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**INFORMATION AND KNOWLEDGE IN HUMAN  
EVOLUTION  
(TO THE BASICS OF SOCIAL INFORMATICS)**

One of the mankind critical problems still remains the knowing its own nature, as well as the laws that determine the development trajectory of the human species in the biological history of the planet and allows, perhaps, to predict its future.

The most notable human difference, in comparison with other representatives of the animal world, is the specificity of human knowledge and information interaction with the outside world.

It seems that this fact gives a direct basis for the application of information and/or "knowledge" approach in anthropology. So far, however, in this direction aren't obtained conclusive results, possibly because of the existing methodological difficulties. We'll outline them briefly.

1. Information approach in its "classical" form obviously is less used in anthropology.

So, the most common is information interpretation, based on the Shannon's approach variations, where the information theory diminishes to the theory of communication and the last one to the mathematics. It is very difficult, in this case, to present information as an object or even a process. Likely it acts as a process characteristic and in that quality is hardly embedded in the reasoning, which requires the understanding of the information nature within any attribute, function, or any other approaches.

In fact, the classical information theory key concept of entropy in a wide range of biology contexts is understood not as mathematical but as a physical concept, and then living matter emerges as the eternal "combat" with this physical entropy. Such understanding of the living matter is not an explanatory one, but

still widely spread. Of course, all facts relevant to the information paradigm in biology extend to the human science.

The information approach content in anthropology depends on the science or a scientific discipline scope of its application. It is logical to consider computer science as a natural foundation for the development of the information approach methodology. However, information science is less concerned with the search for its essence explanation and is understood more as the science about automated data processing. Therefore, if we use the methodological arsenal of information science for the information approach implementation, still the classical approach remains the most used tool, which has accumulated a surprising data amount about the information, but almost nothing about its nature. Once we had to quote the data about the amount of information in the human body in bits, but now it is clear that such calculations have no foundation.

The situation is complicated by the fact that the concept of information is also the key concept for information science and cybernetics in the context of which it acquires a specific meaning.

2. The concepts of "knowledge" and "information" can be used, depending on the research context, as synonyms, and, as shown in [1], can be associated with the principle of complementarity – something like the relationship between the electron-wave and the electron-corpuscle. In this sense, knowledge is the object, and the information is a process. The relationship between knowledge and information is not trivial and, according to Y.A. Schreider, is the subject of information science. The thesaurus concept is common to them, embodying knowledge and information in a common form - a set of elements that express the meaning and semantic relations between them. Thus, the thesaurus is a non-classical object of science and it also simplifies the pattern of information concepts in anthropology...

3. A common point of view is that human knows more and better process information than any other species.

But do humans process the information at an inaccessible level to all other species? “Stanley Coren – a well-known specialist in the behavior and intelligence of dogs – says that dogs get and process quite comparable to the human amount of information. But if the human gets most of the information through vision, dogs get it in the form of smells. In fact, a *dog has more than 220 million olfactory receptors* in its nose (bloodhound 300 million), while *humans have only 5 million*” [2]. The humans, “released” in nature, will surely give up their informational advantages over the other species. Even though, the human has more knowledge with its thesaurus as a set of distinguishable reactions to external stimuli. And perhaps in this regard, it is argued that thanks to the knowledge human has occupied a dominant position in the world. But if N. Wiener understood the intelligence (the ability of knowledge creation) as a tool for survival, G. Bateson drew attention to the fact that it is “a tool of immediate action”. If we assume that the knowledge is a tool of survival, it is quite possible that the human will not look really good on the background of the turtles or ants, which have a much longer history than instantly-reckless “reign” of humanity, and, perhaps, higher chances to stay after the humanity will be (self)eliminated from the scene. In any case, the entire cumulative intelligence of mankind does not guarantee it at least a couple of hundred years of reliable survival. From this point of view, the intellect of the turtles or ants (even “built-in hardware part”) is arranged more providently, more perfectly.

Can a major role be given to the factor, which gives no reason for the cheerful predictions, or, rather, doesn't prove the species advantage of the mankind? It is well known that “knowledge increases the sorrow”. Therefore, the very assertion that human knows more than other species can be questioned. He, rather, “knows”, reflect the world another way. Another, but not better! So, the branch of evolution associated with the increase of the species thesaurus is the only one possible, even though the

humans consider themselves as the crown of nature (a belief, not knowledge allows them that).

Such considerations methodologically complicate the application of the information approach in anthropology. Then, it is possible to avoid awkward questions about the true role of knowledge in the evolution of mankind (after all, the Lord drove the man from Paradise because of it!) in the assumption that information and cognitive abilities were not the main factors of evolution, but rather its result.

As to the basic factor, it is traditionally formulated in the economic context and economic terms. Moreover, economic thinking - as the theoretical thinking - much older than the information, it is familiar to the vast majority of researchers engaged in the human studies.

