THE IMPACT OF THE KNOWLEDGE-BASED SOCIETY UPON SCIENTIFIC RESEARCH*

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Abstract: *Modern life as we know it can no longer be conceived without science. Since the 18th century famous physicists, chemists or philosophers have made impressive contributions in science, all based on knowledge. In the development of the knowledge-based society, science plays a major role. Obviously, the scientific research must improve knowledge and at the same time it should provide the basis for technological development. It is known that technologies offered by the information society, due to their continuous evolution, accelerate the scientific development, thus providing the possibility of progress of knowledge, process that involves storage, transmission and generation of knowledge. This article is intended to be a critical analysis of the degree of interdependence between the information society technologies and the importance of scientific research for the development of the knowledge-based society.*

Key words: science; scientific research; knowledge-based society; information society

JEL Classification Codes: D83, O32, O14.

1. NEW INFORMATION AND COMMUNICATION TECHNOLOGIES AND SOCIETY OF KNOWLEDGE

Scientific research represents today the most important leverage for improving the standard of living, health, culture and, generally, the wealth of a society. It is also true that a healthy economic, social and cultural development is not possible without a well structured high-level education system, based on vigorous scientific research. Not focusing on these activities would inevitably lead to stagnation and, on the long term, the survival of that society would be jeopardized.

The perception of reality by modern society is made through a set of activities embedded in the phrase "fundamental scientific research". The result of fundamental research is a general pattern of how it is made and how the surrounding world evolves. This model can be formulated in reference publications called primary publications and resumed and explained in a less formal language in other publications that quote the primary ones.

New Information and Communication Technologies (NICT) make us enter *nolens volens* into a new era whose main feature is the instant data transfer to which the electronic links and networks are added. The Internet is the heart of the great mutation. Communication highways are, for the current period, what were the railways for the industrial age: an intense factor of boosting and intensifying exchanges (Ibelings, 2003).

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Having the Internet as their brightest illustration, New Information and Communication Technologies have a special impact not only on the growth rate but also on the content of economic activities, whether they are production, consumption, financial or regulatory: we are witnessing this way to the impetus of a new economy.

First of all, we would like to point out that the competitive advantage of countries under the new economic and social realities depends essentially on the following three factors: innovation, training and research (Cavanagh and Gélinas, 2005).

Because the New Information and Communication Technologies target the whole economic sectors, we can speak of a "*numerical economy*" (Boissieu and Flouzat, 2006). Some authors (Landau, 2006) speak of "*numerical civilization*" to express the importance of the paradigm change we are experiencing. The new paradigm is characterized on the one hand by the abolition of many traditional barriers and on the other hand, by the meta-convergence of material science (nanotechnologies), of life (biotechnologies) and information (cognitive sciences) (Gadrey, 2000).

Transformation to a knowledge society requires multiple coordinated actions on both the supply and demand sides of the economy and society. While supply-side initiatives such as programmers to enhance human capital through investment in education and skills are essential elements to upgrade to a flourishing knowledge–based economy, unless the labor market can absorb these increased skills and competencies in the population there will be limited progress towards a fully functioning knowledge-based society. A knowledge-based society can be said to generate, disseminate and use knowledge to improve the standard of living and the quality of life of citizens in a sustainable way (Garner, 2016).

Since the mid-1990s, the Internet has been the universal platform for convergence between computer science, electronics and telecommunications. It has become the privileged and unequal means of delivering very fast any form of information and messages in any corner of the world. Associated with the new networks (Wi-Fi, Wi-Max, GPRS) and mobility tools (PDAs, Smartphone's, Pocket PCs), the Internet now allows entrepreneurs, traders and freelancers, who have been so far struggling with the lack of financial, human and technological resources, to integrate into business structures at local, regional, national or international level (Midiere, 2006).

The planetary stunt of "*everything a market and everything for sale*" is increasingly producing an undifferentiated society where "*from now on has value only what has a price*" (Balantzian, 2003). Putting us in the same direction, the informational revolution once makes us think that by increasing communication among people, barriers will fall, and another time notice that the simultaneous explosion of the Internet and portable telephony makes us more to communicate than to meet and this seduction of the virtual often translates into a crazy run away from reality.

Considering this, we can state that new information technologies associated with knowledge alter both the production process and society as such. Man lives in a world that is no longer composed only of material things but also of symbols. In this complex structured world, dominated by uncertainties that ensure evolution, the entities are relative, the goods being exchanged are now informational flows that connect individuals who are indifferent to one another.

