

## Artículo de investigación

**Intellectual capital of organization in categorizing a universal scheme of interaction between its elements**

Capital intelectual de la organización en la categorización de un esquema universal de interacción entre sus elementos

Capital intelectual da organização na categorização de um esquema universal de interação entre seus elementos

Recibido: 26 de abril de 2019. Aceptado: 20 de mayo de 2019

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**Abstract**

The present study examines the options for the formation and development of the types of intellectual capitals in an organization by categorizing the interaction between the required elements and attracting necessary resources. The method of the universal interaction scheme was used to identify the types of the resources that can be used for the formation and development of various types of organization's intellectual capital. The identified elements of the organizational system determine the content of the process contributing in the formation of the intellectual capital. The possible variants of trajectories for the creation and development of the intellectual capital are typologized, depending on the composition of each components in the universal scheme. For the first time, based on the use of the universal interaction scheme in an organization, the possible ways of obtaining required results are shown in the form of various types of the intellectual capital, which is done by organizing interaction between the required elements and attracting the necessary resources. The obtained results can be used in the formation of a set of software tools that stimulate the development of intellectual capital at the macro and micro levels and its use as a system-forming factor in the development of a knowledge-based economy. The use of the method will allow the creation of a unified scientific theory of the intellectual capital in the future, including the development of a mechanism of managerial influences in order to change its state and ensure its transition to a higher level of systemic and organizational complexity.

**Resumen**

El presente estudio examina las opciones para la formación y el desarrollo de los tipos de capitales intelectuales en una organización categorizando la interacción entre los elementos requeridos y atrayendo los recursos necesarios. El método del esquema de interacción universal se utilizó para identificar los tipos de recursos que pueden usarse para la formación y el desarrollo de varios tipos de capital intelectual de la organización. Los elementos identificados del sistema organizativo determinan el contenido del proceso que contribuye a la formación del capital intelectual. Las posibles variantes de las trayectorias para la creación y el desarrollo del capital intelectual están tipologizadas, dependiendo de la composición de cada componente en el esquema universal. Por primera vez, en función del uso del esquema de interacción universal en una organización, las formas posibles de obtener los resultados requeridos se muestran en la forma de varios tipos de capital intelectual, que se realiza organizando la interacción entre los elementos requeridos y atrayendo Los recursos necesarios. Los resultados obtenidos se pueden utilizar en la formación de un conjunto de herramientas de software que estimulan el desarrollo del capital intelectual en los niveles macro y micro y su uso como un factor formador del sistema en el desarrollo de una economía basada en el conocimiento. El uso del método permitirá la creación de una teoría científica unificada del capital intelectual en el futuro, incluido el desarrollo de un mecanismo de influencias administrativas para cambiar su estado y

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**Keywords:** Intellectual capital; Universal interaction; Element; Resource.

garantizar su transición a un nivel más alto de complejidad sistémica y organizativa.

**Palabras claves:** capital intelectual; Interacción universal; Elemento; Recurso.

## Resumo

O presente estudo examina as opções para a formação e desenvolvimento dos tipos de capitais intelectuais em uma organização, categorizando a interação entre os elementos necessários e atraiendo os recursos necessários. O método do esquema de interação universal foi usado para identificar os tipos de recursos que podem ser usados para a formação e desenvolvimento de vários tipos de capital intelectual da organização. Os elementos identificados do sistema organizacional determinam o conteúdo do processo contribuindo na formação do capital intelectual. As possíveis variantes de trajetórias para a criação e desenvolvimento do capital intelectual são tipologizadas, dependendo da composição de cada componente no esquema universal. Pela primeira vez, com base no uso do esquema de interação universal em uma organização, as possíveis maneiras de obter os resultados requeridos são mostradas na forma de vários tipos de capital intelectual, o que é feito organizando a interação entre os elementos requeridos e atraiendo os recursos necessários. Os resultados obtidos podem ser utilizados na formação de um conjunto de ferramentas de software que estimulem o desenvolvimento do capital intelectual nos níveis macro e micro e seu uso como fator formador de sistemas no desenvolvimento de uma economia baseada no conhecimento. O uso do método permitirá a criação de uma teoria científica unificada do capital intelectual no futuro, incluindo o desenvolvimento de um mecanismo de influências gerenciais para mudar seu estado e assegurar sua transição para um nível mais alto de complexidade sistêmica e organizacional.

