Forming the System Terms Definitions Based on the Principle of Generating Knowledge

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Abstract

In this paper the necessity of the explication of system concepts is established. An evaluation of existing procedures of system analysis is performed and specific singularities of system analysis are marked. The necessity of introduction of system concepts in the form of activity is proved. This activity is like machine that generates knowledge within which the concepts are located like in matryoshka. The analysis of approach to the construction of symbolic form of knowledge machine in the form of acts of activities was carried out. Approaches to the development of presentation of symbolic form of activity act were outlined. It is supposed to provide a symbolic form of activity, not as an object of research but as knowledge about method of creating the object of research. The idea of creating a generating knowledge is described and the principle of generating knowledge is formulated.

"It's easy to make things complicatedand it’s very hard to make them simple"
Alphonse Chapanis

This article is the first step in creating the theory of system approach based on evolutionary worldview of generative knowledge, starting with the system of formation principles of system concepts.

Keywords: systemic approach, symbolic form, the act of activity rate, normalization, generating knowledge, activity, knowledge about method, system concept, principle.

Formulating the Task

Specification of the concepts of the system approach. One of the main teachings of tasks arising from the development of a systematic approach is its explication of the initial concepts. These include primarily the following concepts: "system", "structure", "integrity", "relation type: the part – the whole". These concepts are closely connected with a description of the internal structure of systems and their properties [1, p. 206]: You can not consider the properties separately, they are interrelated and inseparable. Their representation in certain symbolic forms – structural representation – has to ensure the interpenetration of concepts structures. Concepts of systems development, development process and system design are also closely connected with the concept of structure. All these concepts are interrelated and all together form a system of interpenetrating system knowledge. One of the most important tasks of a system approach is to study *the processes of concepts development*. "In the course of social practice people discover in objects and

phenomena of reality more and more of new properties and reflect them in thoughts. These reflected properties of objects and phenomena of the objective world make up *the content* of our knowledge, *the content* of our understanding ... Content of concepts never exhaust all properties of objects, it is always remained relatively limited and one-sided. Following the development of social practice, it is constantly changing, and after *changing the content of the concepts their structure also changes* "[2]. Development of the concept is in a conflict between the concept and its content [2, page 6]. In system approach the need for development of system concept and their structures is due to the contradiction between *the dynamic properties* reflecting properties of the content of the system concept and static conceptual ideas that do not reflect the *dynamic* properties: system thinking, in other words, today is largely researched not systemically, and that is the source of certain contradictions and paradoxes in the understanding its specificity "[1, p. 232]. "Thus, to describe a system thinking, system research methods, etc. we now have to use non-system ideas, concepts and methods and it is ultimately is a common base for emerging of characterized system paradoxical situations. Attempts to interpret paradoxes *statically,* i.e. applied to the system knowledge, taken out of its development, leads to the conclusion that the system thinking is not possible "[1, page 238 - 239].

The problem of statics of basic system concepts is urgent and is not solved yet G.E. Yudin [3] formulated it as follows: "Despite the long history of the concept "integrity", nowadays one can hardly speak of a deployed system of means to express the integrity of content as an essential characteristic of a certain class of objects and make the concept of integrity operational... The idea of the activity of the element in the system is associated with such functional characteristic, and this activity is often very important ... ". From the text it's follows that the system itself must be dynamic, configurable and active, and the element or part of the system should be considered as a whole and also be active (for example, shown in the form of action). To construct a symbolic form of the system concepts it is necessary to use activity, action, movement.

V.F. Petrenko notes [4] similar problems in the definition of a system approach: "We see that in the very beginning of the determination of system analysis many questions raise... Although, systemology focuses on properties such as integrity, hierarchy, emergence, but often they are only proclaimed, but a real study is reduced substantially to the object."

