Quasi-physical model of knowledge

In the search for a unified basis of integration of technology and society

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NOOSPHERE

Technology Knowledge Humanity

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Research interests: quasi-physical approach to conscious phenomena; philosophy and scientific ontology of economic activity (econosphere) and information (infosphere) phenomena; the legacy of V.I.Vernadsky and the phenomenon of the noosphere; interaction of the processes of cognition and management (innovative development, knowledge economy); economic semiotics and sign constructions; institutional economy; organization of organizations; philosophy, theory and practice of computer programs and data; methodology and practice of designing large complex systems.

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INTRODUCTORY REMARKS

Today, the digitalization paradigm dominates in the field of information phenomena. Its essence lies in the application of physical data processing technologies to a variety of social and economic practices.

Today this paradigm is close to exhaustion or to depletion of its innovative potential.

There are two possibilities in the digitalization paradigm. Technologists have to infringe on the sphere of information practices in order to find among them those that can be easily digitized. Sociologists and economists have to make decision to digitize some practices, having little idea of how it might end. Simulation modeling is put forward as an alternative. But it is also applied to practices and does not go beyond digitalization (for example, artificial intelligence).

An alternative can only be an integration of both IT components based on their convergence.

In particular, information practices should be deepened to the same level as evidence-based data processing technologies.

However, neither the natural science thinking (in IT), nor the humanitarian thinking of information practices are suitable for this. Noospheric thinking is necessary, which was initiated by Vernadsky.

Therefore an ontological basis for this thinking - Quasi-Physical Model of Cognition (QPMC) is offered.

I. INTRODUCTION AND PROBLEM STATEMENT

ROLE OF UNSOLVED PROBLEMS OF COGNITION IN INNOVATION:

UPoC > PA > MI

Major innovations (MI) are the results of innovative activity, including practical activity (PA), which is initiated by unsolved problems of cognition (UPoC)

WHAT IS INFORMATION TECHNOLOGY?

IT = PDPT+BP

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SN = Sr + Sd

Today information technology (IT) is the application of physical data processing technologies (PDPT) to informational, in particular, business practices (BP). At the same time, technology is potentially a signifier (Sr), and practices are a signified (Sd) part of a single whole, which has a sign nature (SN).

INTERNAL CONTRADICTION OF IT

PDPT > IP

In terms of the development of knowledge, physical data processing technologies (PDPT) are ahead of information practices (IP). This gives them the opportunity to dominate this pair.

IP > PDPT

In terms of importance, information practices (IP) should dominate. Indeed, technology is built into practice, but not the other way around.

PARADIGM OF DIGITALIZATION

Until information practices, including economic activity, have not reached the scientific level, physical technologies can dictate agenda to them.

It is called the “digitalization paradigm” and consists primarily in the adaptation of “paper” data structures to machine media.

At the same time, the question of developing data structures corresponding to the potential of computer technologies is outside the scope of the digitalization paradigm and therefore is not asked.

FRAGMENTATION OF DATA NETWORKS, PROGRAMS AND ORGANIZATIONS

Digitalization is inevitable, despite of its costs. However, it preserves the fragmentation of data networks and impairs their resilience to change.

Fragmentation contradicts the growing global network nature of economic and other social processes, hinders their coordination and integration.

FRAGMENTATION COSTS

- **DECREASE OF INFORMATIONAL LEVEL OF DATA**

Due to restrictions on the ability to display the signified structures and follow their changes, the potential information capacity of the data is realized only partially.

- **MUTUAL REDUCTION IN THE POTENTIAL OF IT AND IP**

The signifier and the signified (data and economy), as a single sign, are interdependent. As a result, a lag in the development of one component reduces the potential and performance of the other and the whole.

THE LOW LEVEL OF UNIFICATION AND FLEXIBILITY OF DATA STRUCTURES MAKES IT DIFFICULT TO COMPENSATE FOR THE DISADVANTAGES OF DIGITALIZATION

Attempts to compensate for the disadvantages of digitalization by continuously making changes to data structures and in programs run into a low level of unification and flexibility of information structures, which is a consequence of the problems of harmonizing the structures of signifier and signified.

SEMANTIC DIVERSITY, VARIABILITY OF DATA STRUCTURES AND LIMITED HUMAN ABILITY TO CONTROL THEM ARE THE REASON FOR DATA FRAGMENTATION

Fragmentation (FG) of data is a consequence of their semantic diversity (SD) and variability (VD), as well as limited human capabilities (LHC) in terms of the ability to control structures consisting of various elements and relationships between them.

