Cognitive-innovative University: Intension, Concepts, Definitions

N O Vasetskaya¹, V V Glukhov¹, G D Boush²

¹Peter the Great St.Petersburg Polytechnic University (SPbPU), 29 Polytechnicheskaya, St.Petersburg, Russia
²Dostoevsky Omsk State University (OGU), 55a, pr. Mira, Omsk, Russia
Nat.vasetskaya@yandex.ru

Abstract. The subject of the research is University. The aim is to form a brief and detailed definitions of the concept “cognitive innovation University”. The method is based on the categorical-system approach using the methods of traditional logic and the theory of dynamic information systems.

The article deals with the problems of definition of the concept of “University” and its types in the conditions of formation of the digital knowledge economy, due to the imperfection of the methodology. The article provides an overview of the most widely used definitions of the University. It is shown that in most concepts the essential characteristics of the University are empirical, so they are reflected non-systemically. The application of categorical-system methodology using the methods of traditional logic and the theory of dynamic information systems as a methodology for the study of cognitive innovation University is justified in this paper. On the basis of the triadic research method and methods of traditional logic, a brief definition of the concept of “cognitive innovative University” as an object of the socio-economic system is proposed. During the procedure of sequential two-level triadic decoding of the basic concept, leading to obtain an exhaustive definition of the desired concept, a detailed definition of the concept “cognitive-innovative University” was presented.

1. The formulation of the problem in general and its connection with important scientific and practical goals.

Nowadays, the development of the modern world is determined by the active processes of formation and development of a new digital knowledge economy, the main factor in the formation of which is the modernization of higher education as a basis for stimulating social and economic growth [1, 2]. Modernization of higher education, causing a significant renovation of its content and functions, involves the formation of a fundamentally new model of the University, which meets the challenges of the new economy. Thus, the study of this problem has become relevant in terms of theoretical and practical aspects of the subject area.

Over the past decades, researches on operating models of universities are at the center of attention of the academic community. Changing environmental factors can generate the transformation of the higher education in general [3, 4] as well as the appearance of new missions, functions and models of the University. Issues such as the essence of the university, reconsideration of its goals and functions, its development as a social institution and its transformation alongside with the change in social and economic spheres in society, have been massively researched by past and contemporary Russian and foreign scholars [5-7]. A study is under way to present the University as a set of structures functioning
in various spheres of life and sectors of the economy, its types, features of functioning and development.

The lack of a single scientifically based approach describing the functions and structure of the University is a major problem in the study of the formation and development of new models of Universities [8, 9]. The problem can be solved with the help of the system approach, but researchers of the “University” have used to apply it limited. Despite the fact that many scientists qualify the University as a system object and research is based on separate principles of system, there is no an universal approach to the study of this phenomenon.

This circumstance prevents the study of such research tasks as the description of the structure, forms, mechanism of functioning and development of the University. In particular, the described problem, which has become the most popular since the beginning of the XXI century, is even more acute now.

The scientific direction, dealing with the study of the phenomenon of the University as a socio-economic object, has a large number of terms and definitions. Nowadays, the most common concepts and terms are “corporate University”, “research University”, “innovative University”, “network University”, “entrepreneurial University”, etc.

The proposed concepts are based on significant differences in the functioning of the pre-industrial, industrial, post-industrial economy rely on knowledge, as the environment for the emergence and development of the University in it. With the formation digital knowledge economy, the main production resource in the conditions of development of information and communication technologies is intellectual (human) capital. It provides a new kind of University — “cognitive-innovative University”

At the present time in Russia, the forces of state support are aimed at the formation and development of a certain innovative type of University, where the potential of interaction between education, science and business can be successfully realized. The concept of a modern University is based on the idea of a «fundamental triangle», describing the interaction between key factors in the development of the world and national economy: education, research and innovation. A number of measures aimed at commercializing the results of educational and scientific research are being implemented in the form of additional funding for Universities and stimulation of integration processes.