Solving the problem using the words of G.E. Yudin [3, pp. 118 - 121]: "The main problems of research concentrates around two things: finding specific mechanisms and relationships of integrity ... and determine the most important characteristic forms of interaction of integral object with the environment... objects of modern scientific knowledge requires not just expanding existing conceptual apparatus , but a new categorical system, a new system of concepts ... However, since the need of such system exists and finds at least partial satisfaction, insofar new concepts designed to contribute to the solution of a new type of tasks directly adjoin modern science with old conceptual apparatus." Analyzing these problems in the existing concepts of the system approach we can make the following conclusions.

Since the definition of the system includes system concepts, we can assume that any concept also has a system that should have systemic properties. More precise in defining and reporting of system concept it should be contained system properties, which represent activity, movement, action, development, changes. Any study to clarify the meaning of a particular concept should include determination of such definitions and symbolic forms of submission of content aspects of these concepts that will implement the system properties and represent any concept as a system of interrelated, interpenetrating and tunable activities and their properties in a form of certain configurable structure. Confirmation of this can be found in: "... for science in general it is much more important to try to find some ways and means, which generally would permit the study the objects as systems and structures. But at the same time we must recognize, there is no common solutions yet ... "[5].

The question arises, why there was such a situation in which existing conceptual apparatus does not meet the system properties. The answer to this question obviously lies not only in the cognitive tools that are applicable to the systematic approach and which we'll discuss later, but also in the need of substantial correction in the outlook of the systematic approach. It is necessary to identify the principle of the relationship of knowledge systems taking into account the specifics of the systems approach.

But before we move to the proposed approach for solving the problem of creating the system of concepts, we would like to describe the overall image of created solutions with words of Shchedrovitsky [5, p.2]: "Therefore, any concept or knowledge can be regarded as an objective body, that has its own logic of movement and deployment possibilities. **And only this body as a whole forms a content of a particular concept ...** To determine its nature, we can say **that the concept – is kind of a machine ..."**

Before we develop a principle and create a machine of knowledge, it is necessary to analyze the means and procedures that are used in the system approach, to reveal the specifics of a system approach, to identify what they don't satisfy us and formulate new approaches to creating procedures.

Analyzing the tools for building system concepts

As for the cognitive means – analysis means – on which the system approach concepts are built, **the first** mean is a system concept. Concepts of a system approach are defined through the concept "system" [6, p.11]: "...the collection of comments and observations was aimed directly against the attempts to define a system approach through the concept of system. Anyway, I wanted to show that we cannot define a system approach through the concept of the system."

The second mean as a consequence of the first – is object orientation. Definitions, systems, which exist in great quantities, are focused on the object. Since the system concepts are defined through the concept of system then the system approach is object oriented: «It is more important, in my opinion, another, the most significant and crucial point. It seems to me that the very interpretation of the object-oriented research situation is incorrect, because the researcher never deals with the

objects, but always deals only with the objects of study» [6, p.11]. "However, the very treatment of the concepts of the object-oriented meta-system research is wrong in principle, because the researcher never deals with the objects as such, but always only deals with the means of research. [7] Any object-oriented concept of system *reflects its certain properties*, which objects from another domain naturally may not have. To solve the problem of the unification we must solve the problem *of unification of objects properties from different problem domains*. The use of these object properties does not solve the biggest problem of the system approach – the problem of the *synthesis of different knowledge systems* (KS). System images or representations must carry the knowledge about objects from different domains, and are not based on the definition(s) of the system.

The third mean is the isolation procedure or separation of the result from the whole – separation of the system as a result from the creation process. If we talk in terms of system approach then the process of creating the system and the system itself is the whole, in which the system as the matryoshka is a part of the whole: "Therefore, the object with which the methodology is concerned, reminds the matryoshka. In fact, it is a special kind of a combination of two objects, where into the source for methodology object – thinking and activities – another object is inserted – the object of that activity or thinking."[8, p.7].