In the XIX century, there were two fundamental ideas, on which, in essence, are based modern notions of mankind: Darwin's evolutionary idea of human origins and Marx's ideas of the role of labor in this evolution. Indeed, in explaining the human nature as a biological species a key characteristic, factor was considered the transition to a conscious transformation of the world - to labor. This thesis has already received the exhaustive discussion from the standpoint of economic approach and hence was developed in the anthropological, social, and other interpretations of the beginning. The system of views on the reasons and logic for the evolution of mankind created by K. Marx and other prominent economists proved to be extremely influential and viable. At the same time in the frames of economic concepts, there is no answer to the fundamental question: why human started to work?

Two "inconvenient" questions blur the seemingly clear differences between human and other species. First: "Yes, human works, but so do the other species". So, it is possible to object the famous remark of F. Engels that "the labor has created man himself": Why other species do not work, for example, termites or beavers? Is labor the exclusive "property" of the mankind?

Concerning this Marx wrote: “We pre-suppose labor in a form that stamps it as exclusively human. A spider conducts operations that resemble those of a weaver, and a bee puts to shame many an architect in the construction of her cells. But what distinguishes the worst architect from the best of bees is this, that the architect raises his structure in imagination before he erects it in reality. At the end of every labor-process, we get a result that already existed in the imagination of the laborer at its commencement. (Marx C. Capital, vol. I - Marx C., Engels F. Manuscripts, vol.32, p.189).

For a long time, this explanation seemed quite convincing, assuming that the representation of the bee the cells do not exist. Most likely, it is so. But from point of view of our century, already armed with cybernetics, it is clear that the behavior of the system can be implemented as hardware and software. The algorithm can be “wired” into the physical design of the system and can be brought in from outside. In general, the difference between *hard* and *soft* is, perhaps, the subject of philosophic discussion, in other words, it is difficult to discover it by formal methods (because of the fragility of the possible principles of formalization!). Due to the fact that bee’s algorithm is built into her body (or genetic program, that maybe is the same), and the human is “described” as an external, introduced program (not inborn), the difference between them does not seem too fundamental. In other words, the difference between human and bee still need to be explained and so the whole logical superstructure, leading to the production.

The explanation lies in the context of the answer to the second question: why humans *started* to work? Or, in a somewhat different wording, *how did this happen?*

Paradoxically, but these questions turn “economic” context of the evolution into “information”.

First of all, there are two types of natural selection in nature: stabilizing and adaptive. The stabilizing selection is effective for the permanent environment and its historical

“vocation” is to bring the species’ physiology to these permanent conditions as precisely as possible. Adaptive selection is a type of selection “demanded” by the impermanent, changing environment. But even in this environment the organism may be able “to ignore” the changes in the environment, or may react to these changes, responding to them by the active change of their own physiology, or on a more general level of their behavior.

**The primeval man, obviously, “chose” the second path.**

What property of the primeval man on this path has led to the emergence and the development of the “human” branch of evolution? Of course, such a property was based on relevant physicochemical properties and the processes occurring in the body and, most importantly, in the human brain. But in the information aspect, it meant the ability of a population to increase its thesaurus, that is, to increase the amount of the reflected by the body events and relationships surrounding the world and used in life. We can assume that in the biological aspect the higher lability of the brain became the relevant feature, as well as its ability to react to the environmental changes in comparison with those species that were contemporaries of a human ancestor in that time.

This ability obviously was determined not only by common for the species phenomenon of mutations at the genetic level, but also by so-called epigenetic factor. “In recent decades, – says A. P. Ogurtsov, – the diverse models of evolution that are associated with the new principles and interpretations of biological evolution, and cognitive evolution are built. If the old biological theory of evolution rejected the inheritance of acquired characteristics, currently in sociobiology arose the theories of gene-cultural coevolution by fixation of possible subsequent “secondary” coding of genetic information in accordance with epigenetic rules” [3].

The latter can be called random changes at the level of the whole biological organism (e.g., intracellular or intercellular

level) occurring outside of the DNA. “Good” changes of this kind were fixed by natural selection. For example, random “folding” of the brain cortex – purely physical characteristic – is undoubtedly facilitated the contacts between nerve cells. And this clearly facilitated the establishment of links between recorded brain objects and phenomena of the surrounding world.

Physics and chemistry of the brain, especially in conjunction with epigenetic factors in the primeval man led to an exceptional variability of his organism, created a situation where, in terms of cybernetics, the organism was able to answer a variety of environmental conditions by a variety of behavior.

