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THE CONCEPT OF PARADIGM AND ITS ROLE IN INVESTMENT ACTIVITY

The article considers the concept “paradigm” and shows its productivity for creating an innovation activity model for actual problems solution in the sphere of the economics information development.

Keywords: paradigm, ontology of information technologies, ontologies in IT, paradigm model of innovation development, system-semiotic paradigm.

Introduction. The concept of paradigm, brought by T.Kuhn from linguistics to other sciences (to physics, first of all), obtained a wide application not only on all levels of natural sciences, but also on humanities knowledge, technologies and practical activities. It is used in numerous and various meanings, the main of which is a total of philosophic and scientific metatheoretic views, within which this or that scientific discipline is developed. Inter discipline approach (horizontal knowledge integration) accomplished its role. It allowed saving necessary experience for the solution of such cardinal problem of information economic and social development as mutual integration or adaptation of IT and its application objects, since without it the development would become routine or too risky. In this connection it became necessary to elaborate methodology of vertical knowledge integration (VKI) and clarify the notion of paradigm in connection with the stated problem solution.

The connection between IT and social-economic objects of its application is obviously done through information, which has direct relation to signs. However, the concept of information still cannot go further than the philosophic discussions. It is absent as a scientific notion both in economics and information technologies. If we combine economics and IT within interdisciplinary researches, there will be still no way of appearing the searched notion. Appropriate objects should be made clear (objective) for the research and activity by putting forward fundamentally new paradigms, which should satisfy a number of requirements. First of all, there should be tentative theories (one of T. Kuhn’s meanings of paradigm), which get scientific recognition in case of being proved in practice. These theories should consider their objects from “physical”, or rather semiotic point of view, in other words as “bodies” of a particular kind. In this way, the searched paradigms should refer to ontology of signs as semiotic bodies. Then, unlike the

humanities semiotics, the proposed paradigms should not claim the absolute universality. It will be sufficient if they can explain and regulate (optimize) technological accumulated experience, presented in objective view (information and managerial systems, data structures, software etc.).

Definition of the problem. To conduct overall research of a complex concept of paradigm, give its explanation, define its place and role in innovation activity, which guarantees the solution of current problem of economics information development, i.e. the growth of mutual IT and business adaptation.

Results. In the 21st century, globalization and uncertainty of social development replace the period of classic modern. New social movements create new social structures [1]. Social changes via social institutes influence the economy in a great manner. Basing on fundamental statistic material, Carlota Perez demonstrates regular character of similar phenomena, which repeat approximately twice a century [2]. In this respect, M. Khazin believes that fundamental changes affect technologies as well as fundamental scientific views, which form their basis [3].

It is natural that under permanent turbulence the innovation processes cannot help turning into innovation objects. Beside the science, philosophy methodologies, new forms of perception such as methodologism or general systems theory, become part of innovation processes. In order to describe and set regularities, which define structure and innovation functioning, traditional logic and conceptual construct needs to be improved and expanded at the expense of philosophic, humanities and related sciences results. It is necessary to use the idea of heuristics, consider the differences between heuristic and scientifically grounded confrontation of reality and aware that technological decisions are impossible without scientific knowledge of ontology of these technologies objects.

Paradigm is another important concept, risen beyond Economics, but used by economists more and more often. It is questionable concept, so we give an example of it use in economy, particularly in innovation activity in order to choose value, serving the purpose of the research at the most. So, V. Ushakov sees “many paradigms, from Marxism to monetarism” in economy [4]. Karl Marx’s researches can be an example of profound and, what is more important, ontological approach to identify the essence of economic objects as money or goods. This dissertation lay fundamental emphasis on the difference between theories of objects (ontological approach) and methods of their use (functional approach). In philosophy, in first case they mean concept content, in the second – its essence. For centuries, ontology of innovation objects was known and stayed unchangeable, in other words it practically turned into permanent background of innovation activity. So its

opposition to activity methods dwindled. With appearance of objects with completely different ontology, these issues require the closest attention.

