

Management of Intellectual Capital Development of an Organization Based on the System Contradictions Between its Elements

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Abstract

The paper aims to research intellectual capital elements composition with the consequent study of emerging contradictions, which allows obtaining the system picture of intellectual capital, its functioning mechanism, and applicability as a factor that forms and develops the knowledge-based economy. The author's approach to managing the development of intellectual capital, based on the usage of categorial-system methodology, is proposed as a key approach to solving the problem. With the help of a simple compensatory homeostat model, it is shown that successful development of intellectual capital is a product of efficient resolution of a conflict between two composing elements of the system object. The elements, being unstable by themselves, provide stability for the whole system. The applied model allowed getting knowledge about intellectual capital self-regulation mechanism, which is based on cross-interaction between two of its components. Considering possible combinations of feedback types, the feasible components' interaction modes have been determined. Possible development paths for intellectual capital, depending on the intercommunication mode types of the interaction, have been revealed. The paper materials could be used to form complex of program tools for federal, regional and local authorities, aiming to transform the social economic system and advance towards a knowledge-based economy.

Keywords: knowledge-based economy; Intellectual capital; Simple compensatory homeostat model; Contradiction; Feedback.



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1. Introduction

The vital task of the modern economy is the transition to the sixth technological structure, which ensures its competitive ability and sustainable social and economic development in the long term. According to [Lvov \(1990\)](#), [Kondratiev \(2002\)](#), [Glaziev \(2005\)](#), at the present time, six technological structures can be distinguished. The last of them, the sixth one, is the most progressive. It is characterized by focusing on the development of high technology, robotics, biotechnology, molecular biology and genetic engineering, nanotechnology, artificial intelligence systems, global information networks and integrated high-speed transport systems. A peculiar feature of the sixth technology revolution is a shift in emphasis from the tangible to intangible production factors, in particular – to the intellectual capital of companies, which can be considered as the primary source of their competitive advantages.

The basics of technological paradigm concept were presented in the work of economists [Glaziev and Lvov \(1985\)](#) and were further developed in later works ([Lvov, 1990](#)); ([Kondratiev, 2002](#)); ([Glaziev, 2005](#)). According to them, a technological structure is a set of technologies specific to a certain level of production development. The transition from traditional to progressive technological structures occurs in connection with scientific and technological progress. Intellectual capital is an element of the social and economic system that ensures the transition to post-industrial society and the formation of the knowledge-based economy. To provide stable economic growth of leading countries and post-industrial transformation of the economic system, intellectual capital should be used as its main resource. This process could be performed only with a clear idea about which elements compose intellectual capital, how they interact and how someone may influence these interaction processes to develop the appropriate element of an intellectual capital. In this situation, key relevance is obtained by the questions of identifying the quality composition of the intellectual capital elements, as well as by description of their formation, functioning and development mechanisms. This enables to determine probable options of managerial influence on the processes in order to make them more efficient, and thus to ensure knowledge-based economy development.

In a number of papers by Russian and foreign scholars, the various aspects of the intellectual capital phenomenon are considered. [Brooking \(1996\)](#) defines intellectual capital as a set of intangible assets, which may be used to form value and without which company could not exist and develop its competitive advantages. In the work by [Edvinsson and Malone \(1997\)](#), this phenomenon is considered as a possession of applied knowledge and experiences, organization technologies, connections with customers and professional skills that provide a competitive advantage to an organization. According to [Kochetkova \(2012\)](#), intellectual capital is a non-financial resource, which gives competitive advantages and enables adding value to an organization.

The main shortcoming of the mentioned works is the lack of system vision of the object that allows defining necessary components which provide its formation at a certain level.

In a number of other works, this shortcoming is eliminated. Two approaches have become traditional for decomposition of intellectual capital: the first one, where human, organizational and structural capital are segregated ([Saint-Onge, 1996](#)); and the second one, where human, client and process capital are segregated ([Ashton, 2005](#)); ([Bontis, 1996](#)).

Individual works emphasize the relations system emerging between intellectual capital elements and the processes of their transformation. Thus, [Zinov \(2007\)](#) distinguishes two structural elements of intellectual capital: intellectual resources and system of relations between economic subjects in the production, distribution and usage of intellectual resources, as well as the knowledge necessary for their effective functioning. In the work by [Albert and Bradley \(1996\)](#), the process of intellectual capital forming and development is carried out at the expense of transformation of knowledge and intangible assets into useful resources, giving competitive advantages to individuals, companies and nations. [Permyakova \(2007\)](#) understands the process of intellectual capital formation as a choice made of objectives and tasks technologies, material and human resources for making economic benefits and satisfaction of social needs by them.

