

Using the Fractal Nature of Knowledge to Optimize Its Transfer*

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Abstract—The fractal nature of knowledge, both explicit and implicit, is analyzed. The system of human knowledge is balanced and dynamic at each historical stage of its development. Getting a new knowledge instantly turns this system into a non-equilibrium. Thanks to the processes of self-organization, the knowledge system again reaches a temporary equilibrium and becomes a structure similar to the basic fractal of the sociocultural paradigm of society. The transfer of new knowledge should be optimized by saturating the perception of fractal elements should be facilitated through a single system of meaning formation. And for this you need to use all the abilities of human thinking and sensory perception of the world.

Keywords—knowledge; fractal; dynamic system; self-organization; knowledge transfer; paradigm

I. INTRODUCTION

The ideal model for the transfer of knowledge in the process of learning or in the process of communication (no matter in business, in science or simply in interpersonal communication) is the translation of the full volume of information units, understanding their meanings and interrelations from the source of initial knowledge to its recipient. In reality, we have a completely different picture: the recipient learns only part of the knowledge, its fragments, does not see a whole range of interconnections, does not understand the true meaning of the transmitted information, constantly sees in the received knowledge what the carrier thinks makes a bunch of additional information units and their meanings from themselves.

Anger and complaints about this are completely meaningless, since the classical models of knowledge transfer at the instinct level are built on the interpretation of translation and the assimilation of knowledge as a simple linear process.

In other words, if the carrier transmits to the addressee knowledge of the explanatory type: $A \& B \vee A \& \neg B \rightarrow C$, we hope that the recipient will learn the exact same formula

$A \& B \vee A \& \neg B \rightarrow C$. But in reality, we see that the recipient can reconfigure this formula as $D \& B \vee A \vee B \rightarrow C \vee \neg C$.

In fact, the transfer of knowledge is not a simple linear process due to the fact that the consciousness of the recipient of knowledge is not a clean board on which to rewrite the original formula.

The recipient of knowledge already has its own ready-made system of explicit and implicit knowledge, its stock of meanings, its everyday experience, level of language proficiency, level of development of the intellect and other important personal characteristics. This system at each stage of human life is balanced and dynamically developing. Consequently, obtaining new information causes an imbalance of this equilibrium, new information can turn out to be a foreign body for this established system of a person's inner world, which, frankly, most often happens.

Hence, we must initially understand that the human knowledge system is the result of the process of self-organization and lives according to non-linear laws, so that its behavior becomes often unpredictable, which becomes the source of an unexpected reconfiguration of knowledge. Then, in order to achieve the assimilation of knowledge, that is, the reproduction of the carrier's knowledge in the recipient's knowledge system in the most complete and accurate, i.e. In a similar form, we can use the interpretation of knowledge as a fractal — a self-similar structure, whose image does not depend on scale, as a recursive dynamic model, each part of which repeats in its development the development of the whole model [1].

II. FRACTAL NATURE OF KNOWLEDGE

Considering that both the carrier and the recipient of knowledge each have their own system of knowledge, and at the same time, the knowledge of each individual is a self-organizing self-similar structure due to the fact that both the carrier and the recipient of knowledge have a lot of common knowledge: a single value system, lexical semantic structure of this language, standard logic of reasoning, ways and styles of thinking, general stock of everyday knowledge, skills and abilities, sense of humor, albeit developed and learned with varying degrees, but, nevertheless, like each others because of the existence and the media, and the destination of new

*Fund: The study was carried out with the financial support of the Russian Foundation for Basic Research (RFBR) in the framework of the scientific research project ("Social knowledge: the challenges of modern technogenic civilization"). Project № 19-511-44003

knowledge within a single socio-cultural paradigm — we can say: knowledge has a fractal nature [2], [3], [4].