Talking about application examples of paradigm concept in economy, we should mention M. Khazin, who compares basic values of a new financial and economic paradigm in comparison with the existing one [5]. I.P. Makarenko relates new paradigm of economic development to the formation of national innovation systems (NIS) [6]. K. Freeman notes: “The concept of paradigm shift with each technological revolution gained wide recognition, especially in 1990^s, after A. Greenspan started using this idea to explain the American economic recovery at that time” [3]. Carlota Perez, who considers the term of “technical and economic paradigm” as an initial one, uses it to determine characteristics or a total of characteristics, defining fundamental differences between one and another technological and social-economical system, or between different periods of any system development. C. Perez writes: “The deeper we look into the past, the harder is the task to describe technical and economic paradigm, because, in fact, it is mostly an imitation model consisting of implicit principles, which are first realized as a talented decisions, and then appear to be ordinary practicability” [3].

The list of examples can be continued. They include theoretical statements and practical recommendations, which their authors called “paradigm” and which gradually gained popularity among the researchers after 1962, when the world saw the publication of T. Kuhn’s monograph “The structure of scientific revolutions” [7]. The Cambridge dictionary of philosophy defines a term “paradigm” as “a set of scientific and metaphysical beliefs comprising theoretical structure, within which scientific theories can be tested, estimated and reconsidered if needed” [8]. The above stated paradigm examples are obviously to set out this definition. This research results can also be called a new paradigm of innovation activity, but we prefer using the term “model” and keep “paradigm” for defining ideas, concerning the ontology of innovation objects. An example of this is systems-semiotic paradigm (SSP) [9].

Before T. Kuhn, the term “paradigm” was widely used in linguistics to define, for example, verb conjugation schemes. In this case, paradigm means a theoretic construction, objects of which belong to the plane of content, in other words to utterance semantics. Paradigm correlates with syntagma, another theoretical construction, which does not belong to the plane of expression (syntax). Person and gender of an agent (plane of content, semantics) define this or that verb ending (syntax). The closest to paradigm concepts are expressed through words sample, ideal type, logical model.

Thomas Kuhn disseminated this definition to other sciences (then, they were mainly natural sciences) and made the definition universal. It is necessary to take into account that this term changes so much in the process of its use, that paradigms are called even what should be called syntagma according to this word etymology.

Judging from its relevance and a number of followers, the logic “invention” of T. Kuhn appeared to be well-timed. Though, there were some hurdles such as terminological “bubble” resembling technological bubbles of Carlota Perez [3]. It made the meaning indistinct, like it happened with the terms of information, system, systems approach, ontology, model and others. But, T. Kuhn gained not only numerous followers, but also opponents and skeptics (I. Lakatos [10-12], K. Popper [13]).

The cases of abusive term “paradigm” application caused harsh, but justified critics, including from national philosophers (B. Novikov [14]). The term itself stuck in scientific use, though. Moreover, it was not entirely unfounded. Affected by the practice, science entered the period of turbulent changes. In these circumstances, the concept meaning theory prototype and requiring to be confirmed in practice, is useful and necessary. Besides, it is necessary and useful as a tool of theoretic activity as well as of innovation economic practice, when it has to choose the basis between random and odd suppositions as to the properties of innovation products and structural and systematized, though test, design. As a result, for certain product classes (particularly, information) the notion “paradigm” turns into one of the main logic tools of innovation economy, and its philosophic and general scientific content gains explicit economic accent.

According to T. Kuhn, he left the possibility of “paradigm” textual discrepancy: «One gentle reader, who shares my belief that the main philosophical book elements are called “paradigm”, elaborated partial analytic directory and concluded that this term is, at least, used in twenty different ways» [7]. After stylistic incoherence is eliminated, there are left two actually different ways of this term use. Firstly, T. Kuhn uses notion “paradigm” in social and psychological manner, as a set of regulations for scientific team, members of which have similar views on the problem. Secondly, he calls generally accepted solutions of scientific tasks (according to him, puzzles) as paradigms.

