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BASIC COMPONENTS OF SYSTEMOLOGY AS METHODOLOGY OF SYSTEM ANALYSIS AND COMPLEX SYSTEMS THEORY

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A *Sources of forming indicators for managerial reporting depending on management concepts – conventional or strategic – are analyzed. Approaches to establish reporting indicators, according to the Balanced Scorecard, which is recognized in domestic practice as a system of reporting on key performance indicators, are described.*

K *Managerial reporting, strategic reporting, balanced scorecard, key performance indicators.*

ОСНОВНІ ПОЛОЖЕННЯ СИСТЕМОЛОГІЇ ЯК МЕТОДОЛОГІЇ СИСТЕМНОГО АНАЛІЗУ ТА ТЕОРІЇ СКЛАДНИХ СИСТЕМ

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A *У статті виділені методологічні принципи системології як основи іноватики, показано взаємозв'язок та взаємообумовленість соціокультурного і соціотехнічного підходів до іноватики.*

K *Системний підхід, інноваційна діяльність, міждисциплінарні дослідження, інтеграція.*

ОСНОВНЫЕ ПОЛОЖЕНИЯ СИСТЕМОЛОГИИ КАК МЕТОДОЛОГИИ СИСТЕМНОГО АНАЛИЗА И ТЕОРИИ СЛОЖНЫХ СИСТЕМ

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A *В статье выделены методологические принципы системологии как основы инноватики, показана взаимосвязь и взаимообусловленность социокультурного и социотехнических подходов к инноватике.*

K *Системный подход, инновационная деятельность, междисциплинарные исследования, интеграция.*

Problem

Systemology as the methodology for modern interdisciplinary analysis is a particular trend in general scientific methodology of scientific knowledge and social practices that focus on working out and making optimal socio-technical solutions (in broad sense) on structure and behavior of objects as complete units. Basic initial postulate in systemology is function implementation in absence of subject.

Innovation activity is systemic human activity to develop and implement innovations in public practice, a priori, suggesting transformation of scientific values, ideas, discoveries and inventions into products, services, manufacturing and management techniques of varying degrees of novelty. Systematic means inclusion of all functional areas that occur when creating innovations, regardless of their purpose and application areas. Innovation work embodies unity of technological, organizational, managerial and social innovations that form basis of innovative model of economy evolution.

Accordingly, theoretical foundation of innovation is innovatics – the area scientific activity, in which problems of theoretical positions, methodological principles, methods of forecasting and innovation development, planning and organization of innovation are the most important. In this formulation, the base for innovatics is systemology.

It should be noted that scientific studies that have examined prevalence of various market mechanisms of innovation as motivation upgrade an existing or develop a new innovation strategy are not enough. Attention should be paid to issues of methodology refinements and additions of innovation, focusing on its systemological basis.

Analysis of scientific literature and publications

Analysis of various areas to apply systems research, methodological and conceptual positions, experience of their use [1, 6, 8, 10, 11, 13, 15, etc.] says that their specificity is to focus on study of complex large-scale

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(including global socio-economic) issues in a consistent orientation of researchers not only to knowledge of issues being studied and related facilities, and to provide tools for ensuring management of these objects, their resolution. The first reflects proper research function of methodology, the second – transformative and predictive. Their unity causes interdisciplinary character for systems research.

Structure of modern systems research traditionally is divided into three interrelated areas: systematic approach, system analysis and general systems theory.

Purpose of article

Research guidelines in systemology as methodology of system analysis and complex systems theory.

Presentation of main research

In literature there are several definitions of the term "methodology", for example: "methodology in literal meaning (logos – science, knowledge and methods – way, knowledge area) is study of knowledge methods" [5, p.79]; "... methodology – study about structure, logical corporation, methods and activity means"[12, p.232], or "... the set of methods for research used in any science" [14, p.214], etc.

These definitions give traditional view on methodology as a system that implements functions of receiving, creating new knowledge, structuring of this knowledge in form of new concepts, categories, laws, hypotheses and theoretical ideas, theories, organization of new knowledge in public practical activity .

