Elements of the theory of knowledge management as a basis for the development of staff competencies

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Abstract. The article checks the hypothesis based on an empirical construct about the leading role of human capital in building the vector of modernization of economic sectors, which, in turn, determines the importance of its development in accordance with the current demands of the environment. For the formation and growth of a specific highly productive human resource, large organizations should be involved in solving the problem. The development of human capital on the competency-based approach can be characterized in the context of a continuous permanent process that requires a systematic approach to the solution of derivative current tasks for managing training, retraining, formation, evaluation, preservation and scaling of strategically significant professional competencies and ensuring effective involvement of employees in the business processes. These problems can be solved using a unified system for managing the human capital, integrating a set of the most advanced, innovative operational and dynamic tools and information technology support used at each stage of this continuous process, conceptually correlated with knowledge life cycle management procedures.

1 Introduction

Ensuring a high level of professionalism and quality of human capital has always been one of the priority tasks for the economic growth and increasing the competitiveness of companies. However, the updated economic paradigm has determined new imperatives that increase the importance of strategies for building human resources and creating an effective structure and composition of human capital within companies. The aggravated crisis of globalism coupled with the geopolitical instability and anti-Russian economic restrictions became a catalyst for strengthening multiple structural market imbalances, which forced the transition to a new model for ensuring the sovereignty and economic stability of the country. It is based on the principles of rationalization of economic processes, gradual reorientation of the national economy towards high-tech, knowledge-intensive industries based on the effective convergence of material resources and human capital, which was also reflected in the Economic Security Strategy of the Russian Federation for the period up to 2030, where one of the key directions is the human potential.

The external environment initiated the processes of evolutionary transformation of the economy and its departure from the supply model due to the raw materials and speculative sectors in the direction that correlates with the new current paradigm of the transition to the sixth technological order and informatization of processes, where the fundamental variable is advanced knowledge. This paradigm can be defined as the “knowledge economy”, and its driving force is the fusion of high technology and qualified human resources, which endows the economy with the properties of adaptive innovation and is a system-forming driver of its development.

In the changing macroeconomic environment marked by a heightened degree of uncertainty and a sharp limitation in the availability of capital markets, large organizations experienced in surviving multiple crises are able to form a flagship force for economic prosperity. Having the necessary infrastructural and resource capabilities, they are able to implement a systematic approach in reorienting the personnel policy to the updated market demands and become competitive through the development of human capital, improvement of the quality and productivity of labor, and implementation of advanced scientific developments while ensuring the effective employment of the population.

2 Materials and Methods

The special role of human capital as a fundamental factor in the modernization of the economy, as well as the special importance of its development systems through the tools of vocational training and retraining, were explored by Andreeva, Bodrovoy, Butenko, Varshavskaya, Gimpelson, Gorkovenko, Ignatova, Kahuka, Kanaeva, Mau, Nikitina, edler, and Skoreva. The crucial contribution was made by Becker who
developed the concept of specialization differentiation of competencies. The strategic determinism of the effective structure and composition of human capital was analyzed by Armstrong, Bear, Demychenko, Drucker, Kaplan, Kozered, Koch, Kudryavtseva, Lebedeva, Marach, Mikhalkina, Nemirovsky, D. Norton, Panova, and Shemetova.

3 Results and Discussion

The transformation of social, technical and economic paradigms have declared a transition to a new stage in the development of the post-industrial economy, which is characterized by the development of information society and strengthening of the role of human capital as a system-forming factor in the development of the economy, endowing it with the properties of innovation [1]. The processes associated with the revaluation of information as an independent resource increased the overall value of its derivative - knowledge, thereby marking a general transition to the “knowledge economy”. The Organization for Economic Cooperation defines the knowledge economy as a form of economy which recommends that organizations and people acquire, create, distribute and use codified and implicit forms of knowledge to ensure effective social and economic development [2].

The concept of the knowledge economy is most closely associated with the transition to the sixth technological order based on the convergence of NBIC technologies [3]: cognitive technologies, global networking and informatization of economic processes at the micro- and macrolevels, the use of self-learning intelligent and cyber-physical systems for automated data processing and machine-machine (M2M) interaction, bioengineering and nanotechnologies [4].

Knowledge is the result of cognitive activities, has the parameters of truth, validity, and can be practically or empirically tested and verified. Knowledge is not identical to information, but it is its highest evolutionary form. Information is a set of formalized, structured (but not always true) data presented in a form that allows it to be perceptually perceived. Being the result of intellectual processes, knowledge is a result of the transformation of information perceived through the prism of personal views, values and life experience, thereby adopting an individualized format [5].

