

Channels of Knowledge Diffusion*

Mikhail B. Oseledchik

National Research University of Technology
Bauman Moscow State Technical University (BMSTU)
Moscow, Russia
E-mail: balu13@yandex.ru

Marina L. Ivleva

Peoples' Friendship University of Russia
Moscow, Russia
E-mail: ivleva-ml@rudn.ru

Vitali Y. Ivlev

National Research University of Technology
Bauman Moscow State Technical University (BMSTU)
Moscow, Russia
E-mail: vitalijivlev@yandex.ru

Abstract—This paper discusses the knowledge diffusion channels that are basic characteristics of knowledge as a nonequilibrium dynamic system. The knowledge management system role is considered as a way to turn an organization into an environment for knowledge generation through the diffusion of knowledge.

Keywords—*knowledge diffusion; knowledge management; cognitive medium; knowledge generation environment; knowledge as a nonequilibrium dynamic system; mechanism of knowledge diffusion; channels of knowledge diffusion*

I. INTRODUCTION

Recently, a great number of new concepts that describe knowledge transfer and diffusion processes have appeared in the epistemological literature. One of these concepts was the concept of "knowledge diffusion".

"...Knowledge diffusion is distribution of knowledge within the company and ensuring access to it in a form acceptable to the company employees ..." [1].

I.A. Nikitina and N.A. Lavrinenko give the following definition of this concept: "By the diffusion (from the Latin word diffusion — distribution, spreading) of knowledge in this paper we mean the process by which the knowledge accumulated by one company division is transferred to another division thus leading to an improvement in the latter's work by increasing efficiency or the appearance of any other added value" [2].

In this paper we want to expound in more detail this concept content and raise the question of the practical implementation of the phenomenon described by this concept in real knowledge management.

II. THE CONCEPT OF KNOWLEDGE DIFFUSION

Initially, the concept of "diffusion" was used in natural sciences, primarily in physics and chemistry. Diffusion is a physical phenomenon that comprises interpenetration of particles (molecules, atoms) of two or more substances up to a uniform distribution over the entire volume occupied by these substances. It is important to note that a new substance is not formed.

A simple diffusion is a movement of particles from a higher concentration region to a lower concentration region due to chaotic Brownian motion of the particles.

Diffusion can occur in a closed volume, for example, in an ampule, and in a semi-closed volume, for example, in a box, and finally in an open volume, for example in the natural environment.

The characteristics of diffusion as a physical phenomenon with a certain degree of conditionality can be transferred to the phenomenon of knowledge diffusion, which can be both visible and hidden.

What is knowledge? This is the question that all modern science tries to answer. The complete answer still does not exist, but there are certain characteristics and properties of knowledge that we can quite accurately formulate.

First of all, knowledge is a certain entity, an obtained fact. Knowledge is a set of information in various areas.

Knowledge is very complex system acting in the form of social memory transmitted between generations and nations through the mechanism of social inheritance and culture [3].

An acquisition of knowledge occurs due to the social-historical experience absorption during the social life, as well as due to the categorical way of thinking, language, social knowledge system development, that are enshrined in objects of material and spiritual culture.

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For our research, it is of crucial significance that knowledge is a nonequilibrium dynamic system [4]. Knowledge is always an open self-organizing heterogeneous system for exchanging information with the environment.

Firstly, knowledge is always a dynamic unity of different but united into intrinsic system cognitive elements. Due to this fact, any change of individual components of this system inherently causes first of all change of a certain cluster of the system following by the whole system change.

Secondly, thorough analysis of knowledge content demonstrates that it should definitely include rational and irrational elements, hidden and explicit knowledge, probabilistic and certain elements, intuitive theories and logical proofs [5].

Thirdly, any individual continuously exchanges information with other individuals, knowledge databases and coding sources during communication process. At the same time when individual knowledge of a person increases, the whole community knowledge is enriched simultaneously, since both a knowledge carrier and a user when receiving new knowledge give a new meaning to it due to their personal cognitive and psychological characteristics and already possessed knowledge, skills and abilities. In its turn this new meaning starts to generate new original knowledge thus often destroying the old one.