System research – "... it is the unity of scientific, technical, technological, economic problems, which, despite their specificity and diversity are similar in sense of study, and examination of objects as systems, that is, a set of interrelated elements that act in form of a single entity" [9, p.18]. The goal of systems research is to provide a new measure for object from the point of view of whole, identifying object integrity.

System approach is a general method of investigating the object as a whole, that is, as a set of elements that are in interaction. It is "... an explanatory expression of presentation of objects as systems and methods for their description, explanation, prediction, etc." [9, p.18].

According to most authors, the main task of system approach is expression of principles, concepts and methods of system research at scientific methodology. This is one of scientific methodological directions. It focuses not on any special science, regardless of its place in system of scientific knowledge, and to science in general, to integrate achievements from humanities, natural sciences and engineering, as well as practical experience. Multidimensional orientation demands special scientific, organizational, technological, technical training, and other terms together with targeted measures for resource support system activities.

However, systematic approach, having no claim to philosophical solidarity in conclusions, serves as one of the links between general philosophical methodology and special sciences. In other words, a systematic approach is a form of methodological knowledge directly related to research, design and construction of objects as systems. And by its nature it is interdisciplinary, and general scientific.

The main tasks of system approach are [7]:

- Research methodology based on system theories;
- Develop conceptual (content and form) principles and means for presenting studied objects as systems;
- Generalized model systems and models of different classes and properties of systems, including models of systems dynamics, their goal-directed behavior, development, hierarchical structure, management processes, etc.

These tasks contain a clear methodological framework, limited principally within specific scientific knowledge about object and subject of research.

In general, the "systematic analysis appears as a set of special procedures, techniques, and methods of ensuring implementation of systematic approach. System analysis is characterized with non– specific scientific apparatus and an orderly, logical reasonable approach to problem and use of appropriate methods of their solutions, which can be developed in other sciences" [9, p.18-19].

More specifically, system analysis deals with development of theoretical and methodological tools for research, designing systems, and systems management, comprising including human, targeted factor. Therefore, systems analysis is determined as particular type of scientific and technological activities, aimed at the study and design of complex and highly complex objects for various applications. It is characterized as solution of major problems of methodology based on concept of holistic education that was created through systemic approach.

Hence, one of the important areas of systems analysis is to realize that it is necessary and determining the "line" of its close relationship with systems approach. In other words, it becomes possible to enrich applied systems analysis with modern philosophical and methodologically ideas, that let it be used in systems research not only in intuitive representation, but rich in content and objective representation of object as "dismembered" and "gathered" again on principles of integrity of systems approach.

Concept of "systems analysis" is covered by concept of "systems approach". System analysis elaborates and develops general theoretical and methodological principles of system approach for analysis and synthesis of complex systems, research and forecasting of their behavior, managing operation of such systems.

Thus, system analysis should be seen as methodology of scientific knowledge and social practice, which is based on consideration of objects – complex systems – as complete entities, that is, systems analysis is a scientific area of systems research, to deal with analysis, research and synthesis of complex systems with various functional destination, as well as sound corporate processes to function effectively.

For general systems theory it should be noted that it is the science of systems of any types. It, along with special theory of systems is now included in such science, as systemology [1, 6].

Systemology is a system theory, which studies general, specific laws and principles of composition and decomposition of complex systems. As general and special theories of systems are specific forms to apply systematic approach, than systemology methodology is a manifestation of specific system-wide laws for systematic approach. From here, systematic approach is the method of systemology, and system theory – the result of applying this method. Systemology simultaneously acts as theoretical framework and methodology of modern systems analysis.

Systemology as a methodology and as a tool for complex systems research has received conceptual study, development and application, especially in complex technical systems, economics, and industrial technologies. This is due to prospect of underlying ideas in systemology analysis and synthesis of poor-structured problems and develops ways to address them. These problems exist in almost any field of activity. Therefore modern systemology extends its domain of application and finds increasing use in physics, chemistry, biology, medicine, education, psychology, manufacturing, military, engineering, planning, actions, etc.

