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Evolution of cybernetics: philosophical and methodological analysis

Abstract

Purpose–To elaborate the connection between the evolution of cybernetics and the development of scientific rationality (classical, non- classical, post-non-classical) and to emphasize the relevance of the formation of post-non-classical cybernetics for self-developing reflexive-active environment (the third-order cybernetics).

Design/methodology/approach – Interdisciplinary analysis of the evolution of cybernetics and possible directions of its development.

Findings – A connection between the types of scientific rationality (classical, non-classical, and post-non-classical) and the stages of the development cybernetics is presented. Classical rationality is first-order cybernetics dealing with observed systems (an external observer). Non-classical rationality is second-order cybernetics dealing with observing systems (built-in observer). Post-non-classical rationality is third-order cybernetics dealing with the *self-developing reflexive-active environment* (distributed observer).

Research limitations/implications – This is an initial theoretical conceptualization, which needs a broader assessment and case studies.

Practical implications – This proposed direction for the analysis of cybernetics opens new approaches to social control on the basis of the subject-focused models and integration of traditional cybernetic tools.

Social implications – Third-order cybernetics will promote the development of civil society. Direct democracy receives new tools for development.

Originality/value – The value of this research is in the interdisciplinary analysis of the cybernetics evolution and in new possible directions for its development.

Keywords – Cybernetics, third-order Cybernetics, Philosophy, Methodology, classical, non-classical, post-non-classical Rationality, self-developing reflexive-active Environments

Paper type – Conceptual paper

1 Introduction

In recent decades Russian philosophy of science has recognized three stages in the development of science (classical, non-classical, and post-non-classical), which were proposed by V.S. Stepin (Stepin, 2005). If we ignore these changes, we risk losing sight of basic shifts in the scientific fields of control and in the evolution of cybernetics. The revision of general scientific worldviews was followed by changes in the structures of research and in the philosophical foundations of science. Each of the three development stages of science is associated with the dominance of one of three types of scientific rationality - classical, non-classical and post-non-classical rationalities. It is significant to note that the scientific rationalities are not alternatives. Every subsequent rationality has its own specifics but includes also the previous types of rationality. Post-non-classical scientific rationality integrates all three types of scientific rationality.

The analysis of the evolution of cybernetics and the evolution of scientific rationality make possible the hypothesis of their correlation. First-order cybernetics "*cybernetics of observed systems*" (Norbert Wiener) developed within classical scientific rationality. Second-order cybernetics "*cybernetics of observing systems*" (Foerster, 1974) developed within a non-classical scientific rationality. Post-non-classical scientific rationality can become a basis for the formation of a post-non-classical "*cybernetics of self-developing* reflexive-active *environments*" which can be considered as the third-order of cybernetics. The results of the first steps toward the formation of third-order cybernetics are presented.

2 Three types of scientific rationality

In the historical evolution of science, we can distinguish three types of scientific rationality: classical, non-classical and post-non-classical rationality (Stepin, 2012). As stages of science are developing, there are "spans" between them, and the appearance of every new type of rationality did not reject the previous one, but only indicated the limited sphere of its application to certain types of problems.

Every stage is characterized by a special type of scientific activity. If we present this activity as relations "subject – means – object" (value-goal structures of activity, knowledge and practices of application of methods and means included into understanding of subject), the described stages of evolution of science, representing different types of scientific rationality, are characterized by different depth of reflexion on scientific activity itself.

The classical type of scientific rationality, concentrating attention on the object, in theoretical descriptions and explanations, tends to eliminate everything, which refers to the observer, the means and operations of a scientific activity. Such elimination is regarded as a necessary condition for obtaining objectively true knowledge of the world. Goals and values of science, determining strategies of investigation and methods of fragmenting the world, at this stage, as well as at all other stages, are determined by the worldview attitudes and value orientation dominating in the culture. However, classical science does not comprehend these determinations.