Fourthly, knowledge in principle is a combination of assertive (positive), negative and hypothetic components and it changes continuously, practically at every moment of time due to creative activity of its carriers and users and external influence from practical activities of the whole community. As such knowledge acquires new elements through confirmation of its hypothetical components, revaluation and rejection of assertive components that become obsolete and erroneous, by increasing the number of negative components. This means that within the knowledge there are multidirectional processes of confirming and testing probabilistic knowledge as well as building new positive knowledge together with refutation and destruction of old knowledge.

Fifthly, it has long been born in mind that knowledge of any carrier and user (person, group, organization, society) is always systematic and integral, but at the same time is included in higher order system (knowledge of a person is a fragment of the knowledge of organization and society in general, manual or guidance is a part of organization knowledge and so on. At the same time both carrier and user knowledge are fragments of universal human knowledge and culture in general [6]).

Sixthly, it is obvious even with the most superficial approach, that knowledge is distributed between carriers and users very unevenly. Some individuals have more knowledge and more effective ways of understanding and interpretation as well as practical application of this knowledge than others. This happens due to a number of objective and subjective psychological, intellectual and social reasons. This fact underlies the inevitability of educational, knowledge distribution (informing) and reconfiguration processes in any

society and its sub-systems. During communication knowledge is inevitably transferred from one individual to another or to a group of other individuals, regardless of the awareness of these processes, desire and will of the society members, a kind cognitive diffusion, elements and sets of knowledge interpenetration process occurs.

Hence, trainers, i.e. people with knowledge of considerable quantity and quality, appear quite naturally. Such trainers are able to transfer the mentioned knowledge to other individuals — trainees. Due to the uneven distribution of knowledge sets, that are different in their content and subject area, between carriers during communication, trainers and informers, from one side, and trainees and informed from the other side, are quite often change their roles and social functions, and, as a consequence they change their places during knowledge distribution and not even realize it. In other words, all individuals depending on the context, circumstances and tasks of the communication in each particular case play roles of trainers and trainees, as well as informers and those who informed simultaneously. In this context, knowledge existing constantly in two guises, as a personal knowledge and as a social knowledge, possesses independent activity, since any message received during communication is decoded and assimilated by the knowledge subject fully or partially and affects the entire personal knowledge system [7].

Seventhly, knowledge automatically reacts on the influence of the external medium, either by resisting or by adopting via its internal reorganization.

Eighthly, new knowledge almost always plays a role of destabilizing factor that moves the system out of balance and thus brings it to the self-organizing processes – evolutionary changes of the system.

Ninthly, knowledge possesses systems of accumulation, storage, transfer and using of information (by means of its coding and writing to various medias) from the moment of the writing systems generation in its any form. At the same time, it is necessary to note that all the objects of material culture besides their direct practical functions has additional knowledge coding and saving function that was the basis for their idea and purpose of their development and basically their creation as objectification of this knowledge.

Tenthly, knowledge evolutionizes thus complicating its structural-functional organization. Upon that bifurcations can occur, that leads to unpredictability of the way and methods of knowledge development in its all diversity of forms and historical states [9].

In other words, we can argue that open system of knowledge couldn't be balanced, as its operation needs continuous inflow of new information from the environment, which results in increase of system misbalance. As a result, previous interconnections between system elements, i.e. its former structure, destroys, new interconnections between elements are formed and number of new elements rises sharply. Consequently, irreversible processes, such as knowledge destroy and loss as well as knowledge reconfiguration and increment, take place inside this system.

Self-organization process is always peculiar to such a system. Evolution of complex nonequilibrium systems is considered as a process of self-organization within them. Self-organization means the formation of a certain ordered structure in the system without external organizing influence. This process is non-linear, knowledge development is ambiguous, multivariate, and their development rate is constantly changing.

Knowledge is fraught with inner psychological desire for transfer. Everyone knows that in the vast majority of cases a person who knows somethings that others do not sincere craves to transfer his knowledge. In its turn those, who are aware of a certain gap, a certain lack in their current knowledge do everything to obtain the missing knowledge and fill this gap. This fact is the basis for a cognitive activity of the knower by means of satisfying his cognitive interest and aspiration of a researcher for the truth [10].

The reason of it is quite obvious: knowledge is always systematic, but knowledge system is always non-equilibrium and dynamic, i.e. tendency towards equilibrium and completeness is inherent for knowledge system.

Diffusion is one of the mechanisms for achieving equilibrium and equal distribution of knowledge within a certain society or its part.