The “information systems” asset of human (as a generalizing concept for the brain, nervous system, all the ways of irritation perception) was the ability to reflect rarely repeated events (a kind of “statistical sensitivity”) and not very close in nature (time, space, the results of contact with them) or in the sense of objects and phenomena (it could be described as “semantic sensitivity”). The described manifestation of this ability was the abduction that G. I. Ruzavin [4] defines as the argument, which is based on the information that describes certain facts or data and leads to the hypothesis that explains them. It is a universal logic of the search for explanatory hypotheses. The main difference between the abduction and such traditional forms of reasoning like induction and deduction is its focus on the explanation of the studied facts. As you can assume, the abduction is the basis of cognition: “...the first step in the learning process (abduction), according to C.S. Pierce offers something that may exist” [5]. Such good “suggestions” was established by practice and served as a basis for the further complication of the organism system reactions to the challenges of the environment, we can say – increase of the intelligence.

In abductive reasoning, another remarkable feature of the human brain is seen especially clear: its spontaneous activity, inner work aimed to establish relationships between the recorded

in its concepts and relations. It is something that formed in human the phenomenon of thinking.

Thus, the ability of the human brain to react more subtly to the external stimuli was supplemented by the increasing ability to generate new states and thinking. The latter, of course, intensified the information interaction with the outside world.

It is logical to assume that between these abilities and the reliability of the survival of the species was established, in the language of cybernetics, positive feedback.

As the result, over time human species, firstly, became capable of situational reactions, their superposition, and development of more complex behavior. But besides this, he was able “to learn” to associate objects and phenomena in time, to predict, to foresee distant consequences of situational decisions.

These two properties – more precisely react to environmental influences, more sensitively distinguish its state, and to predict more accurately the results of such response to the increasing length of time – obviously, were formed in parallel. The anticipation as a property of the organism to predict the future state of the environment has received a new implementation mechanism: if this property was implemented through the genetic apparatus, now the device of situational response has been added. Natural selection strictly demanded the corresponding “teaching”: fortunate were those representatives of human ancestors that could realize long-term results, the effects of situational decisions.

Here we need to explain what is meant by the situational behavior. Of course, a lizard is able to take into account the behavior diversity of insects that it wants to eat, it can foresee a possible strategy of the insect; similarly, a rabbit can escape a fox somehow responding to her tricks. But it is important that the behavior of individuals within species in the animal world differs slightly. The situational reaction here is recorded in the system of unconditional reactions that originate deep in the history of the species, recorded in the genes. All members of the species act in



similar situations almost the same. The human ancestor has formed a level of individualization of behavior that his situational reaction could be seen in one representative of the species. Thus human got what we call freedom – the ability to form his own reaction to the environment influence and completely individual behavior.

Human freedom is a good thing, because it opens for the individual and for the society a whole new range of opportunities, as well as gives a heavy cross because one is obliged to be responsible for their own decisions. Note the freedom has always been a subject of philosophical analysis, but it is extremely significant in the informational context. Exactly freedom has opened a huge opportunity for the behavior individualization and has created a vast training ground for the formation, on the one hand, possible and on the other – acceptable to the society (human population) individual solutions. Since the early history of human, the speed of trial, error, and spread of successful solutions in the society (the results of individual behavior) increases all the time. The informational aspect of this process lies in the increase of the reactions diversity of human species on the changes in the environment. In the informatics, this evolution is modeled by the increase of the thesaurus of species, and in this case, it can be considered as development.

The cybernetic aspect can be seen in the formation of an inverse connection between increasing behavior diversity of individuals and increasing thesaurus of humanity, as well as between the available diversity of individual behavior and the evolution speed of humanity. The ability to develop and its condition – freedom, gradually became established in society as the most important fundamental values.

So when primeval human noticed that a sharp stone accidentally fall into his hands can be useful in some critical situations. He further noticed that this stone can be obtained after certain operations. His brain reflected, remembered the process of formation of such stones, for example, as a result of the collision

of two stones. Once he saw that such collisions can be done by him. Furthermore, in the classical economic textbooks: the human (now human!) started to work, i.e. consciously (seeing the purpose) to make tools, which facilitated his life and contributed to his survival. This extended to the millennium process was based on certain qualities of the human brain: lability, variability, combined with the ability to memorize. Used above “communicative” terms: “notice”, “reflected”, “saw” reveal, emphasize the informational aspect of the transition of biological species to the human way of survival. This transition, on the other hand, is a phenomenon of the intellectual nature. N. Wiener understands the intellect as a system of filters that separate the useful information from the unnecessary. Note that the interaction of these filters with external information is a process, and the filter system is considered as an object - thesaurus (of individual or population).

The thesaurus, as shown in [6], serves as the dynamic “self-preservation” measure of the living organisms and a default measure of the perfection of the living species development level. In addition, the content of the concept “development” is the increase of the thesaurus (of object, system, population – it can be called in different ways, depending on the object of examination). In the end, the connection between the objects of the external world (essential for the survival), noticed, end established by the individual human, were included in the universal thesaurus, thus increasing the knowledge of all mankind.