**Palavras-chave:** Capital intelectual; Interação universal; Elemento; Recurso.

## Introduction

One of the most important functions in the domestic socio-economic system is to ensure its transformation in the direction of transition to a developed post-industrial society. This transition is based on the formation of the economy based on the achievement of the sixth technological order. In this situation, developed intellectual capital becomes the main source of competitive advantages for an organization, which can be considered as one of the main factors for the effective formation of an economy based on knowledge. Thus, the formation and development of the intellectual capital in an organization is an urgent task of modern science and will ensure sustainable socio-economic development of the country in the long term, due to its successful resolution. The implementation of this process, in turn, will be one of the key directions for the development of the cluster approach to management at the regional and local level (Mindlin et al, 2016). Also, in order to determine the possibilities and methods of using intellectual capital, as a catalyst for the development of the knowledge economy in Russia, it is necessary to identify and describe the essential characteristics of the intellectual capital, the laws of its formation and development, the mechanism of its functioning, the contradictions between its elements, and providing a transition to a knowledge-based

economy. The phenomenon of the intellectual capital has been studying in a number of works by domestic and foreign scientists in various ways, defining its essence and the composition of its elements. In particular, A. Brooking defines the intellectual capital as a set of intangible assets that "can be used to create value, without which a company cannot develop competitive advantages (Brooking, 1996). In the work of L. Edvinsson and M. Malone, this phenomenon is considered as "the possession of applied knowledge and experience, organizational technologies, customer relations and professional skills that give a company a competitive advantage in the market" (Malone, 1997). According to N.V. Kochetkova, the intellectual capital is understood as "a non-financial resource that gives the competitive advantages and the ability to add value to an organization" (Kochetkova, 2012; Khorrami et al, 2015). The main disadvantage of these works is the lack of a systemic vision on an object, which allows to determine which elements should be represented in an organization, in order to ensure its formation at a certain level (Mirzamasoumzade & Mollasadeghi, 2013).

In a number of works carried out by other authors, this disadvantage is eliminated. The elements of intellectual capital traditionally stand

out human capital, consumer capital, structural capital; client capital and process capital (Saint-Onge, 1996; Ashton, 2005; Bontis, 1996). V. V. Ermolenko cites the elements of the intellectual capital as knowledge, experience, key competencies of the staff, and the relations of the corporation with partners and customers (Ermolaenko & Popova, 2012). The main problem of this vision is that the intellectual capital is viewed in a static aspect - as a set of certain elements represented in the organization, interacting with each other. However, the conditions for the formation of components and the possible trajectories of the development in the intellectual capital are not shown (Carreto et al, 2018).

In individual works, emphasis is on the system of relations arising between the elements of the intellectual capital, as well as on the processes of their transformation. In the structure of the intellectual capital, Zinov distinguishes the intellectual resources and the system of relations between economic actors regarding the production, distribution and the use of intellectual resources and knowledge necessary for their effective functioning (Zinov, 2007). In the work of S. Albert and K. Bradley, the process of the formation and the development of the intellectual capital is carried out by transforming knowledge and intangible assets into useful resources, giving competitive advantages to individuals, firms and nations (Albert & Bradley, 1996). In the process of creating intellectual capital, A.M. Permyakova understood that it is necessary to choose goals and objectives, technologies, materials and human resources to create economic benefits and meet the needs of society (Permyakova, 2007; Maharani & Subanji, 2018). However, the scientific papers do not reflect the conditions and factors contributing in determining the possible trajectories of the formation and development of intellectual capital, preventing the definition of its function mechanism and consequently the formation and development of the knowledge-based economy. Thus, the study on the use of the intellectual capital in the formation of the knowledge economy is a subject of scientific interest and is relevant to the framework of the chosen research direction.

### Methodology

The purpose of this study was to identify the process of creating the intellectual capital with a universal sequence of components and stages of interaction and identifying possible options for the formation of the intellectual capital,

depending on the composition of the available resources and the elemental composition of the organizational system. This goal can be achieved using the categorical method, called "Universal Interaction Scheme". The method refers to the categorical system methodology, developed by Professor V.I. Reasonable, and allows you to explore any process in terms of their essential and natural aspects. The process within the framework of the method is represented as a set of elements (components), the number of which is unlimited, and the sequence and number of stages form a certain standard. This scheme also makes it possible to determine the resources required to achieve the desired result, i.e., getting an idea of what kind of intellectual capital is formed with one or another combination of elements.