FG = f(SD, VD, LHC)

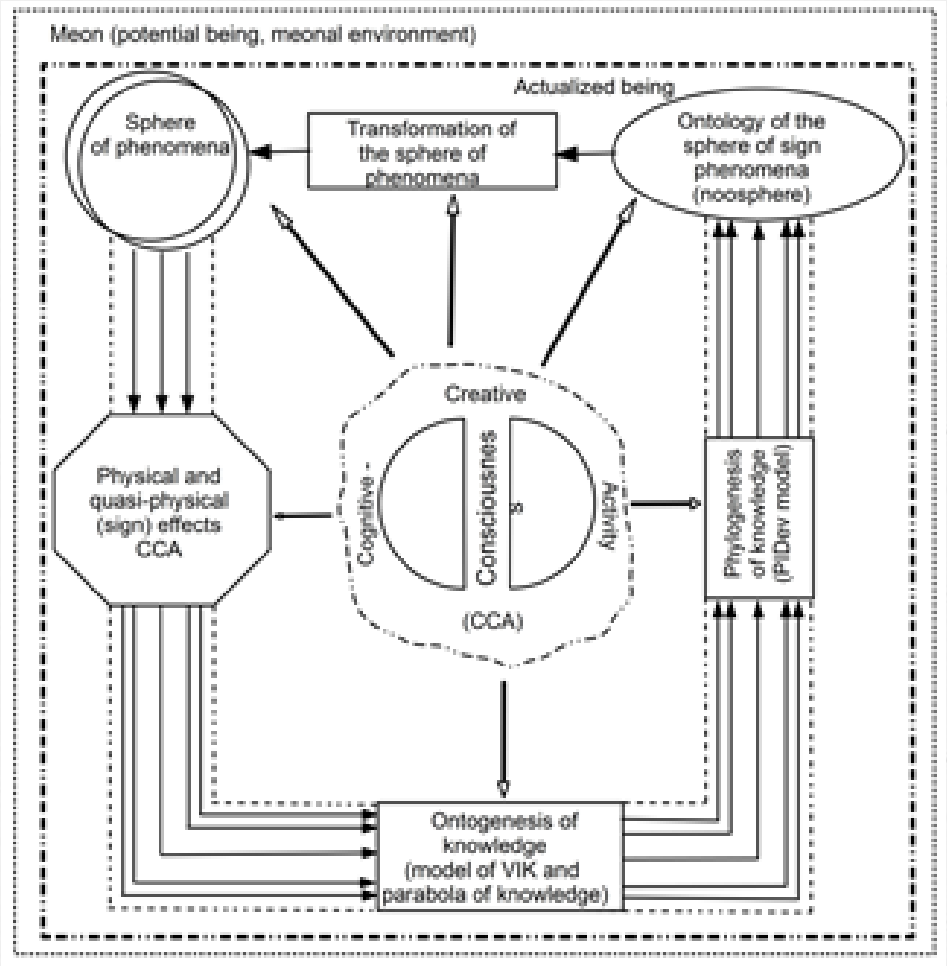
A NECESSARY CONDITION FOR THE EMERGENCE OF A PARADIGM, ALTERNATIVE DIGITALIZATION

Attempts to defragment data under different names and in different terms are constantly being made. This means that the problem has not been resolved and has not received a relevant wording. It cannot be solved within the framework in which it arose. To formulate it is also not easy (as attempts show). This means that what is needed is not just one paradigm, but a model of cognition that is guaranteed to lead to alternative paradigms.

II. DESCRIPTION

OF THE QUASI-PHYSICAL MODE OF COGNITION

QUASI-PHYSICAL MODEL OF COGNITION(QPMC)