It is essential that due to the relative lability of the human brain sometimes he “managed” to fix the connection between objects “not very close” in the sense, the relationship between them at the dawn of humanity did not seem to be obvious, sometimes due to the opposition of their role in human life. “In the philosophical literature, the unity and struggle of opposites is the source of development. The struggle between the opposites led to the formation of a new concept, covering the opposite situation, grasping their community and representing both in their

opposite unity, reflecting the maximum uncertainty of the reconstruction direction of the situation” [1, p. 145-146; 6].

The practice further confirmed the existence of such relationships as they were included in the universal thesaurus. This meant not only its completion, increase, but also the formation in it of some new feature – abstraction. Nature does not use the concept of numbers, it only uses specific items. But the concept of numbers is a useful one and it incorporates a vast complex of human's relationship with the world, “condensed” in the concept of abstraction. “Naturally, – says S.M. Krylov, – the basis for one of the first and most fundamental abstractions of human civilization was “an amount of something”, called the number. It is natural that the quantitative characteristics from the very beginning were connected with the welfare of the individual and society: the amount of food, resources, enemies, wealth, money etc.” [7, p. 16]. In the development of such abstract knowledge, the main role played not by induction and deduction, with which were established more logical “vertical” (hierarchical) connections that were easier to notice, but by the abduction that detects “horizontal” connections that are less logic, but were revealed in the process practice facts by the intelligence.

Thus, improvement of the reliability of human species survival that is a result of the specificity of its interaction with the external world reflects the process of gradual transformation of “simple” properties lability and activity of the brain in the ability to form situational connections, abductive conclusions, in the expanding capacity for abstract thinking.

One of the main directions of abstraction is formalization. As noted by Karl Mannheim, ‘the formalization is that the analysis of specific quality data that contain a certain orientation is pushed into the background, and a qualitative description of the object is displaced by observations of a purely functional nature, a purely mechanical model. This theory of increasing abstraction, that act in combination with the distancing from social life, we call the theory of the social genesis of abstraction” [8, p. 758].

Pitirim Sorokin gives this process a leading role in the development of the society: Thus, – he writes, – the world of concepts or logical interaction, or the interaction of concepts is the ultimate sign of a purely social (human) phenomenon. Hence the social phenomena is the world of concepts, the world of logic (scientific in the strict sense of the word) being obtained in the process of interaction (collective experience) of human individuals. This is the nature of a social phenomenon as a specifically human phenomenon.

But the essence of this issue is defined the best by De Robertis: “By creating the concepts is achieved the ultimate goal of all genuine societies. In the strict sense, abstraction and social preservation are synonyms.” [9, p. 527].

Note that the cause-and-effect relation between the flexibility of the human brain, its ability to establish relationships between objects, and to develop the abstraction ability and the emergence of formal ideas, the result of which became the accelerated growth of his intellect. At a certain stage of the evolution, the intelligence has enabled human to establish a connection between the properties of sharp stone and the actions necessary to obtain such properties, i.e. work.

The intelligence has become a determining factor in the transition to conscious labor, as well as memory. Surprisingly, the events that are happening before our eyes shed light on events of past – we mean the evolution of computer facilities. This evolution clearly demonstrates the interdependence of intelligence (we will not in this context insist on the differences between natural and artificial intelligence) and of memory with which he “has” to deal with. The power of processors and amount of addressable memory has been linked by *a positive feedback*: the increase of the first strictly required the increase of the second – that is the lesson of tiny by historical standards, but an eventful period of modern “computing” history of mankind.

In the natural history the “ability to memorize” evolved at the genetic level, i.e. more adapted to survival were individuals

who had the best (biggest!) set of reactions to changes in the environment, accumulated and transmitted genetically. However, evolutionary changes that increase the intelligence of the primeval human were not very effective from the point of view of species survival: a memory, within which “acted” the unintentionally “improved” intelligence, was not that very small, but very unreliable. The lifespan of primeval human was short and the probability of loss of happily received benefits was high. So, who knows how long would have continued this slow evolution, that unfolded coevolution of intelligence and memory in a biological framework (and it always had some chances to fade, moving to the stabilizing selection), if the beginning of labor activity had not pushed the further history of the planet in conditions of necessary and rapid development.

The information approach permits to see in this process a very important element. The manufacture of a primitive tool, a very significant item, indicated *the beginning of a process of forming the external memory of mankind*. The memory placed in the “inert”, according to V.I. Vernadsky, matter. And exactly at this stage (not later, with the emergence of writing), the information activity has appeared along with labor activity. Meanwhile, a common point of view is quite different. “An important breakthrough happened 35 000 years ago, when unknown the genius has painted the first icon or ideogram on a stone or on a cave wall, to capture an event, person or thing. Thus, he initiated the not spoken memory stored outside the human brain” – according to Alvin and Heidi Toffler [10, p. 160]. However, it is more accurate to consider the beginning of the “not spoken memory” the manufacture of the tool or consumer item<sup>4</sup>.