T. Kuhn’s views of paradigm essence changed with the time. In the beginning, they were samples, lying in the backbone of the theory, in other words their core. “Only when experiment corresponds to a tentative theory, invention appears and a theory becomes a paradigm” [7]. We will look closer at the definition of paradigm as a tentative theory. Over the years, T. Kuhn suggested constant figures, basing on action and theory application

[7]. As a result, nowadays term “paradigm” is applied not only to natural science theories, but also to humanities, methodologies, legal directives, ideologies and others.

A. Naumenko, the author of Triune Continuum Paradigm, claiming the universality and inter disciplinary character, sees the formal characteristics of paradigm specifically in universality: “In practice paradigm is usually defined for a set of sciences. In case when some sciences share the same paradigm, they can connect and synchronize between themselves their characteristic knowledge structures. This enables different sciences to enrich each other with knowledge, gained from different points of view, not complying with the same principles” [15]. It should be objected that truly efficient interaction between sciences happen in a completely different manner. For instance, physical notions are used in the majority of known sciences, including astronomy, geography, biology, economics, sociology and others. Even cybernetic paradigm with its object and management system, direct and back connections appeared within the context of physics. In this case, mechanical shift of paradigm from the lower (e.g. physical) to higher (biological) level is impossible. It explains why cybernetics did not manage to become a theory of management in living organisms and society, remaining a branch of physics until nowadays.

Our task is to get abstract paradigm into constructive shape, with which it will become useful while solving relevant economic problems, related to heuristic innovations. We mean those areas of practical activity, where there is no normal connection between innovations and academic science and where innovations can rely so far only on general theory of systems, system-wide modeling, tectology, praxiology or metodologism, in other words on access methods with poorly defined objects (functionalism). However, judging from 10-year experience, they cannot serve as equal replacement of scientific approach.

Nowadays, in addition to the given dissertations research and works related to it (I.H. Khanin and others [16], M.V. Polyakov [17]), there are new works appearing, which can be estimated as indirect or direct attempts to use Kuhn’s abstraction of paradigm in order to identify and solve relevant problems of social and economic development. For instance, it is A.I. Lipkin’s article “Innovation levels in science” [18]. Innovation in science is, of course, not an innovation in economy. Equal sign between these notions can appear only on the highest levels of abstraction. A. Lipkin considers that the problem is that tools, a total of which is necessary to solve scientific and technological task, turned to be distributed among different scientific specialists. Referring to G. Wise, an American science historian

[19], A. Lipkin writes: “In the simplest case (in science and technology) it can be solved at the expense of a leader, co-organizer and “research-entrepreneur”, who is a key for innovation understanding in research process of the last century”. And further he wrote: “Research entrepreneur finds ways of drawing idealistic scientists and engineers to the attack on the field of practical problems. Eventually, these ways become frozen into institutes and policies” [18].

In this case, it is a situation, when there are enough means for problem solution, but they are distributed among representatives of different professions and a coordinator is needed to guarantee their coordinated operation. VKI method calls this model a horizontal knowledge integration (HKI). Our research, as we noted earlier, is interested in the situation, when it is needed to solve a practical problem with no scientific solution and even without enough tools to get it. In this case, the term “research entrepreneur” cannot be applied here, as it has to guarantee not just horizontal coordination, but vertical (from business results to philosophic generalizations) knowledge integration in the team. That is why he cannot stay just scientist or just entrepreneur. He should be even a philosopher, theorist, inventor and planner to some extent. The world and national innovation economies at this stage of development need managers of such a type, who deal with not only financing and producing, but also developing similar paradigm innovations.