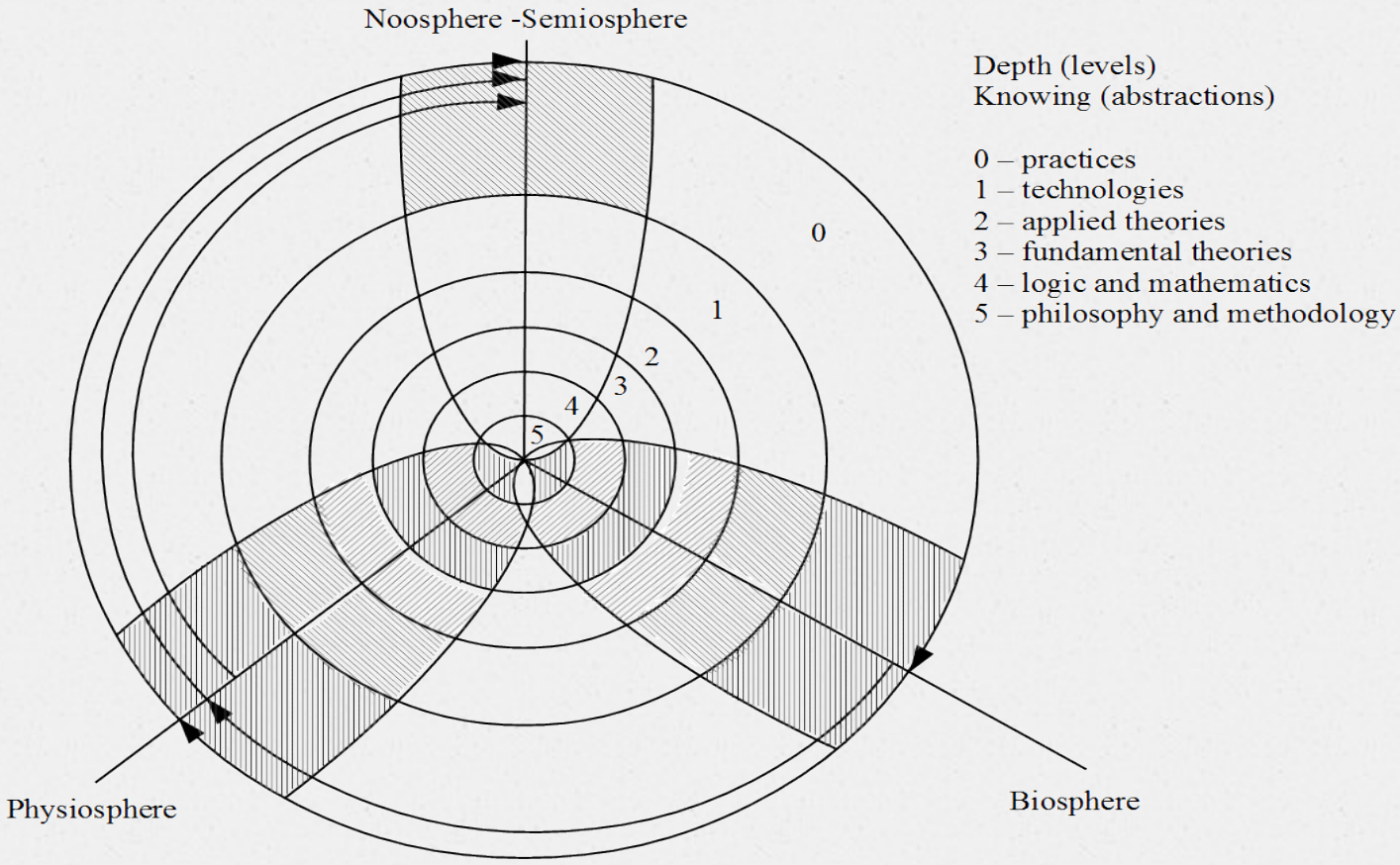
THE MAIN COMPONENTS OF QPMC:

- Consciousness;
- Cognitive-Creative Activity (CCA) of consciousness;
- the sphere of phenomena;
- The totality of CCA effects of consciousness;
- the model of knowledge ontogenesis (Vertical Integration and the Parabola of Knowledge);
- the model of knowledge phylogenesis (Paradigm Innovative Development);
- The ontology of phenomena;
- transformation of the sphere of phenomena.

The main components of QPMC, comments:

According to the QPMC, cognition of physical and quasi-physical phenomena goes on in the same way: through the embodiment of forms of consciousness in meon. The QPMC is based on the "Philosophy of the Name" by A.F. Losev and interprets Marx's concept of embodied forms of consciousness. This path ensures the convergence of all spheres of phenomena and knowledge about them. But there are also fundamental differences, which are discussed below. Practical activity gives rise to new knowledge in the form of embodiment in things and processes. This knowledge must be separated and systematized. The complexity is that science, which is able to systematize knowledge, arises on the basis of the results of systematization. When systematizing, the PIDev and VIK models are used (see below).