Thus, theoretically, results and methods of systemology can apply in different fields of knowledge. In particular, in [6]:

- Solving large-scale heterogeneous and complex problems;
- Justifying conceptual basis for one-type formulation and solution of problems relating to different fields of knowledge and activity;
- Specification of common methodology for study of problems, setting source of great uncertainty;
- Development and formalization of general categories, such as situation, interaction, targeting, complexity, development;
- Refining apparatus for factors quantification;
- Development technology solutions for large-scale uncertain tasks and purposeful behavior in uncertain conditions, etc.

In systemology in terms to disclose the nature of applied basic methods of systematic approach, they identify a number of fundamental principles that are more or less characterized by some general methodological properties for system research [1, 6, 8, 15, etc.].

1. Principle of hierarchical corporation (principle of integrative levels). It consists of taking as postulates the properties and interactions of complex systems directly to the lower level and output of these properties as theorems for systems of this level. At each "step" to the next hierarchical level, the system of prior level becomes part of a higher level. Applying this principle allows to simplify the formal structure of the latter.
2. Feasibility principle (principle of laws formation) postulates existence or creation the models, from which in form of theorems laws of complex systems – workable models – are derived. Laws are concerned with complex systems or artificial systems. They can explain structure and behavior of the first and induce construction of the latter. We should emphasize that systemology considers only those models for which there is an algorithm to find feasible solution, then solution can be found with a given probability over a given time.
3. Principle of plurality says that it is possible to build several models to explain and predict structure and (or) behavior of complex system within margin of observation error. Theory must consist of simplest models for systems of increasing complexity. Each should, at least to some extent, reflect a growing level of complexity of systems behavior. The deeper is analysis of real system – the less certain is our judgment about its behavior, the simpler is model – the less accurate is solution.

The above basic principles of systemology characterizing general methodological properties of system studies, as well as such extending and improving principles of both integration, unity and coherence, purpose, ability to modulate, performance, uncertainty, decentralization, etc. (Table 1), determine systemology essence as methodology of system analysis and complex systems theory.

All of the above is the foundation on which systemology is actively developing. Creative and appropriate use of these principles is the key to success systemology and systems research in solving applied socially important problems in field of synthesis and creation of complex organizational and technical systems in

EXTENDING AND IMPROVING PRINCIPLES OF SYSTEMOLOGY **Table 1**

PRINCIPLE	CONTENT
Integration	Study of integrative properties and patterns of systems and their complexes, disclosure of basic mechanisms to integrate a whole
Unity and connectivity	Joint study of complex systems as a whole and as a set of sub-systems, consideration of any subsystem of complex system with its connections with other subsystems and environment
Purposefulness	Exploring functional trends for complex system to achieve an ultimate goal, certain state, or enhancing (saving) of certain process
Ability to modulate	Research when designing complex systems of certain property (group property) using one or more narrow models in system
Functionality	Joint study of structure and function of complex system
Uncertainty	Recording uncertainty and accidents in complex systems
Decentralization	Combination of centralization and decentralization in managerial decisions taken
Hierarchy	Three-level study of complex systems: study of particular system, study of system as a subsystem, study of system in relation to components of its subsystems
Formalizing	Study of complex systems in order to obtain quantitative characteristics, creation of which narrows ambiguity of concepts, definitions, evaluations, etc.
Physicality	Study of physical laws inherent to complex system, determining cause and effect of system existence and functioning
Ultimate goal	Determining how to reach the final (global) goal in systems

industry, economic, environmental and social sphere, as well as rational corporation and operation and service of these systems.

Next, you must specify the above for innovation activity, given interdisciplinary nature of problem.

Stated problem is directly related to problems of integration the humanities, natural sciences and engineering, and systems research. In particular, innovation in any branch of science finds different interpretations in each of these three groups of sciences. In itself, innovation activity development as domain of economic science from this point of view appears as manifestation of growing trend towards science interaction based on systemology.

