Synergetics of subject-object interactions in the context of the digital paradigm

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Abstract. Digitalization, which has already penetrated almost all spheres of human life (for all the conventionality and even controversy of this term), which was the result of intensive, potently increasing changes, the beginning of which can be attributed to the time of the appearance of the first computers (1940s–1950s), today has reached such a scale and influence that, in fact, has already become a part of us. As the level of “intellectualization” of digital systems developed and increased, conditions were gradually created for the human world to actively “mix” with the world of technology. We currently live in a new paradigm, i.e. in a new, digital civilization, and it is obvious that digitalization and digital technologies are the main paradigm-forming factor of this new system of life.

1. Introduction
In the system of modern scientific thinking, the term and concept of paradigm does not simply mean a set of ideas and views of the scientific community that dominate in a given historical period on how to approach the study of a subject so that the result meets the requirements and criteria of scientific objectivity.

To be considered a paradigm, the scientific picture of the world inherent in a particular era must be totally permeated with a certain dominant idea, a general mental setting that determines not only the content of research and the direction of the scientific search of the majority of scientists (what is now commonly called the mainstream), but the style of scientific thinking itself, the basic approach, the leading method and the precondition for the manifestation of activity must have a certain common source, a common theoretical and methodological basis, and a common energizing center.

For this understanding of the paradigm, modern science owes much to T Kuhn, the author of The Structure of Scientific Revolutions (1962) which is well-known in the scientific world. It was Kuhn who developed a new understanding of the scientific paradigm, expanding the content of this term, which until that time had a rather narrow range of meanings limited by the sphere of linguistics, and giving it a new modern general outlook, and general philosophical and scientific interpretation [1].

According to Kuhn, the next paradigm characteristic of each historical period is not the product of the consistent accumulation of scientific factology and the gradual improvement of the scientific method, but is always the result of rapidly occurring, revolutionary changes in scientific views on seemingly firmly established things. It is this revolutionary leap in the scientific worldview that
T Kuhn calls a paradigm shift, which manifests itself in a sharp change in the way of scientific reflection and is often accompanied by an equally sharp change in the entire way of life, forming, in modern terms, a “new normality”.

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2. Methods and Materials
The basic research method is a comprehensive analysis of the problem based on the principles of poly- and trans-disciplinarity. Methods of subject-historical analysis, analog-comparative analysis and structural forecasting were also applied.

3. Results and Discussion
As the level of “intellectualization” of digital systems increased, conditions were gradually created for the human world to actively “mix” with the world of technology. In the context of such synergy, digital technologies could not but affect the sphere of industrial and organizational management, in particular, the sphere of subject-object relations; because with the inclusion of new, artificially created by human hands, “smart” objects – machines, mechanisms, devices, very much has changed in the science of management and in life in general.

Today we can say with full confidence that the world in which we now live is no longer the world it used to be 50, 40, 30 and even 20 years ago. The same Kuhn's paradigm shift took place; and the first, decisive stage of the digital revolution which was the main content of the so-called the fifth technological order can be considered complete. We currently live in a new paradigm, i.e. in a new, digital civilization, and it is obvious that digitalization and digital technologies are the main paradigm-forming factor of this new system of life.

An important difference that significantly complements Kuhn's scheme of structural revolutions is that the digital revolution was the result of not only scientific and even not so much scientific as technological development. It can be said even with more confidence that, for example, with the emergence of the Internet, scientific forecasting turned out to be the side that lost in the technology competition, since the Internet can be considered to a much greater extent an achievement related to the systemic development of technologies than an achievement of science.

The essential side of the phenomenon for which we use a term with such a vague semantics as "digitalization" is the deep penetration of "numbers" into the consciousness of a person and society, the almost organic interweaving of this "number" into the living fabric of our entire life, which is most obvious manifests itself in such concepts as Artificial Intelligence, with its unmistakable abbreviation (AI), and what now (and among specialists much earlier) is called the "Internet of Things".

The transition from the Internet of people to the Internet of things actually means that, in the system of global Internet communications, a person is the same participant in global network interaction as a coffee grinder or a washing machine with built-in smart chips, i.e. just a terminal element, a physical object (not even an individual!), one of the nodes of the world wide web and just a thing among things.