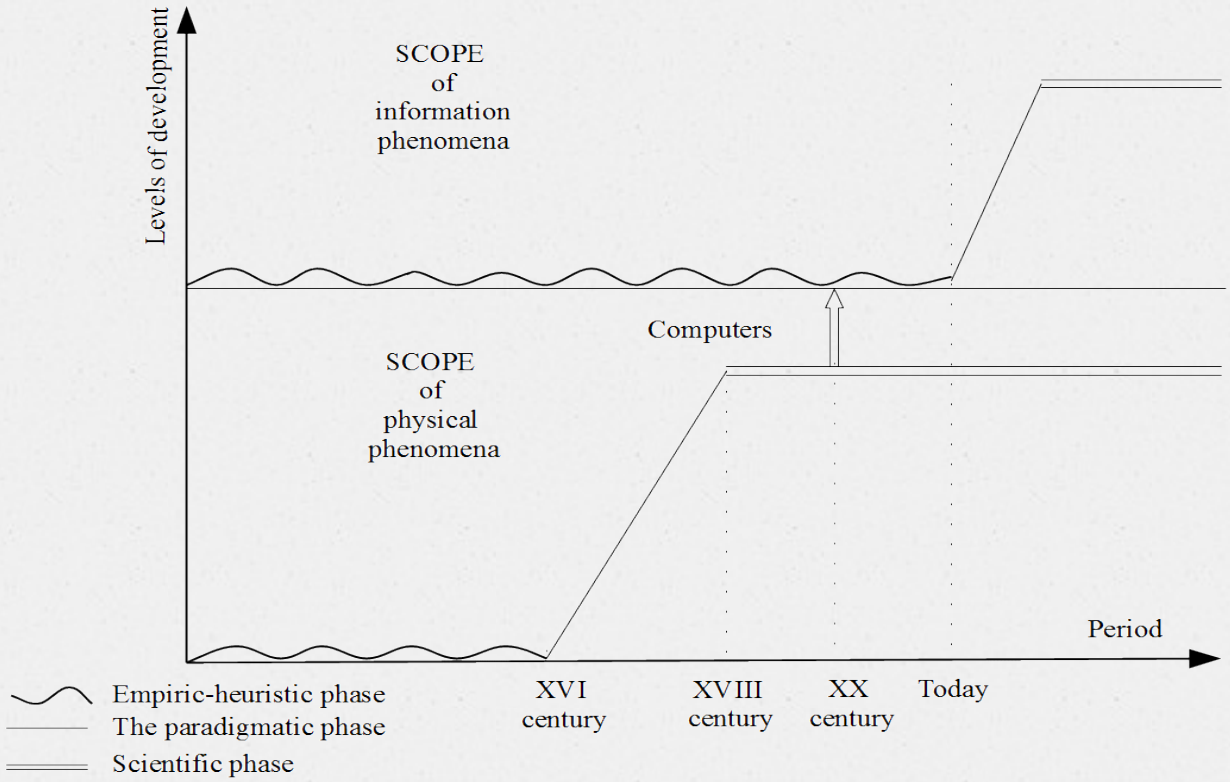
QUASI-PHYSICAL MODEL OF THE OBJECT OF COGNITION



Quasi-physical model of the object of cognition, comments

According to this model, the objects of cognition are the spheres of phenomena, consisting of entities of the same kind, which are not reducible to other entities. By the beginning of the 20th century, such of them as the physiosphere (there is physical bodies in it) and the biosphere (the same way - living organisms) were identified and well articulated. Vernadsky put forward a hypothesis about the existence of the noosphere as a sphere of conscious phenomena, however, his hypothesis lacked a definition of the bodies contained in it. From a comparison of the views of Peirce and Vernadsky, one can draw a conclusion about the decisive role of signs in the noosphere. The noosphere (infosphere) is a sphere of sign phenomena and contains the biosphere, but is not reduced to it. Likewise, the biosphere contains the physiosphere. The spheres of phenomena determine the object (horizontal) structure of knowledge and interdisciplinary research (horizontal integration of knowledge). Signs are quasi-physical bodies. Unlike physical bodies, which consist of other physical bodies, quasi-physical bodies consist of other physical and quasi-physical bodies, consisting of two parts (signifier and signified) between which a correspondence relation is established.