2. Methods

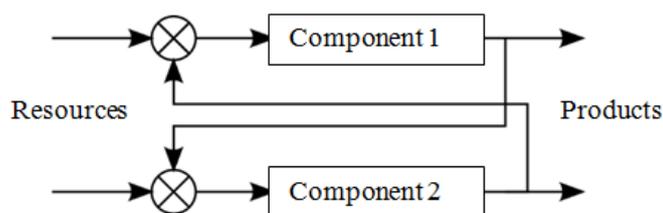
It should be noted that in the academic papers available within the framework of the selected topic, the peculiar features of the intellectual capital are considered fragmentarily and in an inconsistent manner. It means that intellectual capital is not considered as a system object and, thus, the mechanism of its functioning remains undefined, as well as its application as a factor of the knowledge-based economy development. Thus, investigation of intellectual capital elements composition with the further study of contradictions between them is of research interest and current concern. In the author’s view, the present scientific challenge can be addressed using a simple compensatory homeostat model, making it possible to identify and describe contradictions between the revealed components of the intellectual capital on which its functioning mechanism is based. This model is based on the assumption that two unsustainable systems that are in contradiction provide a stable state of the system object.

The proposed universal method allows investigating system objects of different nature by considering possible contradictions between elements of such objects. It allows studying the self-regulation mechanism of a system based on reverse cross-connection between pairs of its constituent elements. The mechanism description allows to understand the nature of relations and interconnections between structural parts of the intellectual capital, as well as to get an idea of possible options for its development. With the help of managerial influences on the contradictions arising between elements of intellectual capital, it is possible to establish a certain trajectory of its development.

The usage of the method provides infrastructure for the transition to a competitive economy based on the sixth technological structure, and a stable social and economic development of a country in the long run.

The concept of compensatory homeostat has been introduced in the economic studies just recently. However, at present, there is a number of papers which successfully apply it ([Dus Y. P. and Razumov, 2006](#)); ([Dus Y. P. et al., 2010](#)); ([Penyevskiy, 2010](#)); ([Boush et al., 2012](#); [Poleshchenko et al., 2011](#)); ([Boush et al., 2012](#)); ([Ermakova and Korabeinikov, 2012](#)). The model of a simple compensatory homeostat is based on the application of a concept relying on the contradiction between two components of a system object (subsystems, constituents) which, being unstable, ensure the stability of the system (homeostasis). The contradiction occurs as a result of competition between these two components for a certain resource which is important for each of them (Figure 1).

Figure-1. Simple model of a compensatory homeostat



System components act as transforming elements and obtain resources. Transformation of them provides results (products) at the output. Each transforming element, during its functioning, affects system state and state of the opposite element. Two options are possible as a result: an increase in productivity of the opposite element (positive feedback) and a decrease in productivity of the opposite element (negative feedback). Combination of these feedback options leads four possible modes of the system functioning.

The possible interaction modes of two subsystems depending on the type of the cross-feedback are presented in Table 1.

Table-1. Possible components interaction options in the intellectual capital of an organization

Mode	Feedback type	Interaction nature	Interaction result
1	--	Both elements block the development of each other	Local regress, decrease in system productivity
2	+ -	Element 1 stimulates the development of Element 2; Element 2 blocks the development of Element 1	Local isogress, temporary retention of the system productivity
3	- +	Element 2 stimulates the development of Element 1; Element 1 blocks the development of Element 2	Local isogress, temporary retention of the system productivity
4	++	Both elements stimulate the development of each other	Local progress, increase in system productivity

Modes 2 and 3 (combination of positive and negative feedback (- +; + -)) have sustainable nature. Mode 1 (two negative feedbacks (- -)) cannot last long, otherwise, the system will decay. System functioning in the mode of two positive feedbacks (+ +) cannot last long as well, the system will break from the excessive resource (Gorskiy, 1995).

3. Results

At the previous research stage, the authors have identified the following components as parts of intellectual capital (Nedoluzhko, 2016):

- education;
- involvement;
- production rationalization;
- self-improvement;
- client-focused rationalization;
- innovative activity.

In continuation of this logic, it is reasonable to assert that the fundamental characteristics of intellectual capital phenomenon are a cognitive activity, which represents different ways of perception and processing of external information, coming out through a set of psychical processes (perception, attention, memory, thinking, imagination, speech, emotions) and psychical states (beliefs, desires, intentions) of a person (Korotaeva and Nefedova, 2012). Let us dwell in more detail on the main components of intellectual capital.