Thus, in this global offensive of the “numbers”, the loser, in a sense, turned out to be a human beings themselves. It should be mentioned that the problem of opposition (or comparison) of artificial and natural intelligence, man and machine, was clearly outlined by the creator of cybernetics N Wiener. Already in 1964, in an article with the characteristic title Are Machines Smarter than Men, published in the form of an interview with US News & World Report, Wiener, answering a journalist’s question whether there is a danger that machines will ever prevail over people, replied that such a danger exists, "if we do not acquire a realistic view of things "and do not understand" what can and cannot be done with machines and what can and cannot be left to a person" [2].
Interestingly, even then, in the minds of people questions arose about intelligent robots capable of seizing power over the Earth. Wiener fully admitted such a possibility providing that people in their machine-worship, in the end, due to their mental lassiness, would come to the idea: “Let's leave all to Iron Mike”, a typical Wiener's phrase expressing the idea of shifting the responsibility for making fundamental decisions onto a machine, onto a robot, or onto artificial intelligence. Moreover, the founder of cybernetics clearly warned about the danger and even catastrophic consequences of an approach according to which machines will be used everywhere and “without regard to people.” If we “do not give human beings their proper place in the world, then we are lost” [2].

It is no less interesting that the problem of the conflict between man and machine was posed in the works of Karl Marx, more than ninety years before the appearance of cybernetics (speech at the anniversary of The People's Paper). Although intelligent machines were not mentioned in the modern sense of this term, nevertheless, the thoughts expressed by the scientist back in 1856 and today sound surprisingly relevant, particularly when Marx says that “the victories of technology are, as it were, bought at the price of moral degradation ... All our discoveries and all our progress, as it were, lead to the fact that material forces are endowed with intellectual life, and human life, devoid of its intellectual side, is reduced to the level of simple material power” [3].

If the phenomenon described by Marx is described in terms of subject-object relations, or in this case relations in the "man - machine" system, then the situation can be expressed as follows: material force - the object principle (machine) is endowed with intelligence, thereby acquiring a subjective principle; man is originally a subjective principle endowed by nature with intelligence who is losing (at least in part) the intellectual side, and is reduced (at least in part) to the level of “simple material force”, a machine turning into an object in the system of interaction between man and machine.

Describing the same phenomenon within the framework of the cybernetic model, the nature of the interaction between a person and a machine can be described in terms of a direct relationship and a feedback, where a person is an initially active element in the system, creating a direct connection in the “person - machine” system (for example, turning on a machine or leading it into action), and the machine is initially a passive, responsive element that creates feedback (which can manifest itself, for example, in a light or sound indication of the machine's readiness for work).

In both of the above descriptions of systems of human-machine interactions, the possibility exists of both interchangeability of subject-object relations, and the possibility of reversibility of direct and feedback relationships, when it is not a person who determines when to activate a machine, but on the contrary, a machine endowed with artificial intelligence or just a control program, will begin to control human actions and determine the order of these actions (as, for example, it could happen on an assembly line with elements of manual assembly).

In systems theory, this is called the principle of reversibility of forward and backward links, but the effect of reversibility, as we can see, can also be extended to subject-object links that play a special role in management models and systems of practical management. The effect of reversibility of connections in control systems means that in certain situations the inversion of control actions occurs, the control object becomes the subject of control, and the subject becomes the object.

In modern, microelectronic-saturated human-machine complexes, a person is so organically inscribed into the digital shell of the system that he/she becomes almost indistinguishable from a machine (in the broader context, a machine is a smartphone, a computer, a processing center, a credit card or some such new objects that became available to us in the digital age). If such indistinguishability takes place, then a person, in a sense, can be considered a machine.

The very history of this approach is quite interesting and did not come from cybernetics at all. The thesis: "Man a Machine" literally in this form and sound ("L'homme machine" in French) appeared in the 18th century (1747) in a treatise of the same name by Julien Offray de La Mettrie [4]. It is important that for the author of this work, the idea of a person as a self-winding machine was not just a philosophical setting, but rather the result of medical observations of how the human body functions, since La Mettrie was a doctor by training. Without denying the presence of a spiritual component in a person, La Mettrie, nevertheless, believed that the basis of a person's spiritual life is his bodily
organization. Being a consistent sensationalist, La Mettrie extended the principle of "man a machine" both to physiology and to the sphere of the psyche and even human consciousness, believing that the outside world around a person is perceived and reflected in his "brain screen".

