods existing in the society, as well as in telecommunication. The convergence of telecommunication, data transmission and the computer technology provides the infrastructure for electronic communication which completely transformed information in the present-day world. Digital telecommunication allows for handling audio-visual and multimedia transmissions. A new challenge is the digital interactive television and multi-dimensional graphics. The telecommunication network determines the process of distributed data processing and digital communication. In the information society, electronic communication becomes an indispensable as electricity.

The telematic revolution, or the convergence of telecommunication, computer and audio-visual technologies, is one of the most important stages of creating the technological basis of the information society [6]:

- the establishment of information society structures is associated with the increasing confidence in electronic information processing system; gradually, we become hostages of the computer technology based on three assumptions;
- the computer should be found in every household and on every desk, so the hardware and software offerings should be more and more attractive;
- the general access to the information systems should be associated with the use of computer networks;
- the costs of recording and making available electronic data should be constantly decreasing, also in proportion to the costs of information development.

The information society also becomes a society of paradox. Culture, art and entertainment are more and more dependent on the electronic means of information transmission. Owing to the interactive and multimedia aspects, the boundaries between education, work and entertainment are less and less visible. The concept of interaction becomes a cultural norm in our eyes. The use of multimedia technologies leads to the removal of differences between various literary genres. With time, however, the problems with retrieving information are growing. Infomedia technologies determining the information infrastructure of the present-day society are based on wide-area and local networks which allow for transporting information and offer solutions dedicated for specific user groups, as well as basic types of network services [5, 16].

They present great opportunities: spatial and temporal constraints on communication are being reduced; information can be stored and transferred quickly and with a high usage value; the price of automated services is falling.

1.2. Problems with the Information Society Concept Implementation

The implementation of the information society concept may not be considered outside the ongoing social and civilisation changes. The information society concept emphasises the importance of the information processing aspects. The basis of such processes is the imperative to collect and store writings. Today, the problem is not the excess of information, but rather the low efficiency of processing systems. The value of information depends on other information (contexts) and the relationships between the sender and the receiver, or the communication process.

The electronic record becomes a factor which reduces the importance of print as the information carrier. The electronic text is, by its nature, open and dynamic. It can integrate sound, graphics, animation and film. It appeals to emotions and senses. It is always open to supplementing it with hypertext references. It can easily change its context. The essential example in this respect are WWW sites. Their contents are more and more often generated on a current basis, straight from the databases initiated by appropriate software.

According to Wilfrid F. Lancaster from the U.S.A., the correct question about the future of the social communication methods should be: "When will electronic communication replace a conventional information exchange," but not "Will it really happen?" In the pluralistic present-day culture, there is also place for printed publications. We observe fast development of dynamic text organisation techniques. Our concepts of books are also changing. The electronic book is a form of the electronic text modelled after an editorial system of the traditional book. In the future, the electronic book will certainly break such a relationship and develop in a completely different way. Most certainly, it will be something more (and something different) than just a medium for printed publications, or a book in an alternative form. The electronic text assumes a different organisation. Electronic text reading carries a new meaning, called surfing or navigation. The open text and the grammar aspects of information become indispensable elements of a multimedia presentation. From the viewpoint of the WWW system (i.e. specific text preparation before transmission), traditional closed texts are examples of the data-centred systems. Copying such a system is not the main objective of electronic documents. Gradually, we abandon the data-centred systems and switch to those which are user-centred [4]. This change is often called a Copernican revolution in the information science. Electronic texts require different methods of presentation than the traditional ones. It is not the information carrier which is decisive, but rather the method of information presentation. The proper medium of the electronic text presentation is the display (or the monitor).

Electronic documents (texts) differ from the traditional ones not only in the carrier system, but also in the method of organisation. The durable achievement of

the hard copy is the development of the page format details and the apparatus which allows to turn the collection of pages into a uniform publication. Although the WWW system makes no direct reference to the conventional page conception, it breaks the linear text structure, owing to hypertext techniques, creating "nodes," which can become elements of any larger unit, if one can skilfully and harmoniously implement them into the site structure. In addition, a digital document should provide for a full text search and automatic indexing.

Electronic versions of documents (books or newspapers) are less and less similar to their printed versions. They are multimedia productions, carrying, in addition to the text and graphics, the background colour, sound and video. Sometimes, 3D graphics or virtual reality modules are involved. Of course, the Internet is an important medium of electronic information promotion. The Internet user looks for information originating from various sources. But the electronic document contents will always be unpredictable. The 1990's are the decade of HTML sites and distributed information sources. The HTML sites and pages, appealing primarily to the reader's or viewer's emotions, are new and universal standards of the user interface.

