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Social Informatics and the Dynamic of Contemporary Society

Ionuț-Constantin Manole and Eugen Petac

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Abstract

As the main engine of social development, education must adapt its new technological advancements to the benefit of the citizens and their needs by taking into account the building of a modern society that is based on knowledge. Computer technology becomes the most appropriate technical support, given the new challenges of the knowledge society. Within this context, the social informatics takes on new dimensions. Nowadays, information security is strongly connected to the investigation area of social informatics. Knowledge society and social informatics are being addressed in the paper in the first two parts. Information security in the contemporary society, within the context of building the knowledge society, is addressed in part three. In the fourth part, we propose the creation of an educational framework for the safe use of online virtual environment. Its purpose is primarily the awareness of the importance of security systems, taking into consideration the new challenges of social informatics in the modern society.

Keywords: Social informatics, knowledge society, information and communications technologies, information security

1. Introduction

Knowledge society is a strategic term, such as *post-modern society*, *post-industrial society*, *experience society*, *consumer society*, *risk society*, *media society* or the *information society*, and similar terms; they tend to focus attention on certain aspects. Issues such as knowledge and education are particularly highlighted by the term knowledge society [1].

Knowledge society is identified as a society based on the creation, dissemination and use of information and knowledge [1]. It is a society with an economy in which knowledge is acquired, created, disseminated and applied to strengthen economic and social development.

What we call the information society in the last decades is marked by increased globalization process, both economically as well as geopolitically. The new economy is promoting a new characteristic attribute, knowledge, empowering them to be integrated into the knowledge society.

Information society emphasizes the amount of information available and accessible. It focuses on technology. Knowledge-based societies are identified as societies that use and apply information in various areas of learning and development.

Manuel Castells [2] argues that 'dominant functions and processes in the information age are increasingly organized around the concept of networking'. According to Castells [3], 'information society is the new mode of human existence, in which the production, recording, processing and retrieval of information in organized networks play a central role'.

Reflected by the thesis: 'Knowledge is information with meaning, and information that acts,' the two characteristics of knowledge, Drăgănescu concludes 'Therefore knowledge society is possible only grafted on information society and cannot be separated from it' [4]. The information society provides knowledge to a higher level. The main features of the knowledge society are emphasized. The truth about existence is discovered through scientific knowledge that is extended and deepened through the society. Existing knowledge must be managed as technological and organizational knowledge. Innovation brings new technological knowledge. The new means, Internet, e-book and using the electronic methods of learning (e-learning), facilitates unprecedented spread of knowledge to everyone on the planet. Referring to the developmental effects of educational paradigm, the author points out that among the operating directions of the knowledge society it is necessary that the education system is based on the knowledge and information society methods (e-learning).

The term informatics is broadly defined as an area covering artificial intelligence, cognitive science, computer science, information science (processing, management and retrieval of information), social sciences and information technology (research, design, development, implementation, support or management of computer-based systems) [5].

Developed after a serious effort to review the specific indicators and of careful reflecting realities of contemporary society, Report to UNESCO [6] of an international commission on education in the twenty-first century, led by Jacques Delors, addressing sore topics joint to educational systems in modern society, seen through the need to adapt to the society of tomorrow. We present below the most relevant topics addressed for our paper:

- Education: a required utopia (a look to the future, tensions that must be overcome, design and build of our common future, lifelong learning—the engine of the society, stages and education connections proper assimilation of reform strategies, expanding international cooperation in the global village).

- Perspectives: from the local community towards a global society, from social cohesion to democratic participation, from economic growth to human development.

This shows that education, the society engine, must adapt the new technological advancements to the citizens and their needs.

2. Social informatics—A broad definition

Social informatics is an area of research that examines social aspects of computerization. A more formal definition would be 'inter-disciplinary study of the design, use and consequences of information technology in interdependence with institutional and cultural environments' [7]. According to Kling, social informatics is a field that is defined by its content (and fundamental questions on it) rather than by a set of techniques and methods very similar to urban studies or gerontology. Social informatics is a research object with systematic, analytical and critical character, helping to 'develop theories that are relevant to the design, development and operation of information systems, including intranets, electronic forums, virtual libraries and electronic publications' [7].