A new stage in the development of such ideas began in the second half of the 19th century. It is believed that it was from this time, or rather from the moment of publication of the work by I M Sechenov "Reflexes of the Brain" (1866), that scientists dealing with complex human problems have moved from the phase of scientific observation to the experimental phase of research, the purpose of which was to show a reflex (and, therefore, potentially programmed through a system of physiological stimuli) nature of both conscious and unconscious human reactions to external and internal signals. In this and his other scientific works, Sechenov showed that physiological processes which can be studied using an objective scientific method based on an experimental evidence base lie at the heart of all, even the most complex mental phenomena.

Later, I P Pavlov, who considered Sechenov "the father of Russian physiology", significantly advanced the study of human higher nervous activity, proposing a scheme for dividing external and internal stimuli ("signals", according to Pavlov) into two levels. The first level, or the first signaling system, is what unites a person with an animal, namely, it is a system of sensations, representations and images of the surrounding world that appear on the "brain screen" (to use La Mettrie's terminology).

The second signal system is articulate speech, a system of words, sound sequences, signs, and meanings and symbols, on the basis of which our concepts of the world around us are built, and which can be considered a derivative of the first signal system; in fact, these are "signal's signals". Pavlov wrote: “Thus, a new principle of nervous activity is introduced: a distraction and at the same time generalization of countless signals of the previous system … - a principle that determines unlimited orientation in the surrounding world and creates the highest human adaptation - science, both in the form of universal human empiricism and in its specialized form” [5]. "Unlimited orientation", in modern terms, actually means that the words of the human language, in fact, represent a program code, the same as a programming language is for a modern programmer.

Considering the connection between the subject and the object of communication on the basis of the second signaling system, i.e. connection between the transmitter of a message (initiator, inductor, sender) and its recipient (receiver, recipient), one should pay attention to the deep and fundamental difference between the position of the one who speaks and the one who listens. This feature of the verbal subject-object connection was pointed out by M M Troitsky.

The concepts of people associated with signs, for example, with words, constitute a special organ of external psychic influence - an organ so submissive that the reagent almost does not feel how others use his psychic apparatus, addressing him with speech; and so subtle that with the help of it, the speaker or writer is able to make his psychic existence, as it were, an object of direct observation for listeners or readers. Thus, the concepts that make up the cultural form of human thinking are the most powerful organ of social relations [6].

V V Maksimov, studying the problem of coding (in fact, programming) of human activity through information, notes that a person's assimilation of certain information not only makes him the owner of this information, but also, "depending on the degree of its assimilation and reception, turns a person who has perceived this information and is "modified" in accordance with it, into the "informational" (virtual) property of the one who transmitted this information to him as a program, as an algorithm for performing the activity assigned to him by this information" [6].

The next step towards the study of the nature of subject-object relations and the study of man as a programmable creature was made by behaviorists. The main idea of behaviorism, especially in its radical, skinner form, is that the processes and events occurring inside a person, such as thoughts, feelings, experiences, emotions, as well as associated behavioral reactions can be effectively controlled (i.e. programmed) from the outside by means of a sequence of stimuli, in the role of which both physiological or mental stimuli, and operands of the second, sign signaling system, or their combination can act. At the same time, overcoming internal resistance to external programming (i.e.,
overcoming internal motivating attitudes, previous experience, as well as factors associated with hereditary predisposition) is achieved through such cyclically applied techniques as reinforcement (reward) and punishment. A similar technique was named by B F Skinner "operant conditioning."

The principles of classical behaviorism apply equally to humans and animals (for Skinner, these were pigeons, rats and cats; for Pavlov - dogs; for Lorenz, geese; for Thorndike, children, as well as cats, dogs, chickens and monkeys). In modern, postclassical behaviorism, a serious step has been taken towards expanding the subject of behavioral science; the field of research, in addition to operant behavior, has also included problems associated with language and thinking, as well as the development of special therapies of acceptance and responsibility. Nevertheless, by virtue of the research method itself, the behaviorist approach remains an approach based on the principle of potential programmability not only of psycho-physiological, but also of mental-linguistic, i.e. intellectual reactions.