Education is a cognitive activity, which does not exceed the scope of the given manner. It is carried out on a physiological basis and leads to the creation of human capital. In this case, the presence of a brain as a material carrier of intellect acts as the initial resource. At the same time, the activities of the employee are influenced by external incentives. As a result, the employee finds the knowledge necessary to fulfill his/her current tasks.

Involvement is a cognitive activity, which does not exceed the scope of a given manner. It is carried out on a social and economic basis and leads to the creation of an organizational capital. An employee uses existing patterns to perform current operations, feeling the need for social self-realization, which contributes to the creation of knowledge in the field of organizational processes.

Production rationalization is a cognitive activity, which implies searching for optimal ways to solve a problem within the chosen strategy. It is carried out on a psychological basis and leads to the creation of organizational capital. In this case, the initial resource is a psychological basis of an intellect – motivation of individual employees is connected to an intention for the realization of higher mental functions, the potential. Such employees have a certain freedom of choosing a way to solve tasks. This allows creating a new knowledge concerning ways to perform organizational processes.

Self-improvement is a cognitive activity, which assumes a revision of the strategy. It is going beyond the proposed alternatives, is carried out on a psychological basis, and leads to the creation of human capital. The intention of employees to realize the highest mental functions and the potential is combined with a willingness to leave the activities proposed from outside and to begin the activities motivated inside and aimed at creating new personal knowledge (human capital).

Client-focused rationalization is a cognitive activity which assumes searching for optimal ways to solve a problem. It is carried out on a physiological basis and leads to the creation of consumer capital. In this case, the physiological basis of intellect is used to search the most effective ways to solve tasks within a chosen organization strategy. This leads to more effective interaction of an organization with an external environment, which varies from organization to organization.

Innovative activity is a cognitive activity, which assumes a revision of the strategy. It is going beyond the proposed alternatives, is carried out on a social and economic basis, and leads to the creation of consumer capital. Necessary baseline conditions for implementing this scenario are the need for realization of a human social purpose in combination with the willingness to leave the activities proposed from outside and begin the activities motivated inside. The result of this process is new knowledge, which can be commercialized (i.e. consumer capital).

The aggregate of possible combinations of the intellectual capital components that enter into contradiction relations is determined by the list of components, as well as by selection of those components, which are leading and system-forming at this stage of the intellectual capital development. Since elementary contradictions emerge in pairs of components, it is reasonable to identify a two-component core in the intellectual capital, the composition of which will change with the transition to each following stage of its development. At the origin stage of the intellectual capital, the core is one-component and includes only the Education component. An employee in such an organization, performing some primitive routine functions, faces the necessity to acquire the certain knowledge required to do the current job. At the next stage in the course of performing current operations, the employee starts to feel like a part of the organization and has a sense of involvement in the corporate objectives. The core is supplemented by the Involvement component and thus becomes two-component. In the course of further development of the intellectual capital, the employee, using the available knowledge, can fulfil the search for the best ways of tackling a problem within the framework of the selected business strategy (Production rationalization), and afterwards revises the strategy and moves beyond the alternatives proposed by the situation (Self-improvement). These processes can be implemented by the employee at any level of development of the system object, even at the initial one. But only that process will be considered as a system-forming one in a two-component core, which at the given stage of development of the system object will be the highest demand from the perspective of enhancement of organizational effectiveness. For instance, if the organization has to modify corporate business processes in order to be competitive at the market and meet the changing requirements of the external environment, it indicates the need

for Production rationalization, whereby the given component will take the lead. Further development of the intellectual capital assumes that the process in the highest demand will be the creation of a new personal knowledge of employees as a result of their leaving the activity offered from the outside and starting a new activity motivated from within. In this case, the Self-improvement component will become a system-forming one, whereas the rest of the components will be subordinated to it.

Thus, functioning and development of intellectual capital of an organization will be affected by the mechanism of its components interaction. The mechanism is determined by the presence of a two-component core in it. The core composition is not constant and affected by the fact which component is in the highest demand at the given moment, from the perspective of enhancement of organizational effectiveness.

4. Discussion

Interaction of components is based, in its turn, on contradictions between their pairs in two-component cores, which determines the necessity of describing the contradictions, possible options of their development and resolution.

In the simple model of a compensatory homeostat, the elements regulate functioning of each other by way of limiting a resource exchange. The human intelligence (intellectual abilities) is considered as such a resource for intellectual capital and can be directed at implementation of different processes, depending on which is the in the highest demand at the given stage of the intellectual capital development.

The content and possible options of the stated contradictions resolution from the perspective of the considered method of the simple compensatory homeostat can be interpreted as follows.

