Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 237 (2017) 804 – 810

Procedia Social and Behavioral Sciences

7th International Conference on Intercultural Education "Education, Health and ICT for a Transcultural World", EDUHEM 2016, 15-17 June 2016, Almeria, Spain

The problem of separating the notions of "knowledge" and "information" in the knowledge society and its education

Alexander O. Karpov*

Bauman Moscow State Technical University, 5, 2 Baumanskaya Street, Moscow, 105005, Russia

Abstract

The concepts of "knowledge" and "information" are key categories by which the understanding of complex processes, transforming contemporary society,occurs.The article deals with the problem of separation of these concepts in the context of the knowledge society formation and the formation of an education system, which should ensure its technical-technological and cultural growth.On the basis of the analysis of works by F. Znanetsky, P. Drucker, F. Machlup, Umesao, M. Porat, Y. Masuda, and a number of other authors as well as based on the analysis of social reality in the second half of the 20th century, socio-historical reasons of "knowledge" and "information" concepts confusion have been defined. The relations betweenconfusing these concepts and the formation of knowledge society concepts and information society ones are shown. A methodological approach is formulatedto the separation of the concepts of "knowledge" and "information" as different psychosocial constructors. Examplesare providedand negative effects of mixing the concepts of "knowledge" and "information" in education discussed.

Peer-review under responsibility of the organizing committee of EDUHEM 2016.

*Keywords:*knowledge; information; society; education; science.

1. Introduction

The conception of the knowledge society defines one of the dominant systems of social life. It transforms education involving the priorities of socio-cognitive growth of a person (Karpov, 2015b). In this system "science becomes increasingly the only source of additional knowledge" while knowledge positions itself as a new crucial principle of a society (Stehr, 1994).

* Corresponding author. Tel.: +7-495-267-55-52; fax: +7-495 632-20-95.
*E-mail address:*a.o.karpov@gmail.com

Peer-review under responsibility of the organizing committee of EDUHEM 2016.
doi:10.1016/j.sbspro.2017.02.152

Just because scientific knowledge plays a determining role in the socio-economic development of modern society, separation of the concept of “knowledge” from other phenomena, which can be expressed by a sign, and primarily from the notion of “information”, is a necessary condition for the authenticity of the research both of the society and its education. This is not an easy task, but it needs to be addressed. Attempts to determine the differences at a structure level, at systematic or abstract levels, as it is often done, are unlikely to be successful because information cannot be structureless; its major part is systematically arranged, and such an absolutely information object as a media message today can carry an arbitrarily large amount of abstract contents.

In a specialized discourse, there coexist contradictory sets of views correlating knowledge with information. Thus, for example, Porat (1978) takes knowledge as a specific type of information. Knowledge as the top form of information is defined in the “Approximate curriculum of "Informatics" discipline”, approved by RF Ministry of education (2000). At the same time, there exist contrary opinions. The UNESCO report “Towards knowledge societies” states, “Information remains a fixed stabilized form of knowledge” (2005). Machlup (1972) believes that “all information in the ordinary sense of the word is knowledge, though not all knowledge may be called information”. Behmann (2010) actually equates the information society to the knowledge society. He writes, “society is characterized as informational if its basic conditions of reproduction depend on scientific knowledge”.

In this article, I will propose my approach to the analysis of the problem in question.

2. Objectives, methodology and research outline

The purpose of the study is to identify socio-historical reasons of confusion of the notions “knowledge” and “information” in the context of the knowledge society and information society theories formation, to formulate a methodological approach to the separation of the terms “knowledge” and “information” as different psychosocial constructs, to show the consequences of these concepts confusion in education.

The research methodology has been built in line with cultural and historical epistemology. The following methodological tools have been used: the comparative analysis of primary sources, the structural-functional analysis of social actions, and the psychosocial analysis of phenomenology of cognition.

3. Discussion of the research outcomes

3.1. The origin of theories and reality of the knowledge society and the information society

As I showed (Karpov, 2015a), the starting point for the analysis of the knowledge society is the decade of the 1940s, and a set of works very fully identifying the knowledge society had been accumulated by 1968, i.e. by the time when the theory of the information society and its reality only began to come out.

