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The Concepts of Informational Approach to the Management of Higher Education's Development

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ABSTRACT

The research urgency is caused by necessity to develop the informational support for management of development of higher education in conditions of high turbulence of external and internal environment. The purpose of the paper is development of methodology for structuring and analyzing datasets of educational activities in order to reduce informational uncertainty of the higher education system and to improve its controllability. The paper presents the author's interpretation of the informational approach to the management of the development of higher education system, based on the theory of the information field and ensuring the reduction of entropy of management. The implementation of the informational approach allows investigating, modeling and predicting the state of higher education system to enhance development effectiveness, taking into account the dynamics, the lack of equilibrium conditions and interaction of elements of the system. This paper is intended for researchers and specialists in the field of management of education's development.

KEYWORDS

Higher education system, management of development, informational approach, the theory of the informational field, principles of development's management

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Introduction

The systems of education throughout the world are undergoing reforming due to global changes in society, transformation of political systems and other socio-economic factors. The essence of management of development of the higher education system is to increase controllability and productivity of the higher education system in terms of

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methodological, organizational, content and technological transformations, which leads to opportunities for the development of positive and reduce of negative consequences of education's reforming.

Socio-economic challenges of society, technological breakthroughs and the crisis of an educational system determine new possibilities and requirements that significantly change the goals, objectives and terms of implementation of higher education.

Deduced knowledge obtained in the process of socio-pedagogical analysis (Levina, 2015; Valeeva & Bushmeleva, 2016; Piscunov et a., 2016; Narikbayeva, 2016) gives the basis for management of development of higher education – the interpretation of the quality of education as a way to reconcile the interests of the agents of education. Its mechanisms is the theory of management (including education's management), management of the quality of education, acquiring innovative sense in the context of development of "new managerialism" that contributes to the achievement of controllability of the higher education system in terms of its universalization and standardization (Shaton, 1999; Saprykin, 2005; Vakhshtein, 2006; Belyakov, 2009; Fominykh et al., 2016; Pecherskaya et al., 2016).

The basis of any kind of governance is information – bi-directional informational flows that lead to control impacts and responses of the system. The diversity and variability of the higher education system, its dynamism, the activity of the control objects, transforming them in entities of management of development, the need to improve controllability of higher education, set a goal of structuring of informational datasets, their groupings, analysis, organization of continuous monitoring of educational activities at the level of the higher education system, its structures and processes. The application of informational approach to the management of development of higher education, as a community of settings, creates the prospect for the development of a managerial system of development of higher education and its informational support.

Methodological framework

Informatization of education

Currently, informatization has become a stage of civilization development of society, opening many areas and opportunities in all spheres of activities. In education, Informatization has gone the way from dissemination of technologies, computerization of the educational environment, changes in the forms of training to "new field of pedagogical knowledge" (Robert, 2012). It is the very information and communication technologies has triggered the development of a new content of education, learning systems, educational resources, educational environments, the proliferation of computer-based testing, automation of management, changing the conditions of realization of educational process and expanding the types of educational interaction and educational opportunities (Khodanovich, 2003; Nikitin, Uvarov, 2008; Bugaychuk, 2013; Pak, 2011; Sokolskaya, Stepanova, 2012).

The development of informatization gave us the opportunity to talk about the achievements in education:

- the proliferation of computer networks and the use of their opportunities in education has generated not only new types of learning (remote), but a single forms of control (SSE- Single State Exams), promoting the implementation of accessibility and universalization of education at all levels;

- implementation of informational and communicational technologies has enabled the creation of information space of an educational organization by establishing the environment of training and education;

- the change of approach into "obtaining" and processing of information has led to significant changes in didactics, new development of tools and methods of learning, technologies of knowledge control, new possibilities of differentiation of educational material on the basis of the psychophysiological features of students;

- fundamentally new methods of information grouping has led to changes in organizational management systems in educational institutions; the functions of accumulation of information are taken by information systems, providing data statistics taking into account and storage about educational processes.