One way or another, the principle that unites the behavior of humans and animals is a principle that can be called the "principle of a programmable machine." Actually, this idea is implicitly visible in the very title of Wiener's classic work: "Cybernetics, or control and communication in an animal and a machine." However, neither Wiener, nor Ashby, nor other pioneers of cybernetics never came to an understanding of the machine in its generic meaning, which would include biological, human and social manifestations, to which La Mettrie first drew attention. In a new cybernetic era this idea in its entirety was developed by E. Mauren [7], the author of the famous "Method", the creator of the concept of complex thinking, the founder of the school of scientific methodology with the corresponding name and the president of the Association pour La pensée complexe.

Considering the problem of the evolution of the life principle, Morin showed how nature, through the use of the mechanisms of "retroactivity" and "recursive causality" gradually moved from proto-machines - "spontaneous motors" (to which he attributed such natural phenomena as the sun, wind, fire, water cycle, etc.), to the creation of more and more complex structures, up to the creation of "machines-beings".

Morin wrote: “Living beings can be understood as negentropic machines formed through the communicative organization of chemical reactions and containing a unique information apparatus embedded in the DNA of genes ... Life is a particular form of negentropic organization” [7]. The life principle, according to Morin, is a manifestation of the natural principle of "active organization", "a complex combination of cyclical automatic processes" that creates a "closed causal cycle" - a machine, and life itself, ultimately, is a "poly-super-meta-machine" [7].

Artificial machines as artifacts, as cybernetic devices, are, according to Morin, on the one hand, the products of a "social megamachine", and on the other hand, they themselves actively contribute to the development of the practice of this "anthroposomal megamachine" [7], which, in fact, is a human society. Criticizing cybernetics for its claim to universality, Morin wrote:

Cybernetics lacks a foundation. It lacks the principle of complexity. It lacks the substrate of the organization. It lacks even the generic concept of a machine ... Consequently, due to the impossibility of leaving the orbit of an artificial machine, cybernetics could not develop the ideas of feedback, causality, finality, information, communication in all their complexity, which deserve to be combined into an interconnected whole [7].

From the point of view of the transdisciplinary approach, which is, as it were, the "visiting card" of E Moren's worldview platform, he also noted the main drawback of behaviorism, which was that "in understanding the reaction as a mechanical continuation of a stimulus, the initial causal source of behavior was not taken into account", internal self-causality of a person, “which generates and regenerates itself from itself” [7]. And this internal causality is that a person, according to Morin, is a "polymachine", which, in turn, is itself a part and a product of the machine of nature that encloses him (man). Morin notes: "The thesis "we are machines" is not a search for reduction for a person, but a search for a beginning, a study of our origin” [7].

It happened, however, that Morin's, not belittling, but elevating understanding of himself as a machine that is a product of nature and the natural principle of development, was not further supported
either by the sciences related to cybernetics, or by natural scientists (biologists, physiologists, physicians, geneticists, chemical physicists), or by the philosophical and humanitarian sciences, including economics, social philosophy, behavior studies, management theory and management. It was precisely this simplifying, reducing approach, the technocratic principle that prevailed, which is clearly manifested today in the philosophy and worldview platform of transhumanism with its idea of total and all-embracing digitalization, although already in the 1970s E. Morin warned about the problem of “digital insufficiency”, which always will have a fundamental and, therefore, irreparable character: “Digital computers have taught us at least one thing about the brain: this is that the brain does not function like a digital computer” [7].

However, Raymond Kurzweil, one of the authoritative modern experts in the field of new technologies in the United States, admits that the possibilities of creating artificial intelligence not inferior to the human intelligence will arise in the not so distant future. Also quite real and partly already implemented are projects for creating virtual reality indistinguishable from physical reality. Finally, the idea of physical synergy between natural (human) and artificial intelligence is also practically achievable, which means the possibility of direct exchange of information between the structures of the human brain and a computer.

What is the real situation with artificial intelligence today? With all the specificity and conventionality of this concept, it should be said (leaving out of consideration the numerous connotative ramifications and corresponding scientific views on this subject) that the project as a whole has been successful, if by success we understand the purely technological dimension of this phenomenon.

One way or another, modern AI devices, chat bots and robots designed on the basis of new generation cognitive architectures capable of creating and maintaining deep learning neural networks are now more and more confidently passing the Turing test which presented an insurmountable obstacle twenty years ago. In other words, what was considered as a conceptual opportunity three decades ago, which should be reckoned with, today has become quite tangible, visible and observable reality.