Since ancient times, wealth and power have been associated with the possession of physical resources while the need for knowledge has been limited if not ignored. The wealth and power of the 21st century will no longer consist of the same possession of physical resources but will arise as a priority from intangible intellectual resources from the knowledge capital.

The process of transition from a tangible, physical resource-dominated economy to a knowledge-dominated economy is particularly comprehensive and profound, generating

substantial changes in all economic activities, somewhat similar to those produced by the Industrial Revolution. Currently, we are in the early stages of the knowledge revolution.

Products and services are, in terms of knowledge, more intense, and due to this fact the delimitation between products and services becomes increasingly more difficult, knowledge tend to become the main feature of activities, more than the resulting products and services. The impact of the knowledge revolution becomes visible in the volatility of the market, the uncertainties concerning economic activities, the insecurity of jobs and careers (Gadrey, 2000).

As result of human thinking, concepts are subject to a permanent process of evolutionary metamorphosis: *data ⇨ information ⇨ knowledge ⇨ wisdom*. The evolution of society is closely related to the evolution of these concepts, and the economy follows the model of society in which it is practised.

Data are raw material, facts, symbols, figures, details that without proper understanding are no use, they have no meaning.

Information refers to the description of concepts based on understanding the relationships between data, defining models and links etc. (what, who, when, where?).

Knowledge is awareness and understanding of a set of information and how this information can be used in the best way and is achieved by understanding the models and include strategies, practices, methods or approaches (how?).

Wisdom is based on understanding the principles governing knowledge, judgments on their usefulness and morality (why?).

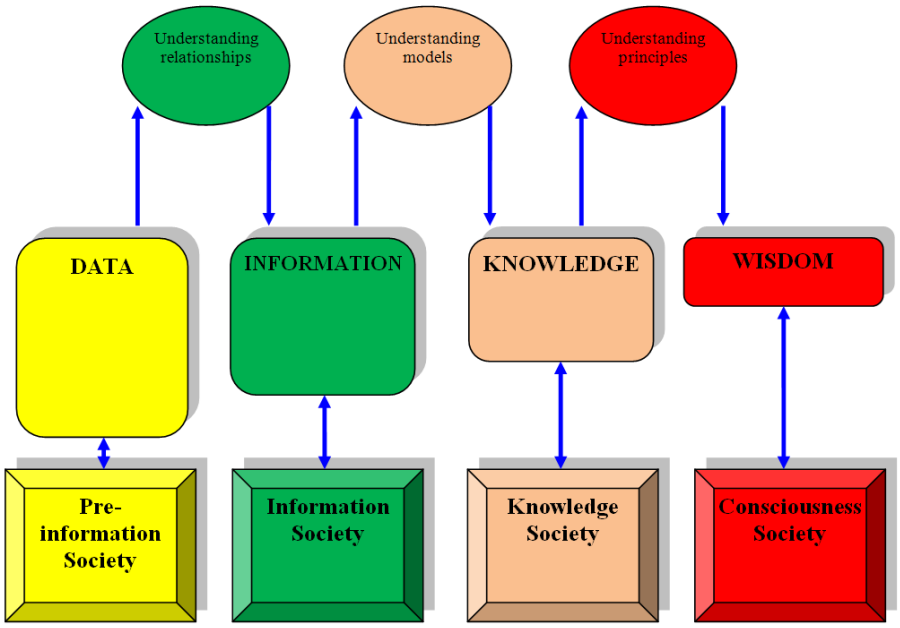

Figure 1. The evolution of society, the road to wisdom and the society of consciousness
Source: processing after Drăgănescu, M., From Information Society to Knowledge Society, Tehnică Publishing House, Bucharest, 2003, p. 46

The new society in which humanity falls irreversibly is defined as a society of knowledge and at the same time as a society of organizations (Drucker, 1992). Knowledge-based organizations are the intelligent collective actors of the information society and have a decisive role in asserting it as a knowledge society. They mark the convergence between two phenomena defining human nature – knowledge and organization – in an emblematic social construction for ideas of collective competence, intelligent action and sustainable performance. In the functioning

of such organizations, processes generically designated by the phrase "3I" are determinants, namely *innovation* (creation of new knowledge), *learning* (assimilation of new knowledge) and partnership *interactivity* related to knowledge (Karnoouh, 2004).

In the very advanced countries we are already witnessing the transition from the knowledge society to the consciousness society or more recently to the wisdom society. In this society a new occupational category appears, "wisdom worker", a creative person having the ability to think and act using knowledge, experience, common sense and understanding, that is a person who can judiciously (wisely) apply knowledge. The society in which these "wisdom workers" will work will be one of conscience based on morality and spirituality (Fildan, 2016B).