The non-classical type of scientific rationality takes into account connections between the scientific knowledge of the object and the character of means and operations of activity. Explication of these connections is regarded as conditions of objectively true description and explanation of the world. Nevertheless, connections between scientific activity and social values and goals are not an object of scientific reflexion at this stage, though implicitly they determine the character of knowledge. They determine what and how we distinguish and comprehend in the world.

The post-non-classical type of scientific rationality broadens the field of reflection of activity. It takes into account correlation of obtained knowledge of the object not only with the means and operations of activity but also with value-goal structures. Here we explicate the connection between scientific goals and purposes and extra-scientific social values and goals. The requirement of explication of values not only does not contradict the goal of obtaining objectively true knowledge of the world but also is a premise for the realization of this goal.

Here is a scheme depicting this type of scientific rationality:

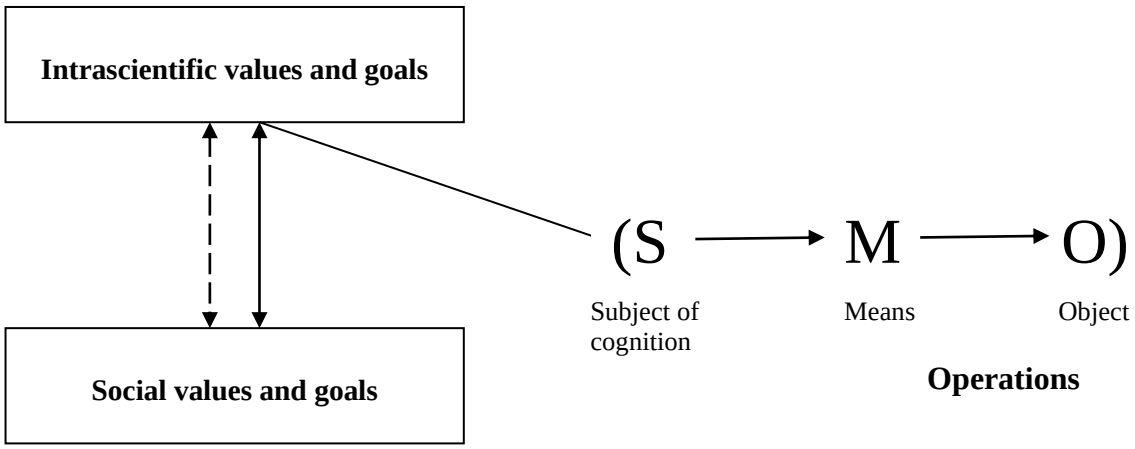

Fig.1 The post-non-classical type of scientific rationality

3 Configurator of the philosophical and methodological cybernetics analysis

For analysing the evolution of cybernetics we use the idea of the system configurator offered by V. A. Lefebvre (Lefebvre, 1967). The idea is that the researcher selects the most significant points of view on the object of research. The object is projected on several screens. The screens are connected with each other. The researcher can correlate various points of view on an object.

We will define structuring positions of the configurator in the context of the traditional points of view of scientific analysis:

- philosophical level (science philosophy - basic types of scientific rationality);
- methodological level (basic paradigms and objects of a research, methodology of scientific approach);
- theoretical level (the basic providing areas of knowledge);
- methodical level (basic methods, models, technologies).

The configurator for the analysis of the evolution of cybernetics is presented in Table 1 and Table 2.

Table 1.
The generalized results of the philosophical and methodological analysis of the evolution of cybernetics (philosophical, methodological and theoretical levels).

Philosophical level		**Methodological level**			**Theoretical level**
Type of scientific rationality	**Basic philosophical approaches**	**Basic paradigms**	**Basic objects of control. The dominating types of activity**	**Basic scientific approaches**	**Basic areas of knowledge**
Classical	Positivism	"Subject – Object"	Complex system Activity in activity	Activity approach Monodisciplinary approach	Cybernetics
Non-classical	Philosophical constructivism	"Subject – Subject"	Active systems Communicative activity	Subject-activity approach Interdisciplinary approach	Second-order cybernetics
Post-non-classical	Humanistic interpretation of philosophical constructivism	"Subject – Meta-Subject" "Self-developing reflexive-active environment"	"Self-developing environments" Reflexive activity	Subject-focused approach Transdisciplinary approach	Third-order cybernetics (post-non-classical cybernetics of self-developing reflexive-active environments)