Theoretical development of the new industrialism idea resulting in the emergence ofthe concept of the knowledge society begins in the early 1940s. Znaniecki (1986) in 1940 sums up the great era of the man of knowledge and identifies the borderline at which socio-economic processes that generate the worker of knowledge begin to manifest themselves. Drucker in his research programme (1940-1968) is developing the fundamentals of the knowledge society theory. He introduces the whole system of basic notions that make up the core of the knowledge society paradigm, among them “knowledge work/job” (1957), “knowledge worker” (1962), “knowledge society” (1968), “knowledge economy” (1968). Machlup (1972) in his work published in 1962 introduces the concept of “knowledge industry” and investigates it.

Drucker (1969) writes that since the Second World war, “there actually has began the shift to the work of knowledge and to the knowledge industry”, which affected the fields of activities like metal working, shipbuilding, construction, management, medicine, etc. The events that had crucially influenced the forthcoming of a knowledge worker became the G.I. Bill of Rights (1944) and the emergence of venture capital firms in America (1946) that created a new economic reality.

Drucker distinguishes the knowledge worker from the brainworker. For example, he uses the term “mind work” when he is talking about mental work rather than “knowledge work” that characterizes the work of the knowledge

worker. The knowledge worker had created modern agricultural production, which became a science industry. The knowledge worker had forced the labor out into manufacturing industry, service industries, and information and knowledge sectors of economy. Knowledge workers are engineers, computer experts, teachers, medical technicians, highly skilled agricultural workers, aircraft technicians, etc. Thus, according to Drucker, the knowledge worker is by no means a brainworker. But "knowledge eliminates neither work nor skill".

Following the sense that had been put into the concept of the "knowledge worker" by Drucker and the reality ofmodern society, I believe that the knowledge worker takes advantage of using both the mental and mixed (mental-physical) forms of work. My definition of the "knowledge worker" relies on a qualitative criterion for the form of his work, namely, the functionally dominant role of joint work of thinking with knowledge in the process of work rather than the absence of physical work, technical involvement in the process of translating a sign or the level of formal education. The knowledge worker can produce both material and non-material products, but the basis of their production is the work with knowledge.

The underlying social structures of the knowledge society begin to form in the nearest postwar period. Among them,there is a new system of division of labor that came together with the knowledge workeras well as what Drucker (1996) noted already in the year 1957 - an innovative system that includes science, pluralistic society of organizations and the societythat relies on education in its development.

The overall growth of sign production (printed matter, TV, cinematography, broadcasting) and its new social role as an information sector of economy become appreciable only in the early 1960s. During this period, in Japan, there appear the first theories in the field of the information society, which is much later than the time of creating basic concepts of the knowledge society theory. The term "information industry" belongs to Umesao (Umesao, 1963) while the term "information society" to Igarashi (Igarashi, 1964; Karpov, 2015a). The first appearance of the term "information society" in the English language wasnoted only in 1970 (Duff, 2013), i.e., after the release of the fundamental papers by Drucker and F. Machlup.

The technical and technological basis of the information society, as was anticipated in the first publications, should have been drawn upby a computer system. By the year 1966,only about 30 thousand computershad been produced; most of them vacuum tubeand transistor computers. The 3-rd generation computer that uses integrated circuits appeared only in 1965 (Masuda, 1983). At the turn of the 1970s, computers only began to provide the appreciable economic efficiency. IBM Corporationmanufactured about 1,000 computers per month. However, technical resources and knowledge to build an effective information system were still lacking (Drucker, 1969).

As noted by Masuda (1983), the process of forming a society based on computerization (society-based computerization) began only in the 1970s. During that period, the computer was being connected with communication schemes in companies and on the regional-national level. By the year 1972, the American national information networkhad been established. However, even in the 1980s the information industry was stillat the stage of formation.

In 1975 Porat (1978) writes that industrial society is becomingthe information society: the computer export from the United States exceeded 2.2 billion dollars. However, the emergence of the information society is estimated by Porat as the growth factor in the production of knowledge, i.e., asthe development of the knowledge society. In 1980, Masuda makes his forecast in the same vein (Masuda, 1983). He suggests that at the more advanced stage of the information society progress, tentatively by the end of the first decade of the 21st century, we should expect the emergence of the high mass knowledge creation society, i.e. a highly developed knowledge society.

Therefore, we should make a conclusion that thehistorical development of theknowledge society theory and its reality is more than 50 years old, whereas the information society in its technical-technological development manifests itself only at the end of the 20th century.