Like us, A. Lipkin use word combination “paradigm innovation”, but he refers it to the creation or changes of “primary ideal objects” (basic abstractions of scientific theory). At this stage particularly, he sees the act of principal, as well as organizational disintegration of science and practice. In his opinion, paradigm innovations cannot be realized by official mechanisms of science functioning: “Paradigm innovations can be supported not by expert council (or Academy of Science proceedings), but by separate scientists”. But he also makes the innovation success dependent on social and psychological climate: “Such approach requires quite big resources and healthy (not corrupted) environment, which the USA are likely to have, and we do not” [18].

In our view, A. Lipkin makes a fundamental discrepancy in this question. The matter is not and so much in science corruption. The support of paradigm innovation can appear to be more beneficial than to its denial. The thing is that “normal” academic science, being though a result of scientific revolution, as an institution and well-functioning mechanism cannot and do not have to organize and make scientific revolution, going thus beyond its own competence. It is practically impossible to solve contradictory tasks: keep the science basis and at the same time doubt and test them.

It explains why paradigm problems of information technologies are not

solved anywhere in the world, including mentioned the USA and Europe. To solve them, it is necessary either successful turn of events, for example, full mutual understanding between the innovator and the investor, or creation of special logic (models), organizational, economic, and legal mechanisms, capable to reproduce similar situations regularly.

According to the concept of paradigm innovations, the initiative should go from innovation practice, in other words from venture business. Besides, one should be guided by VKI method, integrating practice with philosophy, principal heuristics and scientific theories. Stable economic effect, resulting from scientific solution of the practical problem with no scientific support on the level of primary abstractions, will become the best confirmation of scientific innovation validity; especially, when we refer not to physics, but to weakly defined objects of non-existing sciences. First of all, we mean sign objects.

Investment flow in natural science technologies as a result of those critical decisions, which were obtained during technological revolution period and continue being detailed (e.g. corded telephone turned into a mobile, aspirin, discovered and synthesized long ago turned into effervescent tablets etc). This flow is decreasing and requires bigger expenses (e.g. as of 2009 Large Hadron Collider cost \$6 billion). At a global market level, this investment flow is mainly distributed among national systems, capable of bearing similar costs.

However, despite P.G. Schedrovtskyi's statement that "frame technologies" are impossible in innovation area, there is no and cannot be an unbridgeable gulf. They are artificially and temporary disconnected parts of a single whole. Ontologization of liberal arts, which solves problems in humanitarian area (informatics, sociology, economics, and finance) can eventually turn to be a key to the solution of problems relating to the development of natural sciences and technologies based on it. The works of Teilhard de Chardin [20], V.I. Vernadskyi [21], L. LaRouche [22] and our own experience gained during the development and application of systems – semiotic paradigm [9], just prove it.

New fundamental scientific and technological decisions, if they do not meet practice requirements, can initiate "processes of constructive demolition" in Schumpeter's parlance [23], and are capable to bankrupt one and give other enterprises, businesses and the whole national economy unique, competitive lifts, leading to the repartition of the market. As an example from natural science technologies, we can give a personal computer paradigm, which replaced the paradigm of big, mainframe computers, and also paradigms of local area network and the Internet. It should be take into con-

sideration that all these examples lead to a main paradigm (it is known as Turing machine, which follows machine paradigm) and do not go beyond the fundamental paradigm of physical body. Shift of technological modes and their constructive and destructive actions as a natural process are described in C. Perez's works [3]. But, it is also needed to add that at the current stage, one of the sources for destructive conflicts is weakness of scientific support, including scientific paradigms from information products, demanded by practice.

There is a similarity between Schumpeter's notion of basic innovation, causing innovation clusters, and paradigm innovations. However, basic innovations appear under the conditions of developed science, basing on its paradigm concretization. In this case, the shift from abstract to specific, from general to individual occurs. It is different with paradigm innovations. Firstly, the individual innovations, created on an initiative basis, appear. The absence of general principal scheme complicates their distribution and development, and stimulates the development of a common conceptual core – scientific paradigm, which serves as a ground for the basic innovation, creating then an innovation tree, branches of which end up with multiple individual innovations.