Since the mid-twentieth century, some disputes and controversies have arisen in the literature on industrial society and implicitly on postindustrial society. Against this backdrop, the first signs of the new society, the knowledge-based society, have come to light. Globalization has helped to the more easily distribution of information, data, and knowledge. This was largely due to modern technology. During the last decades, four concepts have been used interchangeably, according to Figure 2 (Hadad, 2017):

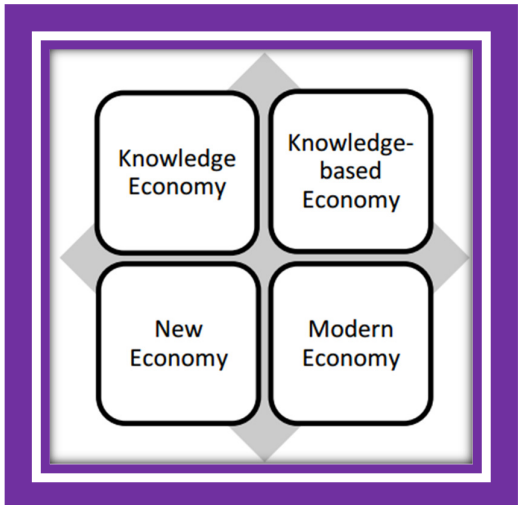

Figure 2. KE concept used interchangeably

Source: Hadad, S., Knowledge Economy: Characteristics and Dimensions, Management Dynamics in the Knowledge Economy Vol.5 (2017) no.2, pp.203-225

Information technology promoters define the knowledge-based organization as "*a community of workers with conception work, interconnected in a computerized structure*" (Holsapple and Whinston, 1987 and Drăgănescu, 2003). The existence of such an organization, provided with local workstations, support centres, communication channels and distributed knowledge collections, requires an explicit design and realization approach.

The knowledge society tends to create in society a unitary computer structure that ultimately serves (Drăgănescu, 2000):

- each citizen with computational power and auxiliary memories, for his self-education, for relations with the economic, cultural, medical, legal, social structures of society. Man will be found not only in an ecological and social environment but also in an informational environment that will change his way of life;
- each organizational unit, both in its internal mode of operation and in its relations with external organizations;
- the society and the economy as a whole, for their leadership in order to achieve the set goals;

- the relations between states and nations.

In the world, few companies have survived without adapting to changes in the environment and society, and this was due to managers who had responsibilities both towards shareholders or their associates and the environment in which they operated. The environment in which a company operates is a complex environment, from which the company chooses both human resources and material, informational, energy and financial resources. Lately, there is a growing focus on the environment, leading managers to find solutions for environmentally friendly materials, cleaner technologies, and the production of recyclable products. Policies, social responsibility, the interest of companies consist of coordinating in such a way as to keep the society as clean as possible. So we can talk about business ethics and, as a result, about ethics in scientific research, because this aspect should be considered from the research side. In terms of society's expectations, scientific research needs to have a response that measures reactivity to society. Here are some measures to be taken:

- businesses research and misconduct should be rejected, going through to companies suing;
- businesses to accept that they also have social responsibilities and to adopt measures to correct any possible mistakes;
- businesses to identify potential problems from the start and to ensure the prevention of occurring;
- to have open and honest communication with the whole society;
- the society must defend itself legally against possible abuses by businesses.

All these measures would avoid any possible crises to occur later. It is easier and cheaper to prevent than to react after the inevitable has occurred.

2. SCIENTIFIC RESEARCH AND TECHNOLOGICAL DEVELOPMENT

Scientific research and technological development is one of the areas in which such a courageous policy must be pursued, as it is the field that allows for the reduction of disparities.

Research should be geared mainly to international partnerships in general and to cooperation with the European Union in particular.

A local innovation and technological support system must be set up to allow both access to European Union technology service centers and the use of native specialists. Gradually (among other things, through human resources policy), favorable conditions for investment in high technology (foreign and domestic capital) will be created.