Thus, the ability to diffusion is one of the of knowledge basic essential features. Knowledge naturally could not remain the property of a single individual. With the rare exceptions knowledge – both explicit and implicit – transfers from one individual to another via various channels which can be both verbal and non-verbal.

III. CHANNELS OF KNOWLEDGE DIFFUSION

In our study, we consider the channels of knowledge diffusion that could be used for purely pragmatic reasons: to increase the effectiveness of the knowledge management system.

A considerable attention in related papers is paid to a so-called cultural diffusion, which means the process whereby cultural traits spread from one society to another. Cultural diffusion allows cultural heritage to improve. Mixing of world cultures occurs through ethnic groups, religions and nationalities.

There are many types of cultural diffusion: the diffusion of technology, economic diffusion and diffusion of knowledge.

Currently the scope of knowledge in society always exceeds the scope of knowledge and skills belonging to an individual. The mechanism of knowledge diffusion bases exactly on the phenomenon of components transfer from a region of higher knowledge concentration to a region of lower concentration driven by the ability of knowledge components to move independently.

We want to point out one very important feature of the knowledge diffusion – its irreversibility. New knowledge acquisition and digestion by an individual makes this new

knowledge an essential part of the individual knowledge system. This new knowledge belongs to the individual forever and could be reconsidered, reconfigured and transmitted further by him.

Within the scope of society as an open system, diffusion is always uncontrollable and unpredictable. Within an organization scope as a semi-closed or closed system, diffusion could be programmed in a certain way by creating a system of convenient and efficient channels. Diffusion of knowledge within an organization could be accelerated due to the existing knowledge management system and its motivation [11].

Thus, we assume that diffusion is demonstration of knowledge self-organization, as well as commitment of knowledge system to completeness and equilibrium.

Tasks of an organization as a social institute are its preservation as a structure that ensures a good living standards and prosperity of its members, its development, i.e. achieving of pragmatic results primarily economic success. In this regard, any organization should solve its functional tasks successfully. The organization must be competitive.

For example, a company that creates telecommunication equipment strives to become a market leader in order to increase its sales. For this the organization need to develop and produce more modern and efficient product that will be popular due to its high performance that exceeds the performance of analogous products [12], [13].

Such a company inherently needs to continuously update its fund of knowledge. It needs new knowledge about the current state of the market, new products and new manufacturing processes as well as product sales. The knowledge inflow should be highly intensive as in modern economy knowledge obsolescence speed is very high, practically much higher than company material resources. Only this allows taking an advantage of obtaining additional profit.

Such a company thus faces the challenge to accelerate new knowledge diffusion coming from outside and already existing knowledge of a company among its employees in order to strengthen and increase its human capital.

One very interesting phenomena arises at this point: a company is naturally a cognitive medium, i.e. a medium that is inhabited by knowledge that is operated due to it belongs to its carriers and inside the network that interconnects these carriers.

IV. COGNITIVE MEDIUM

I. Nonaka and N. Konno in their article “The Concept of “Ba”: Building a Foundation for Knowledge Creation”, based on the study of Japanese philosophers K. Nishida and Shimizu proposed to consider such a medium as Ba [14].

Ba is a kind of a common place for the new relationships generation. This place could be:

Physical (office, dispersed business space);

Virtual (e-mail, teleconference);

Mental (shared experience, ideas, ideals);

Any combination of the mentioned above places.

“What differentiates ba from ordinary human interaction is the concept of knowledge creation. Ba provides a platform for advancing individual and/or collective knowledge. It is from such a platform that a transcendental perspective integrates all information needed. Ba may also be throughout of as the recognition of the self in all. According to the theory of existentialism, ba is a context which harbors meaning. Thus, we consider ba to be a shared space that serves as a foundation for knowledge creation. Knowledge is embedded in ba (in these shared spaces), where it is then acquired through one’s own experience or reflections on the experiences of others. If knowledge is separated from ba, it turns into information, which can then be communicated independently from ba. Information resides in media and networks. It is tangible. In contrast, knowledge resides in ba. It is intangible.”