THE PHYLOGENESIS OF KNOWLEDGE

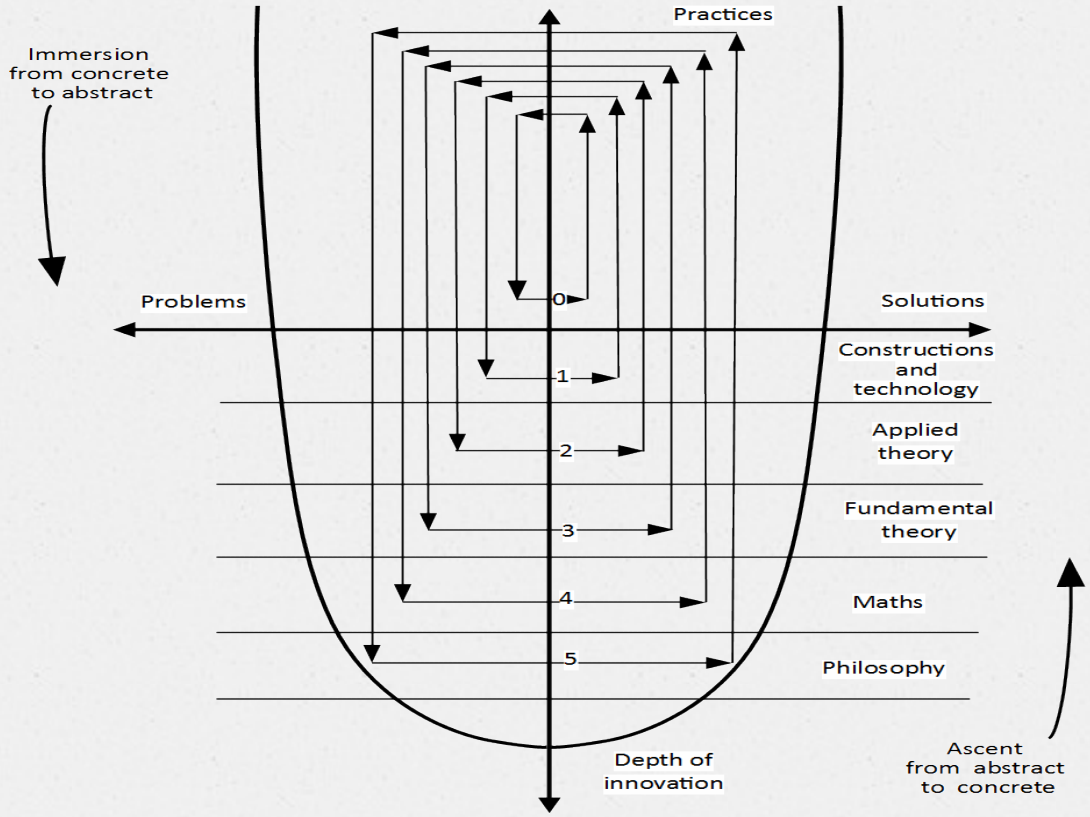


The phylogenesis of knowledge, comments

The PIDev model can be called the model of phylogenesis of knowledge. This example shows the ways of development of the physiosphere and the infosphere. The culminating stage of cognition of the spheres of phenomena is paradigmatic innovations. In this phase the scientific basis of cognition is formed by putting forward and testing trial theories. This stage divides the cognition process into two stages: pre-paradigmatic (empirical-heuristic cognition) and post-paradigmatic (scientific cognition). Cognition of the noosphere has approached the end of the empirical-heuristic phase and is ready for the transition to the paradigmatic phase. Paradigmatic innovation is one of the priority tasks for the development of the infosphere.

This model also reveals the root cause of IT and business disintegration problems. It consists in the fact that IT at the current stage is based on physical data processing technologies applied to information practices. To solve this problem, it is necessary to bridge the gap in the development of knowledge of information practices. It is clear that the PIDev model develops Thomas Kuhn's views on the structure of scientific revolutions.