How can scientific production improve? An increase in the impact of research goes by paying greater attention to the impact of both researchers and practitioners. Here are some of the directions that can be considered (Levin, 2004):

- the impact should be an evaluation criterion in awarding grants, requiring researchers to introduce accurate specifications as to how dissemination of research results will be achieved;
- assisting and supporting researchers in order to be able to develop impact-enhancing activities, such as possible strategies and models to ensure impact;
- supporting universities, - the education sector, just as it is with the field of engineers or exact sciences;
- strengthening the input of potential beneficiaries in developing and reviewing research proposals. Sometimes, discussions between researchers and users can lead to interesting studies that can stimulate the interest of potential users;
- trying to maximize profit from existing research. Often, researchers are seen to be involved in new research before they have fully exploited the results of the latest

research. For this, data should be available to anyone who can use it. Another proposal is to motivate researchers to devote more time to exploiting data before undertaking new research or receiving new grants;

- building networks between researchers and users with common interests as a way to develop programs on a larger scale. Following the first direction, stimulating the impact of research goes through improving the use and exploitation of research.

Good international practice shows that performing research is done in universities or companies (organizations) with private funding or self-financing. It is difficult to identify patterns to restructure research in universities as the most famous in terms of performance, in developed countries, are private and not the public ones. Secondly, their regulation and operation is based on the promotion of meritocracy that promotes affirmation, promotion and protection of value etc. A possible solution could be the development of research networks to facilitate the efficient use of local/regional human and material resources (Fildan, 2016 A).

In a globalized world, universities are seen increasingly more as producers of knowledge, innovation, technology and qualified workforce from a strictly economic point of view, thus contributing to the creation of wealth and competitive advantage. It is also expected that universities generate revenue due to high demand of superior education that comes from all over the world. But this should be looked at also through the fact that universities do not just produce technology and manpower, but they form people, individuals, an active part of the society. Thus, universities have the responsibility to create professionals who contribute to the long-term national well-being. The university is the central element in the generation of new ideas to influence society. Thus, universities are required to realize the need for themes and studies that evaluate the impact of new knowledge (Răulea et al, 2016).

Despite the diversity of decision-making mechanisms in different countries, a number of common criteria and features of the process of selecting priorities in science have been highlighted, namely (Sandu and Poenaru, 2000):

- in developed European countries - the interaction between the goals of the scientific and technological community and those of the political factors;
- the existence of institutions dedicated to setting R&D priorities collectively referred to as “research councils” or “national science and technology committees”, independent political bodies based on objective expert assessment teams which also configure the destination of R&D funds;
- periodic review of the system of priorities;
- the existence of consultative mechanisms to set R&D priorities involving representatives of the scientific community, firms, government, trade unions and experts in different fields and consultative procedures are flexible in order to adapt quickly to changes in the economic and social environment, the final users of R&D results having an important role in setting priorities especially for applied research;
- the formulation of priorities is reflected in programs or multiannual strategic plans and are articulated on the one hand with the political, economic and social constraints and, on the other hand, with the avant-garde areas of science and technology; in the implementation of priorities, an important role is assigned to the selection of the most competent research team, as well as a program coordinator that must impose itself by scientific and managerial prestige;
- the pluralist and decentralized prioritization model works more effectively when objectives are relatively constant and allocated resources are increasing;
- the budget is an essential factor for shaping, selecting and implementing priorities, and the most difficult issue, namely that of budget allocation, must be resolved considering

solving the emergencies based on the information transmitted by the economic and social environment to the scientific environment;

- the stimulation of scientific performance and the priority allocation to centers of scientific excellence are a major concern;
- in the EU countries, priority proposals are made by economic ministries, debated with experts in special workshops before being adopted by the Government and forwarded to the Parliament;
- the prioritization takes into account the international dimension of science and technology, international funding mechanisms and the opportunities to attract world-renowned specialists to national projects.

Developing research and access to knowledge is essential to any powerful nation. It is particularly important to ensure access to international scientific bases and increase the involvement of the Romanian research environment in international networks of major importance for the development of science and technology.

In the following, we will briefly present a few platforms that support research by giving access to full text to a whole range of journals, books, encyclopedias, or online databases.

The ProQuest Central Platform (http://www.proquest.com) provides online access to full text and summaries of scientific journals from prestigious academic publishers, academic associations, professional associations around the world.

With a total of more than 21,830 periodical titles, dissertations, newspapers, reports, documents, videos, ProQuest Central is one of the most comprehensive sources of online full-text encyclopaedic documentation. On a single online platform are available 27 of the most popular ProQuest databases covering over 160 domains, including business, science and technology, medicine and health, literature, society and culture, art, history, religion, computers, education.

EBSCOhost (https://www.ebsco.com/) is an online reference service accessible via Internet providing access to a database collection. These databases can have multidisciplinary academic content, specialized in a particular field or encyclopaedic and include articles from periodicals (abstract and/or full text), books, quotes, references, reports, research market studies, case studies, images and maps.