The ba concept includes the following important characteristics:

- The key platform of knowledge creation is the “phenomenal” place. Such a place of knowledge can emerge in individuals, project teams, informal meetings, e-mail groups and at the front-line contact with the customers. In this context ba is a certain emerging community.
- Ba unites material, virtual and mental medias. It is a world in which individual recognizes himself as a part of the environment on the state of which his life depends. Creation of new values and knowledge occurs inside ba.
- Ba exists in many levels, that are merged into a big ba – basho. The working group is a ba for an individual, company is a ba for group, and a market environment is a ba for a company.
- When all these bas are merged into big basho, the knowledge formation process is accelerated.
- Participation in ba-medium is an involvement and possibility to expand beyond self-limited perspective, for synthesis of rationality and intuition that leads to creativity. “Within an organization, then, one can both experience transcendence in ba and yet remain analytically rational, achieving the best of both worlds.”
- Ba is the system with spatial and time boundaries within which knowledge is activated as creative resources. Knowledge is intangible, boundaryless and dynamic. It is of no value if not used in specific place and specific time. Therefore, the use of knowledge requires concentration of knowledge resources at a certain time and place.
- “Ba is the platform for the “resource concentration” of the organization’s knowledge assets and the

intellectualizing capabilities within the knowledge-creation processes. Ba collects the applied knowledge of the area and integrates it. Thus, ba can be thought of as being built from a foundation of knowledge.”

By distinguishing explicit and implicit knowledge I. Nonaka and N. Konno argue that knowledge creation is a process of interaction between explicit and implicit knowledge, and this process is spirally unfolded. This interaction leads to new knowledge creation. A combination of explicit and implicit knowledge provides four methods of knowledge transformation as a process of self-transcendence. Hence the famous model SECI (Socialization, Externalization, Combination, Internalization) appears.

Knowledge diffusion happens just inside the cognitive medium that was described in details previously. This cognitive medium is shot through with a great number of communication channels that leads to the desired effect of diffusion and appearance of relatively universal and equilibrium system of actual company knowledge.

However, certain obstacles appear on the way of effective diffusion. These obstacles are well describes in A. Ablabekova study “The role of innovation filters during the process of new knowledge diffusion” [15].

“Reduction of the effectiveness of innovation knowledge diffusion could happen due to the fact of existence of numerous innovation filters in social-economic system.”

An innovation filter is a family of social-economical terms and mechanisms that specifies rate and effectiveness of the innovations diffusion process characterized by the certain parameters. The role of an innovation filter resides in separation of a whole innovations flow into those that are detected and non-detected by the system.

A. Ablabekova identifies a market filter, an institutional filter and informational filter.

“A market filter is the expected social benefits derived from the innovations implementations expressed in national product gain in the monetary value.”

The institutional filter is the cultural, political and social characteristics of this society. If innovations are compatible with these characteristics they are introduced rapidly, and if incompatible they are introduced slowly or not introduced at all. This filter selects legitimate from the cultural point of view innovations, which conforms social security requirements.

Informational filter is an availability of information about innovation in global informational flows. It is obvious, that the more the business unit informed about the positive properties of a certain innovation, the higher his interest in its implementation. Beyond that, sophistication of information transfer channels defines availability of other information, which is necessary for the successful innovation implementation.

In our opinion, in the context of information society formation in Russia, a navigation filter could be identified as a bottleneck for innovation knowledge diffusion. A

navigation filter is a combination of technical and cultural terms that defines the integration degree of infosphere as well as the ability of rapid search of the required object in it. Available and effective navigation systems that allow scanning the whole global infosphere by a certain set of key characteristics of informational object are regarded as technical requirements. Under the cultural terms we assume informational culture of each individual user as a complex of knowledge and skills for working with informational flows.

In such a manner, as the cited author aptly notes, for acceleration and simplification of the knowledge diffusion it is necessary to minimize these filters influence.

V. CONCLUSION

For the purpose of effective work of knowledge management system, it is necessary to create the most favorable conditions for knowledge diffusion, as well as to clean and deepen its channels.

Therefore, within the organization must be:

- digital library;
- knowledge databases;
- electronic archive;
- trained personnel able to find and provide information necessary for employees, including information available in foreign language;
- well-developed basis for regular training of employees for information navigation skills;
- an encouraging system for creation of personalized individual information channels;
- a system of constant information exchange between employees; encouraging their communication.

This is exactly what allows turning an organization into an environment that generates new knowledge and makes a company competitive.

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