Grabbing the spotlight is the concept of 'computer information systems as socio-technical systems' [7]. Kling's idea to achieve 'missing link' between human environment and the given attribute of simple tools given to the information technologies, can be considered beneficial to the online environment today.

Complex, interdependent, social and technical systems include the following:

- People in different roles and relationships between each other and with other system elements

- Hardware (computers, workstations, peripherals, telecommunication equipment)

- Software (operating systems, utilities and applications)

- Technical (scientific management models, schemes of voting)

- Support resources (training/support/help)

- IT structures (content, those content providers, rules and regulations, such as those that authorize people to use systems and information in specific ways, access control)

'These are not simply a static list, but are interconnected within a matrix of social and technical dependencies' [7]. So, it has been made the connection between the components of the system. Today, we can see the effects of this mind set adopted by many designers of computer systems, namely, proximity to the human element and its folding needs, along with a security structure of the combined system.

Although there are minor variations that are shown between the different definitions, but most experts agreed that social informatics is an inter-disciplinary field of study and research, diverse, comprehensive and highly dynamic regarding the changes caused by information technology and communications in social life. Another landmark is the harmonization of the society with and through the information and communications technology (ICT).

Social informatics area of investigation is extremely broad, including [8] the following:

- Studies and analysis on the impact of introducing information technology in society

- The importance of social context in computer networks (socio-technical networks)

- Computer-mediated communication (C.M.C.)

- Organizational changes resulting from the use of ICT (work, communication, structures, power relations)

- The relationship between technology and social change

- ICT and changes in education (distance learning, e-learning, etc.)

- Privacy and social control through ICT

- Project management with ICT support

- The impact on privacy and individual development

- Dynamics and trajectory ICT—policies and guidelines

- Public access to the Internet, etc.

Research information systems have the ability to draw attention to developing new technologies. Benamati [9] said that 'changing technologies obliges our discipline to change more quickly than others'. Web 2.0 phenomenon has captured the attention of industry technology and informatics, media and other professions and disciplines.

The Internet is in the fifth stage of its development. First stage, starting from its appearance in the 1960s until the late 1980s, ARPANET [10] has been a well-kept secret, used by government scientists and researchers. The second phase, between 1987 and 1992, has made open the Internet to the public. In the third stage, 1992–1996, began with the realization of the HTTP [11] protocol, on which was created the World Wide Web (WWW) [12] and search engines. The global network has become an information service accessible from 1991 and, as described by Berners-Lee [13] (1991), 'the WWW project combines techniques of finding information and hypertext to create an easy to use global information system, but powerful at the same time'.

In the fourth stage of development, the Internet becomes a place where people are organizing communities that collaborate, cooperate and sometimes compete. Some favourite digital tools and services at this stage include social networking sites, collaborative writing tools, network services, file exchange between customers/users (peer-to-peer) and more. O'Reilly and Daugherty describe this stage in the evolution of the network as a 'Web 2.0', O'Reilly [14], a term introduced and officially registered in 2004. O'Reilly offered a clearer definition of the term thereof as the (2006) [15]: 'revolution in computer industry caused by the move towards using the Internet as a platform, and to understand the rules for success on that new platform. The most important of these rules is this: Build applications that use the network effects to attract more people to use them'.

In the fifth stage since 2010, it begins Web 3.0—that is sometimes used as a synonym for Semantic Web, representing a 'web of data' that enables computers to understand the meaning of information on the WWW that means total dynamic web pages by including vector graphics and the introduction of 'Semantic Web' [16] as a tool of computing systems to observe information in texts and generate new information based on them.