The paradigm approach completes an innovations' investment aspect, which is of prime importance, but only if the investments are supported with challenging ideas and intellectual capital. V.M. Heets and V.P. Semnozhenko caution against idealizing investment aspect while generating and implementing investment government policies: "Investment potential for foreign investors should not be taken as a competitive factor. In fact, this approach is limited, as during postindustrial period nonmaterial factors become the most important economic growth factors. The main positions belong to intellectual capital and human factor [24]." We consider the scientific paradigms, resulting from current actual problems, to be the most capacious and constructive, as well as the most efficient form of intellectual capital. Financial capital is dead without intellectual one. The older and, correspondingly, the more worked out the scientific base of technologies is, the more money is spent on development and realization of innovation projects, to say nothing of the riskiest complex heuristic innovations. At the same time, paradigm innovations, being the early stage of scientific discipline formation, require, as a rule, minimum investment.

Based on L.M. Timoshenko and V.O. Hrishkin's researches [25], it should be noted the importance of unique competitive advantages, which can be created according to paradigm approach, for small business development, indices of which are significantly less than in developed world economies basing on innovation technologies.

V.M. Heets and V.P. Seminozhenko also note the importance of “implementing long-term programs, which are at the joint of fundamental science and economically-perspective technologies and projects (e.g. space, sea exploration, new system of developing education)” [24]. Nevertheless, not all economically perspective technologies and projects, requiring fundamental knowledge, appear at the joint with fundamental sciences solely, because fundamental sciences (e.g. sciences, the objects of which were signs) necessary for their realization cannot exist at the moment. To initiate their creation in a directory way is obviously impossible. But, this process can be started by venture business through practicing paradigm innovations. In order to do so, there should be appropriate creative and legal basis, educational, research and business mechanisms created [9].

At the same time, technologies, being at the joint with existing fundamental sciences, require for their realization, above all, enough money and qualified researchers in order to lead them to commercial application. Not coincidentally, some researchers say that the main factor defining the level of company’s development (and national economy’s) is possibilities to access investments (A. Shneider, Y. Kazman, G. Topchishvilli [26]). In addition, the possibility depends not only on company’s state, but also on its position on economic and financial map of the world. Thus, the unique competitive advantage at a higher level than of basic innovations, is a convincing factor, making the access to innovations easier.

So, among multiple definitions of term “paradigm”, according to the goals of the given research, we should concentrate on one of Kuhn’s definitions, according to which paradigm is a tentative theory capable to explain and intentionally change experimentals. Being confirmed experimentally, such paradigm strives to turn into a full theory.

As Thomas Kuhn mainly based on the natural sciences materials, this theory concept, first of all, referred to chemical or biological bodies. Thomas Kuhn did not have the necessity to focus on implied default ontological character of discussed paradigms. His term can be referred to economic and social objects without a doubt. In methodologies or ideologies, the term “syntagma” were more appropriate, which in linguistics refers to plane of expression and not to plane of content, as the term “paradigm”. That is why, within this research we detail the notion “paradigm”, having limited its use with tentative theories materialized in physical objects.

Thus, the connection between the notion of paradigm, accepted in the given work, and ontological approach to innovations is set. In the above-mentioned researches, this connection was not of principal importance while solving the global economy informatization problems. In our opinion,

the reasons are following. One the strongest sides of leading innovation economics is art and methodology of organization and management, directed at commercial or social effect. Historically, it developed the most in innovative and technological revolution, basing on natural sciences. Due to the scientific and technological revolution, happened about 300 years ago, certain potential of scientific support for technologies appeared. During the following period, ontology of majority of innovation products stayed almost without changes. Under these conditions, methodology, in other words management and not ontology is important.

However, the practice more often faces intellectual objects. Under these conditions, the insufficient level of liberal arts ontologization is manifested. The necessity of ontological approach based on semiotics started to be recognized by, for example, sociology (I. Shmerlina [27]). The term “ontology” is also widely used in IT. (D. Sova [28, 29]). But, instead of facing the ontology, information of global economy continues mechanically using methodological approach. In this connection, the term “ontology” by itself acquired methodological meaning in IT. In fact, dictionaries of programming languages for application domain areas and information systems have this name.