KNOWLEDGE VERTICAL – THE ONTOGENESIS OF KNOWLEDGE



The ontogenesis of knowledge, comments

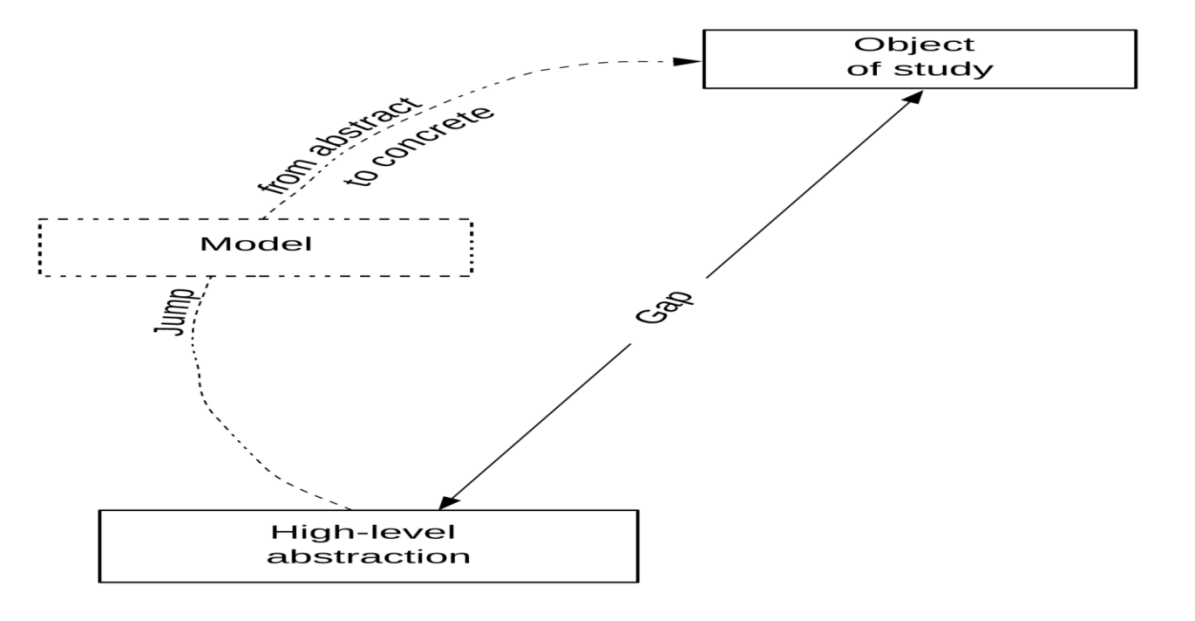
The VIK model can be called a model of ontogenesis of knowledge. The model describes the process of forming innovations. The upper half-plane in the figure is assigned to specific (practical, materialized) knowledge. In this case, specific processes are considered as temporal things. The upper half-plane corresponds to the zero level of abstraction. The lower half-plane is reserved for abstract knowledge, which do not refer to single things, but to their sets, ignoring the uniqueness of each of their elements. The plane is divided into five levels of abstraction: constructions and technologies, applied theories, fundamental theories, mathematics, philosophy, including methodology. The left half-plane is occupied by problems, the right half - by solutions. According to this structure, innovations are changes that can occur at any of the six levels of abstraction shown in the figure. The depth of innovation is determined by the maximum level of abstraction. Innovations that touch on fundamental theory are called paradigmatic. The left branch of the parabola corresponds to the method of immersion from the concrete into the abstract, as a result of which abstractions (paradigms) are formed. Along the right branch there is an ascent from the abstractions of paradigms to the concrete. As a result of the impact on the world of things, changes occur to it, generating new materialized knowledge that require systematization, and the cycle repeats again. It should be noted that, as we discovered, Shiali Ramamrita Ranganathan described such a cycle before us back in 1957.

The words that in cognition one should proceed from specific practical problems, and for their solution to use as deep abstractions as possible, can be interpreted as the principle of vertical integration of knowledge. Such words can be found in the works on the history and theory of science by V.I. Vernadsky.

III. QPMC IS ONTOLOGICAL BASIS OF NOOSPHERIC THINKING

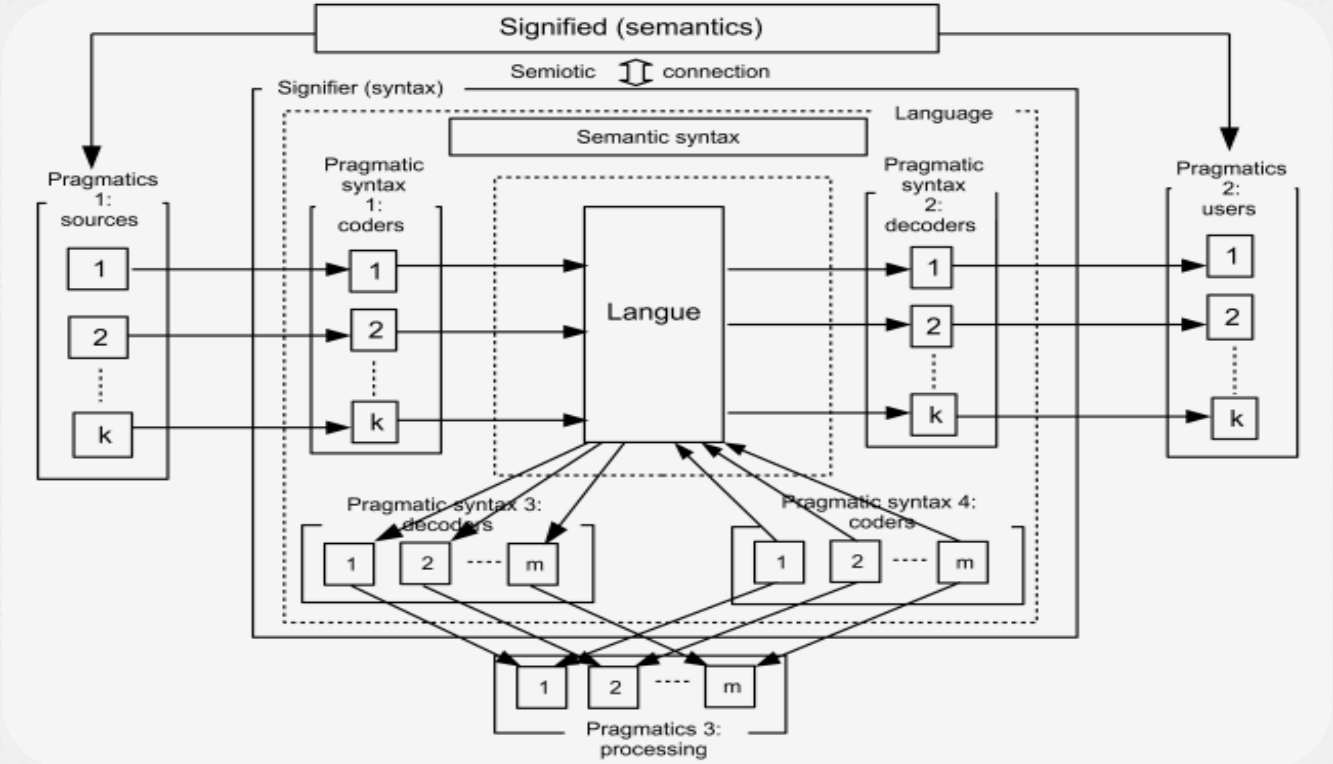
QPMC structures the noosphere and systematizes thinking about it. Therefore, it is the ontological beginning of noospheric thinking.