Interpretations of the informational approach in pedagogical science and practice

The spread of informational technologies contributed to the creation of pedagogical Informatics – "the theory of reception, conversion, transmission and assimilation of information in the educational process" (Khutorskaya, 2002), within which the informational approach provides for the integration of educational and informational processes on the basis of presentation of information and communication forms (subject and object). Such vision of informational approach enables the transfer of ideas and concepts from related fields; formation of interdisciplinary areas of research; the synthesis of scientific base. However, with its main category - information this vision greatly limits the applicability of the approach, narrowing it to the database possibilities.

Another vision of the informational approach is the integration of information flows from the standpoint of designing of the content of education based on the logistic theory, providing balancing of informational flows in the educational environment of the University (Vlasova, 2013). The resulting information exchange system (accepting only of valuable for every entity of the system of information flows) helps to streamline and focus of informational flows, both in the projecting of educational content, and organizational management of the University, increasing the intensity and quality of internal and external communications and forming demanded by the potential employers of graduates' competences. The development of this direction is the information-environmental approach, which is using educational space, depending on the infrastructure, its functions and capabilities, adequate to modern social theory and practice, becomes a methodological basis for accumulation of experience through learning activities in the information environment (Kirilova & Vlasova, 2013).

The third aspect of information approach's use in education is the selection and integration of informational flows of managerial information for the management of educational systems and organizations. Here the classic management cycle (goal setting, planning, organization, control and analysis) is seen as an informational cycle of exchange to ensure accuracy, relevance and distribution of managerial actions. As a rule, in this direction informational approach stands in addition to other approaches, strengthening their technological capabilities.

Finally, the fourth aspect is the vision of the informational approach as a means for studying the structure of the pedagogical system and relations of its elements on the basis of three components of pedagogical process (the subject used for the transmission of knowledge from teacher to learner, and defining the cognitive basis for formation of skills and competencies; functional, intended for the formation of the ways of activity (skills); communication, contributing to the regulation of the educational

process) (Yakovleva, 2009 etc.). In these circumstances, the value of information (its ability to transmit the necessary information for the regulation of the educational process) is significantly reduced because of the limitations of an educational system; so, to make decision a personal, subjective information is involved, and operational information which is not in demand is stored by the system.

Informational approach in the context of management of higher education's development

Developing presented visions of the informational approach, we consider the informatization and informational approach as a methodology to meet the current needs of the practice of management of educational systems, such as: research methods, modeling, forecasting, improvement of management and development.

Information is understood as a resource of educational system that determines a number of the following positions:

— information, like any resource, needs to be "obtained" and used further;

— information as a resource acts only in case if it is recycled, systematized, collected, accumulated;

— information as a resource, is not only inexhaustible, but also has the ability significantly to be increased over time in the cognitive, content, technological and procedural aspect;

— information as a resource, is the basis of knowledge, going through the process of their production;

— information as a resource requires a streaming of flows transmission (communications);

— information as a resource that generates new types of processes and activities in all systems.

The basis of our interpretation of the informational approach is an idea (Marr, 1987; Denisov, 1998) that *external and internal environment of the system, because of the possibility of its creation and functioning, has all the information for its development and the perception of this information by the user (researcher / Manager) can be extended from simple visualization to the analysis, if further action is to extract from it characteristics that reflect its qualitative properties.* According to this view, external and internal information of the system of higher education are transformed in the presentation of a user in the limits of its understanding, reflecting the interesting systemic qualities with the required level of accuracy.

All incoming information in the course of analysis of educational activities is to be processed, recognized, organized, filtrated, which involves the use of exact mathematical methods and information technology, not only reducing its quality but also promoting the allocation of features, their understanding, development of solutions and responses to provide the required level of functioning of the system (Zinchenko, 1971). The processed information about the educational activities allows us to identify the cognitive characteristics of the higher education system (knowledge about the system, laws of its functioning) that determine new opportunities for its study. Continuous cyclical transformation of information into knowledge, with the help of which can be "obtained" new information and serves as the basis of information analysis of the higher education system, providing dynamic feedback to the system's activities, its internal and external perturbations.

The ultimate goal of information analysis of the system of higher education is constructing of an informational dynamic model that allows carrying out the functions for retrieving of information, its processing and management of actions of the system at different levels and types of management. It is proposed to consider the implementation of the information approach in managing the development of educational systems and structures based on the theory of the information field of A.A. Denisov (2003), providing information description of discrete elements of the system through examination of the information "as pair category in relation to the matter as the structure of matter, independent of its specific properties".