The fourth mean should include a system approach used in the division procedure of the whole into parts. This procedure is taken from the analytical approach. But it is known that part of a system approach should be considered as a whole. The application of analytical procedures of dividing into parts in the system approach isn't explained. Perhaps it would be better to use in system approach the process of objectification of part in the whole. A procedure of objectification is the activity of disclosing the contents of the whole.

The fifth mean includes procedures that lead to a static presentation of symbolic form of an object – the transformation, which is the consequence of using the above means. The symbolic forms of definitions and properties of the system are represented as something static, in a form of result of the activity, rather than in the symbolic form of generating new knowledge.

The main reason for this is that in a system approach there used widely applicable means of an analytical approach – so-called procedure [9]: «... the transformation of "verb" into "noun". In such a way the "verb" (an activity) has turned into "a noun". Replacing the process and the action by description, we hereby, replaced the process steps (movement) by description of pragmatic static results».

The sixth mean is a structural analysis – the construction of structural models, consisting of parts – structural elements. The means of studies have become the construction of structural models. Thus, the transformation procedure of dynamic into static is being used again. This leads to a unification process with the static organization structure describing the result of this process. The merging of different knowledge takes place – knowledge about the organization of the structures with knowledge about the structure itself. Such situation has arisen because of the use of the above procedures because the analysis assumed that the structure of the system is

known and it has an object definition [10, p.8]: «To make the initial abstraction form the system and connect with the task of synthesis, the researcher must, at the starting point, have …an idea about the real system and the structure of the object which he researches and wants to play, and, moreover, he should correlate with this view all existing unilateral projections – knowledge» and [5, p.19]: «The system of knowledge about the object is usually identified with the subject system, and then the subject system, is mechanically applied to the system object. Then for this, in fact one, system different interpretations are given: it's a system of knowledge, or an object of system, reflected in this knowledge..... Meanwhile, the systems of knowledge of subject and object obviously do not coincide with each other, and in any case cannot be identified». But the organization of structures and the structure itself are not the same thing. For example, it is stated in the ideas expressed by V.N. Borisov [11, page 10]: «The structure of the cognitive process becomes nonlinear: it is carried out simultaneously on two interacting levels– the object and overobject – performing the functions of pre-planning and management of cognitive processes». Object level is the structure, and the overobject – is organization of structure. This merger has led to the biggest problem – to the existing contradiction in the notion of communication.

The seventh mean is the definition of communication. Definition of communication is performed via the definition of its fixation in the form of symbolic forms in the structural representation of the object. Definition of communication as knowledge again has an object orientation, as means of connecting of certain knowledge about the object properties. Since knowledge of object properties do not coincide, then to solve the problem there appear notions of interfaces, as knowledge about the communication [5, page 29]: «But in order to overcome usual tautology here – the communication is what is expressed in the knowledge about relationship – you had, obviously, to build special images for communications themselves that differ from forms of their fixation in the statements». Again based on the fact that the communication structure is set and defined on the basis of a given structure representation of the object, let's try to give a definition of communication. Communication is the process of establishing the link and the link itself is obviously also a process. Between bonds and description of connection there is nothing in common [5, page 21]: «.... in such system of description and the signs of logical connections the relationship of the objects are not reflected (not shown). The system of object is one and the system of description is something quite different, and between them there is no isomorphism of image or relation of image». *Then the process of creating a link must define the notion of communication.*

The eighth mean is knowledge about the idea of symbolic form of the object. Depending on the selected cognitive means as the knowledge it can be obtained the static symbolic form description of the functioning of the system or in the form of changes, developing, configurable, creating an evolutionary system paradigm [12, p.25]: «... the ways and methods of constructing models of individual acts of thought depends on what system image of the object we are going to build – the functioning system or the development system». If we talk about the system approach that used in

the familiarity of new forms, it is possible without going into details, to say that the basis of symbolic forms is comprised of knowledge of system representation as a description of its functioning. The symbolic form does not display the specificity of the system approach as a process of changing the system, it is represented as a static result of this change.