3.2. The year 1962: Confusion ofthe notions of "knowledge" and "information"

The year 1962can be consideredthe beginning of confusion of ideas about "knowledge" and "information" in the socio-philosophical discourse in relation to the theories of the new society. That year the pioneer work by Machlup "The Production and Distribution of Knowledge in the United States" (1972) was published, the main task of which

was “to develop the conceptual framework for an analysis of knowledge-production”. According to the information provided by Machlup later (2014), the bulk of his research paper was initiated in the mid-1950s. Umesao (Comment on the paper Umesao, 1991) notes that he waswriting his work “Information Industry Theory: Dawn of the Coming Era of the Ectodermal Industry” late in the year 1962 to publish it in the January issue of “Asahi Hoso” magazine (1963). According to Duff (2013), it is quite possible that Umesao was under the influence of the Machlup’s work. However, in the content of the “knowledge industry” notion introduced by Machlup there is at least one fundamental difference from what Umesao used to understand as the information industry. This difference is the economically productive role of knowledge, not in terms of sign production but as an independent industrial power*directly*involved in the creation of a material product.

Machlup included the following branches in the knowledge industry as an economic category: research and development, education, mass media, information machines, information services. Education, both secondary and higher, is the largest area of knowledge industry, notes Machlup (1972) (the biggest part of the book,Chapter IV,is devoted to education). “…The allocation of resources to education and to research and development is an important economic variable which can significantly alter the rate of increase of knowledge, both basic and applied”.

Machlup insists on the need to apply the term “knowledge” rather than “information” to characterize the new social status; he writes, «it is more desirable to use, *whenever possible*, the word “knowledge” the ordinary meaning of “information”». He will stick to this point for life, up to his last multivolume work “Knowledge: Its Creation, Distribution, and Economic Significance” (1981-1984). Machlup uses the word “information” only in its subsidiary meaning. For example, he uses the phrase “production of information” to name the creation of reports, messages, instructions, orders, and he characterizes specialized structures of commercial firms as information-producing departments.

Umesao (1991), on the contrary, uses the word “information” to designate “everything that is transmitted by means of signs”. He uses the broad understanding of the word “information” as “the whole system of signs that are passed on from person to person”. The information industry, according to Umesao, is “the branch of industry that offers any information in an organized way”. This includes broadcasting, cinematography, newspapers, magazines, informationagencies, theatricals and shows, tourist offices, bookmakers’ offices, industrial espionage, etc. Umesao sees the modern (post-war) era as the era of mass media growth and in this sense he calls it the era of the information industry.

Umesao identifies education and religion as the predecessors of the information industry, whichhave been engaged in the professional selling of information and which today make up a part of it. There existgeneral professional characteristics of those who are involved in the information industry, like “masters in dealing with signs” or “experts in sign technology”. The information industry is the industry of non-material things; “it is a virtual industryand it cannot be referred to reality. And, generally, it just cannot be an industry”.

In Umesao’s conception, technology plays a crucial role in the development of information industries. He says, «the information industry has finally got restructured itself along the lines of “industrialization”», and “in the first place, due to press, radio waves and so on”. However, the information processing technology using automated counting machines is in an extremely immature stage, but it can give it a “wonderful development”. “It is the development of electronics and the theory of automatic systems that will create the technological base of the information industry”, he says.

Umesao inscribes the era of information industry into industrial stages of civilization development. To designate them, he uses metaphors from the conceptual dictionary of embryology. Endodermal industry corresponds to the agrarian era; it serves to satisfy the requirements of digestive organs. In industrial era, the work of human hands and feet is being replaced, i.e. theextension of muscular system functions takes place; this corresponds to the metaphor ofmesodermal industry. Umesao considers the development of information industry as the dawn of the coming era of ectodermal industry. The central challenge that symbolizes this era is the extension of functions of the brain and sense organs.

In the era of information industry, which is the main axis of ectodermal industry, Umesao argues, *spiritual* industrialization will occur, and its attributes are quite appreciable today. Unfortunately, his romantic predictions failed to materialize. Propaganda, pornography, yellow press, comics, computer games, etc., i.e. the overwhelming

majority of information industry today serve to oust spiritualityfrom people.

The works written by Machlup and Umesao are two historically central narratives that are near the origins of the knowledge societyand information society theories. They both analyze a subject matter, which representa significant *common* part of social institutions: education, science, computer sector. However, the product of these social institutions' activitiesis identifiedin these works differently, they use different terms: "knowledge" and "information". The reason is that the first narrative speaks of knowledge production systems while the second speaks of sign translation systems. Machlup's conception should be related to the paradigm of the knowledge society, not because he uses the term "knowledge" instead of the word "information" whenever possible, but because his socio-economic model focuses on the productive function of knowledge associating it with the "increase in productivity and thus with the rate of economic growth" (Machlup, 1972). Information as the agent of the sign translation system, being just a message, of course, does not possess such a function.