Regarding the Web 3.0,[1] we can say that enhances existing network resources on the Internet that can be read by users. This is done by adding extensions, called metadata, to existing documents, allowing data to be processed automatically by computers through the concept of similarity.

3. Information security in contemporary society

The introduction of computers in almost every dimension of the society has changed the way people and organizations obtain or use information, or doing business: greater efficiency is achieved, control of operations is increased and there is better access to information. Along with many benefits, computers and connecting them to the network presents negative aspects, such as the emergence of new types of offenses (distribution of computer virus), and the possibility of committing traditional crimes through new technologies (such as fraud or forgery).

With the spread of technology, more powerful and available at increasingly smaller prices, and massive expansion of inter-connectivity, offered to the potential attackers the possibility to create quick attacks without geographical barriers, often with serious consequences for the victims and with little chance of detection or incrimination. Because electronic attacks against information systems can make a lot of negative consequences of financial, operational, legal or strategic type—at the individual level, organization or national, the risks for electronic attacks must be well understood to be reduced or even eliminated.

Cybercrime is a real phenomenon these days, which is frequently reflected in the media. Fear of informatics attacks exceeds on intensity then that of ordinary theft or fraud. Criminological research on crimes carried out through computer systems aim to change the classic way that are seen as offenses in the criminal justice systems.

In the PhD study 'The legal aspects of cybercrime in the information society' (study COM-CRIM) [17] realized for the European Commission by Ulrich Sieber, from the University of Wurzburg, Germany, the following categories and sub-categories of computer crimes are shown:

- Violations of privacy

- Economic offenses:

  ○ Penetration of computer systems in order to overcome technical security difficulties ('hacking')

  ○ Cyber espionage

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1 The term is conceptually formulated for the first time in 2006 by Tim Berners-Lee, creator of the World Wide Web and director of the World Wide Web Consortium: 'People ask me what is Web 3.0. I think if you add vector graphics, and all content being dynamic, interactive and attractive, over Web 2.0, and also provide access to semantic web over an enormous data space, you get access to an incredible data resource'[18].Also, he defines the Semantic Web as 'a component of Web 3.0, a data network that can be processed directly and indirectly by computers'[18].

- ○ Piracy of computer programs

- ○ Computer sabotage

- ○ Computer fraud

- ○ Distribution of pieces of information that is illegal or injurious (racist propaganda, dissemination of pornographic materials, etc.)

- Other crimes:

  - ○ Crimes against life

  - ○ Offenses related to organized crime

  - ○ Electronic warfare

4. Effective use of educational framework to prepare society awareness on cyber security

The educational system has to be folded on the educational needs of current and future generations regarding electronic information security and safe usage of online environment. Therefore, an educational plan should be considered that combines both what has been achieved so far in social informatics, especially the safety information, and also the requirements and needs of their future. The emergence of Internet of Things (IoT) and the Internet of Everything (IoE) must provide to the educational environment the issue of future threats analysis or problems that may occur if future generations are not aware of them. As a result, the need for such a debate and planning is more than necessary.

Category	2014	2015	2016	2020
Consumer	2277	3023	4024	13,509
Business: Cross-industry	632	815	1092	4408
Business: Vertical-specific	898	1065	1276	2880
Grand total	3807	4902	6392	20,797

Source: Gartner, Stamford, Conn., November 10, 2015; Web:http://www.gartner.com/newsroom/id/3165317).

Table 1. Internet of Things—basic devices installed by category (Millions of units)

IoT is increasingly becoming a topic of conversation, in more formal (companies, organizations) and informal (in the family setting and occasionally in everyday people's relations) contexts. It is a growing concept that has not only the potential to influence the way we live or will we live, but also the way we work.

After the broadband Internet became widely available, the connection costs are falling, many devices are created with Wi-Fi capabilities and contain built-in sensors; technology costs

decrease and use of smart phones has become overwhelming. All these things lead to creating a perfect setting for IoT.

