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Economic Model of Information, Information Society, and information Literacy: A View from Russia

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Abstract: The article reveals the theoretical model of information as an economic resource. The emphasis is put on the role of information in social and economic evolution, development of information society in Russia in the context of global trends. Further, the author proceeds to the concept of 'information literacy' and a new educational role of university libraries. The service model itself is changing: from satisfying information needs to an advanced model of want formation. Besides, in the 21st century, research libraries find new users: in addition to students and faculty, their services increasingly attract the attention of business. The article is encouraged by the experience of the introduction of new library services in the Research Library of Ural Federal University, as well as the promotion of a university library in the business environment.

Keywords: information, information society, lifelong learning, information literacy, knowledge-based society, continuous professional development

Introduction

Information in the simplest definition means is provided or learned facts about someone or something, and what is conveyed or represented by the arrangement and sequence of things *(Oxford Dictionaries, 2017).* Already in this definition, we can observe the duality of the phenomenon of information: on the one hand, facts do exist objectively; on the other hand, by changing the combination and sequence of facts, we can change the meaning of the message.

From an economic point of view, information has two important properties. First, information is easily alienable, i.e. accessible to any number of people without loss of its original qualities. Secondly, the costs of the second and subsequent copies of information tend to zero (Panikarova and Vlasov, 2015).

The term *'information'* traces back to the Latin *'informatio'*, which means clarification, representation, and notion. Thus, since ancient times, information has been opposed to uncertainty; it is a means of eliminating it. Over time, the role of information has constantly increased, and in the middle of the last century, the importance of information as a resource became absolutely critical for social and economic development. At the same time, the growth rate of knowledge in recent years has been determined by the development of information and communication technologies (ICT) - Moore's law, i.e. the amount of knowledge doubles every 2-3 years by analogy with the chip's power.

There was an opinion that the development of digital technologies would kill libraries substituting them. In our opinion, the role of libraries (primarily, research libraries) as information hubs is increasing in contrast; they do not only provide information, but also teach the art of information management. The purpose of this work is, on the one hand, interpretation of the economic content of the category 'information'; on the other, identification of the new role of university libraries in terms of the competence of *'information literacy'* and realization of *'lifelong learning'*.

Economic Model of Information and Information Asymmetry

As a first of all, it is necessary to determine the place of information in a raw of data - information - knowledge. Some researchers argued that knowledge differs from information by structuredness (Dissanayake, 1985). In this interpretation, it is not entirely clear what is the difference between information and data - in fact, information can also be structured. The information differs from knowledge by authorship and the focus of scientific knowledge on the solution of fundamental or applied problems. In turn, the data represent the primary material, which is converted into information during processing. Trichotomy of knowledge - information - data was also used in the report of Morss and Rich (1980).

To understand the role of information in the process of economic growth and social development, we should have a look at the classical Cobb-Douglas production function:

$$Q = A\, L^{\alpha}\, K^{\beta}$$

Taking into account the critically increased role of information in the manufacturing process, a number of researchers suggest a modification of the function interpreting information as an independent factor of production (e.g., Gurina, 2005).

$$Q = A\, L^{\alpha}\, K^{\beta}\, I^{\gamma}$$

Other researchers argue that information does not have self-production capacity; however, it affects the returns on the use of labor and capital (Popov, 2015). The modified production function, in this case, looks as follows:

$$Q=A\, L^{\alpha}\, K^{\beta}\, e^{\gamma I},$$

where γ is the influence of scientific and technological progress; I is information.

The publication of the Nobel laureate George Stigler (1961) was a significant milestone in the interpretation of the economic content of the category 'information'. While classical

economic theory implies that consumers have all the information about the products and prices "by default", Stigler pointed to information asymmetry and related costs of information search. Later, Stigler applied his theory of information to the labor market (Stigler, 1962).

Akerlof (1970) demonstrated information asymmetry on the evidence from the market for used cars ('lemons'). The car is an experience good - its qualitative characteristics are revealed only in the process of operation. Information asymmetry lies in the fact that only the seller, not the buyer, has exact information about the quality of the car. With the equality of prices, this leads to the fact that the market is occupied by cars of inferior quality.