Is it possible from the viewpoint of social-humanitarian science to use productively the category of "system of signs" (or "information"), which includes such totally different in their social functions objects like road signs, love letters, price tags, literary works, parking fines, legal acts, etc.? To my opinion, it seems very problematic. Umesao (1991) unwittingly suggests a criterion separating the information as such from other sign systems. He says that information from the point of view of values exists "until you hear it, but heard once –this is the end". It is obvious that this characteristic defines the sign systems of a news type (messages). Narrative masterpieces, drama plots and theatricals, featurefilms and documentaries, paintings, scientific monographs, textbooks, etc. do not correspond to this characteristic. People repeatedly address these collections of signsthroughout their lives. Thus, this criterion indicatesthe non-authenticity of involvement in the information industry of all that operates with signs or produces them.

Today, in the second decade of the 21st century, we can say that the knowledge industry, in contrast to the information industry (the industryof messages) has been genetically incorporated into the manufacture of things. It has not only become a part of industry, but on the contrary, it has incorporated industry in itself. It is far from being "imaginary", as Umesao characterized the information industry; it is a fundamental basis of the real sector of economics. The knowledge worker is a person who creates the increasing part of objects of the contemporary world from knowledge and matter, who materializesknowledge in technologies, methods of industrial engineering, in social order. He differs significantly from many information workers playing the role of someone else's opinion translators.

3.3. Methodological approach to the separation of the "knowledge" and "information" concepts

Definition of knowledge through a sign causes difficulties when analyzing knowledge as a producing force of modern society because a sign, taken by itself, cannot produce anything.

My position is as follows: knowledge is not information and the definition of knowledge cannot be deduced from information, while information is not knowledge and it is not able to become knowledge (although information can *contribute* to the creation of knowledge).Knowledge and information are not specific types of each other. Knowledge and information *are expressed* through the sign, but it does not mean that each of them is a sign or is the same as the other.

Using de Saussure's words (2015), the sign, being a combination of sense and image that are equallypsychic, serves for expressing something, including expressing something created bythinking. Novels, political acts, technical structures, recommendations forwomen of fashionare expressed through the sign. However, they are still present outside the sign. Information speaks about them, knowledge provide existence for them. But this does not mean that they are knowledge or information.

Information is the expression of the impact of the external onthe internal. A broken string, heart pain, stifling air and tears of farewell "turn into" information. Information is included in the perception of an action so that it *witnesses* about it. Knowledge grows fromthe mentally internal and as the mentally internal. This internal is also knowledge, but most of all it is just thinking thatforms both the knowledge and itself. Knowledge is the expression of the internal'sinfluence on the external. Knowledge createsboth music and medicine that saves life; it destroys the

environment and produces instruments of murder. Knowledge is included in the formation of an action so that it lies at its heart and defines it. At the same time, the existence of knowledge and information presupposes each other. Information triggers the process of knowledge growth and knowledge underlies perception of information.

The expression “work with knowledge” and its derivationsshould be understoodambiguously: either as the effect of thinking on its own knowledge or its effect on the external forms of knowledge expression – its mediators. The second option is characteristic of the knowledge worker.

Scientific knowledge is the knowledge that has been obtained as a result of science activities; this scientific knowledge being codified in scientific sources, circulating in research teams and being included in the content of science education (education, which uses methods of science in educational cognition). The most well-known properties of what information lacks but knowledge possesses areitsactive character and the ability to generate a new knowledge. This is what determines the analysis of society as the knowledge society.

3.4. Negative consequences in education

The confusion ofthe concepts of “knowledge” and “information” produces an acute psychosocial contradiction. This is the contradiction between the internal (sensible) and the external (superficial) understanding, between an independent and socially programmed thinking.

Drucker (1969) mixes the concepts of “knowledge” and “information” in some places. Trying to emphasize the active nature of knowledge, he says that the contents of a book «is only “information”, if not mere “data”. Only when a man applies the information to do something, does it become knowledge». When analyzing processes of learning, Drucker defines arithmetic, history, language, musical notes as information, Porat (1978) ascribes teachers to information workers (the category of “knowledge distributors”), bringing them into line with office workers, accountants and telephone operators.

Today we see *how*the confusion between the concepts of “information” and “knowledge” makes legitimate the changes in the lives of people, in economy and social structure at the behest of officials or on the basis of the preconceived expert opinion rather than of scientific research of a problem situation (Karpov, 2013).