1.3. Problems Relating to the Shaping of the Information Society

Changing the communities into information society is not only a technological process, but primarily a social one. Implementation of modern hardware and software, as well as modern technologies should generate new forms of intellectual activities relating to the abundance of information and the necessity to operate new types of information sources.

The problems of shaping the information society are the following:

- Problems of access to information (democratic or available to elite?). Access to information is more and more a key to business and social success. The statement that those who hold information hold power and money is more and more true.
- The problems of social development and cultural changes. There is interdependence between the development of communication and information technologies, the information products and services on the one hand and the existing socio-economic conditions on the other hand.
- New methods of electronic information provision and new forms of information. Electronic publications exist in addition to print or as a replacement thereof.
- New tasks and requirements of the information users related to the changes in needs and expectations of information receivers. Presently, information users may not operate without computer skills or access to the Internet.

- Problems of copyright protection and the future of printed books. The new situation requires libraries to make legal adjustments co-operate in networks. New skills are required from the staff (Internet librarian).
- Problems of information assessment.

One of the basic problems of the development of the information society is the limited ability of communities to adopt and use new information technologies, including coping with the ever growing quantity and deteriorating quality of available information [3]. These processes pose a threat of excessive split, or division of communities into those which have access to information and those without it (information poor communities), both in global and local aspects. Thus, it is necessary to liquidate information illiteracy so that the access to information became general.

Such problems can be grouped into three following classes:

- 1) logic and linguistic problems associated with primary information transformed into various forms of derived information, as well as recording, ordering, retrieval and dissemination of primary and derived information;
- 2) psychological and sociological problems associated with the information reception (information needs and the customs of information use);
- 3) technical and organisational problems associated with the processes of information flow from the source to the user, e.g. the problems of using the computer technology for social communication purposes; I would like to mention that classes of problems are identical with the interest of information science and scientific activities [2].

That problems concern information management, information ecology, including the sustained development of the information society, information ethics, information linguistics, electronic information protection, information economics, law problems and telematics. These problems can become either sources of inspiration, or warning. A special role is assigned to librarians and scientific information workers in resolving these issues.

The telematic revolution, subjected to the convergence of the telecommunication infrastructure, computer and audio-visual technologies, is one of the most essential stages of the information society concept development.

2. Sustainable Development of Information Society Needs of Ecology of Information

“Sustainable development refers to the fulfillment of human needs through simultaneous socioeconomic and technological progress and conservation of the earth’s natural resource systems” [14]. To achieve this, careful attention must be

paid to preservation of the information as a kind of natural resources in the environment of man.

2.1. The Man in the Information Environment

Man as a living creature, processing information that constitutes one of the elements of his ecosystem, operates in an information environment, which Juliusz L. Kulikowski has called an “infosphere” [11, 12]. I suggest to call it the “anthropinfosphere.” This kind of infosphere is composed of the whole of information made available to man through his consciousness, which information may potentially be used by him when fulfilling his life objectives. The anthropinfosphere constitutes an information environment, that is man’s surroundings, which covers those kinds of social data that are available to him actually and potentially.

In the information process, that is during such operations as data gathering, selecting and providing, a great role is played by man’s information needs which reflect his interests, expectations and preferences. In order to fulfil those needs, information supplied to man should be complete (as opposed to incomplete, partial one) and true (as opposed to untrue and false one). Information related to particular fields of human life is inseparable from circulation. There is a circulation of information in our environment, in the same way as the circulation of elements in nature or substance exchange in alimentary cycles. The exchange and provision of information, no matter of what scope and quality (i.e. good/bad, true/false and full/incomplete) is made possible owing to technical means. This has ever since been so. Time and space were chief obstacles for information circulation. Man’s in-born potential of information transfer was limited to speech, shouts and gestures. In order to get information, one had to go personally to the place where it was available; in order to transfer information, one had to deliver it in person, too.

Presently, “the possibility of covering much larger quantities of information, caused that people stopped to respect it. Since information is cheap, we tend to be wasteful whereas information is merciless. It occupies every niche it can fill in, makes use of any unguarded moment to invade and stay at any place where it can find a bit of free space” [8]. Such a “governing” information may become dangerous to man. This is especially visible in the field of the Internet use [1]. One can even speak of the toxicity of the process.

Using the term of toxicity of mass communication processes, Neil Postman emphasised such negative issues, as:

- improper selection of information qualified for transmission;
- contamination of the infosphere by non-essential and untrue information, pseudo-information (lengthy, vague, unclear), disinformation (fabricating, concealing, distorting) and para-information (wild guessing, groundless, non-constructive) [13].