Thus, in everyday life, individual, as a rule, encounters unstructured (uncodified) information, such as posts in social media, news on television and in the Internet, advertising. The goals of providers can be very far from the goals of consumers of information; the possibility of content manipulation creates prerequisites for opportunistic behavior. Developed information skills resist the negative consequences of information asymmetry.

Raise of Information Society

Until the beginning of the twentieth century, all scientific knowledge stood on "two whales" - substance and energy. *The substance* is a fundamental concept in physics; besides, the substance is a philosophical category, one of the two eternal beginnings of all things. The first theoretical concepts of substance can be found already in the works of ancient Greek philosophers. First of all, it is atomism, which is the first attempt at a physical explanation of the material structure of the world. Democritus and Leucippus put forward the hypothesis that the world consists of the smallest particles of different shapes - atoms - and the emptiness that separates them. The doctrine of atomists found a logical extension in the works of Aristotle, who considered it to be the eternal indestructible beginning of everything. It was Aristotle's physics that was the fundamental doctrine in the period of scholasticism. In the Renaissance, substance became one of the main natural philosophical problems (Nikolai Kuzansky, Giordano Bruno,

Galileo Galilei, and Rene Descartes). T. Hobbes and J. Locke understood substance more "bodily". It was the physical understanding of substance that became the basis for the industrial revolution of the 17th century.

The second "whale" of science is *energy* - a scalar quantity that measures the motion of substance and transition from one state to another. The term energeia also appeared in Greece in the works of Aristotle. From the Greek, energeia is translated as 'activity', 'reality', 'action' or 'energy' (Bradshaw, 2004). Although many relate the term exclusively to the movement, Aristotle viewed it as part of metaphysics, in contrast to 'kinesis.' Leibniz used the notion of 'living power' in his works, and the first person who introduced the term 'energy' in the modern sense was Thomas Young. It is obvious that the concepts of substance and energy, as a unit of measurement of its movement and state, are inextricably linked.

The first scientific journals appeared in the 17th century - *Le Journal des Sçavans* and *Philosophical Transactions*. In the 19th century, the number of newly opened journals increased significantly. At the same time, the question of conceptualization of the notion 'information' arose. It became obvious that, as a matter of fact, being an immaterial category, information directly affects the material world. *Information* has become the third "whale" of scientific knowledge, economics, and social evolution. Information research is important both at the theoretical and applied level.

Since the first half of the 20th century, attempts to comprehend the category 'information' have begun. In 1928, R. Hartley was the first to propose a methodology for the quantitative assessment of information (Hartley, 1928). His theory is based on the set: when choosing one of the elements, we get a certain amount of information. The more elements in the set, the more information we get. Hartley's theory was developed by R. Shannon (1976), who grounded on a statistical probabilistic approach: random events fall under the law of normal distribution. In 1948, the book of mathematician Norbert Wiener *Cybernetics or Control and Communication in*

the Animal and the Machine (Wiener, 1948), which marks the emergence of a new science. The main object of this science is information processes: acquisition, storage, and transfer of information. Almost at the same time, the first electronic computer ENIAC and its Soviet analog MESM (Small Electronic Counting Machine) appear in the USA.

So, in the middle of the last century, it became obvious that humanity is moving to a new stage of development. This process was reflected in the works of the largest economists and sociologists of the 20th century. For example, Alvin Toffler divided the entire development of mankind into three waves (Toffler, 1980). The first wave - agrarian civilization, the second wave came along with the industrial revolution, the third wave is an *'electronic cottage'*, i.e. new technological structure. Daniel Bell introduced the notion of the *'post-industrial society'* linking it, again, with technological changes, the advent of computers, information transition into digital form (Bell, 1973).

The term *'information society'* seems preferable, since it reflects the key factor that underlies social development. While Karl Marx considered the mode of production to be the basis for the change of formations in the course of human history (Marx, 2010), we propose a *resource-based* periodization:

1. *Agrarian society* (5 thousand years BC - 17th century AD). A huge era that began with the agrarian revolution: the emergence of irrigation farming, domestication of horses and other animals and their use in agricultural works. It was there and then that the great civilizations of antiquity appeared. Throughout the agricultural age, technologies were constantly improved. The key factor of production was land, then - labor and capital.