The new economic paradigm knowledge as the foundation for building innovative business processes, the implementation of which is aimed at creating ultra-high added value and achieving competitive advantages. Thus, in accordance with the resource approach in strategic management, knowledge is defined as the key competencies of the organization, which become the decisive determinant of its successful competitive strategy [6]. Within the unified economic ideology, according to Drucker, “knowledge quickly turns into a determining factor of production, pushing other factors into the background” [7]. The development of the knowledge economy and formation of its advantages are characterized by the following parameters [8]:

- Strengthening the role of the service sector. Here we are talking about the most knowledge-intensive areas, including consulting, education, design, technology and IT services. In the UK, these products account for more than 25% of total exports, while the total amount of income from services is higher than the return from the production sector, which allows for the exchange of knowledge products for energy and goods;
- availability of special in-depth knowledge and competencies of specialists in those industries on the basis of which the concept of the knowledge economy is being implemented. India, which has been striving for the development of knowledge-intensive industries, is characterized by a high percentage of specialists in industries that require highly specialized competencies (pharmaceutics, medicine, IT services, nuclear energy, automotive industry). India accounts for 1/2 of the global IT outsourcing market, and Indian programming specialists are one of the best in the world;
- raising the level of intellectual development and education of society, development of institutions that support and stimulate these processes. In the 1980-90s, Finland, being currently one of the leading competitive economies in the world, shifted the priorities of government policy towards the development of education as the main driver of the transformation of the socio-economic structure, which made it possible to reorient to the sphere of telecommunications and IT technologies. As a result, by the beginning of the XXI century, the economic indicators of the country become one of the best in Europe. From the 1980s to the 2010s the volume of exports of science-intensive technological products quadrupled (from 5% to 20%).

At present, Russia affected by toughened external macroeconomic factors is in need of transforming the current model of socio-economic development into the mainstream of the intellectual economy of knowledge. According to Salikhov and Salikhov, this type of economy can be an alternative to the “archaic structure of the national economy based on non-reproducible economic resources” [9]. Knowledge is the fundamental re-equipment of economic sectors and its reorientation from the irrational model of redistribution of rent from the sale of raw materials. It has potential to increase the efficiency of activities and labor productivity due to the fact that knowledge as a special type of economic resource has a number of specific properties that are not characteristic of other types of resources. The authors of this study identified these properties:
- unlimitedness – the volume of available and produced knowledge is significant, while the processes of creating new knowledge are global and permanent. An important task is the need to select relevant, advanced and promising knowledge that can be effectively applied;
• ability to replicate - as part of labor functions, training or advanced training, new knowledge can be generated on the basis of primary knowledge, capable of creating even greater positive economic effects;

• transferability - knowledge can be transferred to an unlimited number of users, which ultimately increases their overall value, and this can increase the efficiency of human capital during its clustering [10]. Thus, the larger the organization, the greater the return generated by the knowledge accumulated in it;

• persistence - as a result of the application, as well as in transferring knowledge, it is not spent like other resources, which determines its unlimited potential as a key driver of economic growth;

• synergy – having an independent value, knowledge is able to generate an additional multiplicative positive effect in relation to other factors of production, increasing the degree of economic efficiency of its use in production processes.

Being a natural source of creative economic transformations and innovative processes in the economic system, knowledge has strengthened its role as a key integral factor in ensuring economic well-being and development. Knowledge as an independent factor of production and a source of competitive advantages has played a special role since the early 1990s, when, due to the work by the management consultant Wiig, an independent sub-branch of knowledge management was created [11]. Senge in his book “The Fifth Discipline” formulates the concept of self-learning organization as a new phenomenon of economic activities [12]. These works gave impetus to subsequent research and experiments within the knowledge capital management: studies by L. Prusak and T. Davenport [13], I. Nonak and H. Takuechi [14], U. Bukovitz and R. Williams [15] are of importance. These authors formulated the basic theoretical and methodological apparatus of the concept of knowledge management.

The knowledge management system is a set of management activities that ensure the continuous movement of knowledge in accordance with the model of its life cycle. The knowledge life cycle (KLC) is a set of stages that form an algorithm for the technological processing of knowledge aimed at creating a single mechanism for integrating knowledge assets into the business processes and obtaining marginal economic effects from their use (Fig. 1).

![Knowledge Management System](https://doi.org/10.1051/shsconf/202316400050, 00050 (2023)SHS Web of Conferences 164, 00050 (2023)

**Fig. 1.** Life cycle of knowledge.

Thus, the general concept of knowledge management involves the application of the integrated system approach to the collection, creation, preservation, distribution, use and evaluation of all knowledge assets, including databases, documents, algorithms, and procedures, as well as knowledge of employees [16].

The knowledge management system architecture is based on three integrated components identified by Milner [17].

1. People. In view of the fact that the person is both a generator of new knowledge and its end user, each stage of the knowledge life cycle is ultimately focused on creating a mechanism for the effective reproduction and reuse of knowledge by employees.

2. Processes are a system of intra-organizational relations aimed at ensuring the permanent movement of knowledge within the company. This component also includes a specific corporate culture that contributes to the sharing and use of knowledge within the organization, encouragement of knowledge sharing practices between employees, openness to new knowledge and the search for the most relevant knowledge for solving professional problems.
3. Technology. It is an integrated information technology infrastructure that provides ergonomic functionality for the work of people with formalized corporate knowledge, allowing them to interact to share knowledge.

In terms of organizational assets, knowledge is divided into two types [18]:

- implicit knowledge – non-formalized knowledge about objects and operations manifested through heuristics – flexible practical guidelines stored in the neural structures of the brain, formed in the process of observation, cognitive activities or empirically. Implicit knowledge can manifest in practical actions unconsciously, when the specialist makes intuitive decisions which makes knowledge inseparable from the carrier;
- explicit knowledge – formalized content presented on various media – virtual or physical, unified information base.