According to this theory, information exists in the form of reflection as:

— information of perception “J” (sensitive information);

— the informational potential of “H” (logical information);

— information complexity (content, meaning), as the intersection of sensitive “J” and logical “H” information.

Results

The concepts of information analysis of higher education system

Based on the theory of the information field of A.A. Denisov (2003), its concepts should be applied to develop a methodology of management of higher education’s development in order to reduce information uncertainty of the system (entropy), its high variability relatively to the external and internal environment and to improve its controllability (Levina, Bazhenova, Beydina, Denisova, Popova, Makarov, Shakhnina, 2015).

The concepts of information approach should be described and their applicability possibilities should be noted to the higher education system for the information analysis:

1) The law of sensitive reflection (the adequacy of matter reflection). The reflection (perception) arises based on the potential of information (as properties of matter) and, as a rule, is not completely transparent to the reflected object, the information potential (the "information in itself") exceeds our perception ("information for us"). Information of perception J is accumulated in time and space and consists of information flows from the material objects (subjects) of the educational system, forming its informational field relatively the criteria of measurements of the user (researcher) and represents a mapping of the element base of the system. Then the logical conclusion is that the relevance of indicators of the information field, reflecting the higher education system (filter of estimation) is very high, their criterion efficiency must be justified, proven and meet the objectives of the analysis forming new knowledge about the functioning and potential of development of the system in the current time.

2) The law of logical reflection (the essential state of the system). According to it the material properties of the system are adequately reflected are determined by the laws of logic. Conventionally, static condition of the education system allows distinguishing classes of objects (entities) of the system: educational, educational and managerial processes, communication processes at all functioning levels, system agents, which provide its functionality.

The possibilities of cognition of the information field, its information potential “H” depend on the essence of the perceived object and conditional distance to it (that is, selected characteristics, adequacy of methods of "obtaining" of data, speed of transmission and processing of information).

3) Information complexity of the system is determined by the logic (in particular case - Descartes) product of the perceived "J" and logical "H" information characterizing the content and level of complexity of the received information display: C=J∩H or C=JxH

This postulate means the possibility of the study of systemic complexity and the ability to assess by quantity the integrity of the system, when the sensitive and the logical information have deterministic and statistical measures. For educational (and other social) systems, the measurement process of information is not always possible, it is probably about reducing of the uncertainty of the system describing its behavior and identifying features in response to internal and external impacts.

Regularities of information approach to the management of higher education's development

A.A. Denisov (2003) in the framework of the theory of the information field carried out the formalization of the laws of dialectical logic, in relation to the higher education system based on them one can define the following regularities:

1) The essence of the concept "J" is reversible to its volume "n", that is, the total number of homogeneous objects or phenomena, information about which formed the basis of the concept. That is, simple measures of the essence of phenomena, mostly reflect its state; the ideal state of an object occurs when "n"=1, then the concept about the object completely coincide with the knowledge about it. When transferring the knowledge about the object, from one object to many, the relativity of knowledge is increased and probability measures of measurements are used.

2) The continuous development of all types of systems, that is, the need for mandatory consideration of the state of the object being studied not only in current time but also in its inertial development, since the semantic essence of an object lies not only in his state but also in the potential development of future states; that is, the question rises about the development of scenarios of higher education's development, with scenario simulation's base which can vary depending on the desired characteristics of the researcher – the time, response of the system or objects in the system, internal or external conditions.

3) The law of negation's negation – is a spiral or iterative development of the system, when the return can be done to its original form (state), while the internal content of these states is changed (positive or negative increment). Here development always includes and certain inertia of the system, when in case of negative or positive tendencies, there is a tendency towards the pessimistic or optimistic scenario.

4) The law of unity and struggle of opposites, where we are talking about true opposites existing in the same space and time. The synthesis of opposites and contradictions creates a system unity that serves as the impetus for the development of any system. The managerial objective in this case is to avoid critical states of the system -"struggle" and "solidarity" of opposites, each of which leads to the loss of system positions. As needs and desires, goals and aspirations, ways and means, scale, and orientation of behavior of each individual, as an entity of the educational system are, to some extent, the regularities, the nature of which is extremely complex, and absolutely unsustainable, we believe that in the aspect of education research it makes sense to speak about a heterogeneous natural manifestations of society, separate individual relations and institutional relations as various structural subsystems of education.