2. *Industrial society* (17th - late 19th centuries). This period in history can be divided into two parts: the early industrial era (17th - first half of the 19th centuries) and the late industrial era (first half of the 19th century - the turn of the 19th-20th centuries). The early industrial era was characterized by the appearance of manufactory production, steam engine technology, and the

active conquest of colonies by Europe headed by Britain. The world became Eurocentric. In Europe itself, life was moving to fast-growing cities. The main factor of production was labor. The appearance of large-scale factory production marked the onset of the late industrial era. Urbanization processes were accelerating; regarding factors of production, the emphasis shifted to capital. In Europe, increasingly large and bloody interstate conflicts were beginning to emerge.

3. *Hydrocarbon society* (early 20th - 70s of the 20th century). Since the beginning of the last century, oil has become a major factor in the world economy and politics. In the technological sphere, there appeared fundamental changes in the mode of production associated with the development of an internal combustion engine, widespread distribution of electrical energy, and assembly line production. There was observed a further concentration of production and capital; rapidly growing cities were gradually turning into urban agglomerations. Interstate conflicts led to world wars, the cold war and a range of local conflicts, in which tens of millions of people died. On the global scene, a bipolar geopolitical system was being established, which was characterized by a constant confrontation between the USSR and the United States. The peak of the hydrocarbon era was the establishment of OPEC and the huge increase in oil prices caused by it in the first half of the 1970s.

4. *Information society* (1970s - 2020?). With the advent of computers and the subsequent mass automation of manufacturing processes, the mankind is moving to a new stage of development. The very term "information society" appeared in the 60s in Japan and the United States (Machlup, 1962).

5. *Knowledge-based society* (2020? -?). Now we can only guess what will be the future society. However, knowledge seems to become the key public value and the main factor of production. Thus, the great dream of the classical philosophers will come true.

The concept of the information society entered both scientific and political discourses;

nevertheless, its versatility complicates consideration of this phenomenon in the framework of only one approach or discipline. In our opinion, the best classification of information society concepts belongs to Webster (2002): (1) the introduction of technology, (2) the economy, which is highly dependent on information and information technology, (3) changes in the nature of work and the number of employees engaged in information and information technologies, (4) the emergence of information networks that cross traditional geographical boundaries and change the relationship of space and time; (5) the constant presence and tangibility of information as part of the culture.

In the political discourse, great attention has been paid to the development of the information society by global organizations, such as the UN, World Bank, and OECD. The approach of the International Telecommunication Union (ITU) is more technological, i.e. based on ICT development indicators (ITU, 2014):

- Current level and dynamics of ICT development in different countries relative to other countries;
- Progress in the development of ICT in both developed and developing countries;
- The digital divide, that is, the differences between countries in terms of levels of ICT development;
- The potential of ICT development or the extent to which countries can use ICTs to increase growth and development.

In 2016, Russia took the 43rd place in the Index of ICT Development dropping by 1 line compared to the previous year ("ITU | 2016 Global ICT Development Index", 2017). If we look at the values of the indicators in detail, the main gap from the developed countries is observed due to fixed telephone subscriptions and fixed broadband subscriptions (Figure 1).