From the standpoint of the information approach the “human became human”, when he has learned to store

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<sup>4</sup> If the commodities meet the requirement of "long-term" use, then they can also claim the role of the first external memory carrier. Here we can mention, for example, the skins of large animals, able to protect from the cold more than just one generation...

information outside his body, in the created by him artificial material world. Fundamentally important argument: the ax was not only the first object and the result of labor, not only the first “artificial” object, but also the first external (and yet created by man) repository of information.

Further evolution has discovered a successfulness of such attempt. Its reason has an incredibly simple explanation: the information was kept “in stone” safer than in its cradle – the human's head. This shows the most important cybernetic factor in the development of mankind: the reliability (durability) of the collective memory of the population.

The paradoxical and absolutely fundamental feature of the human branch of evolution of living nature was the fact that the ability to *situational* behavior, response to transient circumstances, was the foundation of a *sustainable* external memory.

It was really great, decisive step in the history of mankind. (However “step” was probably a very long in time. The archaeologists and anthropologists are to judge whether it was tens or hundreds of thousand years ago.)

It was a step towards the formation of tightly associated with the living, but still inanimate world, the step that freed a person from the total power of genetic memory and laid the foundation of a new image of social memory (this process actually enables the use of the term “social”) – the artificial memory, embodied in the results of labor and in the transformation of nature.

Why this process “started”? The answer can be given in the framework of cybernetics: because axe, and then everything that was done by the human, by his labor – all this, as it turned out, increased the chances of human species survival. Hereinafter, the cybernetic law of positive feedback: the bigger memory volume – the more it can store. Consequently, it is possible to extract more if needed. So, human using a stick for hunting or defense, of course, enjoyed the experience of his ancestor, once discovered

(received thereby new knowledge!) the usefulness of this device. The human used the item, but at the same time (this fact so far attracted little attention of researchers) he used the information.

The reliability of man-made external memory, together with the knowledge of primeval humans their usefulness has led to the fact that the memory at the disposal of the human was cumulative (able to increase). Human's relationship with the external world, preserved in the external memory, hasn't allowed to open them again and formed the knowledge base for further growth of knowledge.

Fundamentally new - diachronic - communication type has been formed. With the increasing importance of its role, such communication gained the right to be called "social". The process of socialization, typical for human society, is firmly inscribed in the natural process of child maturation and development, is essentially the process of understanding the meaning of a huge amount of information interactions mediated by the man-made material world, the external memory.

The history of mankind has acquired the features of accelerated development. In this process, the decisive factor was the information that existed in the society as an external, relatively stable, and accumulated. It can also be considered as a materialized, stored on tangible media knowledge, a form of existence of human thesaurus.

However, the equally fundamental role is played by information included in the circuit feedback that occurs in the interaction of humanity with this new form of social memory. This information is considered in the framework of cybernetic models of the world understanding. It is worth remembering in this context that very often information wasn't considered outside the management and worked along with the latter, the core concept of cybernetics.

In the evolution of mankind, the informational approach within the cybernetic concepts allows focusing on feedbacks that accompanied the interaction of mankind with man-made external

memory, to reveal causal relationships in the holistic process of evolution.

The ax created by the human was an imprint of his knowledge outside of his biological body. This fact had to raise the revolution in the human history and especially in the picture of the world, which every member of the human race had in front of him.

Before that “moment” the connection of “Me”-“He” was regulated by a genetic program, by instinct. But the occurrence of a third actor on the life stage – the memory (ax, fire, caves, stick, etc.) – and this confused the predefined life of the species.

Now we can only imagine what a giant intellectual effort human had applied to realize the existence of “a new player on the scene” and to determine his own position in the newly emerged triangular relationship: “Me”-“He”-“Memory”. So, possible variants of the relationships, distribution of triumphs and downfalls, memory usage experience and the relationships experience with other members of the species. All this has demanded an extremely sharp increase of human intelligence. The intelligence considered as the ability to establish connections between objects and phenomena of the surrounding world, as the ability to select, analyze and use important (for survival) information.

It is known, that the number of links between elements of the set (including the set of thesaurus elements) increases proportionally to the square of their number. It is clear that each new element of the external memory, whether it was the bow and arrows, copper jewelry or spade, has dramatically increased the number of relationships in primitive society (the herd) about these new elements and has demanded a greater understanding of a new intelligence level.

The experience of the external memory use was successful. The bigger was this external memory, the safer was the survival of the humanity. And so, the greater was the prerequisites for a further memory increase.



Such feedback could act as within other biological species in the frames of the natural selection. But in the human society, the selection wasn't quite "natural", because it included the factor of human mental activity, its impact on the content, speed and effectiveness of feedback.

At the more general level of reasoning, we can conclude that the logic of the human society evolution is defined by the nature of the interaction of a few factors:

- physiological characteristics of the primeval human brain that provided its lability and ability to respond;
- diversity features of the natural environment of humanity development;
- volume and characteristics of "the external memory" (of the artificial material world);
- nature of intraspecies relations regarding "external memory" in human society, and in "the species-environment" interaction with its participation;
- content of the feedbacks between biological and external memory, between external memory and intellect of mankind.