Table 2.
The generalized results of the philosophical and methodological analysis of the evolution of cybernetics (methodical level)

Type of scientific rationality	Methodical level				
	Basic types of control	**Basic models**	**Basic mechanisms and technologies**	**Basic ideas of knowledge**	**The dominating ethical regulators**
Classical	Classical control	Analytical (mathematical)	Feedback Hierarchical structures	Information	Ethics of domination of target orientation
Non-classical	Reflexive control, manipulations, etc.	Imitating models, business games, etc.	Communication relations, reflexive processes Network structures	Knowledge tied to subjects. Personal (hidden) knowledge.	Communicative ethics
Post-non-classical	Environmental control	Models of self-developing reflexive-active environment	Control through self-developing environments, through culture, values, technologies of assembly and destruction of subjects of development	Active knowledge. Virtual immortality.	Ethics of strategic subjects

The problem of scientific rationality development can be considered in the context of scientific paradigms generation (Kuhn, 1962) and at the same time as a clash of competing scientific programs (Lakatos, 1978). It is important to note that the new type of scientific rationality is not an alternative to the previous one; rather it includes previous types through the corresponding ontologies.

The post-non-classical scientific rationality integrates both classical and non-classical rationality. As a result, cybernetics should be considered as a uniform area of knowledge. In post-non-classical representation of cybernetics, all levels are integrated into general cybernetics of the first, second and third order. This process is achieved through the system of ontologies, which establishes self-developing reflexive-active environments.

In the last decades, the Russian interdisciplinary scientific society has shown considerable interest in the philosophical bases of cybernetics development (Novikov, 2016). In 2017, the WOSC initiative was essential in the process of bringing the worldwide scientific community together for joint discussions.

3 Classical scientific rationality: first-order cybernetics

Philosophy

Classical scientific rationality, focusing attention on the object, seeks to reduce research to theoretical explanations and descriptions of everything that concerns the subject, means and activity operations. Such elimination is a necessary condition for acquiring objective and true knowledge of the world. The philosophical foundations of first-order cybernetics were mainly formed within positivism. Modelling of the person was based on a behaviouristic approach, which was also based on positivism.

Methodology

The traditional idea of control was born in the context of classical science, and it was restricted to a "*subject-object*" paradigm. The classical vision of the subject-object interaction is presented in numerous philosophical works of René Descartes, David Hume, Immanuel Kant, Ernst Mach, Edmund Husserl, Ludwig Wittgenstein, etc.

The activity approach is one of the basic cross-disciplinary approaches in Russian science. It was primarily created within psychology (Leontyev, 1978, et al.) and has significantly influenced the studies of Russian cybernetic experts. Freedom of a subject is significantly limited by the purposes and norms regulating activity. Reflexive activity has been limited to the framework of an activity approach.

There was a monodisciplinary approach to control.

First-order cybernetics

Cybernetics was the dominating science in control. It was defined as science about the general regularities of control processes and information transfers in mechanisms, live organisms and society (Wiener, 1948).

First-order cybernetics is the "*cybernetics of observed systems*". To model control processes various approaches were used: functional, function-structural, axiomatic, informational, operations research, classical game theory, etc. Within this "subject-object" paradigm the main mechanisms of control are negative and positive feedbacks, which are a basis of homeostatic mechanisms of control, systems of automatic control, etc.

Knowledge infirst-order cybernetics

An information approach dominated in the organization of knowledge. The information streams and problems connected with their rationalization were the focus of attention. The founders of the information approach warned about its restrictions. Claude Shannon predicted searches for applications of his theory of information, and Russell Ackoff proved the incorrectness of use of this information approach in the management of social systems.

Ethics in first-order cybernetics

The dominant ethical representations have been determined as target ethics. It may be found in the second ethical system in the models of Vladimir Lefebvre's ethics (Lefebvre, 1982).