Any humanities are categorical and a priori in their grounds; essentially they are translation of method of knowledge pre-paradigm, based on universal ontology.

Technical sciences learn general principles and laws of world structure in process of concrete empirical study of nature. Purpose of research is to penetrate into the depths of structure of matter and nature of interactions, knowledge of phenomena and processes essence through discovery of fundamental laws in objective world.

Science has created an abstract world of universal symbolic constructions. They create ideal objects without any of their connection with empirical experience. Method of natural sciences is pure deduction. Its main principle is consistency of theory.

Along with human, technical and natural sciences, systemology should be another fundamental way of scientific knowledge. It carries meaning of general characteristic for all sciences. Systemology creates a special world of systems in which each system acts as a very general universal in form, grasped a constructive way, which has a base of empirical experience, to convey meaning of objects and phenomena of the real world, embodied in interpretable abstract forms.

Relationship between triad sciences and systemology is manifested thought highly complex groups of phenomena and processes occurring in modern science. Communication problems of science integration and research system with problems of innovation may be subject only to the extent, in what understanding of one and another is projected.

It is appropriate to refer the methodological analysis scheme to clarify relationship between the human, natural and technical sciences [2, 3, 4, 16, 17], which states that "... these science groups differ not so much by study objects as by the type of their classification to those objects. Specific to each type of group relatedness, or type of objectivity, may ... be described in two ways: from methodological and social-institutional points of view" [16, p.27].

Methodological differentiation is fixed by using concept of limiting problems, reflecting specificity of the humanities, on the one hand, and natural – on the other.

Marginal problem in human sciences can be formulated differently: "What is the society, or a human, or an activity?". But these concepts are interdependent. Each of them, one way or another, involves others, and being accepted into a specific concept as the original, it serves as basis for definition and explanation of the rest. These concepts relate to reality, which may be beyond natural world, obeying natural-sciences laws. For example, reality of economic relations. In other words, the ultimate problem constitutes knowledge, which, in any case, is more or less conscious, in more or less concrete forms, bears a "fatal print of humanitarian knowledge" [16, p.27]. Last highlights qualitative identity of objects in reality. But naturalistic interpretation of knowledge ignores constructive nature of object. Therefore qualitative features largely reflect properties of objectivity type for each object.

Methodological specifics of human science can be fixed with two limiting problems: "What is nature?" and "What is life?". The first of these gives the domain of physical and chemical sciences, the second – for biological sciences [16, p.181].

Again, if we reject naturalistic interpretation of knowledge about reality, both these limiting problems largely reflect those of dichotomy of "living-non-living".

Objectivity type inherent with technical sciences is constructed in objective space, bounded by vectors of humanities, natural sciences and engineering. It is assumed that each of the vectors, when projected on the other two, will give a nonzero projection. This assumption reflects interrelationship between all three groups of sciences, which is expressed at the level of their specific methodological orientations.

Literature emphasizes that projection of vector for humanities on technical sciences is the result of productive "... subject-transforming activity of human, social recognized meaning of which is fixed, and therefore does not require discussion .... Going from point of activities to streamlining process flow diagrams, we move from methodological setup of social sciences to methodological principles of technical ones. The last ... act as knowledge about schemes of subject-transforming activity" [16, pp. 29-30].

During methodological analysis of projection of human science vector on technology "... we arrive at approximately the same result as in analysis of social science relation and technical and scientific facilities, such as: type of objectivity, appropriate technical sciences, characterized by an orientation to knowledge objectified scheme and structure of subject-transforming activity. Objectification thus can be arbitrarily large" [16, p.31-32].

Thus, existing between humanities, natural and technical sciences, social and institutional differences are due to peculiarities of social order in knowledge functioning relating to each of the groups of sciences. "Functioning peculiarities find their expression in features ... of settings that are specific to research activities in each of the three groups of sciences ... due to the fact that they are socially institutionalized ... may have an effect regardless of their awareness of measures in each case "[17, p.185].