As a result, the task of forming a methodology for the systematization of types of Universities becomes more relevant. This concept should cover all kinds of existing state-supported universities, as well as universities that have not been identified by scientists, for example, innovative cognitive University.

2. Formulating goals and objectives.

The main purpose of this study is to form a brief and detailed definitions of the concept “cognitive innovation University” with the categorical-system approach using the methods of traditional logic and the theory of dynamic information systems. To achieve this goal, the following tasks have been accomplished: the review and analysis of the terminology of the theory of Universities in Economics was carried out; the expediency of using the concept of “cognitive-innovative University” and the definition that most accurately reflects the nature of this phenomenon have been substantiated.

3. Research method.

A large number of definitions of the phenomenon of «University», encountered in domestic and foreign research, differ in their studied characteristics, properties, structural elements. This does not contribute to the formation of a coherent scientific theory of the University, which is necessary to provide a reliable scientific platform for projects and programs widely implemented in Russia. This does not contribute to the formation of a coherent scientific theory of the University, required to provide a reliable scientific platform for projects and programs widely implemented in Russia.

The solution of the problem with definition formulation is related to the methodology. Features of economic objects of research, such as invisibility, non-repeatability, high variability exacerbate this problem, limiting the possibility of using logic methods that could solve it [10, 11].
To form the concept of the phenomenon “cognitive-innovative University” the methodology of categorical schemes was used, represented by one of the universal cognitive tools, namely the triadic method. This approach is effectively used in forecasting scenarios of socio-economic processes using circuit technology. In the theory of dynamic information systems, a logical and mathematical justification of triadic have been implemented. It was also proved that the triad allows to combine the requirements of the minimum content when achieving the completeness of the description of the object at a given level of detail (deciphering categories). The category “cognitive-innovative University” is supplemented by the application of the principles of formal logic to highlight the necessary and sufficient features of the University. Initially, a simple definition of the concept of “cognitive-innovative University” will be formed on the basis of traditional logic, then the apparatus of categorical-system methodology (CSM) [12] and the theory of dynamic information systems (TDIS) will be used to obtain a detailed definition.

4. The main research material with the full account of the scientific results obtained.

Review of the current definitions of University. The current definition of the University as a socio-economic object does not give an unambiguous interpretation of this concept, which indicates an insufficient degree of elaboration of the problem for the study of this phenomenon. The uncertainty of the basic concept, which is the determining one, does not make it possible to further study the subject area. This shows the insufficient degree of elaboration of the problem for the study of this phenomenon. The uncertainty of the basic concept does not make it possible to further study the subject area.

The classical definition of a University as “a higher educational institution where specialists in fundamental and many applied Sciences are trained” has repeatedly changed its formula, reflecting the new knowledge gained about universities in the process of their development. The knowledge economy differs from previous socio-economic models in such specific features as the development of education, science and technology, the processes of their integration and commercialization, the intellectualization of labor, internationalization and globalization, the development of network structures and information and communication technologies. In such circumstances, the process of modernization of higher education has significantly changed its content, adapting it to the realities of the modern economy [13, 14].

A number of definitions of the researchers of this phenomenon in Economics are presented in Table 1.

Definitions of University and similar concepts

| Concept                | Definition                                                                 | Resource, Author            |
|------------------------|---------------------------------------------------------------------------|------------------------------|
| Entrepreneurial university | A higher education institution that systematically makes efforts to overcome limitations in three areas: knowledge generation, teaching and transformation of knowledge into practice by initiating new activities, transforming the internal environment and modifying interaction with the external environment. | G. N. Konstantinov, S. R. Filonovich [15] |

Entrepreneurial university

 University should demonstrate entrepreneurial behavior as an organization; members of the University: teachers, students, employees-should be entrepreneurs; interaction between the University and the environment should lead to

John. Ropke [16]
collaboration between the University and the region in terms of business development.