The limit generalization of the presented picture allows us to describe it as the development of a system (humanity) in the environment (nature), where the environmental diversity and system diversity were connected by the positive feedback, mutually contributing to the increasing diversity of both the environment and the system. The real state of mankind at the particular stage of evolution was caused by specific parameters of the natural environment, on the one hand, and by the physiology of the species (in this case – human) on the other. For example, now we can imagine how challenging the environment diversity of our distant ancestors was when they needed to survive on the border of forest and steppe: they had literally "to stand up"...

Thus, the informational approach in exploration of human society evolution creates a new platform for understanding patterns of evolution, involving such modern means of knowledge as informatics (if we consider the latter as the

theoretical basis of information concepts), cybernetics and synergy. On this ground, sociology gets a new understanding.

According to N.A. Sliadneva “the fundamental basis of social relations and processes is the type of socio-information communications. Two modern authoritative sciences – informatics (social informatics) and sociology (in the context of their own term system) consider the environment of the existence and development of the society, human society as information or social space respectively. We think it is appropriate to combine these two research context and to use the term “socio-information space” instead of “the environment”. Therefore, society is the totality of physical entities (individuals) that are united by certain communicative relations of social and informational nature that form the socio-information space.

The validity of the interpretation of “the social environment” as informational has become apparent only in our days (in the late XX – early XXI centuries) in connection with the processes of informatization, reality virtualization and the development of the information approach as the foundation for a new scientific picture of the world and scientific methodology” [11].

The study of the laws of communicative relations evolutionary transformations from the standpoint of the informational approach help us to discover the overall logic of the evolution of humanity, revealing in it some aspects, that aren't less important than, for example, production-economic or technological.

Therefore, not only feedbacks that characterize the interaction of the abovementioned factors are interesting, but also the models of the resulting trends and laws that are formed under their influence, traceable in the history of mankind. These laws can be described, for example, by the exponential dependency (the growth of scientific and other information), curves "with saturation" (asymptotically approaching some limiting line, for example, the development of a dictionary for a new language),

communicative curve (the entropy for two incompatible dependent events) [1; 12-14].

The evolution of the humanity is clearly and in full details described in the industrial-economic aspect.

Here is the list of some consequences of the beginning of the "exploration" of "the external memory", as well as generalizations which, perhaps, are destined to complete the picture of the society evolution in its information-cybernetic aspect.

1. At a certain stage of biological evolution the primeval human, thanks to the specifics of his nervous (informational!) system organization, was able to detect and realize the advantages of the use of certain objects of the external material world (in particular, sharp rocks) for life support, and with time he started their purposeful production – labor. From the standpoint of the informational approach, this event is interpreted as a transition to the use of external for the biology kind of memory. The ability to store information/knowledge more reliable and durable in comparison with the biological body resulted in its consolidation in the society and became a major factor in the further evolution of humanity. Note that man-made external world that surrounds humans is considered as a result of the labor, the conscious industrial human activity, and as knowledge, its external storage, memory embodied in the external environment.

2. The paradox of the transition to the use of the external memory was the fact that the exceptional (compared to other species) flexibility of the human brain, its ability to establish situational connections among the reflections of the world made it possible. Such resistance has occurred through variability! This fact is the proof that the unity and struggle of opposites actually led to the development

3. The obvious selective value of transition to labor activity, sufficiently described in the works of the classical economists', now must be comprehended from the information approach standpoint as a value formed in the process of labor and

embodied in its results the external memory. The reliability and durability of this memory were the basis for the storing in it the increasing number of the results of the human intellectual activities.

4. The highlighted reliability and durability characteristics of the external memory have conditioned its cumulative ability, that is, the ability to accumulate. Its volume grew dramatically due to the positive feedback of this volume and the human activity indicators (survival reliability, food sufficiency, and others). In fact, the changes in the artificial external memory played the same role as biological mutations, however, due to their cumulative ability have significantly accelerated the evolution process (trial, error, selection and changes fixation).

5. The discovered by human ability to create and use labor tools formed the conditions for the manifestation and development of his freedom, previously unattainable in the living world: every representative of the human race then, and throughout the evolution could use a created man-made world, but could not do it. The man-made world shaped the space of human freedom as possibilities for interaction with it and to ignore it. Every single person determined their behavior on their own. Such freedom has become a testing ground for the formation of selective-valuable behavior with regard to the outside world, and in intraspecies relations, where the freedom gained in the end the highest rank among human values, surpassed only by food and security (and sometimes exceeding them). In cybernetic aspect this situation increases the diversity and object (society), and environment (now including the man-made part).