The project for the development of a deep interface between artificial intelligence and human brain structures turned out to be no less successful. The idea, which was based on the idea that the natural neurological model of reality (which, in fact, is for us conditionally genuine reality, “a thing for us”, as opposed to an unknowable “thing-in-itself”, if we use Kantian categories), can be more or less completely replaced by artificial correlates of our physiological and neurophysiological reactions, i.e. our sensations, emotions, feelings and even thoughts, to a large extent proved to be potentially realizable.

The conceptual and technological platform on the basis of which this global project unfolds is described by Kurzweil in The Age of Spiritual Machines:

Let's take 2029 as a starting point and bring together some of the trends that I talked about. By that time, we will be able to design nanorobots... capable of penetrating your capillaries and traveling through your brain, studying it from the inside... For complete immersion in virtual reality, we will deploy billions of these nanorobots so that they are located at each nerve fiber emanating from all our senses. If you want to remain in true reality, then they will sit in their places. If you want to go to virtual reality, they will begin to suppress the signals coming from your real senses, and will replace them with the signals that you would receive while in a virtual environment [8].

And further: “When we get to 2050, the main part of our thinking, which, in my opinion, is synonymous with human civilization, will have a non-biological character”[8].

But even if we ignore the purely technological solutions offered by Kurzweil, there are enough scientific developments to see the possibility of the existence of such an "interactive matrix" (in the meaning given to it by the Wachowski brothers in the corresponding cult film), in a different technical implementation, but with the same effect in terms of the possibility of total management of society based on the new synergy of subject-object interactions.
The transfer of social reality into the space of artificial interactive modeling may well be carried out without a person's physical connection to the global computer network. Indeed, even at the level of modern psycho- and neurophysiological models, it is clear that the human body contains all the components of what programmers call the operating system.

Moreover, we can say that the very consciousness of a person, in fact, is a potentially programmable environment, and the person himself, in a sense, can be considered as an intelligent machine, a bio-mental programmable structure.

And today it is no longer just a scientific model, but quite real, rapidly expanding in the scale of its application, technological and social practice, as evidenced by the bringing of this practice to the level of the requirements of the state standard, in particular, GOST R 43.0.3-2009 [9] prescribes the requirements for the operator's intellectual activity using information presented in a form corresponding to the psychophysiology of his thinking, including in the form of a virtual reality information space.

Noon-technology, which is understood as "the technology of creating information in a form corresponding to the psychophysiology of a person (using the results of research obtained in noonics), for the implementation of optimized information exchange processes in the systems" man - information - machine "when creating, storing, transferring, application of messages" [9], obviously should be attributed to the sphere of interaction of technologies "high-tech" and "high-hum".

Only one list of key terms in this Guest contains 61 points of meaningful descriptions for the corresponding concepts, among which are, for example, "visceriosis", "disiosis", "imersing", "impressionization of brain activity", "interior", "introjection", "clearathiasis", "cognitiasis", "modeling-nooning", "subsified information", "reflexosemantics of thinking", "symbiotic information management", "cephalization of brain activity", "exteriorism", "ergatic information activity" and other terms; they are meaningless to a non-specialist, but are a working and even a routine tool for specialists in the field of AI, cognitology, Internet science, psycho-neurophysiology and other disciplines, including those important for such a field as the economics of knowledge.

4. Conclusion

If we conditionally divide the history of the development of Nature by stages, then, in accordance with one of the schemes, we can distinguish three forms of organization of matter, as, for example, did V I Iskrin, the creator of "New Psychology" [10], and these forms are: prebiological, biological, and postbiological. The biological form, which is dominant in our era, being squeezed into the "narrow corridor of existence", following the universal principle of "vibrations of life", should, according to the author, "seek its own line of development through continuous, random in each case, trial deviations from it " [10]. Is modern digitalization such a deviation and shouldn't this phenomenon be called an overdose of rationality, a disease of perception of the world, a “constructional anomaly,” to use Iskrin's terminology?

Here is the answer given by the author of New Psychology, with whom I would like to disagree, but find it difficult to: “There is nothing eternal in the world. Intellect, moving society forward along the path of progress, leaves to history this buffer material form, its characteristic reflection, spiritual organization, and man. The psyche grows into the consciousness of the subject of the third universal, logical form of the movement of matter. The mind, thanks to which we are people, undermines our own - human, dual existence, obsoletes feelings, abolishes empathy, makes the soul unnecessary... This is impossible to accept. This can only be understood” [10].

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