Springer Publishing has included on the SpringerLink platform (http://www.springerlink.com) since 2006 published books and encyclopaedias. The advantage of online versions is that they can be used by several people at the same time such as on a library network. In addition they can contain illustrations and graphics, audio and video files. The access is made from the SpringerLink platform along with the publishers' journals. Currently there are over 47,700 books grouped in 13 collections: Architecture and Design, Behavioural Science, Biomedical and Life Sciences, Business and Economics, Chemistry and Materials Science, Computer Science, Earth and Environmental Science, Engineering, Humanities, Social Sciences and Law, Mathematics and Statistics, Medicine, Physics and Astronomy, Professional and Applied Computing. The Business and Economics collection is considered one of the most important of SpringerLink Publishing, proven by both the number of titles and especially the value of published works.

DOAJ - Directory of Open Access Journals (https://doaj.org) is a portal recognized for quality open access journals, a registry for identifying peer-reviewed academic journals that do not rely on the subscription model. DOAJ includes open access journals from all fields of science, technology, medicine, social sciences and humanities. Currently (2017) DOAJ indexes 9,434 scientific journals of which 6,872 are available as articles. DOAJ contains information on 2,476,325 articles from journals published in 129 countries by almost 2,000 publishers. Areas of interest covered: architecture; urbanism; design; arts in general; decorative arts; drawing;

design; picture; sculpture; visual arts; construction engineering; social sciences; geography, anthropology, philosophy, technology etc.

The ScienceDirect Platform (www.sciencedirect.com) provides online access, full text to scientific journals, academic books, book series and encyclopedias. More than 20% of the global information in the fields of science and humanities, technology and medicine is published on the Elsevier ScienceDirect platform. It is a very important academic resource of our days and includes the journals published by the Elsevier Editorial Group (Elsevier, Churchill Livingstone, Saunders, Mosby, Cell Press, Pergamon, Butterworth-Heinemann, Academic Press, The Lancet, JAI Press, North Holland, Masson).

THOMSON WEB OF SCIENCE (webofknowledge.com). THOMSON ISI aims to provide information on the scientific recognition of articles and the identification of new trends and technologies worldwide.

- ✓ Web of Science is an online bibliographic and bibliometric database, including scientific journals. Available on the Web of Knowledge platform, it provides access to summaries of articles from over 12,000 scientific journals and 148,000 scientific conferences from 256 disciplines.
- ✓ Web of Science is structured according to the area of the covered topics as follows:
- ✓ Science Citation Index Expanded™ – totally indexes over 8,600 major science journals from approximately 170 disciplines;
- ✓ Social Sciences Citation Index® – totally indexes over 3,120 journals from 55 disciplines of social sciences as well as 3,500 technical magazines;
- ✓ Arts & Humanities Citation Index® – lists over 1,730 humanities and art magazines as well as articles from 6,000 journals in the field of social sciences;
- ✓ Conference Proceedings Citation Index – contains over 148,000 journals from scientific conferences. It is divided into two editions: Science; Social Science and Humanities;
- ✓ Books Citation Index: indexes over 30,000 books selected since 2005 so far with over 10,000 new books added each year.

3. CONCLUSIONS

Information and knowledge are the vital components of society whose value is boosted by the phenomenon of globalization and the high dynamics of cutting-edge technologies, particularly information and communication technology, which has enabled redundancy and resource sharing that, can be accessed in the virtual environment. In this context, the spread of knowledge and the generation of new knowledge is a phenomenon with strong dynamics and with major implications at individual and social level. The knowledge-based society has arisen because the mix of economic, cultural and social processes is increasingly based on knowledge, and therefore knowledge becomes an engine of development under competitive conditions, which requires a fair distribution system, access and knowledge generation for social development.

The trends towards globalization and the formation of the "new knowledge-based economy" have become stronger, making it imperative to increase the competitiveness of European firms through innovation ever more urgently than ever. Despite these efforts, innovative performance at European level has not improved over US or Asian competitors. On the other hand, there was signaled the danger of a "gap in innovation", which could even separate European regions according to their innovative performance and therefore their ability to prosper in the new economy. There is a large gap between European enterprises in terms of adaptability and adoption of the new, with the resistance of change and structural barriers to innovation.

In conclusion, the knowledge-based society can only be built through the synergy between knowledge processes and those of stimulating creativity, research and innovation. To this end, intellectual capital with its innovative, relational, motivational valences is the core of the knowledge society.

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