To the question: 'What is the Internet of Things?' We can answer in a simple and effective way that is the concept of connecting devices, virtually any device with a 'Open' and 'Closed' switch, can connect to the Internet. This includes everything from mobile phones, washing machines, coffee makers, lamps, wearable devices and almost anything else. It also applies to machine components, for example, an engine of a car or boat or drilling equipment.

A more general definition is given by ITU [19]: 'Internet of Things (IoT) is the network of physical objects—devices, vehicles, buildings and other elements—in electronics, software, sensors and network connectivity, integrated, allowing these items to collect and exchange data'.

Analysis firm Gartner says that [20] by 2020 there will be over 26 billion connected devices. It is a large number of connections (some even estimate this number to be much higher than 100 billion). IoT is a huge network that connects 'things' (which also includes people-implanted medical devices for monitoring or survival, like pacemakers). The relationship will be between people-people, people-things and things-things.

Regarding Internet of Everything (IoE) [21], 'is a term with expanded meaning that focuses on devices and consumer products connected to the Internet and equipped with expanded digital features. It is a philosophy in which the future of technology is composed of several different types of devices and elements who are connected to the Internet worldwide. The term is somewhat synonymous with the Internet of Things (IoT)'.

The new rules for the future will be, 'anything that can be connected will be connected'. It is not difficult to see how and why it is such an important topic today; certainly it opens the door to a lot of opportunities but also to more challenges. Security is a big problem, which is often brought to the fore. With billions of devices connected together, what can people do to ensure that their information will be safe? Will anyone be able to enter the device and thus get access to the whole network? Also, IoT opens worldwide companies to more security threats. Then there is the issue of privacy and personal data sharing. This is a sensitive topic even today, so one can only imagine how that conversation will evolve and concerns when talking about many billions of connected devices. Another problem that many companies will face is on the massive amounts of data that these devices will produce. Companies will have to find a way to store, track, analyse and cope with the large volume of data that will be generated. There are numerous websites that promote online safety, but the way they are working is not interactive and productive.

Pedagogical context provides a mean through which the student is educated in the online environment and not just informed. It is necessary to use some pedagogical tools in the propagation of the elements of social informatics. It is also necessary to emphasize from the pedagogical point of view, the use of information security services. Specific teaching methods such as systematic exposing of knowledge, conversation method, questioning method and others must be in the spotlight. It must be used in a specific way of organizing individual security services lessons, and also methods for evaluating school performance results.

We propose the creation of an information system to accommodate the needs and cognitive characteristics, reported on a number of indicators (such as age, sex, concerns, needs, etc.).

The need to create an educational platform for security services lies in the connection between real and virtual environment. Security services are a key point in the future society. The making of an interactive platform to create a centralized computerized system has a role in educating students for the safe use of virtual online environment.

The platform should be of interactive portal-/cloud-like architecture, having integrated basic computer security services.

User guidance will be made depending on the area of interest: security banking application, electronic information security (online and offline, on various kinds of media), guide for Internet browsing, social security, protection of the person in the virtual environment, etc.

It will be taken into account: security policies, creating and managing passwords, user types (standard user/system administrator), security of physical connections, network vulnerability, Internet services security, firewall, handling security incidents, viruses, resources on cyber security, etc. It will be used in modern solutions to create an interactive information system between user and informational database.

The database will contain information structured on interest category. Various parameters will be taken into account to guide the platform's user in finding and assimilating required information. Specific teaching methods will allow a greater degree of efficiency of the educational platform. What should be considered when creating such a platform is the way of interaction with users; thus, current technologies offer new ways of interaction. For example, the user can create a more detailed profile, when entering the platform. Profile that should be done on the basis of questions addressed effectively. The profile can contain not only information related to general data, but can be customized, but not to be understood as custom (which could affect privacy). The application can guess what the user wants to obtain. On the basis of collected information, a security - Strengths, Weaknesses, Opportunities, Threats SWOT analysis of the user profile may be done. From the pedagogical point of view, information collection can be performed using programmed instruction and computer-assisted learning. Through this training method, the subject learns paced, the educational material is divided into small sequences of study, followed by tests, the subject and instructor (the education platform here) can observe the progress of the training immediately.