1) Education – Involvement contradiction.

Mode 1 – is the least favourable mode, when an employee has the poor intelligence of education and perception (Dresviannikov and Loseva, 2012). In the course of education, the employee is interested in mastering only basic skills with the help of which he/she will be able to perform only general current operations. At that, the employee does not share the core values and the central objective of the organization (effectiveness enhancement), i.e. he/she does not identify him/herself with the organization and is, in fact, a time-server. In the event when the employee initially feels involved in the formation of the primary organizational values, but the situation occurs that new knowledge proves destructive for his/her system of values, he/she refuses to acquire it.

Mode 2 – the employee, in the course of education, not only develops the required skills, but also starts feeling like a part of the organization, realizes the necessity to enhance its effectiveness, and feels involved in the processes taking place in the organization. However, just as in Mode 1 the employee considers he/she has enough knowledge to do the job well and thus support organizational effectiveness. Thus, the formed employee's system of values blocks the need for further training.

Mode 3 – being initially committed to efficient work in the organization the employee realizes the necessity of acquiring knowledge in order to make his/her activity in the organization even more efficient. It is possible that deeper knowledge of specific nature of the organization's activity, methods, techniques and tools used for work will cause the employee to realize the contradictions with his/her own system of values, which, in its turn, will shatter the community spirit.

Mode 4 – is the most favourable situation, when developing the required skills, the employee starts feeling like a part of the organization and realizes the necessity of its effectiveness enhancement. The employee is willing to acquire new knowledge for that in order to make his/her activity in the organization more efficient.

2) Education – Production Rationalization contradiction.

Mode 1 – the employee has a poorly developed intelligence of perception and that of thinking. While performing the current routine operations using skills developed in the educational process, the employee does not recognize the need for improvement of production processes, as it will generate the necessity of acquiring new knowledge. On the other hand, effective actions with respect to production rationalization can be directed at the highest possible automation of production processes, so that the employee had to think as little as possible when solving current problems.

Mode 2 – acquiring the knowledge required to perform current routine operations the employee realizes a necessity of a more efficient performance. New knowledge enables him/her to take actions for the rationalization of production processes. When the set objective is achieved the employee refuses further training.

Mode 3 – the employee intensively acquires new knowledge in order to use it in the improved production processes. However, just as in Mode 1, having mastered the current level of rationalization of production processes, the employee does not recognize the necessity of his/her further improvement and stops training.

Mode 4 – is the most favourable situation. While acquiring the knowledge required for performing current routine operations, the employee realizes the necessity to improve the production processes. On the other hand, improvement of production processes preconditions the necessity of acquiring new, more complete and relevant knowledge. These processes are interconnected and have a cyclic nature.

3) Education – Self-Improvement contradiction.

Mode 1 – in this situation the employee has a poorly developed intelligence of perception and poor creative intelligence. The employee is motivated from the outside to acquire new knowledge with the purpose of performing current routine operations. At that, he/she does not realize the necessity of setting new problems and tasks going beyond proposed situations. If the employee is oriented towards a revision of the business strategy and personal growth, then, on the contrary, he/she will not strain after study of current operations considering it inexpedient.

Mode 2 – while acquiring the knowledge required to perform current routine operations, the employee gains experience enabling him/her, in the long run, to generate a new business strategy and move to a whole new level in his/her development. However, just as in Mode 1, the employee will consider further training unnecessary since the content of routine operations will be contrary to the new business strategy selected by him/her.

Mode 3 – striving for self-improvement, selection of a new business strategy and setting of new problems and tasks, the employee realizes that he/she needs new knowledge to accomplish them. Nevertheless, having acquired it the employee comes to a conclusion that further self-improvement is unnecessary.

Mode 4 – in this situation, the employee strives to acquire new knowledge for a more efficient performance of the current production operations. As a result, he/she realizes the necessity of self-improvement, personal growth, and search for a new business strategy since the current strategy has run its course. At the same time, making efforts to achieve personal growth, the employee strives to acquire new knowledge in order to perform routine operations more efficiently, yet within the framework of a new business strategy.

4) Education – Client-Focused Rationalization contradiction.

Mode 1 – the employee has a poorly developed intelligence of perception, as well as social and cultural intelligence. Acquiring knowledge required to perform base routine operations, he/she is not interested in a search for the best way of tackling a problem within the framework of the selected strategy of interaction with the external environment. Similarly, using certain available methods of resolving specified problems, the employee thinks it is unnecessary to acquire new knowledge since the available one enables him/her to resolve a given problem in a standard way.