It follows from interconnectedness of methodological and socio-institutional attitudes. However, choice in favor of one of them in innovation allows capturing different aspects of analyzed knowledge. And, speaking of methodological attitudes, knowledge is seen as "knowledge about", while social and institutional setting is characterized by knowledge as "knowledge for." In this case we are not talking about the fact that in the first case, we are in a common methodology, and the second – in a particular science. Social and institutional settings are methodologically relevant. They allow you to specify type of representation for each objectivity group in science.

Considering methodological principles, we actually compared three groups of sciences, using internal scale to compare them. Social and institutional settings enable to compare each science group through bringing to their common outer measure, namely activity. In this case, humanities are relevant to goals and values of various social groups, they are engaged in rational-critical interpretation, and validity of these goals and values, that is, interpret reality. Natural sciences can be correlated with activity terms – in action as well as possible (in the latter case, natural sciences are considered as generator for activities program). Finally, knowledge is obtained in technical sciences, can be attributed to means of action. It is important to keep in mind the mobile nature of boundary between conditions and means of action. In course of historical development of society activity many conditions, as human gets ability to control them, transfer to group of means.

In relation between socio-institutional and methodological orientations certain ambivalence is observed. On the one hand, social and institutional settings for three groups of science in certain sense are derived from methodology. The latter specifies different types of knowledge, which relate to each other by standards given in by society development. That is, differences in methodological orientations in three groups of science are the source of fatal and irreducible diversity that exists in scientific knowledge. Each of these orientations produces specific cognitive interest, directs movement of knowledge in appropriate group of sciences, and explains inherent autonomy. However, mutual correlation of methodological orientations, which creates issues of self-determination in each sciences group in context of all the others, is the basis for type of relationship between them, which is result of their relationship. It is about moving from one science group into other cognitive models, conceptual schemes and the like, that is, representations are so general and abstract that their specification can be carried out in course of study, conducted in framework of various methodological orientations. Therefore, human, natural and technical sciences can not be fully described only with their socio-institutional settings.

On the other hand, social and institutional settings, in certain sense, are primary to methodological, as they provide social space for possibility of implementing methodological orientations. Social and institutional settings of different groups of sciences related to each other through external base, which are society activities. This opens possibility for a different type of relationship between them – interaction of human, natural and technical sciences. Issue of interaction between sciences arises, when science has access "outside" – in scope of practice. But we can not entirely attribute socio-institutional setting to outer side of science, because they are directly involved in formation and structuring of scientific activity, and to ensure its dynamics.

Thus, interaction of science in innovation is manifested through construction of coherent knowledge complex. This ensures integrity and orientation of each of them on the same shape or scope of transforming activity, at the same practical situation. A concrete content of each set of knowledge sets by context of situation. Knowledge changes with the changing situation. Fundamental point here is the need to combine three different social and institutional settings in complex to simultaneously perceive study, streamline and programmable grounds of forecasted activity that allows seeing it completely with all its inherent complexity and contradiction. Therefore, we are talking about interaction, but not about relationship.

Considering system research as one of the methodological foundations of innovation activities, we should note the following.

All system studies in systemology are usually divided into two classes: studies that have mostly theoretical orientation, and research that bear distinct nature of application.

The first class of systems research is applied if necessary comprehensiveness and synthesis of heterogeneous knowledge about certain complicated objects in a single theoretical perspective. "System approach ... is more specific, situational, it acts as a methodological understanding of practice for systems research ... performed in different areas of knowledge" [16, p.35-36]. Here interconnection between humanities, natural sciences and engineering is shown, and theoretical systems studies are forms of such relationship.

But methodological orientations for different science groups are not orthogonal. Therefore, system studies can act as those only when underlying general representations will be sufficiently abstract. That is, dominance of single orientation group of sciences entails reducing specific features for others. And systems research here is a form of relationship only because of high abstraction of underlying common representations.