The SWOT analysis can be dynamic, thus making step-by-step improvements on the level of education in information security services, to the one who is accessing the platform. Finally, and also intermediate, the user can see his minuses, what has he learned and how is he progressing in his educational path. The information system cannot take the place of a teacher, but it can replace and improve it by offering numerous benefits, being an adjuvant to the lack of time, distance and availability of many users who would like to improve their knowledge of security information services in the knowledge society we live in nowadays.

Conversations about IoT will continue to be done all over the world, while we seek to understand the way this will impact our lives. Also, we try to understand how these many

opportunities and challenges will arise in the context that more and more devices start to join IoT. The Internet offers to the children great opportunities to discover, create and connect, but can also become a dangerous factor in the education and maturation of a child. For now, the best thing we can do is that the current and future generations to be educated about what is IoT and the potential impact that can be observed on the way we work and live.

5. Conclusions

The way how society is developing nowadays, by relying on knowledge, has been leading to the need for ever-faster expansion of the concept of network inter-connection, in a word: communication. This communication is created without borders of any kind, such as cultural, economic or territorial. The flow of information is becoming bigger, and the areas of interest are more and more diverse. Informatics is becoming the technical support that is the most conducive to this new challenge. But like any support, how we use this base becomes the focus of discussion.

Concluding on our study, we could say that information technology is neither good nor bad, referring to its usage. The way technology is used gives its moral coordinates. Thus, if the society will not be trained to use these emerging technologies from the development of computer networks (such as Internet banking, online communication, brought to new levels today, large data transfer, increased power expression, in different contexts and for almost any topic of debate, creating virtual personalities, etc.), it is likely to witness an unwanted event, generally speaking, the obsolescence of the online environment.

Offenses made by computer systems influences real life more powerfully nowadays. In the coming years we will face a technological assault increased from Internet of Everything, when we will see the most types of devices existing today connected into networks. The benefits will be enormous, and threats will be more than troubling.

In order to control many different devices in our common life, both personal and collective, it must pose a problem to the pedagogical context in which this has the solution: moral and preventive education in the online environment through effective teaching tools. In moral education users must be educated to use responsibly and consciously the resources of information technology and communications, and in preventive education they must be educated to know the dangers they are exposed to and take action to mitigate them. In this context we can discuss about new challenges such as artificial intelligence, virtual reality, cloud computing, network virtualization, software-defined networks (SDN), big data, intelligent vehicular ad hoc networks and information security.

The more the society gets translated into the online environment, the more everyone living in modern society may suffer. How society understands new technologies and their strength becomes a deciding factor in the future development. Kling's idea to bring into attention 'interconnected matrix of social and technical dependencies' must be developed through the pedagogical factor. Educating the general public should be made gradually and in close relation, as far as possible, with age and its particular characteristics.

Computers are using within Web 3.0, semantic understanding of the data. This is an opportunity to generate new training methods. Information security should not be introduced and presented separately to the society from the users' online experiences. It should be used as a satellite through the users' online journey. Something like a permanent assistant, who is dynamic and friendly with the participants in the web system, and also provides information on every step of online browsing. Today, it can be guessed by developing artificial intelligence, various features of the human personality. Nowadays there is an opportunity, that was only a dream a few decades ago, to automate various processes by creating a virtual model that meets in users training, pedagogical features.

Thus, the online environment will enjoy a greater receptiveness and openness to the general public of all ages. Will fulfill in this way what expressed O'Reilly through the words: 'to understand the rules for success'[15] in the Internet platform, by using 'the networks effect'[15] in building applications to attract more people to use them. This will result in bringing a greater efficiency and safety in the interconnected computer networks and thus in people's lives.

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