6. The existence of positive feedback can be detected between the amount of external memory of mankind (in other words, the complexity of the man-made external world) and the level of his intellect. The growing man-made world required the human ability to perceive it not only in all its complexity, but in its fullness and integrity. This ability led to the emergence of the

new results of the mental and material intellectual activities. In fact, the mankind began to develop as a symbiosis of biological and “inert” (according to V.I. Vernadsky) matter, i.e. the society was understood as the developing holistic object.

7. The mankind’s success in survival, strengthening of its species among other populations through the use of knowledge, now stored beyond the biological body, approved in him the creativity phenomenon, based on the own internal brain activity - thinking, and on the increasing diversity of the environment that generates new information. The man was able not only to inductive and deductive, but abductive conclusions, abstraction and formalization.

8. One of the important findings of the information approach in anthropology is in the identification of the knowledge alienation phenomenon – a particularly noticeable phenomenon in recent times. But the conscious ax manufacture can be considered as embodied in it a certain amount of its creator’s knowledge. At the early stages of human history alienated knowledge existed only in materialized form, in the form of labor tools and their products. But thanks to the ability to abstraction humanity has mastered sign activity, and next the text activity. The emergence of the text and images meant the knowledge alienation of the object-carrier. The knowledge has acquired object-carrier independent form of existence. The prevalence of alienated knowledge in society has increased dramatically, expanding opportunities of diachronous and synchronous communications. In the middle of the last millennium printed text, not a material object – the product of labor – became the primary means of transmitting information and knowledge in society. The process of alienation acquired further development, and now we are witnessing the separation of the sign from the referent (an understandable effect of the ongoing process of abstraction!), the transition to “super symbolic” economy (according to E. Toffler), with numerous revolutionary consequences for the life of the society.

9. The existence of effective information/knowledge external storage has transformed the social function of the human. So, he didn't have to memorize essential for life information, but this has increased the need for new information that objectively reflects the world and is useful in the information (scientific information) practice. Note that the key property of scientific information is the intersubjectivity, emphasized independence from the cognizing subject (at least for the classical period in the development of science). The role of such alienated knowledge in production-technical of human activities is well-known.

10. The knowledge alienation from material objects and the emergence of the text/printing form of storage included one positive feedback between the material embodiment of knowledge – technology, and alienated knowledge that circulates in society in symbolic form (texts, drawings, etc.). The scientific-technical revolution is their joint creation that was accompanied by an information explosion and an information crisis. The emergence of the information science and cybernetics, for which information processes have become object of study, was the society's response in science. The patterns of growth, aging, and concentration-dispersion of scientific information were formed. The cumulativeness of the information external storage eventually led to the phenomenon of acceleration: the reduction of the time interval between two homogeneous events in the life of society. The acceleration result was the approach of mankind attention and the professionals' information needs to experience the moment, the orientation on the newest knowledge and innovations, to a novelty as the principle of the attitude to the world. This trend spread to all aspects of the society. M. Epstein writes: "We got into some adventurous story, where with every step grow the tension of the mystery and the exciting unknown. Moreover, the action develops on the rise. Think about it: we live in a new era, new time, and a new period of this new era. All the newest were already updated several times, but the means of our language hasn't any degree superior to the superlatives to cover

this situation. Every year of the new era is almost as saturated with novelty as the previous centuries. If the laws of plot forming are approximately the same in all areas, does such speed mean we are approaching the end: in unit of time is happening more and more events until they will happen..." [15, p. 402-403].

11. For a long time, mankind external memory has increased extensively due to the growth in the number and diversity of storage devices. However, in the XX century with the invention of the computer, passive external memory became active, able to carry out transactions without direct human intervention. These simple at start operations over time acquired explicit signs of "intelligence". Indeed, some of the algorithms used by computers are objective dependencies implementation (e.g., mathematical operations), and part is the essence of human reasoning. But the peculiarity of this now active external storage is that it accumulates information operations, as well as the passive memory like "paper" stored information. In other words, the alienation was extended to the intellect, creating the phenomenon of artificial, machine intelligence, which in many cases is difficult to distinguish from natural.

12. Till certain time, the external memory of the humanity was a factor of his natural intelligence development and was used, first, as a repository for extracted by human information/knowledge, and, second, as a source of information for individuals, a means of intraspecies communication. But since then, the information amount of the external storage became significantly greater than placed in the planet's population minds. Right after computers "have gained strength" (now united in the global network) external memory has greatly exceed the capabilities of the people inhabiting the planet. The humans faced the need of another rethinking of the essence of their life: the man-made world can not only remember, but also process information much better, at least in the industrial sphere and in several others. And, as a consequence, the human is evidently displaced not only from production but also from education and

medicine, where a significant part of the operations based on the information technology potential. Now the humans enrich their intellect by comprehending their tasks in a growing artificial world that has become self-sufficient in its further development and only occasionally accepts “smart injection” from humans. The result of the intelligence development of the artificial world is its further development! Convincing evidence of this is Moore’s law (doubling of the elements number on a chip roughly every two years), formulated half a century ago and active since then. It seems that the humans forsake mental operations with pleasure and are ready to pass important decisions in various spheres of life to the computers. The sign of the feedback between human intelligence and the external information storage size, obviously, has changed to the opposite.