| Collaboration Type                      | Description                                                                                                                                                                                                 | Reference |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Entrepreneurial university              | The University, reoriented to innovative entrepreneurial activity, expressed in the search for effective organizational and structural reorganization, increasing revenues from all areas of the University, in an effort to become a significant player in the market of educational services | B. Clark [17] |
| Network University                      | The University, building its cognitive space as a system of scientific and educational partnerships of network type and using the concept of open innovations for its development, becomes a global communication link in the knowledge economy | A. Karpov [18] |
| Network University                      | Not only the higher education institution, but the form of organization of the educational program, which provides for special ways and strategies for its development and promotion, heterogeneity of its participants, represented by individual classical universities or other specialized higher education institutions | O. N. Belenov, M.V. Kirchanov [19] |
| Creative Innovation University          | A University where the philosophy of innovation, creativity and self-improvement are the basis of the main activity                                                                                           | A. P. Gorbunov [20] |
| Innovation University                   | The main activities of the University are scientific and educational based on innovative approaches and management methods.                                                                                     | E. A. Orlova [21] |
| Cognitive University                    | The University is a «reactor» in which the generation of knowledge, innovations, new products is «accelerated» beyond a certain critical mass because of the concentration of intelligence, communications, entrepreneurial activity and necessary resources. | A. V. Lapteva, E. S. Efimov [22] |

The definitions of the University shown in Table 1 are non-systematic and empirical. In the presented definitions of the University as a socio-economic phenomenon, attention is paid to such parameters as the integration of educational, scientific and entrepreneurial (practical) activities; the nature of interaction within the University, namely the network interaction between its structures.

Thus, representatives of different scientific fields have formed significant differences in the definition and content of the idea of the University. Conceptual approaches to the classification of the phenomenon of the University as a subject of higher education have a narrow focus and differ significantly.
Triadic research method to the definition of cognitive innovation University. The triadic method of research developed on the basis of TDIS (theory of dynamic information systems) assumes reflection of the sought category in three sought categories. This idea also finds application in traditional logic, when the definition of a concept uses a logical triad of categories: universal class (universe, a set of objects within which the concept is defined), class (it is associated with the defined concept), complement (all other elements of the universe, not included in the class).

The most common concept in this model of the brief definition of the University is the concept of “integration association”, which includes all forms of Association of economic entities into a single entity. For the University the general concept is the institution of higher professional education.

The logical theory of definition requires identification of necessary and sufficient signs of the studied phenomenon, allowing to distinguish it unambiguously from a set of similar, but not identical phenomena. Thus, the integration of educational, cognitive-research and production activities is a necessary feature for the allocation of cognitive-innovative University in a separate class from the specified set of elements; a sufficient feature that allows to cut off non-University forms of associations from the resulting set is the network nature of interaction within the University (Fig. 1).

To sum up, cognitive innovation University can be briefly defined as a type of institution of higher professional education, characterized by the presence of integration of educational, cognitive research and production activities, network nature of interaction within the institution.
derived concepts makes it difficult to understand them due to the limitations of human thinking. Therefore, the two-level triadic decoding seems to be a necessary and quite sufficient composition for the construction of scientific definitions.

First of all, the formation of the triad of concepts, revealing the content of the concept of “University”, should be based on the universal characteristics of the University. Secondly, it is necessary to pay attention to the specific qualities of the University as a socio-economic system.

Generalization of all the above allows us to distinguish the following conceptual triads (each concept is deciphered):

- [0] training;
- [1] research;
- [2] production.

Figure 2 shows the result of the “two-level decryption” of the concept of “cognitive innovation University” of the second level.

![Diagram](attachment://diagram.png)

**Figure. 2 Two-level triadic interpretation of the concept of “cognitive innovation University”.

The concept of “training” for the University can be represented by the following concepts:

- [00] training knowledge technology;
- [01] training self-learning technology;
- [02] training communication technology.