4 Non-classical scientific rationality: second-order cybernetics

Philosophy

Non-classical scientific rationality takes into consideration interactions between knowledge about object and character of activity means and operations. However, interactions between scientific and social values and the purposes of inquiry remain outside of scientific reflexion, though implicitly they determine the nature of knowledge: what exactly and in what way we single out and grasp something in the world. The results of scientific research are influenced by comprehending the correlation among the explained characteristics of objects and the features of means and scientific activity operations. The problem "*means determine object*" was in the centre of attention.

The considered research promoted a transition from the domination of positivism to philosophical constructivism which becomes one of the leading directions within non-classical rationality.

Methodology

In such relations, the researcher becomes only one of the person in the specific system of the reflexive relations. This research has created the basis for a transition from the paradigm of "*subject–object*" to the paradigm of "*subject – subject*".

An increase in the role of the subject leads to the need to revise the domination of the activity approach. In our opinion, adequate to the specifics of a non-classical scientific rationality was the subject-activity approach (Rubinstein, 1997). While the basis of classical scientific rationality is activity in action, non-

classical rationality along with it includes other forms of activity, in particular, communicative and reflexive activity.

The basic role of the paradigm "subject-subject" and using active systems as a basic type of control objects defined active collaboration of representatives in various fields of knowledge: philosophy, psychology, sociology, political science, biology, etc. An interdisciplinary approach becomes the basic scientific approach.

Second-order cybernetics

The idea of cybernetics of the second order offered by Von Foerster — *"cybernetics of observing systems"* (Foerster, 1974) — can be considered as a concept which corresponds best of all to non-classical scientific rationality. In biology, these ideas were reflected in the concept of an autopoiesis (Maturana, 1987). Vladimir Lefebvre (Lefebvre, 1986) described the differences between Western and Soviet approaches to second-order cybernetics formation. However, these approaches share much in common, as they both recognize the concepts of objects activity, their ability to reflect and to self- organization.

At the same time, the role of reflexive activity has sharply increased (Umpleby, 2014). Communicative reflexive activity (Lefebvre, 1967) becomes the leading concern (Müller, 2015). The philosophical foundations of second-order cybernetics were formed generally within philosophical constructivism.

It is important to note the change of the observer concept. In first-order cybernetics there was a monopoly of the external observer, in second-order cybernetics built-in observer is integrated into the control object along with the external observer.

The transition in control from the "subject-object" paradigm to the "*subject-subject*" paradigm has led to the formation of new types of control: reflexive control (Lefebvre, 1967), information control, control of active systems, etc. Classical game theory and the problem of choice were significantly upgraded in the context of non-classical scientific rationality.

The specifics of second-order cybernetics were represented in the control of economic systems. Thomas Schelling (Schelling, 1960)awarded with the Nobel Prize in economics showed that rational behaviour in games can include not only maximizing the expected income but also convincing the opponent of the player's expected strategy. The initial statement of Robert Aumann (Aumann, 1974) who was also awarded the Nobel Prize in economics says that the balance in economic relations is understood as a result of complicated processes of social interaction, and the result is cooperation with the maximum outcome for all participants.

Knowledge in second-order cybernetics

The picture of the world in non-classical science cannot be presented by knowledge without subjects, without their subjective realities; otherwise, an adequate interpretation of knowledge is impossible. A subject's picture of the world forms the overall non-classical world view. Valentin Turchin (Turchin, 1977) stressed that knowledge in any form without communication with the subject (observer) is logical nonsense. Personal (hidden) knowledge (Polanyi, 1964) becomes also the most important direction of second-order cybernetics. The basic ideas of knowledge change in second-order cybernetics.

Ethics in second-order cybernetics

Communicative ethics (Lefebvre, 1982) become dominating in second-order cybernetics (Lepskiy, 2016).