13. The abovementioned gives grounds to believe that the humans relationship with created by them world of technology, information technology, artificial intelligence and robots respond to the communicative model. It describes the information interaction of the human with his own creation, the artificial world, as mega communication in the process of which human gradually passes to the world his knowledge and intelligence. Nevertheless, the technical devices, high information technology carriers enter the biological body of the human, taking the “purely human” functions and significantly modifying the relationship of people with the outside world. At the same time, “the Internet of things” rapidly grows with fantastic predictions for the future. The share of “the human communications” in their total mass will continue to decrease. The mankind is indeed approaching “the post-human” condition.

14. The existence of an effective external memory has changed the social role of the human (bearer of knowledge, “a living memory” to a researcher with the complement function of that total external memory) and eventually made the individual’s thesaurus incomparable with the humanity thesaurus. The human now knows only a tiny (and decreasing) share of what the



mankind knows, but the total thesaurus of all humans on the planet now much less than the panhuman thesaurus. Of course, the humans along with their artificial world know much more than without it.

This fact needs to be understood in a cybernetic context: how to ensure the integrity of the mankind, when the thesauri of individuals overlap less and often lose a significant proportion of the unity when something external to people increasingly determines their future. Concerning the anthropological effects, "... 200 years after Malthus a new and growing disparity in the development of mankind - not a demographic, but informational was discovered. The disparity exists between humanity as a total information manufacturer and individual as its consumer and user. The basic law of history is in the gap between the human and humanity in general. With each generation, the human being gets heavy baggage of knowledge and experiences that have been accumulated during previous centuries and which he is unable to master" [16]. The available experience shows that throughout most of human history, individual intelligence hopelessly behind in this race. Despite some outstanding spurts, the gap was deepened. The most convincing proof of the latter is primarily a steady deepening of specialization, ongoing in almost all spheres of human activity [17, p. 80].

15. The modern social conflicts, which anthropology is designed to interpret, can be modeled from the standpoint of information concepts. The growth of "the inert component" of the panhuman thesaurus worries many researchers, although they are formulating their concerns differently. A. Peccei notes about the embodied knowledge (technology): "... *a similar effort should at the same time be made to have mankind realize that technological advance — what is generally called "progress" — cannot go on anarchically and torrentially, with one breakthrough following another, irrespective of its usefulness, or the possible long-term consequences for the development of life on the planet*" [18, p. 238]. A message to an external environment

not only of the memory but also of the intelligence completes “the great transition”: the transformation of “the silicon brother” into the head of the family, leading element of this highly complex system that is still called the humanity.

“When robots and automatization fulfill our main duties, so we are well fed, dressed, and safe it is fair to ask: What for humans exist?” [19].

F. Girenok considers current world situation as an anthropological catastrophe [20].

Thus, the information approach allows us to complement the existing ideas about the causes, driving forces, and logic, anthropologic and cultural genesis. According to N.A. Slyadneva, “the informational basis of the cultural genesis is a fundamental law of the culture and civilization development. It can be formulated in several ways. The cultural phrasing of this law is: the dominant information and communication format is a collection of the most widely used methods and means of operations with information that at each historical stage, determines the level of the development of culture as a way of mastering reality, nature, and dynamics of cultural processes, forms of cultural artifacts. Since human is a cultural genesis key factor (its subject and object), the possible anthropological phrasing of the law is: the human in general and in certain historical eras is both a creator and user of the dominating information-communication format and its product” [11].

The above mentioned communicative model puts these features into the chronological order: the man was the creator and user, and now (naturally?) becomes an external for his biological nature information machine, including memory, intellect, and material production tools.

Concerning this N.A. Slyadneva writes: “Unfortunately, we cannot claim, that humanity is “doomed to progress”, which isn’t a given result of the human history, but is man-made, entirely dependent on the wisdom and diligence of humans, their ability to find unconventional solutions to unconventional problems, to

limit selfishness and to control emotions. The progress requires not only the ability to do all that is necessary but the ability not to do what is pointless. We can't see the future of the next generations, so we can only hope they will meet the terms of these conditions" [21]. E. Toffler has predicted that in the future will benefit those who are aware of the information limits...

All these facts show the importance of the external memory in the evolution of the mankind, its properties, logic, parallel development, and finally, the logic of the interaction between society and this memory that gained the capacity of the external intelligence. The information picture of anthroposociogenesis supplements the already formed in the science ideas about it and forms the foundations of social information science.

The main question addressed to the present is that humanity has to determine its attitude to what is happening, formulate its will, and describe the desired state in the future.

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