The basic categories of the scheme are as the following. Process- the interaction of the elements, during which the initial state of the object is transformed into some qualitatively new object. Energy source/resource (E) - indicates that any process in an open system provides the resource (energy) necessary for the interaction of the system elements and its transformation. Elements (P) are structural parts of the system that interact with each other within the framework of the process and determine its content. Interaction (i) is a specific reaction between the elements of the system, due to the quality of the elements and the resource ensuring their interaction. The result (R) is the product of the interaction between elements with specific characteristic of the reaction. Effect (F) - the consequences of the formation of a product for the system itself, the environment, and other systems "12". As part of managing the operation and development of a socio-economic object, a controlling entity is added to the universal interaction scheme to influence individual components of the process and achieve the desired result and effect, and the managerial influence is directed to the controlled object.

### Results

The intellectual capital of an organization as a system can be subjected to research using the categorical method, "Universal Interaction Scheme". In this case, it is presented in the following categories. Process - the interaction of elements of the system, during which the initial state of the object is transformed into some qualitatively new object. The formation and development in the intellectual capital can be considered as a process. Energy source/ resource - that serves as a source of energy for the

interaction of the elements and its transformation within the specified process. In our opinion, the types of intelligence act as a resource in the unity of its three foundations: physiological, psychological, and socio-economic foundations. At the same time, the physiological content is the natural basis of human intelligence, the psychological one is its potential, and the socio-economic one is the nature and extent of practical use and economically determined directions of development.

The elements are structural parts of the system that interact with each other within the framework of the current process and determine its content. In this study, the elements of the intellectual capital in the framework of the applied method were attributed to the types of cognitive activities in the organization, implemented in various ways due to the impact of internal or external factors, - stimuli-productive activity, heuristic activity and creative activity. In the first case, the cognition is carried out only at the expense of external stimuli, and the employee uses only the specified or initially found method of action. The second option involves a certain activity that is not due to the action of external factors, the use of new, original, more advanced ways of solving problems based on the analysis of activities. In the third case, the essence of the phenomenon is studied from where the employee sets new tasks and solves new problems, and is ready to abandon the activity proposed from the outside and starts an activity motivated from the inside.

Interaction - a specific reaction between the elements of the system, due to the quality of the elements and the resource, ensuring their interaction. This reaction in the intellectual capital can take place within the framework of various types of cognitive activities leading to the creation of various types of the intellectual capitals including training, involvement, production rationalization, self-improvement, customer-oriented rationalization, and innovation activity.

The result is a product of the interaction between elements with specific characteristic in reaction. The result of the interaction between these elements is the creation (formation) of its various types including human, organizational, consumer types.

Effect - the consequences of the formation of a product for the system itself, the environment, and other systems. The effect for the organization itself in this case is expressed in the transfer of the intellectual capital to a different levels of development — higher (progress) or lower

(regress), depending on the quality of the interaction between the elements in the intellectual capital as a system; for the environment - a transition to a more developed economy (for example, based on knowledge) or to a less developed one (return to a primitive service economy).

## Discussion

The result of the intellectual capital of the organization in categorizing the universal scheme of interaction between its elements is presented in Fig. 1. The use of this method in relation to the socio-economic system, as a rule, implies the presence of a managing subject, caused by the need to make a managerial impact on the system in order to obtain the necessary result. For the intellectual capital, controlling entity is the management of the organization (shown at the top of the diagram). In addition, a necessary element of the scheme in this case will also be the object - to which the administrative influence is directed. In the scheme of interaction of the elements, such an object will be the organization itself.

The figure shows in different colors the possible options for the types of the intellectual capitals that can be obtained by having certain resources at your disposal and organizing the interaction of its elements with their help. The initial stage of creating the intellectual capital is the formation of human capital as a result of the stimuli-productive activity of employees, carried out on a physiological basis (the red color of the arrows). This process involves teaching employees the skills that they will use in the future. At the next level, the heuristic activity of workers is implemented as a used resource, carried out on a socio-economic basis. The process of using the resource ensures the involvement of workers in the business processes of the organization, and the formation of a sense of belonging to the organizational results, indicating that it has reached a certain level of efficiency. The result of this process is the creation of the organizational capital (the yellow color of the arrows). Moreover, the management of the organization gets the opportunity to use a new resource - creative activity of workers, which is implemented on a psychological basis and involves the implementation of production rationalization, resulting in the creation of organizational capital (blue arrows). At the fourth stage, with the help of creative activity, implemented on a psychological basis, the process of self-improvement of the employee is implemented, resulting in the creation of human

