Methodical approaches to providing sustainable development of the transport industry management system based on self-organization

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Abstract. Current conditions of the cognitive economy formation demand to take into account the leading role of information, knowledge and human capital in the development of the transport industry management system. The article substantiates the conceptual approach to the self-organization of a management system on the basis of innovative changes. Human capital is the key aspect of self-organization, so the directions of improving the workforce quality are justified. Basing on the information-innovative genesis of the process of self-organization, the authors justified the necessity of preventing asymmetric information. For this purpose the actions against the resistance to innovations were proposed. The implementation of certain measures contributes to the effective development of the transport management system.

1. Introduction
In modern conditions one can follow the trend of increasing the role of knowledge in all economical realms. Knowledge becomes the key attribution, the main commodity and the basis of value and market restructuring. The interconnection of knowledge, ideas and innovations becomes the main instance of development [1]. So this direction should be taken into account when implementing control actions in accordance with the fluctuations of the system.

Information exchange is the basis of knowledge and its transformation into innovation. According to M. Eigen’s theory, information exchange is the basis of self-organization of the system [2].

All the existing information, software and computer technologies, methods and models are designed to support decision-making, while the result is subjective and depends on the person making this decision. Therefore, currently being developed cognitive technologies that create the basis for a knowledge economy are in the forefront of the development process. The human capital is the key factor in the production of the knowledge economy.

Globalization and unification of the world economy, the active formation of the knowledge economy, specifics of the current stage of scientific and technical progress demand to pay special attention to the problem of improving the workforce and ensuring its compliance with current social and economic requirements.

Thus there is a relevance of developing scientifically based methods and mechanisms for improving the human capital of enterprises and organizations for the purpose of the effective management process self-organization on an innovative and cognitive basis.
2. Materials and Methods

Basing on the postulates of theories of self-organization, changes and information listed above, the authors present the process of self-organization of the economic system (Figure 1).

![Diagram showing the process of management system self-organization]

Figure 1. The role of human capital in the process of self-organization of the management system

The process of accumulation and selection of information is the basis of evolutionary and revolutionary changes. Information accumulates in the system. The process of appearance and accumulation of new elements should be autocatalytic so that the system will not come to the equilibrium state, which is a disaster for complex systems [3]. Basing on the "knowledge-ideas-innovations" chain one can assume that the accumulation and selection of information occurs constantly, forming new system elements-innovations of various types. With the change in incoming information and its value, earlier and less valuable innovations disappear being replaced by new ones. It follows that organizational, technical, economic and institutional innovations are the elements of the system. The process of formation and change of innovations based on the information flow is the basis of the self-organization of the system. In this case, the process of evolutionary functioning of the system can be considered as a process of small accumulation of innovative advantages in accordance with changes in the situation. This process can be called the adaptation of the system to changes. It is important to use the situational approach in the context of adaptation, which involves the comparison of the situation and necessary and sufficient innovations, since according to E. Lasker's principle they are dispersed in the case of not using small advantages at the appropriate moment. Moreover, the adaptation process contains constant organizational innovations, which are attributed to structure changes or to new structures arising (usually in the targeted initiated order) pursuant to environmental changes (according to the theory of functional systems of P.K. Anokhin). These innovations should be planned on the basis of a functional approach, since the arised structures are efficient due to their special focusing on overcoming certain influences of the environment.

In the case of insufficient value of incoming information which causes the contradictions described above, or when the autocatalytic effect of updating system elements is absent due to the lack of valuable information, the progressive accumulation of small innovative changes leads to the appearance of a bifurcation point in the system development, where the system chooses the path of development. That is how the moment of self-organization comes.

In case of revolutionary changes at bifurcation moment, there is a possibility to direct the system to the priority branch of development by resonant control of its progress. For that purpose it is needed to differentiate the necessary innovations, the intensity of their use and the value of the information entering the system. In other words, it is possible to change the process speed of self-organization of the system and the duration of its development stages by changing the intensity of growth in the number of elements (innovations) and the intensity of their use. Thus it is possible to change the parameters of the system by developing a methodology for assessing the value of information and selecting innovations both in the terms of direction and duration of the innovation cycle. At the same time, the autocatalytic
nature of the innovations appearance for all elements of the system confirms the idea of the constancy of the changing process in the system.

Information perception and assessment are subjective and have a cognitive basis, so it follows that they depend on the development level of human capital, including labor.

It is recalled that this problem has two interrelated aspects: quantitative aspect and qualitative aspect. Without diminishing the role of the former aspect, the authors emphasize that it is the improvement of the workforce quality in accordance with the current level of scientific, technical and cultural achievements of the society, their development tendencies and changes in the socioeconomic nature that is becoming particularly relevant.

Many studies confirm that the insufficient quality of the workforce firstly leads to its accelerated physical and moral wear, and secondly, it causes crisis and regressive conditions in all areas of society life, particularly in the economy and in the management system. Thus, improving the quality and structure of the workforce should become one of the most important parts of the current stage of the Russian economy development.