Before you make certain conclusions about the effectiveness of used cognitive means, we would like to dwell on the thought expressed by G.P. Shchedrovitskii about the specifics of the system approach [6, p.10 -15]: "... a system situation is not defined by the object that is mastered by activities and thinking, but on the specifics of the procedure itself ... *Any system situation, as I am now convinced, is unbalanced ... Once we seemed to solve the problems we are facing in the system analysis problem and create the proper uniform multidimensional design, as a systemic problem is removed, we no longer have the system situation and there is no system, there is only a design* .... Where system objects are then? It turns out that they exist only in this movement from multi-object representation to the integrated one-subject representation».

And the last [5, p.17]: «I guess, in this situation it is useful to ask: why all the attempts to isolate the specific features of systems for such a long time does not give a positive result? The answer is in some sense trivial: apparently they are trying to unite in one class too different phenomena, they do not see ... more significant and profound distinctions that really define the nature and life of "systems"».

The analysis allows us to identify these "intuitively understood characteristics of whole as well as its elements that do not give positive results. *Obviously this knowledge is about the objects rather than about their properties.* All funds are aimed to identify knowledge about the object properties, and iconic representations of system concepts and a systematic approach are given through this knowledge about the properties. This is what generates a system of tautologies, when the definition of the first property is determined by the definition of the second property, and vice versa.

If the above is the specifics of the system approach, than it goes a few other findings: a systematic approach *represents a mechanism of creating and modifying rules of the acquisition of knowledge; correlation of various knowledge must be done in the process of changing the system, all the definitions and concepts of a systematic approach should describe the process of changing the system, its structure and not its structure as an object. The system* ***has systemic and non-systemic conditions.*** *In the system state its relationship are defined structure is constant. In the non-system state the process of changing the system structure and relationships takes place. In a non-system state system it has a symbolic form of the mechanism of changing of their properties and relations. The processes of changes should be examined in the system. The concepts of a systematic approach can be used only for non-system state.* The knowledge of the properties of the object will be contained in this mechanism. *Once we solve the current problem in the system analysis and create a proper single multidimensional construction, we get an object in the form of knowledge (methods) of its receipt.* If the mechanism of creating and modifying an object has the

knowledge presented in a particular symbolic form, the non-system state is represented in a symbolic form aimed to transform of knowledge into knowledge. On the other hand, we can speak of the class of cognitive systems that can be represented as a set of interrelated cognitive mechanisms of action for the creation of cognitive tools (methods) developing parts of the designed object.

The analysis of the means shows that at the present time there occurs an application of the tool of the analytical approach to a system approach (when part of the system and the relationships between them are defined). The use of the examined cognitive means of analysis leads to the aforementioned problems and paradigms in the conceptual apparatus of the system approach. The specifics of the system approach is not taken into account. The ideas formed are not as the process of change, dynamics, but as a result of this change. The separation of dynamics from statics requires the use of concepts to build a system of knowledge. Let's consider the existing approaches to the creation of symbolic forms to the representation system in the form of activity.

Directions of development of the system approach

One of the directions of development of a system approach is based on the idea of synthesis of knowledge through the act of symbolic form of action. It is needed to get away from the notion of object and present the process of reproduction as a type of representation of complex objects, in the form of a specific sequence of acts of activities (knowledge about the properties of the object), and then submit the conversion process (properties) of the object in these symbolic forms [5, p.20]: «In the latter case, at the forefront of the study are not acting elements and even the relationship between them, and communication elements. It is important for us to note that these are the objective of communication, i.e. not the connection between the elements of knowledge about the object but relationships between the elements of the object and the object itself, not as a product of mental activity, but as something that should be studied and reproduced in a certain way in the symbolic form of knowledge». This trend has been developing by followers of G.P. Shchedrovitsky [13, 14, 15, 16, 17]. The idea is implemented by detailing the activities on the acts and development of symbolic forms of such acts (syntax and semantics of a graphical language methodology), with which one could describe the activities to identify the object's properties. In the most iconic forms of interrelated acts, creating the business model, knowledge of the properties of the object are contained. Matryoshka – is a knowledge about properties of the object contained in the acts of complex activities. It is considered not *an object* but *subject* of study.