In education, knowledge defined as information acquires the status of temporary acquisition, which isby no means necessary for life and work. When literature and history in school become information only,the spiritual bases of learning, public spirit and sense of belonging to one’s people and countryare precluded. The information of the school type (including the information from the “teaching” Internet), in contrast to knowledge, is susceptible to rapid decay, because mentally it is not integrated into thinking activities. Then the action, being always stipulated by knowledge, becomes impossible. Such a “knowledge” eliminates possibilities of not only the knowledge worker but also of the knowledge society as such; and education educates bunglers rather than justamateurs (Karpov, 2010).

4. Conclusion

The concepts of “knowledge” and “information” are key categories by which we understand complex processes transforming contemporary societies. Separation of the concepts of “knowledge” and “information” in the socio-humanitarian, administrative and political discourses is a fundamental prerequisite for the authenticity of social action. For education, this separation plays a fundamental role, since the prerequisiteof the knowledge worker education is the cultivation of thinking, which could operate with complex structures of scientific knowledge. Scientific knowledge and cognition, rather than speculation, rumors, opinions and superficial judgements that are an integral part of the notion of “information”, give us the opportunity to hope that the development of the knowledge society will increase.

Acknowledgements

The author would like to thank the Ministry of Education and Science of the Russian Federation for the grant support of the study completed. The results published in the article have been obtained in the framework of the implementation of the State order project (grant No. 27.1560.2014).

References

Bekhman, G. (2010). Obschestvoznaniya – transformatsiyasovremennykhobschestv [The knowledge society – Transformation of contemporary societies]. *Kontseptsiya "obschestvaznaniya" v sovremennoisotsial'noiteorii* [*The concept of the "knowledge society" in contemporary social theory*], 39-65.

Drucker, P. F. (1969). *The Age of Discontinuity: Guidelines to our Changing Society*. London: Heinemann.

Drucker, P. F. (1996). *Landmarks of Tomorrow.A Report on the New "Post-Modern" World*. New York: Harper.

Duff, A. S. (2013). *Information Society Studies*. Abingdon: Routledge.

Karpov, A. O. (2010). Knowledge Society: A Weak Link. *Herald of the Russian Academy of Sciences*, 80(4), 372-377.

Karpov, A. O. (2013). Ontologizatsia, "ontologizatsia" iobrazovanie [Ontologization, "ontologization" and education]. *Voprosy filosofii*, 9, 31-42.

Karpov, A. O. (2015a). Osnovnye teoreticheskie ponyatiya obschestvaznanii [Basic theoretical concepts of the knowledge society]. *Vestnik Rossiyskoi Akademii Nauk*, 85(9), 812-820.

Karpov, A. O. (2015b). Formation of the Modern Concept of Research Education: from New Age to a Knowledge Society. *Procedia – Social and Behavioral Sciences*, 214, 439-447.

Machlup, F. (1972). *The Production and Distribution of Knowledge in the United States*. Princeton: Princeton University Press.

Machlup, F. (2014). *Knowledge: Its Creation, Distribution and Economic Significance*. Vol. I*:* Knowledge and Knowledge Production. Princeton: Princeton University Press.

Masuda, Y. (1983). *The Information Society as Post-Industrial Society*. Washington: World Future Society.

Porat, M. U. (1978). Global Implications of the Information Society. *Journal of Communication*, 28(1), 70–80.

Primernaya programma distsipliny "Informatika" [*Approximate curriculum of the "Informatics" discipline*]. (2000). Ministerstvo obrazovaniya Rossiiskoy Federatsii [Ministry of Education of the Russian Federation]. Moscow.

Saussure, F. de. (2015). *Course in General Linguistics*. London: Forgotten Books.

Stehr, N. (1994). *Knowledge Societies*. London: SAGE.

Towards knowledge societies. UNESCO world report. (2005). Paris: UNESCO Publishing.

Umesao, T. (1991). Jōhō sangyōron–kitarubekigaihaiyō sangyō jiidai no yoake. *Jōhō to bunmei.UmesaoTadaochosakushū* [Information Industry Theory: Dawn of the Coming Era of the Ectodermal Industry. *Information and Civilization.Collected works of TadaoUmesao*. Translated from the Japanese by N.G. Rumak], 14, 24-42.

Znaniecki, F. (1986). *The Social Role of the Man of Knowledge*. New Brunswick and Oxford: Transaction Publishers.