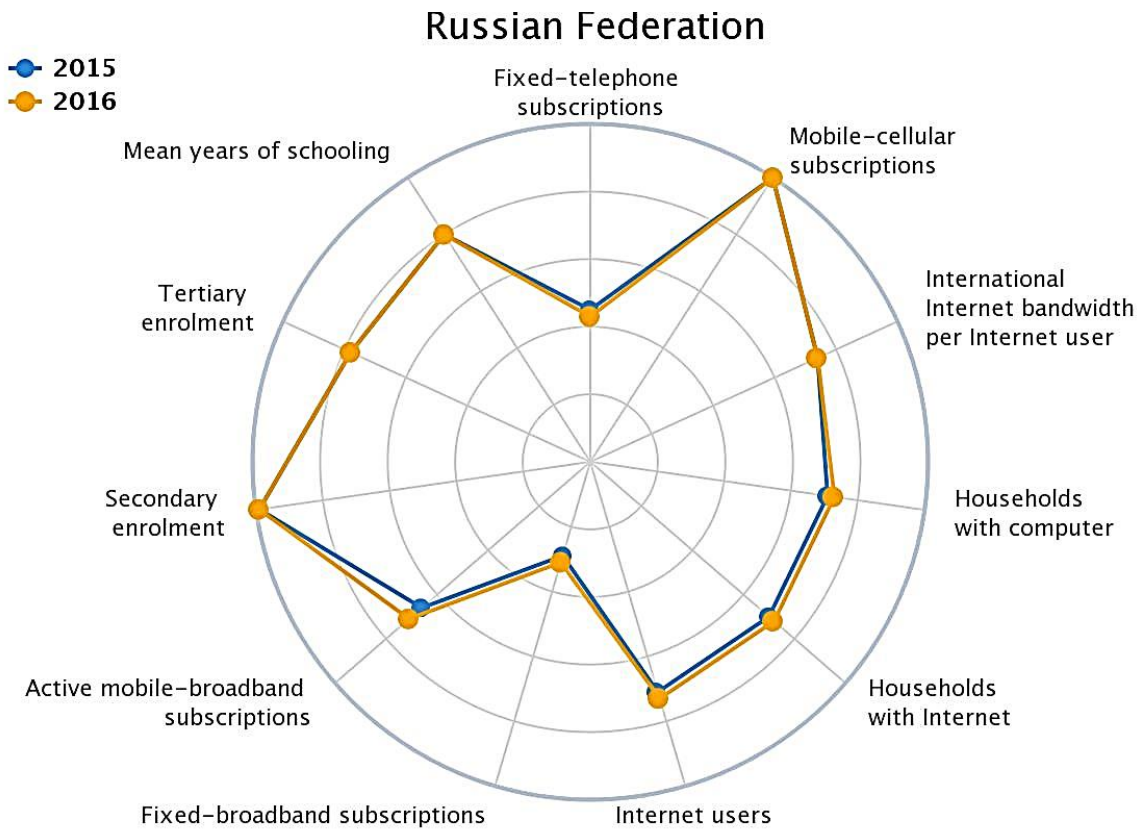

Figure 1. Indicators of ICT development in Russia. Source: ITU.

At the same time, the low values of these indicators can be explained by a large number of rural areas and the large distance between settlements in Russia. The OECD publication Skills Matter (2016) makes it possible to look at the problem from a different angle: having indicators of education comparable to developed countries, Russia has a very significant gap in the use of

skills in economic activity (Figure 2).