5 Post-non-classical scientific rationality: third -order cybernetics

Philosophy

Post-non-classical scientific rationality broadens the field of reflexion on scientific activity. It takes into consideration the correlation of the acquired knowledge about an object not only with the features of means and operations but also with value and target structures. At the same time, the connection of inner-scientific goals with extra-scientific ones, social values and aims is explicated. Moreover, the problem of

their correlation with the comprehension of valuable and target orientations of the scientific activities subject is also solved.

In the context of this rationality, basic scientific approaches to cybernetics and control have to be focused on harmony causal (cause and effect) and teleological (target determination) approaches.

In post-non-classical scientific rationality, there is a transformation of philosophical constructivism. It becomes "softer". The emphasis is on communicative processes of the subjects forming reality, on the influence of these processes on restrictions of their freedom (Lektorski, 2001). Freedom is thought of not as control, but as the establishment of an equal partnership with what is out of the person: with natural processes, with other persons, with the values of other cultures, with social processes. Such an approach assumes non-reduced variety, pluralism of different positions and points of view, cultural systems engaging with each other in dialogue and changing as a result of the interaction. This new understanding of the person and the natural relation is the basis if not the ideal anthropocentrism, but the idea of joint evolution.

Methodology

Self-developing systems are in the centre of attention of post-non-classical scientific rationality (Stepin, 2003).The paradigm "*subject – self-developing reflexive-active system (environment)*" (Lepskiy, 2010) becomes a key paradigm of control and cybernetics. It is important to note that the environment is considered to be a *meta-subject*. As a result, the paradigm can be presented as "*subject – meta-subject*".

A self-developing reflexive-active environment is a meta-subject, which possesses invariant similar to the properties of subjects: purposefulness (activity), reflexivity, communicativeness, sociality, ability to develop, etc. Such an environment has integrity that essentially distinguishes it from networks. This is an interaction of active elements, organized in a special way. Active elements can be created on the basis of the natural intelligence (the personality, group, etc.), the artificial intelligence (agents) and the integration of natural and artificial intelligence.

The organization of interaction of active elements among themselves and with the environment in general is defined by the system of values, principles, ontologies (maintenance, support, development, designing and, providing innovations), criteria (efficiency, safety, development, satisfaction) and by the specialized subject-focused information platform (Lepskiy, 2010; 2015).

The idea of self-developing reflexive-active environments was created under the influence of the following inter-disciplinary ideas and concepts. Philosophy, sociology and psychology have given us the ideas of post-non-classical scientific rationality, which integrates concepts of various scientific schools (Stepin, 2005), ideas of noosphere (Vernadsky, 2007), the concept of the society as a social system (Luhmann, 1982), principles of the Russian psychology (Leontiev, 1978;Vygotsky, 1981; Rubinshteyn, 1997), studies of the Russian methodologists (Shchedrovitsky, 2002) etc.

Cybernetics has given us an idea of second-order cybernetics by Heinz von Foerster (Foerster, 1974), Stafford Beer's models (Beer, 1981), W.R.Ashby principle of complexity in control (Ashby, 1956), the reflexive models of Vladimir Lefebvre (Lefebvre, 1967, 1982), a synthesis of representations of cybernetics and its development by Stuart Umpleby (Umpleby, 2014), ideas of Valentin Turchin about metasystem transition and concepts of the future of cybernetics (Turchin, 1977), etc.

The model of organization of self-developing reflexive-active environments, described in this abstract, will allow us to solve a number of current scientific and practical problems (Lepskiy, 1998, 2010; 2015). It will:

- support of processes of identification of the society (project identification gets the leading role);
- assemble of the subjects of development into meta-subjects, help to consolidate state, business and society actors on the basis of shared interests, stimulate and support the development of the civil society;
- improve mechanisms of democracy on the basis of convergence of direct and representative democracy;
- overcome market egoism through the transition to a harmony of subjects of development;

- create opportunities for all subjects in the field of social activity and mobility;
- stimulate and support the formation process of a new type of elite — an elite of development, and create necessary provisions to include it in the processes of strategic control;
- help to design complexity problem solution in the processes of social systems control (Ashby principle);
- create development conditions of new socially oriented economic mechanisms of development;
- create effective mechanisms of innovative development;
- decrease social tension, prevent conflicts, increase security with technologies of the operated chaos, "orange revolutions" and other destructive influences;
- initiate transition processes from technogenic to a socio-humanistic civilization, etc.