capital (green arrows). At the fifth stage, customer-oriented rationalization occurs through the use of heuristic activity on a physiological basis, and consequently consumer capital is formed (blue arrows). Finally, at the final stage of the cycle, innovative activity is implemented on a socio-economic basis using creative activity,

which also results in the creation of the consumer capital (the purple color of arrows). The result of the combination of the listed components of the scheme results in the development of the intellectual capital in the unity of its three types, and the transition to another level of development can be considered as a long-term effect.

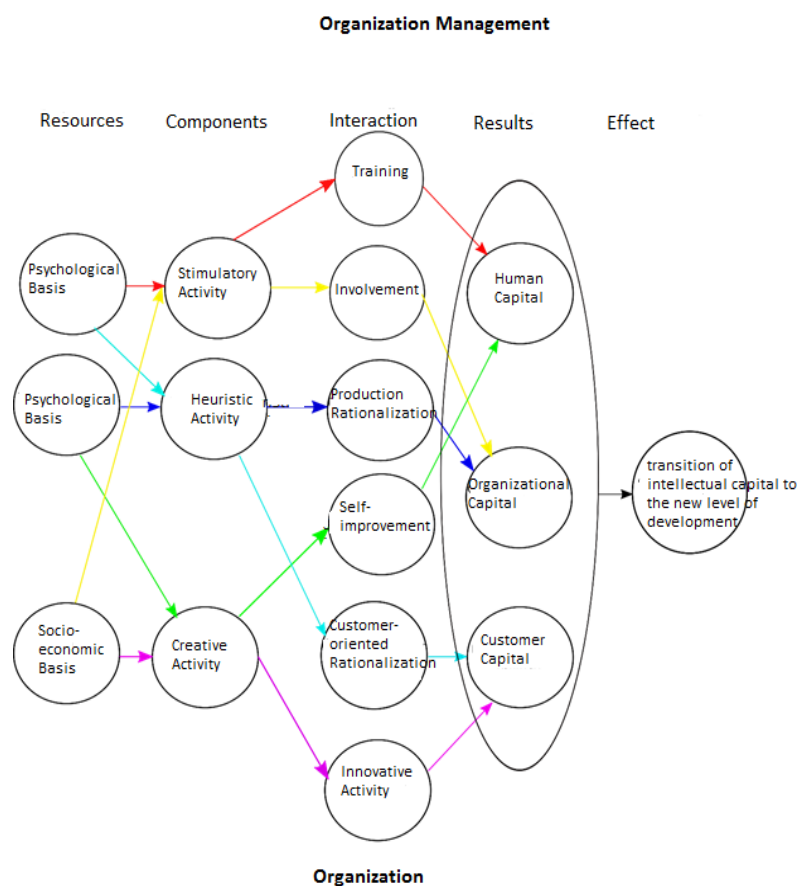


Fig. 1. A detailed scheme of the interaction of intellectual capital elements \*

\* Source: compiled by the authors.

Regarding assessing the level of formation of intellectual capital in the organization, it can be concluded about the need for the development of one or another kind of capital. For example, it may consider to improve ways of interacting with customers, i.e. strengthening the component of consumer capital. The types of cognitive activities, by which the development of this type of capital is ensured, are customer-oriented rationalization and innovation activity. In the first case, the resource for the formation of the consumer capital is the natural basis of intelligence, which the employee uses to identify new, more progressive ways to solve the existing problem. In the second case, the desired result can be obtained through the application of the socio-psychological aspect of the intellect, which

is determined by its living conditions, social purpose, world outlook, and professional self-determination. The high level of social responsibility of the individual in this situation determines the formulation of new tasks and the solution of new problems, readiness to abandon the activity proposed from the outside and the start of activity motivated from the inside. Obviously, the first option for the development of the consumer capital contains minimal requirements for the resources and elemental composition of the system, so it is easier to be implemented. Regarding this case in the organization, no specific requirements are put forward with regard to the availability of the necessary resources and mode of operation. When implementing the second option, it



becomes necessary to provide certain conditions for the life and specific world view of the worker, giving potential to him/her to set tasks him/herself, and consequently to carry out innovative activities.