Second class is characterized by research and development carried out on the basis of methodology for system analysis. They are always focused on specific, well-defined practical problems. Direct object, with which system analysis has to do, is the activity, aimed to solve the problem. These activities must be organized and coordinated. In other words, system analysis serves as programming activities, and activities taken in concrete forms. Purposefulness of this activity, its focus on achieving final result, gives integrity features for it. Thus, all necessary elements to implement interaction of sciences are present, and system analysis serves as a methodology that provides this communication. However, system analysis is a methodological and organizational form of interaction, contents of which in particular case is determined by content of actual problem to be solved with its help.

Methodological problems of conceptual design for various system concepts and application of each of them to study possible forms of relationship between humanities, natural sciences and technical are outlined incompletely, if you do not address issues of multi-disciplinary systems research.

Until now, it was about integration of science, which meant activities in frames of special social institution, which is characterized with certain forms of co-participants, situated in real history and forms of registration, and related to other types of socially necessary activities and institutions in which they are fixed. At the same time it is important to address specific areas of knowledge, or both, to identify historically established field of knowledge, characterized in every period of its existence, with unity of fixed research subject, method and language. For this purpose, term "discipline" is used.

Namely in research activities, discipline is represented as a set of attitudes and methodological tools available for researchers from relevant specialty, as well as in form of certain scientific institutions. Thus, research being done under set of views and descriptions of objects relevant to certain discipline, will be denoted as mono-disciplinary no matter which sort of reality it is part of.

Areas of reality identification are related to a slightly different group of factors, where different types of research are developed. As a rule, their characteristics consider not only objects properties and development level of individual disciplines, but a number of conditions of social and historical character, which created a need for comprehensive study of these objects. Very often researchers use term "interdisciplinary research" to describe the area.

The term "interdisciplinary research", as applied to study of methodological issues in innovation, characterizes only research activities, demanding immediate synergies from different disciplines in a single system research. These studies focus on interdisciplinary study of problems and areas and are often combined into a major innovative project. It is a specific type of problem-oriented research, located between areas of pure theoretical research, where the main thing is knowledge and scope of informed action, where applicability, efficiency, practical results of applied systems research are in first place.

Formation of interdisciplinary research is performed in several stages. In the first stage an interdisciplinary subject area is formed, which is combination, on the one hand, of practical needs identified as problems, and on the other – a multi-disciplinary set of disciplinary images of phenomena, their connection with problems of the first group is assumed. Different structure of these two entities requires, as a preliminary step, which ensure possibility of research, creation of translational bridge between them, that is, primary isolation and limitations of research object from its structural components, correlated with subjects exploring this discipline' object.

Gradually there is a shift in emphasis in area of interdisciplinary research mastering facility. Gradual regrouping of empirical facts, their union around various scientific concepts, changes in terminology are implemented. For example, in interdisciplinary studies of environmental problems of sociology and economics with emphasis on the latter, instead of terms "respect for nature", "prudent use of natural resources" and other problems are appearances of "ecological balance" and "resources reproduction". The point, of course, is not that same conditions obtain new scientific-sounding name, but the fact that use of second group of terms means trying to correlate events with appropriate scientific tradition, as each term is associated with idea of defined range of research problems in specific disciplines range.

Prerequisites for transition from interdisciplinary subject area to interdisciplinary research are:

- Creation of empirical working concept for single interdisciplinary subject area with reflection of real relationships between research subjects of different disciplines;
- Approach to analysis of empirical data obtained from different disciplinary research aimed at interdisciplinary study and interpretation of material.

Working concept can turn to theory of new research field (or be replaced with such theory) based on research experience and results. But this necessity can solve number of problems, such as those associated with creation of research teams, implementation the interdisciplinary collaboration of experts.

Methods for pooling experts' efforts are diverse. It should be noted, however, that in contrast to professional participation in professional expertise or in discussion interdisciplinary area where professional can assess some of its aspects, all without departing from scope of their own specialty, maximum success of interdisciplinary research is achieved by bringing together experts in course of study. Empirically they distinguish, at least three levels of such joint efforts for appropriate interdisciplinary coordination for each of them.