This paradigm can be applied to the organization of active knowledge, for reflexive mechanisms of management of complexity, etc.

Formation of this paradigm is inseparably linked with the formation of the subject-focused approach (Lepskiy, 1998).

The necessity of complex use of natural science and humanitarian fields of knowledge generates high methodological complexity. The solution of this problem is possible upon transition from an interdisciplinary to a transdisciplinary approach. An exit out of limits of separate disciplines and the conceptual directions with the involvement of external experts is necessary. The most important functions of external experts (integrators) are the following:

- *communication, effective communication among subjects (observers), representatives of different disciplinary directions*;
- *navigation*, support of subjects in various navigation types in various fields of knowledge, including subjective knowledge and identification of implicit (personal) knowledge;
- *representation*, support of a reflexion of subjects;
- *mediation*, identification of special disciplinary connection with the general elements of culture;
- *ontology*, connection of subjects with life realities;
- *integration*, integration of knowledge on various subjects.

Implementation of these functions determines exits of the subjects from separate disciplinary into transdisciplinary spaces and demands to equip their positions with transdisciplinary tools.

Third-order cybernetics

Now formation of scientifically ensuring control and the use of cybernetics in the context of post-non-classical rationality has begun (Lepskiy, 2015). In our opinion, an issue of formation of post-non-classical third-order cybernetics is realized. Thus, the main thesis would be *from "observed systems" to "observing systems" and* to "*self-developing reflexive-active environments"*. From the paradigm *"subject-object"* to the paradigm *"subject-subject"* and further to the paradigm *"subject - metasubject"*.

Transition in control to the paradigm "subject – metasubject" led to the formation of new types of control. Control through self-developing environments becomes dominating. Control of "the soft force", control of chaos, control of complexity, control via "mechanisms of functioning of the environment", control "via mechanisms of assembly of subjects" and many other types of control. Control through self-developing environments also begins to be used in control of economic systems. For example, the 2007 Nobel Prize in Economics was awarded to Leonid Hurwicz (Hurwicz, 1972), Eric Maskin (Maskin, 1977), and Roger Myerson (Myerson, 1981), for their contributions to mechanism design theory. Their research is focused on the paradigm "subject-polysubject environment" in control of economic systems.

The inclusion of the person in dynamic models of social systems becomes the basic approach. This trend is observed also in economics. For Example, the 2002 Nobel Prize in Economics was awarded to Vernon L. Smith (Smith, 1982) "for having established laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms".

Knowledge in third-order cybernetics

Let us consider separate aspects of knowledge representation in post-non-classical scientific rationality:

- knowledge and a problem of subjectivity loss in realities of "the digital world";
- the principle of the double subject in self-developing reflexive-active environments;
- a problem of active knowledge in self-developing reflexive-active environments;
- integration of knowledge in self-developing reflexive-active environments.

Knowledge and a problem of subjectivity loss in realities of "the digital world". In our opinion, the solution is to look for the adequate organization of interaction of the subject with the self-developing reflexive-active environment, which should include various reflections of the acts and texts and should have some attributes of subjectivity itself. Communication of the subject with the metasubject becomes a basis for the assembly of the whole. The metasubject should contain mechanisms of support of assembly of subjects included.

The principle of the double subject in self-developing reflexive-active environments (Lepskiy, 1998). This principle defines the most important technological procedures of the self-developing reflexive-active environment and the organization of knowledge:

- the procedure of reflexive decomposition of subjects (identification of subject positions);
- the procedure of the virtual subject identification;
- the procedure of virtual active elements generation;
- the procedure of discharge from subjects of the formalized types of activity;
- the procedure of reflexive synthesis (creation of activity models, models of activity subjects, personal models, etc.).