5) the law of transition of quantitative changes into qualitative which defines the need to understand the relativity of the identified trends in the development of any process and the resulting development scenarios, strategic plans and programs, because they can change to their opposites as a result of the development. This law in

practice requires consideration of the nonlinearity and instability of all processes, the understanding of the emergence of the objects when the sum of the qualities of the parts is not equal to the qualities of the whole. In relation to a person, one can say that the first reaction to anything and the latter reaction may differ substantially while under the influence only of the internal properties.

6) Universal interconnection and interdependence that requires into account all of the factors determining the investigated process (external and internal). The account of this law involves the consistency in the consideration of the nature of each object and is interpreted as the emergence of various deviations from planned levels by strategic attitudes (indicators of educational activities) and expected outcomes caused by changes in the external and internal environment of the educational system; for example, at the global level it is the emergence of the information society, change of ideological or educational paradigm, technological achievements, etc.; at the local level – the quality of training and methodical support of the process, ability of the teacher, personality characteristics of the student and so on.

Thus, the theory of information field, significantly expands the vision of the information approach and its implementation in managing of the development of educational systems to bring at the level of theory and practice many ideas and implementation mechanisms of the related Sciences – philosophy, systems theory, information theory, mathematical modeling. The functions of the information approach from technology level in performance of considered studies in this view come to a philosophical level, functioning for advance conditioned information uncertainty and high dynamics of the educational system with the aim of its reduction and formalization, contributing to improve the efficiency of controllability and optimization (improving the quality) of educational processes.

Discussions and Conclusion

The limits of applicability of the information approach in education are very wide: from didactic forms and means, based on information and communication technologies' possibilities and information systems' modeling of artificial intelligence, providing training and management. Without downplaying the role and importance of the teacher as the carrier of knowledge and culture, it is necessary to mention the importance of adequate informational educational systems and environments in education, and the need to train all professionals for the information activities, improving information culture, professional competence and efficiency of information activities of education's entities.

The present study is focused on the development of managerial infrastructure of the higher education system from the standpoint of reducing its uncertainty, identification of probabilistic patterns and increase of its controllability. The exchange of information within the management of development of higher education is carried out within the established goals and development plans and depends on the level of education, type of determination in all types of representing the managed process by the entity.

The implementation of the information approach can be seen in the following sequence of steps:

— the isolation of the education system, clarifying its researched level and types of control, definition of internal and external characteristics (influences), the functionality of the system in the framework of the strategy for the reforming and development of education;

— the definition of information sources for the analysis of the educational system on the basis of their information potential;

— information analysis of educational system's entities, allocation of characteristic features, grouping;

— the formalization of input, output parameters, results of educational activity of educational system's entities;

— the establishment of informational flows, vector relations of the education system's information;

— development of a dynamic information models of higher education system, allowing to formalize all processes in the system; receive timely information on the state of each of the system's entity according to the results of its operations; to identify criteria and borders of control; to carry out forecasting of development at all levels of the system's management.

Thus, the information approach is defined as the leading one in research and is considered as the objective possibility to reduce uncertainty through the higher education system (structure, process, phenomenon) in the form of information field containing all the information for its development. Information is the basis for any management, its essence which is necessary for the coordination of actions and managerial impacts for the operation or development of educational (or any other) system.

Information approach to the management of the development of higher education, in our opinion, is to view the educational system as an information field that contains all the information for its development, reflecting the systemic features with the required level of accuracy. The mechanisms of perception of the current information system of higher education and the construction of scenarios of development depend on user-defined boundaries of the study, complexity and specificity of the methods of information processing. This approach allows making adequate managerial decisions in conditions of high uncertainty and possible opposite requirements of educational agents.

A set of presented dialectical laws in the interpretation of the information approach defines a complete and closed system of analysis of all, including educational systems and processes, identifying a plurality of states between truth and falsehood, in contrast to the logic that uses only a binary relationship. The implementation of the information approach allows investigating, modeling and predicting of the state of the higher education system to improve its controllability and efficiency of the development taking into account the dynamics, lack of equilibrium and interaction of system elements.

Disclosure statement

No potential conflict of interest was reported by the authors.

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