1. Specialists from various disciplines are performing parallel study of various problem aspects, discussing and consolidating obtained results during this problem study in research report. It is assumed that in course of this discussion and data integration (with respective "lapping"), progress is reached in development of complex interdisciplinary problems.
2. Specialists from various disciplines are trying to preserve unity and integrity issues, working simultaneously, informing each other about intermediate results and participating in attempt to interpret it interdisciplinary, and in some cases adjusting own research program after such working discussions.
3. Researchers at all stages are seeking more precise and, at the same time, general formulation for problem, compare and critically evaluate each other's working hypotheses and methods of research verification. Results, therefore, are directly integrated.

One of conditions for successful solution of problems at interdisciplinary research is direction of major organizational effort – not only to regulate research, how to facilitate direct communication of all categories of researchers and practitioners, and making this the most constructive forms of communication. This fact is especially important in preparation of researchers in terms of interdisciplinary team. It is about ensuring constant satisfactory communication in three ways: a) within mono-disciplinary studies (between theoretical and laboratory studies), b) between representatives of various disciplines, c) between researchers and practitioners.

Interdisciplinary research, sooner or later degenerate or get a push for further development.

The fact that in each case it is about limited time for system investigation, assures the target shape of its corporation. Initially the goal is formulated completely – to explore possibilities for problem solution. If this problem really allows sharp, from scientific point of view, wording of study it can be solved. And results of study will provide an opportunity to reduce practical handling for object, instead to use number of standardized procedures. Participants in study turn to other issues of mono– or interdisciplinary nature at the end.

Another way to complete interdisciplinary study is its transformation into a new scientific discipline. This happens if problems found during interdisciplinary field of research, turns to be permanent, and is recognized methodologically. They create scientific theory of objects of certain class, and methodology for their study. Similar process takes place today with interdisciplinary research in field of innovation activity, which some scientists group under term "innovatics".

Conclusion

Fundamental principles of systemology characterizing general methodological features of systematic research, as well as extending and improving principles of integration, unity, and connection, focusing, simulation, performance, uncertainty, decentralization and so define essence for systemology as methodology of system analysis and theory of complex systems.

Innovatics, based on systemology, is becoming more independent research field as an interdisciplinary methodology for particular type, where special sciences retain their independence and specificity, but their theoretical constructions are united around the system-wide problems of innovation.

1. Akimov A.A., Gamidov G.S., Kolosov V.G. Systemological basis for innovatics. – St.P: Polytechnic, 2002. – 596 p. [in Russian]
2. Bertalanffy L. General Systems Theory – review of problems and results / / Systems Research: Yearbook. 1969. – Moscow: Nauka, 1969. – P.30-54. [in Russian]
3. Bertalanffy L. General Systems Theory: Critical Review / / Research on general systems theory. – Moscow: Progress Publishers, 1969. – S. 23-82. [in Russian]
4. Blauberg I.V., Sadovsky V.N., Yudin E.G. System approach: assumptions, problems, difficulties. – M.: Znanie, 1969. – 48 p. [in Russian]
5. Bor M.Z. Fundamentals of Economic Research. Logic, methodology, organization, method. – Moscow: Publishing House "DIS", 1998. – 144 p. [in Russian]
6. Hamidov G.S., Kolosov V.G., Osmanov N.O. Fundamentals of Innovatics and innovation activities. – St.P: Polytechnic, 2000. – 323 p. [in Russian]
7. Gvishiani D.M. Theoretical and methodological basis of systems research and development challenges for global development // Systems Research: Methodological problems. Yearbook, 1982. – Moscow: Nauka, 1982. – S. 23-54. [in Russian]
8. Druzhinin V., Kontorov D. Systemology Problems. – M.: Sov. Radio, 1976. – 234 p. [in Russian]
9. Isaev V.V., Nemchin A.M. General theory of socio-economic systems. – St.P.: Publishing House "Business press", 2002. – 176. [in Russian]
10. Clear J. Systemology. Automation of the Solution of Systems Problems [Russian translation]. – Moscow: Radio i Svyaz. – 1990.– 544 p. [in Russian]
11. Nikolaev V.I. Systems engineering: methods and applications. – M.: Mashinostroenie, 1985. – 199 p. [in Russian]
12. New philosophical dictionary / Comp. by A.A. Gritsanov. – Minsk: Publishing House V.M. Skakun, 1998. -896 S. [in Russian]
13. Rudnev V.E., Volodin V.V., Luchansky K.M., Petrov V.B. Developing technical objects on basis of system analysis. – Moscow: Mashinostroenie, 1991. – 320. [in Russian]
14. Philosophical Dictionary / Ed. by I.T. Frolov. – Moscow: Publishing House of "Political literature", 1981. – 445 p. [in Russian]
15. Fleishman B.S. Systemology Fundamentals. – M.: Radio and communication, 1982. – 346 p. [in Russian]
16. Yudin B.G. Science Integration and systems research // System Research Yearbook. 1986. – Moscow: Nauka, 1986. – P.26-44. [in Russian]
17. Yudin B.G. Methodological characteristics of interaction processes for social, natural and technical sciences. – // Systems Research Yearbook. – Moscow: Nauka, 1981. – P.178-197. [in Russian]