But, information, programs, data, knowledge, systems turned to be out of ontology frames, remaining as cognitive structures in their essence used for modeling (describing) the reality.

Ontologies are referred to the objects of modeling, and not to the reality, including IT objects. It is obvious that methodological (activity) approaches, being the advantage at commercial use of knowledge potential, turns to be a disadvantage when it is necessary to create new knowledge. So, to manage innovative development of global economy it is necessary to comprehend a paradigm as a tentative theory, directed at real objects of activity (signs, messages, information, data, programs).

Counting the above mentioned, classification is offered to include a class of paradigm innovations. There, the results of heuristic innovations without reasonable scientific support, serve as empiric material to propose tentative scientific theories at the highest levels of abstraction (paradigm), which in their turn are used at optimizing heuristic products.

As the conducted analysis shows, many researchers consider that at the current development stage of global economy’s informatization, the approach to innovations is not enough. They also refer to the concepts of ontology, paradigm, institutional mechanisms and unequal economy development, temporal disagreement between practice and science, though they render them differently. It serves as an additional prove, that we made the right choice of research objects and ways for their achievement. The find-

ings, previous developments, vertical knowledge integration (VKI) method, and also experience of development and systems- semiotics paradigm (SSP) application, led to the concept of ontology, paradigm, scientifically-grounded, heuristic and paradigm innovations, forming an integral system, representing a real alternative to the heuristic approach.

Historic analysis of innovation processes shows that the appearance of paradigms, grounding heuristic innovations and turning them into basic ones, often depends on chance. The innovation product can wait for this for centuries and millenniums. Neither science and innovation practice, nor their close interaction in existing forms can guarantee the emergence of paradigm innovations even when there are all-necessary for them conditions. In order to have paradigm innovations proved as a regular form of innovation activity, they should be, first of all, understood as possibility and necessity, become a real philosophy, be fortified with models and mechanisms, used by participants of innovation processes. Being a convincing unique competitive advantage of this or that national economy at the moment of its emergence, this knowledge can and must be a basis of international cooperation at the level of economy, philosophy, science, education and innovation integration.

Conclusions. The paper offers a specified paradigm concept, which lies in the basis of paradigm innovation development (PID) model. This model presumes that similar paradigms appear neither from philosophy, nor from existing knowledge. Only practice can be their source, and practice authors, capable to think like philosophers or theoreticians, or working closely with philosophers or theoreticians capable to think practically.

Investors relying not only on ratings (sometimes they do not reflect even approaching global crisis), but also considering the results of logical analysis, should note the developments, performed within PID models. Uniting modern philosophical and theoretical ideas and accumulated practical experience, such developments open completely new page in business information development, providing their participants convincing and long-term competitive advantages at minimum risks.

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КОНЦЕПЦІЯ ПАРАДИГМИ ТА ЇЇ РОЛЬ У ІНВЕСТИЦІЙНІЙ ДІЯЛЬНОСТІ

Стаття розглядає поняття парадигми і показує його продуктивність для створення моделей інноваційної діяльності для вирішення актуальних проблем у галузі інформаційного розвитку економіки.

Ключові слова: парадигма, онтологія інформаційних технологій, онтології в ІТ, парадигмальна модель інноваційного розвитку, системно-семиотична парадигма.

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КОНЦЕПЦИЯ ПАРАДИГМЫ И ЕЕ РОЛЬ В ИНВЕСТИЦИОННОЙ ДЕЯТЕЛЬНОСТИ

Статья рассматривает понятие парадигмы и показывает его продуктивность для создания моделей инновационной деятельности для решения актуальных проблем в области информационного развития экономики.

Ключевые слова: парадигма, онтология информационных технологий, онтологии в ИТ, парадигмальная модель инновационного развития, системно-семиотическая парадигма.