The concept of “training knowledge technology” refers to the methodology of development of knowledge, skills, students in interaction with the teacher (mentor). In the process of learning cognition technologies, students are introduced to different approaches to learning, as well as stimulating consciousness and development of learning skills, which contributes to the development of analytical and educational skills necessary for the effective development of academic knowledge and a confident
approach to various educational situations. Training knowledge technology related to the method of project-based learning and problem-based learning method. Students are confronted with solving real problems, pressing for industrial enterprises of the real sector of the economy and successful solution affecting the further development of the economy.

The concept of “training self-learning technology” includes the development of a methodology for the self-development of knowledge and skills by students (self-study, self-education), which is the mastery of the techniques of self-setting educational goals and objectives, finding ways and methods of solving them. One of the methods of self-learning is a method based on independent information search, where students are involved in finding solutions to real problems and result in effective interaction with the instructor finds the right answers to scientific questions. The role of the teacher in these conditions is changing dramatically. The teacher becomes not just a person who transmits information and knowledge to the student, but a mentor who helps to master the skills of obtaining knowledge in the process of independent work on tasks.

It should be noted influence on the process of training the need for the integration of science, education and production. As a result, learning occurs through solving real problems of industry by performing research, R & D, etc., created on the basis of integration of educational structures (basic departments, joint laboratories, research centers) with the use of achievements of modern science and technology.

Within the framework of “training communication technology” there is a development of personal, collective, information communications of students. The methodology of communicative interactions assumes in the process of multi-sided communications not just the possibility of students' statements, which in itself is important, but the introduction of their knowledge into the educational process.

The concept of “research” can be deciphered by the following concepts:
- [10] the study of human;
- [11] the study of nature;
- [12] the study of society.

The study of human and his spiritual activities is based on the methodology of the humanities – a relatively new field of philosophical knowledge arising and emerging, along with the methodologies of social science that explores society as a highly complex, evolving system consisting of large and small groups of people with their goals, interests, consciousness, material resources, and methodology of the natural sciences, explores the nature and world around us.

The concept of “production”, in turn, is deciphered by the triad of concepts:
- [20] the production of intellectual capital;
- [21] the production of knowledge;
- [22] the production of information products.

The main function of the University is to produce (train) personnel to ensure sustainable progressive development of society. That is, the production of intellectual capital, namely, a specialist of new quality, is one of the triad that characterizes the concept of “production”. This function is the most important in the conditions of formation of the knowledge economy, when intellectual (human) capital becomes the main engine of economic development. In addition to intellectual capital, the University generates new knowledge and new information products (educational technologies, methodological materials), which are used in the future in the process of training highly qualified specialists for the new economy, in demand in the labor market.

It should be noted that the studied qualities, functions, processes of cognitive innovation University are reflected in the definitions of the authors presented in Table 1, but the system of their presence in the definition of this phenomenon is not traced.

With the help of triadic decoding of the basic concept in the framework of studying the phenomenon of the University as a system object and systematization of its characteristics, the detailed definition of the concept of “cognitive-innovative University” can be formulated as follows: Cognitive Innovation University is a type of higher education institution with a network nature of interaction for the
integration of educational, cognitive research and production activities, based on training technologies of knowledge, self-learning, communication; study of human, nature, society; production of intellectual capital, knowledge, information products.

5. The conclusions of the research and the prospects of the further studying in this area.

The analysis of domestic and foreign literature shows that there is no systematic approach to the definition of “University”. On the basis of methods of categorical-system approach and traditional logic the brief and detailed definition of the concept “cognitive-innovative University” is received. This definition, in contrast to the existing definitions of “University” in the scientific literature, reflects the fundamental differences of cognitive-innovative University from other types of institutions of higher professional education. The proposed definition provides a platform for systematic research of such aspects of the University's activities as “structure”, “mechanism of functioning”, “opportunities for development”, etc.

The definition includes such concepts characterizing the University as “training”, “study”, “production”. The use of categorical schemes to construct the definition of “cognitive-innovative University” develops the methodology of research in this subject area, as well as economic theory in general, providing methodological tools for finding the most significant aspects of economic phenomena, reflecting their nature.

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