2.2. Ecology of Information

Now the problem is no longer the large quantity of information since it will keep on growing. We cannot stop it. Instead, we can try to somehow cope with that information flood, at least through the selection which is inseparable from evaluation. Still, information cannot take control over us. It is us that have to subdue and master it. How to protect information in the Internet? How to protect oneself against too large a number of data, incomplete information, information noise, information smog [15], unwanted and untrue information; how to select (choose) effectively information?

Such endeavours have recently been labelled "information ecology." The term "of information ecology" are analogous to the terms already in use: ecology, human ecology, protection of environment, ecological factors which concern the specific types of man's environment. Both components of the term of "information ecology" are well known. Ecology is a branch of biology which deals with the examination of mutual relationships between populations and not only between individual organisms or between organisms and their surroundings. The word "ecology" makes us think of protection of natural environment and removal of its contamination. It is also present in such terms as "social ecology" or "culture ecology." We often hear of ecological movements, clubs or activities. In this way we refer to the notion of ecology which dates back to the times of Ernst Haeckel, as a division of biology dealing with the examination of relationships between plants, animals and the whole of environment they live in. Also the term "information" is familiar to us. It is obvious that the meaning of "information ecology" depends on the understanding of the information itself. So, what is the ecology of information? "By the term «information ecology» is meant the sum total of information quality, management, products and value, as well as the evaluation of information services and needs and liability. Information ecology is a science which studies the laws governing the influence of information summary on the formation and functioning of bio-systems, including that of individuals, human communities and humanity in general and on the health and psychological, physical and social well-being of the human being, and which undertakes to develop methodologies to improve the information environment" [9]. Currently, there are still very few reports on it. Certainly, it concerns the external factors affecting the so-called "information purity," protecting information against "pollution" that may consist in fact falsification or untrue information, or in providing incomplete information. In this way, ecologic information would be free of lies and would not falsify the actual reality image, and, through that, it would be reliable.

Therefore, the scope of our consideration under information ecology scheme is the relationship (arrangement): information versus man being its user. Both man and information are the elements of the same communication system, or, using a slightly different terminology, of the same ecosystem. Without information flow – similarly as without material or energy flow – no ecosystem can survive. Collecting, classifying, cataloguing, disseminating and using of information by a human being makes him or her morally obliged (because of the consciousness of consequences and free will). In the case of information ecology, the emphasis is put directly on information, and indirectly on man. We should protect information like our natural environment because it affects man, either positively, or negatively. The ecology of information is a kind of prevention. The result of that prevention as a set of man's specific activities has to be ecological information, that is such which displays the following features: it is true, reliable, complete and valid. Those features have to result from a rational man's interference with information processes, with man's ecosystem. Already quoted Piotr Chrzastowski believes that "We simply have to start treating information as our natural environment in which we have to live, in the same way we care for nature, and, consequently, to care for information and not to contaminate it. Otherwise, we will be drowned and swept away by the wave of bits which we no longer will be able to process. The power of computer lies not only in that it can set things in order but in that it can more accurately create confusion if only we let it do so" [8]. Instead, the Internet should be only one of the many ways of access to information. Accordingly, we must be aware that given the undoubtedly many advantages of the Internet as the information source, it is charged with such a sin as the incomplete, outdated and untrue nature of part of its information contents.

Information ecology is a science which studies the laws governing the influence of information summary on the formation and functioning of bio-systems, including that of individuals human communities and humanity in general and on the health and psychological, physical and social well-being of the human being, and which undertakes to develop methodologies to improve the information environment. Generally speaking by the term "information ecology" is meant the sum total of information quality, management, products and value, as well as the evaluation of information services and needs and liability. This is a special branch of knowledge.

2.3. The Research Points to the Ecology of Information

I consider ecology, the science of understanding and managing whole environments, rather as a kind of a metaphor. Natural environment is only one, but

there are various ecosystems in a global scale. Caring about pro-ecological initiatives, which improve natural environment quality, we have to adjust our activities in social and technological areas to objective, ecological rules. It means that metaphoric perspective should not darken the fact that ecological rules take precedence over human products. Still, metaphors can be quite powerful; they often drive behavior and help to build a new organizational vision.

When we begin to think of the many crisscrossing relations among peoples, processes, support structures, and the other elements of a company's information environment, we have a better model for managing the complexity and variety of current information use. You could also describe information ecology as "holistic management of information" or "human-centered information management." The essential point is that this approach puts humans back at the center of the information world, banishing technology to its rightful place on the periphery.