The principle of the double subject can be interpreted as a dynamic transformation of subjects in the virtual group subject.

The problem of active knowledge in a self-developing reflexive-active environment. The ocean of knowledge becomes less foreseeable and available in traditional access forms. The traditional system of navigation of knowledge became hopelessly outdated, search engines essentially had not changed for the last fifty years. It is necessary to replace the paradigm of approach to the knowledge organization and navigation in the space of knowledge, by creating environments of the active knowledge inseparably linked with creators of knowledge including virtual. The solution to this problem is possible in a self-developing reflexive-active environment in which the externalization of various forms of subjects activity is included (activity, communicative, reflexive). These environments permit combinations and interactions of the subjects in various forms of natural and artificial intelligence. The environments of active knowledge will allow satisfying not only property of relevance (compliance to the obtained information, to the inquiry formulated by the user), but also a **pertinence (**compliance of knowledge gained by the user to his/her requirements). Creation of the environments of active knowledge assumes participation of the environments in the solution of the problem of implicit (personal) knowledge identification.

Integration of knowledge in self-developing reflexive-active environments. These environments create conditions for integration of knowledge based on the system of special ontologies (Lepskiy, 1998).

Ethics in the third-order cybernetics

The dominant concern is the ethical treatment of the subjects included in any meta-subject (a family, group, organization, country, etc.), the scientist's identification of himself/herself with this meta-subject and regulating interaction while taking into account his/her influence on the meta-subject. Such an approach to ethical regulators can have both positive and negative consequences. Positive consequences are connected with identification and assembly of subjects of development in mega-subject as complete entities. Negative consequences are connected with a potential possibility to lead to totalitarian social systems. It is a complex scientific issue that can be solved by integration of various types of scientific rationality based on the adequate organization of self-developing reflexive-active environments (Lepskiy, 2016).

6 Conclusions

In recent years philosophy as a science has developed new concepts of scientific rationality development (Stepin, 2005), which summarize the cross-disciplinary experience of scientific research. Three stages of development of scientific rationality (classical, non-classical and post-non-classical rationality) are distinguished. These types of scientific rationality are not alternative to each other; rather each subsequent type of rationality includes the previous types through the corresponding ontologies.

The philosophical and methodological analysis of cybernetics evolution proved its connection with the development of scientific rationality (classical, non-classical, and post-non-classical). The classical scientific rationality is similar first-order cybernetics. The non-classical scientific rationality is connected with the second-order cybernetics. The cybernetics of self-developing reflexive-active environments (third-order cybernetics) corresponds to the post-non-classical scientific rationality.

The analysis of cybernetics evolution in the context of development of scientific rationality allows us to define specific traits of the second and third order cybernetics: basic philosophical approaches, paradigms, objects of control, the dominating types of activity, basic scientific approaches, areas of knowledge, types of control, models, mechanisms and technologies, ideas of knowledge, and the dominating ethical regulators.

In this article, we haven't considered new problems of development of mathematics and logic adequate to development of cybernetics. The role of mathematics and logic will increase. We plan to prepare another article.

In post-non-classical representation cybernetics of the first, second and third order are integrated as a unity, as a uniform area of knowledge. This is achieved through the system of ontologies of the organization of self-developing reflexive-active environments.

It is important to note in this article, that the self-developing reflexive-active environment is influenced by cross-disciplinary ideas and concepts of philosophy, methodology, sociology, psychology, cybernetics, etc. Self-developing reflexive-active environment is a metasubject, which possesses invariant similar properties of subjects: purposefulness (activity), reflexivity, communicativeness, sociality, ability to develop, etc. Such environment has integrity that essentially distinguishes it from networks. This is an interaction of active elements, organized in a special way. Active elements can be created on the basis of natural intelligence (the personality, group, etc.), based on artificial intelligence (agents) and the integration of natural and artificial intelligence. The organization of interaction of active elements among themselves and with the environment in general is defined by the system of values, principles, ontologies, criteria and also by the specialized subject focused information platform (Lepskiy, 2010; 2015).

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