The knowledge of the individual is almost impossible to inventory: to list all the units, the entire content of knowledge of the subject is unrealistic because of its partial unawareness by the subject himself. The body of knowledge of the individual is enormous, but is in a collapsed, not actualized form (since the surface of the human lung is larger than a tennis court, but squeezed into a very limited volume, the same phenomenon is characteristic of the human circulatory system, and here is the favorite example of Maldenbroth about the practically endless coastline of Great Britain). Depending on the requirements of adapting to the given environmental conditions at any given time, it turns out that the subject still has some knowledge [5].

The knowledge of an individual can be systematized only partially, depending on the possibility of his principal codification, the rest of the knowledge is contained in the form of non-codified elements, in particular, in the form of practical skills and abilities, intuitions, metaphors, certain emotional images, but at the same time knowledge is closely interconnected by numerous semantic series, associative, logical and other chains, which, if necessary, allows instant updating of the necessary knowledge [6] [7].

Knowledge is dialogical: it is always a product of the internal and external dialogue of the carrier of knowledge with its addressee in the case of the transfer of knowledge and in the process of its individual rethinking. Consequently, the knowledge of the individual never remains static and balanced: there is a constant process of generation and degeneration of knowledge, his rethinking and reinterpretation, complication or primitivization as a result of the internal dialogue of the subject of knowledge [8].

Assimilation and understanding of the knowledge gained by the subject depends on the level of discipline and training of his thinking, on the general level of culture and education, on the standards of accepted logic, on the social orientation of the subject. Therefore, the depth and correctness of understanding are not the result of a linear process of knowledge consumption. We will never be able with a high degree of accuracy to perceive the knowledge of another individual due to a multitude of small circumstances that influence the way of understanding and identifying certain semantic units. At the same time, the interpretation of knowledge as a stochastic fractal allows one to be loyal to the fact that the knowledge transmitted by the carrier, consisting of {ABCDEF} elements, will be reproduced as the self-similar system {A1B1C1D1E1F1}.

The ability to reconfigure the received knowledge and its increment by the subject depends on the degree of its creativity and the measure of freedom from the usual cultural schemas in favor of the new inversion variants (in favor of the new logic and new schemas and the choice of a new method of meaning formation — this was noticed by K. Levi-Strauss [9] and V.S.Bibler [10]), therefore, it is almost impossible to calculate and predict new results and discoveries that a particular individual will make. But with a high degree of probability one can predict the possibility that

a particular subject is capable of obtaining new results and discoveries, and can also make a good career.

Knowledge is communicative: in the process of communication, it is more accurately assimilated by the individual himself, for a more effective transfer of his knowledge, the subject also reconfigures it, turning it into a more systematic, accurate and understandable recipient.

There is a continuous development of the mental abilities of the subject, the totality of his experience, which leads to a change and rethinking of the set of knowledge that he has.

In the knowledge of the subject there are erroneous elements, often the subject can use absurd ways to substantiate judgments that can give both true and false results [11].

III. THE ESSENCE OF THE KNOWLEDGE TRANSFER PROCESS AS DAMAGE FRACTAL

Consequently, the transfer of knowledge is at the beginning the process of fractal fracture, since upon receiving a new knowledge destroys the recipient's existing cognitive system and is perceived and interpreted incompletely and inaccurately by it. Then, due to the self-similarity of the cognitive systems of different individuals living and thinking in a single lexical-semantic space, the process of assembling a fractal begins: the resulting components of the new knowledge are combined into single formulas and are perceived more or less adequately and isomorphic to the original message. New knowledge of the recipient turns into a fractal of knowledge of the addressee. But then comes the most interesting and important stage: the process of reconfiguring knowledge, when, thanks to the presence of a whole set of recipients' difficult-to-understand personal attractors, knowledge begins to be reinterpreted and reinterpreted. The result of this reconfiguration is creatively enriched knowledge, often unexpected in its new content for its original carrier.