The authors suppose that improving the educational and professional training of the workforce is the main direction of increasing the quality of the workforce. It involves the development of the following aspects:

- a system of general and vocational education aimed at the professional training of a new workforce;
- a system of in-process stuff training, at the workplace in particular, and also "point", "targeted" accomplishing of training new-starters (for instance, graduates from higher education institutions);
- a self-study and distance learning system with providing of appropriate conditions;
- a system of continuous education aimed at preserving and improving the workforce;
- a system of vocational guidance and psychological support for young people, and unemployed citizens, as well as for employed wishing to change occupation;
- services of the employment service for training unemployed citizens and unemployed people, as well as a mechanism for supporting and organizing advanced training for workers at risk of dismissal.

It is worth noting that all these aspects are interrelated and interdependent, and the urgency of the issue of efficiency increasing of creating workers with higher education is great and obvious as well, because it is predetermined by the very content of the "highly qualified specialists" category and their huge role, played in the modern cognitive economy. The authors specially point out that the emerging "knowledge economy" not only exacerbates the requirements for the quality and quantity of employees significantly, but also creates a number of its own requirements, making the role of highly qualified staff even more significant and multifaceted in society. It is important that in the conditions of a difficult modern times it is highly qualified specialists who are intended to become active participants in economic reform and also a kind of social stabilizer [4].

However, the authors consider that the issue of the efficiency of the highly qualified specialist reproduction is especially important due to the fact that higher education is the most important source of perception and accumulation of innovative information and is closely connected with the main changes in the system of economic management.

3. Results
In the view of the above, it is reasonable to present the self-organization process of the management system of economic development (at any level of its ranking) by the following figure (Figure 2).
Practically all modern scientific schools accept to some extent the innovative genesis of changes in the system and its development [5]. The innovative genesis appears in the substantiation of the life cycle of changes, beginning with the wave theory. The statement about the importance of innovations in the development process was justified to a greater extent within the evolutionary theory that reveals the dependence of qualitative changes in the organization of production ratio to technical innovations. Based on an analysis of the available theoretical basis, it can be concluded that innovations (including technological ones) are the source or a catalyst of organizational and economic changes. Thus, the development of the economic system, including enterprises, is based on the concept of three aspects: information, innovations, changes.

Implementation of this concept at the enterprise level is schematically presented in Figure 3.

**Figure 2.** Conceptual diagram of the process of the management system self-organization
Actualizing the constant interrelation of the elements of this concept, the system should take into account not only the criteria of its reliability, importance and urgency, but also the problem of information asymmetry while assessing the value of information. The problem of asymmetric information can be taken into account in practice while assessing the risk of innovation. However, its personified nature should be considered [6].

In this regard, the problem of resistance to changes becomes especially urgent. In most cases resistance to changes is considered as a threat regarded to the process of change, but it can be perceived as an opportunity to assess the appropriateness of the changes depending on the subject and the object.

The theory of managing change suggests classifying all the existing methods of overcoming resistance to change according to several characteristics, for example, to the stage of the life cycle of the changes; to the employee status by the nature of resistance to change; to the reasons for resistance to change; to the level of occurrence of resistance; to the type of change; to the nature of the source of resistance, and to the conditions for implementation of the changes [7].

In practice, the variety of methods can eventually be classified according to the approach of the leadership (the range of approaches varies from coercion to adaptation, from "hard" to "soft" methods and is determined depending on the conditions for implementing changes), and of the nature of employee resistance (the range of positions - from support to direct resistance to change, which is determined by individual and group position).

In this case, a clustering matrix was developed in order to choose a method for overcoming resistance to changes (Figure 4).

Following the proposed methodology of overcoming resistance to change will reduce the risk of resistance subject to the contribution of employees to the implementation of innovations, participation in the management of team members, which will enable the use of cognitive technologies in the planning and implementation of innovative changes.
4. Discussion
Each element of the transport industry management system is in the process of constant updating on the basis of economic changes characterized by the attributes of innovation, institutional changes, organizational changes having the of self-development nature [9]. Self-development is due to the pursuance of self-regulation and constant learning in the social subsystem, the accumulation of new knowledge and the receipt of new information in the management system. The aiming of all the industry management system elements to continuous improvement and renewal is their integrative characteristic. In turn, the implementation of any innovation entails the implementation of the entire necessary spectrum of transformations, according to the life cycle of organizational and economic changes, a certain part of which can also have an innovative genesis. The success of innovations, as well as the stable dynamics of the evolution of the industry, is largely due to the relevance of the information entering the system and the qualified process of its processing, accompanied by the accumulation of new knowledge [8]. This success is achieved due to the qualification level of the workforce, the human capital of the industry, and by the prevention of asymmetric information. Well-coordinated implementation of these processes will contribute to a stable evolutionary dynamics of the innovative development of the industry.

5. Conclusions
When improving the management system of the transport industry it is necessary to focus on the elements that ensure the prolongation of the evolutionary stage of self-organization, taking into consideration the process of formation of the cognitive economy and the advanced knowledge development based on information support in all branches of the economy. A conceptual approach to the self-organization of the management system is proposed for this purpose with paying due attention to the implementation of innovative changes. The authors substantiated the major role of human capital in assessing the relevance of information and in the process of accumulating the knowledge which are
necessary for the implementation of innovative changes. In order to develop human capital, the article proposed the directions for improving the quality of the workforce in the transport sector, and developed the system of choosing methods for overcoming resistance to innovative changes in the industry. The practical implementation of the proposed methodological basis will conducinge the sustainable development of the transport management system.

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