MODELING AS A JUMP FROM THE ABSTRACT TO THE CONCRETE



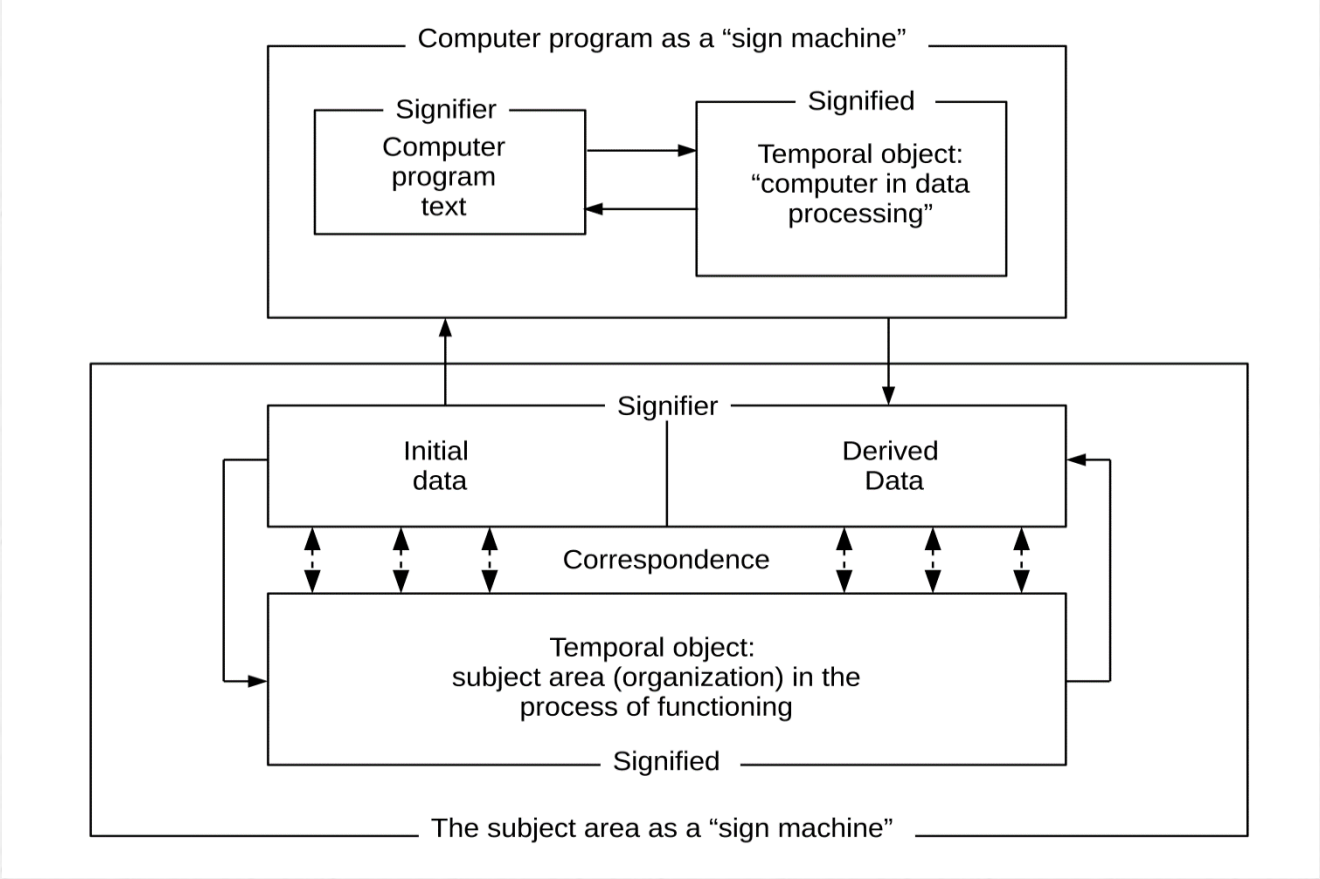
If in the field of phenomena the level of fundamental theory and the levels of applied theories and technologies are not filled, the ascent from the abstract to the concrete looks like a risky jumping and is called modelling.