In a situation where a manager seeks to strengthen organizational capital in the organization's intellectual capital, two goals can be pursued - developing a corporate culture or improving intra-organizational business processes, as the technological component. In the first case, the organization requires workers with a prepared world view and professional self-determination, but the process of their interaction is based entirely on the initially defined methods of action. In the second case, the worker must have intellectual potential (knowledge, experience, and a certain type of thinking) in order to search for more effective ways to solve the set tasks.

Perhaps, as a result of the analysis of the intellectual capital, the leadership of the organization comes to the conclusion that it is necessary to develop human capital in the first place. In this case, two possible trajectories of its development are also realized. The simplest case is when an employee receives information about professional techniques and operations used in the company through training with more experienced employees. The implement of this option does not require the fulfillment of special conditions, except for the availability of free time for the employee conducting the training. The second case is more difficult - the employee must have a certain motivation to feel the desire to develop professional skills through the formulation of independent tasks. Apparently, for the development of human capital through the implementation of such a trajectory, it is necessary to initially hire workers who meet certain criteria in terms of personal characteristics.

Using the scheme, you can move in the forward direction, i.e., having information about which types of resources, used for the formation of intellectual capital, are represented in the organization to the greatest extent, and which elements of the system are most actively used, and it can be concluded what types of intellectual capital can be obtained with their help. For example, knowing about the presence of the training of new employees in the organization with a developed training apparatus, one can expect that there will be human capital at a high level of development, formed through the cognitive activity of learning. Accordingly, if an

organization has developed agitation mechanisms and techniques that ensure the formation of a sense of employees' involvement in organizational results, then the organization's management has the right to expect the creation of the organizational capital through the development of a developed corporate culture. If the specific organizational activities do not imply severe restrictions on the methods of activity used, employees are given a certain freedom to choose possible ways and solve problems, and they are psychologically prepared for such a search to a sufficient degree. Then, the expected result will be the creation of organizational capital through production. In a similar situation, when an employee has a sufficiently strong internal motivation to independently formulate new, more progressive tasks, the result will be the development of human capital through the cognitive activity of self-improvement. If the necessary experience of workers in the field of interaction with customers is combined with their willingness to search for more effective ways of interaction, a result will be obtained in the form of consumer capital at the expense of customer-oriented rationalization. Finally, when the employees' intellect is used to set new tasks and solve new problems, taking into account the necessary directions of economic development (i.e., the company carries out innovation activity), the result is also the development of consumer capital, however, in terms of creating innovative products / application of innovative technologies / forms of organization / methods of marketing products.

Thus, using information about the resources available and the elements of the system, the management of the organization is able to manage the processes of formation and development of the necessary types of its intellectual capitals.

### **Conclusion**

The use of a universal interaction scheme related to the intellectual capital of an organization yielded the following results.

1. The identified types of resources that can be used for the formation and development of various types of intellectual capital in the organization included the physiological basis, due to the presence of a human brain; psychological basis, considered in the context of the psychological characteristics of the employee's personality; socio-economic basis, determined by the impact of the necessary directions of socio-economic development.

2. The elements of the organizational system, interacting in the process of creating and developing the intellectual capital of an organization, are defined. Among them, it is possible to distinguish stimuli-productive activity, based on a simple reproduction of the methods and techniques of solving problems already used in the organization; heuristic activity, suggesting the employee searching for new ways to solve the tasks; creative activity, through which the employee goes beyond the limits of the alternatives offered by the situation and independently formulates new, more progressive tasks for himself.
3. The possible combinations of the interaction between the elements of the intellectual capital are described. Also, the available resources and the possible results obtained in each of the combinations are considered.
4. The possible ways of obtaining the necessary results are shown in the form of various types of intellectual capitals, and through organizing the interaction of the required elements and attracting the necessary resources.

The obtained results can be used in the formation of a set of software tools that stimulate the development of intellectual capital at the macro and micro levels and its use as a system-forming factor in the development of a knowledge-based economy.

The application of the method in perspective provides opportunities for the creation of a scientific theory of intellectual capital, including a formed model of intellectual capital and a description of the composition of its elements, qualitative characteristics and the mechanism of its operation, which, in turn, will allow management actions to change its state and ensure its transition to a higher level of systemic and organizational complexity.

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