The assimilation of these new meanings of knowledge in turn entails the rebuilding of the carrier's knowledge system and its transformation into the recipient's knowledge fractal. And this, in turn, leads to the transformation of the entire cognitive paradigm that unites both the carrier and the recipient of knowledge [12].

Now you need to pay attention to another important detail. If knowledge is a self-organizing complex developing system, then the concept of "management" to it can be used only with a very large degree of conditionality: management is always making organizational changes, it turns out that we are organizing a self-organizing system. It sounds absurd.

And here we come to the most fundamental point: the difference in the transfer of knowledge in the learning process and in the process of communication.

Learning is the transfer of knowledge from a "teacher" to a "student", i.e. from the carrier of new knowledge, owning a large fragment of the general culture as an ordered semiotic field, to the addressee using a smaller fragment of the cultural space. In this case, purposeful cultivation of a

cognitive fractal takes place at the addressee in accordance with the existing cognitive fractal of the carrier of knowledge [13].

Knowledge is always an open system of information exchange with the environment: an individual exchanges information in the process of communication with other individuals, knowledge as such, being a combination of assertive, negative and hypothetical components, is constantly changing, acquiring new elements of knowledge, by confirming its hypothetical components, reassessment and rejection of assertive components acquiring obsolete and erroneous status by increasing the number of negative components. Such a system is peculiar to the process of self-organization. This process is non-linear, the development of knowledge is ambiguous, multivariate, and the pace of their development is constantly changing [14].

Using the terminology and ideology of I. Prigogine and S. N. Kurdjumov, we can consider knowledge as a dissipative system in which entropy is constantly increasing. In fact, knowledge in general is the unity of knowledge of an individual and knowledge of society, which has a codified core and a huge fundamentally non-codified peripheral content, determined by the intellectual, psychological and everyday circumstances of the individual.

The distribution of knowledge between individuals is completely uneven and asymmetric, as well as the fundamental possibilities for the growth of individual knowledge.

Consequently, the intensity of the development of knowledge of individuals and their various social groups is fundamentally different. The assimilation of general knowledge by weaker individuals and marginal social groups leads to its disorganization, since ignorance and fragmentary perception of cognitive units are characteristic of these knowledge carriers.

On the other hand, stronger individuals and their communities are faced with a constant increase in the flow of information, which blurs existing ordered structures of the organization of knowledge. Nevertheless, the general knowledge system is capable of digesting and organizing the resulting chaotic avalanches of new knowledge according to the attractor structures existing within the knowledge system (sets of the most stable formations, forms that processes in dissipative environments evolve — in particular, traditional attractors are such attractor structures knowledge development such as problem, hypothesis and theory, in the form of which new knowledge is fixed). Therefore, knowledge as a whole can be viewed as a self-sustaining, self-organizing structure. As indicated by S.N.Kurdyumov, "an ordered structure-process grows out of chaos, and chaos, in turn, leads the process to one of the structure-attractors: it generates order" [15].

In the process of communication, the transfer of knowledge goes from one equal user cultural semiotic space to another user. In this case, we are dealing with the understanding and assimilation of new knowledge as with the process of assembling a fractal.

IV. CONCLUSION

In the process of communication, not only codified, but also so-called "implicit" personal knowledge is being exchanged. Consequently, in order to optimize this process of assembling a fractal, cultural semiotic space should be as saturated as possible, and the perception of the elements of the fractal should be facilitated through a single system of meaning formation. And for this you need to use all the abilities of human thinking and sensory perception of the world. That is why it is ideal to use metaphors, analogies, stories, visual images, intuitions, musical fragments — everything that initiates the processes of perception and generation of meanings, changes the emotional state of a person, which ultimately leads to the moment of illumination - all parts of the puzzle fall into place and a moment of complete understanding of the new knowledge arises.

Consequently, there is a control problem without control. You can not manage self-organization, but you can give it additional incentives to move in the right direction. The more informal and easier the communication within the group, the more impressive the results in the accumulation and cultivation of knowledge this group achieves.

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