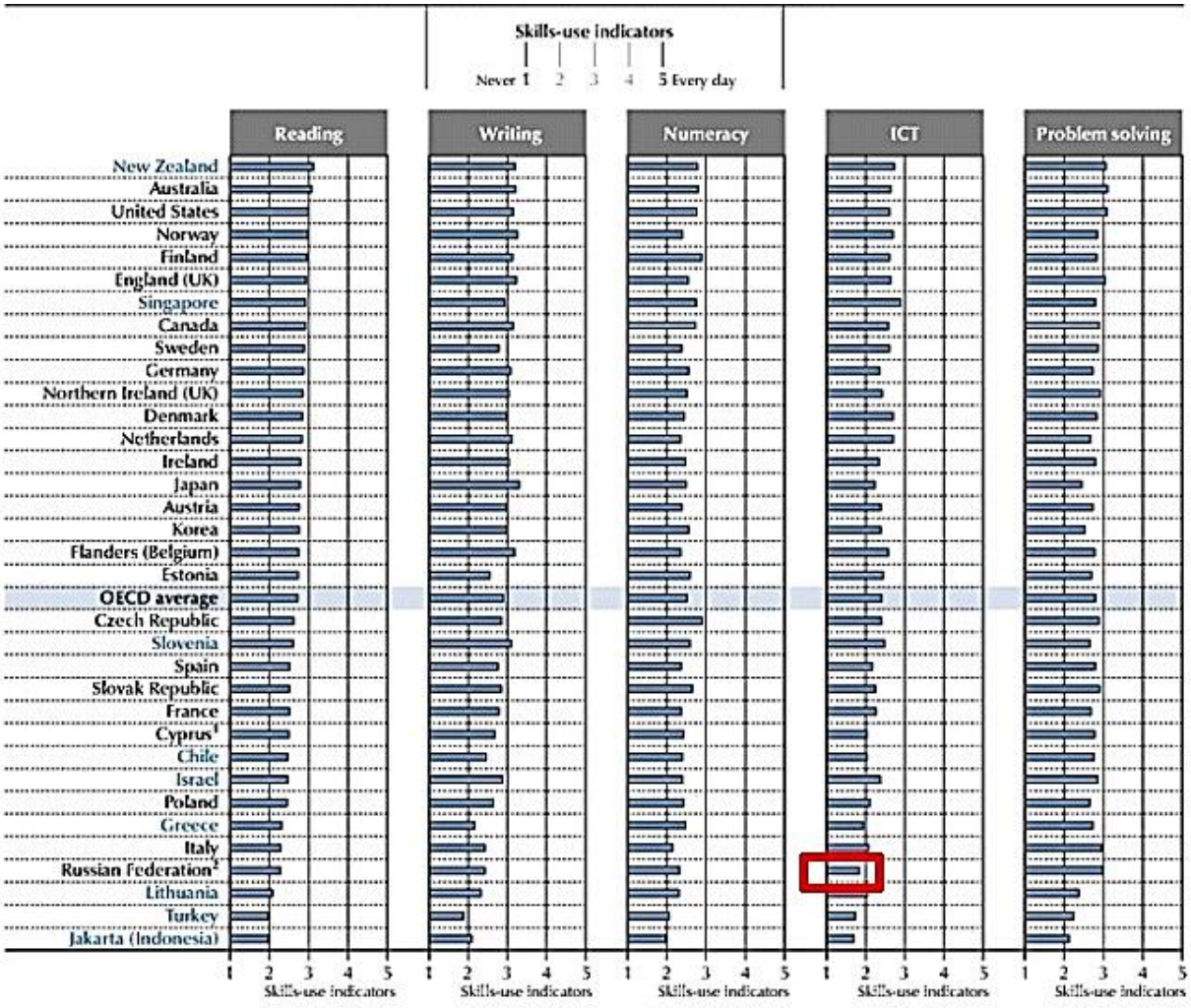

Figure 2. Information skills at the workplace. Source: Skills Matter (2016), OECD Publishing.

Note that digital divide is related not only to economic inequality between countries but also to the level of information skills that can only in part be explained by the level of education (Ünver, 2017). In our opinion, it is the low rates of the use of skills that cause Russia to lag behind in terms of the information society development.

Information Literacy

The information society places new demands on education, knowledge, skills, and competencies obtained by students; information literacy is critical among them. Information

literacy is the ability to search, organize, interpret, evaluate, and create information (Khokhlov, 2009b). In turn, information literacy is an integral part of an information culture, which involves mastery of information skills and knowledge at a high level. Some researchers believe this definition is too general (Mukan and Fuchila, 2014), there is a tendency to reduce the concept of information literacy to the instrumental aspect, i.e. mastery of information technology. The authors of this study do not share this view, since possession of a high-level competence involves the understanding of the object, i.e. the synthetic structure of information flow, in our case. The reduction of this issue only to search tools and information management seems an unjustified approximation.

Association of College and Research Libraries (ACRL) in its framework document, which settles the standards of information literacy for higher education, defines information literacy as a set of integrated capabilities spanning reflexive search for information, an understanding of how information is produced and evaluated, as well as the use of information in the creation of new knowledge and ethical participation in the scientific and educational processes (ACRL Board of Directors, 2015). The document consists of six framework concepts:

- The authority of the source, implied and contextual. Implied authority is based on the fact that different communities recognize different types of authority. Contextual authority arises when the information need defines itself the necessary level of the authority of the source.