The task of multidisciplinary research is solved by introduction of procedures of configuration of knowledge of subject research. Procedure of exception provides knowledge about object properties to one system of knowledge. This direction is effectively used as a graphical language in various fields of activity for learning acts.

The elements of symbolic form of reproduction activity are two processes – the actualization and the norm. Actualization – is what realizes the norm, and the norm – is that normalizes actualization. The norm is a rule performing an action

process of reproduction. Actualization is the process of shaping the content of symbolic form, which defines the properties of the object. Normalization is *an actualized translation*, creation of new standards with aim of defining the future activities. The new standards are set by broadcast procedures. A significant aspect of the normalization is that its subject is the upcoming activity, i.e. normalization is activity over the activity [13, page 33].

In our opinion this is a very important first step in the development of the concepts of systematic approach. The specifics of a systematic approach is counted, the abstraction from object orientation is performed because *not the object itself is presented, but the subject of research as a process of reproduction of the object properties. This activity and the result of it are inseparable – that expresses one of the basic properties of system – integrity* [13]: «From the point of system activity, the system acts as a special form of a schematic representation of activities. The very same activity serves as the content of systemic forms». In this direction, a number of ideas are developed.

Whatever the advantages of this scientific direction are, it does not solve some problems. It is known that the system can change not only the act of action occurs, but also change the normalization of cognitive tools, etc.

The second direction is the representation in the form of knowledge of mechanisms of action [7, 9].

If you develop these ideas, the question arises on how the requirements should also correspond to the newly created symbolic form.

Requirements to the symbolic form of activity

The priority task is to construct of theory of system object when in the foreground is usually the problem of synthesis of different knowledge systems, multidisciplinary research must give some unified theoretical framework, "remove" these private (relative to the global problem) subjects and their results" [3, p.148]. V.N. Borisov proposes to solve this problem by constructing a "transition" or movement from the definitions of subject knowledge of one domain to another definition of subject knowledge of another domain [18, page 5]. The transition from one sign form to another as refines G.P. Shchedrovitskii must done using the another knowledge [19, page 9].

Knowledge can be obtained only as a result of actions by other knowledge. But then the question arises – what the symbolic form of system knowledge corresponds to this thesis, which of the existing symbolic forms presented in the form of work of creation of knowledge, shows how you can generate new knowledge through other knowledge. And if that statement is true, then we introduce the term symbolic form of system knowledge (SFSK) – a movement (activity, machine knowledge) depicting it as a symbolic form of changing process and receiving (generation) of new knowledge through other knowledge. To answer the question – by what specific cognitive resources (activities, works, machine knowledge) consisting of system knowledge we can obtain the required definitions of system approach and what should be the form of the sign – SFSK?

Any symbolic form of determination of system notions should reflect the specifics of the system approach to reflect the system state of the system, i.e. should have the most important property of system concepts – ability to change, to be not a noun, but a verb [10] and be presented as a single mechanism of changes in the way of building a system.

But before proceeding to knowledge (e.g. principles) and to the process of formation of the world as the ideal image of the process of creating symbolic forms of system concepts definitions, we should state how these terms should be understood and how we can get it. Philosophical encyclopedia provides the following definition given by F. Schelling [20]: "The concept as the action, is opposed to feelings, but the concept (which coincides with the self-consciousness, with "I") itself creates this contrast...." This definition should be interpreted so that the system concept as knowledge is a whole consisting of two interpenetrating activities of knowledge – knowledge of the action (note that concepts are not divided into parts, concepts are objectified) and knowledge of the concept of "action". Together they form a "matryoshka": knowledge of action produces certain knowledge of the concept of "action", knowledge of the concept of "action" contains in itself knowledge of the action. Changing the content of knowledge of action will lead to changing (objectifying) definition of concept knowledge of "action" (quality). To "objectify" it we need to learn how to build these cognitive actions and change their content. Knowledge of action is knowledge over knowledge.