Mode 2 – acquiring the required knowledge in the course of interaction with the external environment, the employee realizes the necessity of optimizing the interaction. However, having found the best way of tackling the set problem, he/she refuses to acquire further knowledge considering the task accomplished.

Mode 3 – the situation is opposite to the Mode 2. The employee fulfills optimization of the interaction pattern with counterparties mainly under the influence of external stimulus. His/her activity to acquire new knowledge is limited to a strictly regulated scope of knowledge, which from his/her perspective can be useful in the given situation. Fulfillment of an objective on arranging a more efficient interaction with the external environment automatically means termination of training.

Mode 4 – the cyclic interaction of two components in the most favourable mode. In such a situation the developed social and cultural intelligence enables the employee to see new, more efficient ways to fulfill interaction with the external environment. In the course of training, the employee acquires the required knowledge, which allows him/her to understand that there are more efficient ways of arranging interaction with the outside environment. Therefore, the employee requires further training in order to implement these ways.

5) Education – Innovative Activity contradiction.

Mode 1 – a situation when the employee, having scrutinized common ways of accomplishing routine operations, restrains from moving beyond the alternatives proposed by the situation. Creation of the economic result in the organization is as per the standard script. On the other hand, participating in the creation of a group knowledge at the organization's level, the employee can often fail to personalize the knowledge at the level of mastering standard ways of resolving routine problems (manuals, regulations). Refusal from regulation can be caused by realizing the fact that the interaction patterns and business strategy of the organization will be most likely soon revised.

Mode 2 – personal knowledge of the employee, acquired in the course of resolving routine problems, enables him/her to see real opportunities of moving beyond the alternatives proposed by the situation and of refusing from the activity offered from the outside, in order to start the activity motivated from within. For instance, the employee that has worked in a certain area for a while can systematize the acquired knowledge, start his/her own business and offer something special to consumers. Nevertheless, implementing an innovative approach to a business operation, such employee concludes that further training is unnecessary. In the long run, this can ruin the initially successful business activity.

Mode 3 – a reverse situation, when a brilliant idea, with respect to moving beyond the alternatives proposed by the situation and implementation of the innovative approach to business organization, gives the employee an incentive to enlarge knowledge in the area of performing common routine operations. However, acquiring new knowledge in the given area and intensively broadening the set of competences, the employee can encounter difficulties in making decisions with respect to which skills shall be deemed as primary and which are secondary. The abundance of information, which is often irrelevant, will finally bring him/her to confusion, and as a result to decrease in efficiency of the innovative activity.

Mode 4 – is the most favourable mode, when an active search for opportunities to move beyond the alternatives, proposed by the situation, encourages the employee to acquire the required knowledge, including in the area of resolving standard operational tasks. On the other hand, gaining new knowledge upon fulfillment of routine operations allows the employee to form an alternative vision of the situation and as a result, developing an innovative strategy for business operation.

Resulting from the study of possible contradictions between the pairs of intellectual capital system-forming core components and analyzing components interaction modes within the framework of each contradiction, a conclusion can be made, that the most favourable mode is the Mode 4, when both elements stimulate the development of each other, resulting in a local progress. The progress is of local nature since the system effectiveness growth ensures its transition to a new level of a system-related and organizational complexity, where another pair of the core components will be considered as the system-forming ones. In Modes 2 and 3, the intellectual capital will function without change of the system and organizational complexity, i.e. the potential will be accumulated for further

changes (local isogress). Finally, in Mode 1, when both components block the development of each other, the efficiency of the intellectual capital will decrease, thus causing local degradation of the system. Thus, currently available mode of interaction of the intellectual capital core components determines the direction for its development, which can be taken into account when generating a complex of managerial effects aimed to form and develop the organization's intellectual capital, as well as an improvement of the mechanism of its functioning.

5. Conclusions

Application of a simple model of a compensatory homeostat, pertaining to the intellectual capital of the organization, allowed obtaining the following results:

1. The idea of the mechanism of intellectual capital self-regulation, based on the cross feedback between its two components, has been formed.
2. Possible modes of components interaction, based on the use of possible combinations of the cross feedback types, have been revealed and described.
3. The correspondence between the possible paths of development of the intellectual capital and types of interaction modes between the components has been set.

The results obtained can be used to generate project events of the federal, regional and local authorities to implement an innovative way of an economic development and transformation of economic systems towards the transition to the knowledge-based economy.

Application of the method in the long term enables to produce a concept of management that forms and develops intellectual capital of an organization, based on homeostatic methodology with the purpose of changing its state and ensuring its transition to a higher level of a system and organizational complexity.

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