- Creation of information as a process: the processes of search, creation, and dissemination of information differ, which is reflected in the final product.

- The information has value: legal and socio-economic interests influence the processes of creation and dissemination of information.

- Research as a search query: information search is an iterative process; received

answers constantly generate new questions.

- Science as a dialogue: research in the scientific and professional areas is a discursive practice, which involves the formulation, discussion, and evaluation of new ideas and discoveries during a long period of time.

- Information search as a strategic survey: the search is often a non-linear multi-step process that requires the evaluation of multiple sources and mental flexibility, which empowers finding of the new ways in the course of research.

The actual content of the information literacy standard is the discussion problem itself; in Russia, it is currently absent. The adoption of such a standard will empower meaningful implementation of information studies at different levels of the educational process. Besides, there are no criteria for evaluation of information literacy competence. We believe that such a standard should include a multilevel system of criterial evaluation of each knowledge or skill, which in turn will assess the information literacy of the person as a whole.

The new paradigm involves changes in the service model of university libraries. Of course, the librarian must have full knowledge of information resources as an integrated system (Gendina, 2009). However, the ability to pass this knowledge on to the others is also of great importance. Research Libraries Association statistics show an increase in demand for library workshops and training sessions ("Service Trends in ARL Libraries, 1991-2012", 2012). D. Elmborg argues that the transition from the reference to research services, and training in information management are the most important trends in the modern library (Elmborg, 2006). The main thing is not the content itself, but the way it is organized and categorized. The transformation of the university library from an information infrastructure element into the subject of educational activities was described by Belarusian researchers Gancherenok and Anokhin (2015). The researchers also emphasized the role of university libraries in the creation of analytical products in the field of scientometrics and publication activities of the faculty.

These activities are reflected in the new standard in the professional field of library and information work in Russia.

The low level of information literacy development is a serious barrier to the economic, social and political development of Russia. A key role in the solution of this problem is assigned to educational institutions. It is here that the skills of education and information processing necessary for continuous professional and personal development are laid. A comparative analysis of students from Russia and Germany revealed significant differences (Zhukova, 2011). The difference is not in the frequency of use of new information resources and not in the skills of using them for information purposes, but in information search skills with the use of various tools. In other words, the gap cannot be explained solely by technological or economic reasons; these competencies are formed exclusively through clarification, training, and reflection (Heinze, 2008).

Conclusions

The paradigm of education is changing. Earlier it was possible to get a sufficient stock of knowledge for the entire subsequent life and career while studying at University; now, the amount of scientific and technical information is growing exponentially that constantly makes a new information retrieval essential. In the early 70s of the 20th century, almost simultaneously with the Bologna process, the concept of *Lifelong Learning* (LLL) emerged. In Russia, we more often use the term *'continuous education'*, but its essence is the same. It does not matter whether it is formal or informal training, but information literacy is an essential part of this process. That is why research libraries gain new users from the local business communities recently.

Nevertheless, the development of information literacy is not the only urgent task in the course of information society construction. The concept of information literacy is a part of the broader notion of information culture. A significant component of the information culture is axiology, i.e. value component. Without this, even the developed information infrastructure and skills mark a

quasi-information society only. In our opinion, the values of the mature information society include:

- Freedom of expression of one's opinion using multiple channels of communication;
- Drawing up an opinion based on multiple sources;
- Filtration of information content by the user;
- Protection against opportunistic behavior of information providers;
- Continuous development of the skills of information search, interpretation, creation, and dissemination.

These parameters are much more difficult to estimate by means of quantitative methods; therefore, there are no systematic studies of the formation and development of the information society values. This area of future research seems very promising.

Grounding on the experience of research library of Ural Federal University, we can observe not only changes in the library services but also changes in the service model itself. From satisfying simple information needs of users the library staff passes to work ahead of the curve. Very often we have to deal with not yet formalized a feeling of lack of something that is to be turned into a conscious need for information. In our opinion, this is exactly the *educational role of the library* in the XXI century.

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