Definition of concept as knowledge must explain the process of formation, chaning of knowledge through other knowledge. This other knowledge has to be presented in symbolic form of knowledge and as a machine, this machine should be based on the knowledge of the process of change – the evolutionary worldview.

Thus, any system definition as a symbolic form is generating activity as knowledge machine. This is the most important component of system approach – it's symbolic form must be submitted in the form of knowledge machine generating system representation of changing object properties. Construction of knowledge machine is the key problem of systemic approach, the solution of which will solve all his problems. *The essence of the proposed new ideology – in system analysis object or subject will not be explored, but methods, techniques will be explored as construction activities. The object will be contained within these actions, "**what**" we should get **should be comprised in the "how"** we will get it,* this activity as a way of getting knowledge must be represented in symbolic form.

The first and most important requirement is due to multi-disciplinary system knowledge. How to solve this problem, how in the same symbolic form on the one hand to consider various properties of an object subject area, and on the other it should abstract from domain object. It is needed to come up with such as SFSK activity that would allow to abstract from subject areas, and in the process of objectification or updating the filling of it with knowledge (content) about the properties of the object of study in this subject area was carried out. *SFSK construction as activity or as abstract knowledge machine will allow us to solve the problem of synthesis of system concepts and then develop a general theory of systems.*

The idea is to find such a knowledge of the symbolic form, which will allow, firstly, to present it as a symbolic form of activity and, secondly, to interconnect knowledge from different domains. It should be the activity of higher level of abstraction such as a cognitive tool for creating objects, and not an action to obtain knowledge about their properties.

To implement the formulated idea it is needed to create a different principle of creating a symbolic form of system concepts as knowledge machine. This principle should organize the system knowledge in a completely different structures and formations. It is necessary, as noted above, to divide the structure and process of structures organization. Structure as matryoshka must be inside the process of creating (organization) of the object. It should produce the schematization into symbolic form of the research subject as an action to develop the object properties and knowledge about how to create an object as cognitive means. The means of cognition sequence (method) in the form of rules of normalization should be provided performing actions of obtaining knowledge about the object. The shift to the next level of abstraction – to present action of knowledge is needed in the symbolic form of cognitive activity as a means of creating knowledge.

Principles of creating the symbolic form

Also symbolic form of *reproduction as a single mechanism of action, activity includes normalization as a single process of creating norms as methods and means of implementing the steps of creating the object.* The symbolic form of norm is the rule carrying out the action. Consequently, there is a need to build a symbolic form of transition from one norm to another, and vice versa. It is known [18] that such transition is a process of cognition. In [18] the cognition is defined as a form of movement from one knowledge to another. In fact, movement is the link between knowledge and implementation of interpenetration processes of direct and inverse knowledge transforming. Transformation logic should be presented in a particular symbolic form. Symbolic form (SF) is a movement methodology, which should reflect the logic of knowledge as interpenetrating processes of transformation of knowledge. Movement is a set of actions; any knowledge must be represented as a SF of mechanism of action, which should generate each other: «An adequate image of "development" of any subject, including "design" necessarily includes two opposed to each other and interconnected systems. One must portray the process of modifying the initially given object, the other - the mechanism for this change ...» [21, p.1]. «We can say that the process – is an application of the method to a specific time interval (step process)» [22]. But «Unlike natural objects, the action does not exist, it is carried out» [13]. The movement itself provided SF of content knowledge [23]. In the SF a knowledge of the transforming methodology is reflected, and in its content transformation logic of knowledge is implemented: «Thus, a method of knowledge is not external to the cognitive activity prescription, and, in the words of Hegel, a form of self-motion content knowledge» [18]. A content of symbolic form determined by the purpose, it is the knowledge that you want to use to achieve the goal.