1. Акимов А.А., Гамидов Г.С., Колосов В.Г. Системологические основы инноватики. – СПб.: Политехника, 2002. – 596 с.
2. Берталанфи Л. Общая теория систем – обзор проблем и результатов // Системные исследования: Ежегодник. 1969. – М.: Наука, 1969. – С.30–54.
3. Берталанфи Л. Общая теория систем: критический обзор // Исследования по общей теории систем. – М.: Прогресс, 1969. – С. 23–82.
4. Блауберг И. В., Садовский В.Н., Юдин Э. Г. Системный подход: предпосылки, проблемы, трудности. – М.: Знание, 1969. – 48 с.
5. Бор М.З. Основы экономических исследований. Логика, методология, организация, методика. – М.: Издательство «ДИС», 1998. – 144 с.
6. Гамидов Г.С., Колосов В.Г., Османов Н.О. Основы инноватики и инновационной деятельности. – СПб.: Политехника, 2000. – 323 с.
7. Гвишиани Д.М. Теоретико-методологические основания системных исследований и разработка проблем глобального развития // Системные исследования: Методологические проблемы. Ежегодник, 1982. – М.: Наука, 1982. – С. 23–54.
8. Дружинин В., Конторов Д. Проблемы системологии. – М.: Сов. Радио, 1976.– 234 с.
9. Исаев В.В., Немчин А.М. Общая теория социально-экономических систем. – СПб.: Издательский дом «Бизнес–пресса», 2002. – 176 с.
10. Клир Дж. Системология: Автоматизация решения системных задач: Пер. с англ. – М.: Радио и связь, 1990. – 544 с.
11. Николаев В.И. Системотехника: методы и приложения. – М.: Машиностроение, 1985. – 199 с.
12. Новейший философский словарь / Сост. А.А. Грицанов. – Минск: Изд–во В.М. Скакун, 1998. –896 с.
13. Руднев В.Е., Володин В.В., Лучанский К.М., Петров В.Б. Формирование технических объектов на основе системного анализа. – М.: Машиностроение, 1991. – 320 с.
14. Философский словарь / Под ред. И.Т. Фролова. – М.: Изд-во «Политическая литература», 1981. – 445 с.
15. Флейшман Б.С. Основы системологии. – М.: Радио и связь, 1982. – 346 с.
16. Юдин Б.Г. Интеграция наук и системные исследования // Системные исследования: Ежегодник. 1986. – М.: Наука, 1986. – С.26–44.
17. Юдин Б.Г. Методологическая характеристика процессов взаимодействия общественных, естественных и технических наук. – // Системные исследования: Ежегодник. 1981. – М.: Наука, 1981. – С.178–197.

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