It places the primary emphasis not on generation and distribution of information resources, but rather on the effective use of a relatively smaller amount. An information ecologist, like an architect or engineer, would still plan a company's information environment; but that planning would allow for evolution and interpretation. In short, ecological approaches to information management are more modest, behavioral, and practical than the grand design of information architecture and machine engineering. While this ecological approach may be new to information management, it's quite familiar to business strategists and economists.

3. Conclusion

The paper provides an overview of issues associated with sustainability of information society. Of particular interest in this connection is ecology of information. The continuous increase of often outdated, incomplete and unreliable information causes that it is necessary to implement a reasonable information evaluation and selection process. These issues are especially important at this time since we are in major expansion in information and knowledge management capabilities. It is the thesis of the paper that information and information resources must be evaluated, selected and protected from "pollution." Information "garbage" can threaten the man. Information ecology is one of essential and important factors that should form natural ecosystem for peoples.

Let us then clean the world off outdated, untrue and incomplete information. It seems that, in addition to the problem introduction, the most suitable conclusion to my paper may be drawing the attention to an urgent need to undertake broad and complex research on information ecology and to inspire activities in the ecology of information. Ecology of information gives us a new perspective of view on information resources and its users as a type of environmental resources for man.

References

- [1] Babik W.: *Information Ecology*. Zagadnienia Informatyki Naukowej, No. 2(78), 2001, pp. 64–70.
- [2] Babik W.: *Information Ecology – the Challenge 21st Century*. Praktyka i Teoria Informatyki Naukowej i Technicznej, vol. 10, No. 1, 2002, pp. 20–25.
- [3] Babik W.: *Information Ecology as a Remedy for Threat from Modern Information Technologiapp*. Proceedings of 10th International Seminar “Scientific and Technical Information in Central and Eastern Europe”, Zakopane 10–12 May 2001, Information Society Technologies, Warsaw 2002, pp. 65–69.
- [4] Babik W.: *Information Management in the Computer Communicated Society*. Proceedings of 7th International Seminar “Scientific and Technical Information in Central and Eastern Europe”, Zakopane 26–28 October 1998, Information Processing Centre, International Centre for Scientific and Technical Information, pp. 5–9.
- [5] Babik W.: *Transformations in Information Society – New Challenges*. Proceedings of 8th International Seminar “Scientific and Technical Information in Central and Eastern Europe”, Warsaw 1999, pp. 34–38.
- [6] Babik W., Rykaczewska-Wiorogórska B.: *Telematics – Concept and Usage in Information Society*. Zagadnienia Informatyki Naukowej, No. 1(71), 1998, pp. 64–73.
- [7] Capurro R.: *Towards an Information Ecology*. [In:] Wormell I. (ed.), *Information Quality. Definitions and Dimensionpp*. Proceedings of a NORDINFO International Seminar “Information and Quality” (Royal School of Librarianship, Copenhagen 23–25 August 1989), Taylor Graham, London 1990, pp. 122–139.
- [8] Chrzastowski P.: *Ecology of Information*. *Teleinfo On-Line*. Przegląd rynku informatyki i telekomunikacji. Wolna Trybuna, No. 7, 1997, <http://www.teleinfo.com.pl/ti/1997/07/f05.html>.
- [9] Eryomin A.L.: *Information Ecology – a Viewpoint*. International Journal of Environmental Studies, Sections A & B, No. 3/4, 1998, pp. 241–253.
- [10] *Europe and the Global Information Society*. Recommendations to the European Council. CORDIS Focupp. Supplement 2, 15 July 1994.
- [11] Kulikowski J.L.: *Human and Infosphere*. Problemy, No. 3(384), 1978, pp. 2–6.
- [12] Kulikowski J.L.: *Information and the World We Live*. Państwowe Wydawnictwo Naukowe, Warszawa 1978.
- [13] Postman N.: *Technopoly. The Surrender of Culture to Technology* (Polish edition). Państwowy Instytut Wydawniczy, Warszawa 1995.

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- [14] Sage A.P.: *Sustainable Development: Issues in Information, Knowledge, and Systems Management*. *Information. Knowledge, Systems Management*, No. 1, 1999, pp. 185–223.
- [15] Tadeusiewicz R.: *The Dark Side of Internet*. Centrum Badawczo-Szkoleniowe Wyższej Szkoły Zarządzania i Administracji w Zamościu, Zamość 1999.
- [16] Tadeusiewicz R.: *Internet Community*. Akademicka Oficyna Wydawnicza EXIT, Warszawa 2002.
- [17] Kulikowski J.L.: *Contribution to the Fourth Information Forum in Zakopane (Poland), 1977*. Conference Proceedings of 4rd Forum on Scientific and Technical Information, Zakopane 2–7 September 1997, Warszawa 1998.