The logic of converting of one knowledge into another and vice versa is carried out as follows. We take the first knowledge and present it in the form of the first mechanism of action, such as shown in [7]. The content of these mechanisms of action is the knowledge generating the first knowledge. Each of knowledge of the action mechanism of the first knowledge is represented in the form of mechanisms of actions, which consist of relevant target knowledge systems. Then from the derived target knowledge systems we generate action mechanism of second knowledge, which generates a second knowledge itself. Similar from second knowledge, going way back, you can get the first knowledge. Under the interconnection and interpenetration of knowledge should be understood the use of the same knowledge to construct various cognitive mechanisms of knowledge.

Let's now create SF description logic conversion, which is expressed in symbolic form methodology of the process of cognition. It is needed to construct symbolic form of cognitive process. This requires building a symbolic form of cognitive mechanism of action from system knowledge, such as specified in [7, 9]. Then from single cognitive mechanisms of action it is necessary to form symbolic form of movement as a collection interpenetrating symbolic forms of single action mechanisms, i.e. from aggregated individual mechanisms of action it is needed to form a motion mechanism. The contents of these mechanisms are knowledge, the choice of this knowledge is determined by the purpose of constructing the logic of cognitive procedures. Knowledge about the cognition interpenetrate into knowledge about the movement and knowledge of object properties and their movement.

It is occurred schematization in symbolic form of not action of obtaining the properties of the object, but rules (knowledge, normalization) of performing steps of creating an object with the specified properties in the form of activity. There occurs transition to the next level of abstraction – the level of modeling of methods as cognitive tools of creating the object. This makes it possible to solve the main problem – the problem of multi-disciplinary research and relation of multidisciplinary knowledge. There realized the relationship of knowledge as means of creating the object. Since we are talking about creating knowledge through knowledge, then knowledge should be used in the form of rules as a mechanism to perform the action. Creating the symbolic form of normalization will solve the problems of formation of system concepts. Distinctions between the mechanism of cognitive action and act of action is that in cognitive action as a tool that perform an action methodological knowledge is used, and the result is inside of this action like in matryoshka.

To understand the essence of the proposed idea and to distinguish it from the others, let's rephrase the tasks and allocate differs from the known approach. Adequate image of "development" **in the form of knowledge as a way of creating of any object**, including the design, necessarily includes two opposite and, at the same time, interconnected systems.

One must portray the process of changing **the method of creating** the initial (first) a subject in the form of knowledge, the other – the mechanism for this **change of knowledge as a way to create an object with desired properties**. *It is performed the representation in the form of activity of* ***not the*** *model* ***object****, but it is represented*

*as a symbolic form of interrelated **processes** (knowledge) as cognitive tools created object. It is practically modeled the cognitive process of creating the object*.

Proceeding to the principles. The basic idea of constructing the symbolic form satisfies the above requirement and is in sketching of normalization action in the form of a mechanism. The proposed idea can be expressed by using the following general principles. **The first** - system concept is a generating system. Generating system is the collection of interpenetrating knowledge activities as creating method of system concept of the object. Activity is normalization, represented as a cognitive mechanism of action as a cognitive tool that generates knowledge to create symbolic object form. Cognitive tool of creating the object concept can be detailed to the properties (attributes) of the object being created at the same time transforming into the act of activity. Principle describes a system concept as a system of cognitive mechanisms of actions and knowledge occurring in their content and moving the content. System concept will be formulated from knowledge systems within the cognitive mechanism of action (subject and methodological knowledge) and logic of content moving (from means to attributes) of mechanisms of action.

The basic process of transition from the knowledge of the object to the symbolic form of their creating means is performed through the **second principle – generating** activities as a model of ideal interpenetration and mutual generation of diverse knowledge. Interrelationship is the use of the same knowledge to build cognitive mechanisms of action as generators or generated by mechanisms of actions.

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