PARADIGM OF QUASI-PHYSICAL ONTOLOGY OF SIGN



An example of the application of the QPMC model in the infosphere is the sign paradigm. It was obtained according to the method of immersion from the concreteness into the abstractness. The empirical basis for this was the results of programming experience. As a result, the paradigm of the sign arose as the embodying of the invariant scheme of the operation of a computer program.

SCHEMATIC DIAGRAM OF THE ARCHITECTURE OF A COMPUTER PROGRAM



THE ARCHITECTURE OF A COMPUTER PROGRAM, COMMENTS

The maximum convergence of natural science (machines) and humanitarian (program texts) knowledge is achieved in a computer program. Today, this process follows an empirical-heuristic path, usually for data with low semantic diversity.

Creating a more semantically rich database and programs requires their convergence and understanding.

In the figure, the concept of a program as a sign construction includes a program text (signifier) and a temporal object - a computer that implements the data processing process (signified). Data as signifiers themselves form sign constructions together with the subject area signified by them. It could be an organization.

The diagram shows that the text of the program does not directly depend on the subject area, and the data plays the role of a flexible docking node between the program as a data processing system, the subject area and the user.

IV. Conclusions

FROM PHYSICAL TO QUASI-PHYSICAL MODEL OF COGNITION - CONVERGENCE OF KNOWLEDGE

Productive abstractions	FMC	QPMC
Empirical base	+	+
Primary and secondary knowledge	+	+
From abstract to concrete	+	+
From concrete to abstract	-	+
Embodied forms of consciousness	-	+
Physical effects of action	-	+
Quasi-physical effects of action	-	+
Convergence with humanities	-	+

Convergence of knowledge, comments

The proposed model of cognition called quasi-physical, resembles a physical model of cognition. First of all, what they have in common is the reliance on the empirical base, the understanding that it is primary knowledge that needs scientific systematization by way of ascent from the abstract to the concrete. In QPMC this procedure is supplemented by the method of immersion from the concrete into the abstract. The added common point consist in the similarity of objects and the possibility of convergence of physical and humanitarian objects of cognition. The last one in the QPMC are interpreted as sign nature. One and the other QPMC considers as embodied forms of consciousness and the effects of conscious activity. However, in contrast to physically whole phenomena, quasi-physical, according to QPMC, break up into real (signified) and "imaginary" (signifier) components, between which a correspondence must be established and maintained by conscious efforts. QPMC organizes an impressive range of ideas. At the same time, it complements this list and concretizes a number of ideas. Their very systematization uses the similar experience of recognized intellectuals: Vernadsky, Peirce, Losev, Mamardashvili.

SOME AREAS OF APPLICATION OF QPMC

1) Formation of the paradigm of ontology and fundamental theory of signs;
2) Formation of applied paradigms and theories: programs, data, organizations;
3) Solution of practical issues, in particular:

- Data infrastructure as a mutual problem of information technology, economy and society;
- Creation of methods and means for augmentation of semantic content of texts.

As shown, the QPMC allows for a new interpretation of the essence of signs and programs. However, the most compelling and final confirmation of the productivity of QPMC will be the practical results of its application. This can be a solution to the problem of a data infrastructure, mutual for data processing technologies and information practices, or semantic augmentation of intellectual texts, as an alternative to extracting meanings from them that are not necessarily present there. QPMC is an important and independent, but not the final stage of research.

Thank you for your attention!