The model of transformation of explicit and implicit knowledge was proposed by Nonaka and Takuechi in a cyclic form – “Spiral of Knowledge” (Fig. 2).

The transformation of knowledge within one form or the transition from one form to another is due to four processes:

- socialization: formation of implicit knowledge, its transfer in the process of interaction of employees in the form of discussions, seminars, working groups or mentoring;
- externalization: a process of identifying, conceptualizing and extracting tacit knowledge with their subsequent transformation into explicit knowledge from the side of the carrier through the formalization and fixation in the content form on the carrier;
- combination: combining disparate forms of explicit knowledge, their transfer, systematization, presentation in an accessible form due to which new explicit knowledge is formed as a combination of individual elements;
- internalization: emergence of implicit knowledge from explicit through training employees using formalized materials due to which corporate knowledge is assimilated and consolidated in an implicit form by the cognizing subject.

Developing the idea of Nonak and Takuechi, we concluded that explicit knowledge is a form of corporate knowledge formalized and stored in documents, materials, programs, databases; implicit knowledge is a form of individual knowledge of each individual employee. Both forms of knowledge are implemented in the final product, business processes, strategies and managerial decisions, however, in the methodological work on knowledge management, this issue is revealed superficially, postulating the axiomatic nature of capitalization of valuable knowledge in the form of the final economic effect. It is obvious that the use of both explicit and implicit knowledge is impossible without the human resource. Being a fundamental component of competencies, knowledge can be realized only through practical activities of specialists. Competences are add-on to knowledge that determines the system of human actions centered around the materialization and exteriorization of knowledge, thus being the “missing” logical link in the chain.

The relationship between knowledge and competencies has been explored by some researchers. Salikhov and Salikhova emphasize the qualitative integrity of knowledge and competencies, claiming that

![Fig. 2. Implicit and explicit knowledge transformation scheme.](https://doi.org/10.1051/shsconf/202316400050, 00050 (2023)SHS Web of Conferences 164, 00050 (2023))
competencies are “a complex organic unity of explicit and implicit knowledge, abilities and properties, functional potentials and skills, motives and semantic constructs for solving specific scientific, educational and production problems” [19, 23, 24]. Bortnik, Stozhko, and Sudakova revealed the special role of knowledge in the system of higher education, determining their fundamental place in the hierarchy of competence formation, while pointing out an excessive degree of concentration around “functional skills”, leading to a “blurring” of the final result of the educational process [20].

The Center for Strategic Research “North-West” conducted research order by the Ministry of Industry and Trade of the Russian Federation and formulated the key most sought-after qualities of modern specialists - skills of creating interdisciplinary teams, flexibility, openness to new knowledge, the ability to learn quickly, to develop competencies [21]. Thus, the main component of the professional competence is determined by the openness of the professional profile, which allows the specialist to update her/his competencies through training [22].

The unity of knowledge and competencies determines the need for mutual integration of knowledge management and competency development elements within a single system. Some processes result in the creation of tacit knowledge (internalization, socialization) are focused on the further development of individual professional competencies, and other processes result in the formation of explicit knowledge (externalization, combination). In accordance with the “Knowledge Spiral” model, both forms are dynamically mutually transformed; the knowledge management system and the competency development system are complementary, while knowledge itself as an object is the area of conjunctive connection of these two systems (Fig. 3).

Fig. 3. The diagram of the relationship between the knowledge management systems and the competency development.

The fundamental role of knowledge as a determinant of the development of personnel competencies necessitates the construction of integrative links between the elements of the knowledge management system and the elements of the competencies, united within the single process of developing the human capital. Ignoring the knowledge aspect when developing tools for training and retraining specialists can neutralize its effectiveness due to a combination of factors formulated by the author based on empirical research data:

- development of competencies is a sequential process of assimilation of knowledge external to the student with its further implementation in the form of practical actions, as a result of which the “correct” actions are fixed in the form of skills and abilities.

The lack of knowledge excludes the possibility of forming relevant competencies;

- a qualitative leap in the level of a certain competence during its development is impossible without the assimilation of new knowledge that complements the previously formed knowledge core. Without additive knowledge, the growth of the level of competence is limited by the boundaries of improving exclusively existing skills and abilities;

- it is impossible to transfer competencies from one subject to another. Only knowledge is transferred as part of the learning process or observation of the work of a more competent specialist. Using the acquired knowledge, the student develops a competence through practical actions, within which the necessary skills and abilities are consolidated.
The issue of assimilation of the transmitted knowledge is of particular importance, which actualizes the effectiveness condition for the development of various teaching methods and technologies;

- being a necessary condition for the development of competencies, knowledge is not a sufficient condition for their presence. This empirical postulate determines the need to develop tools for assessing and attesting personnel based on the results of training. If this subject is an answer of the person presented in a symbolic form (oral, written), the methodology is aimed at verifying the exclusively knowledge component of the competence. When the subject of assessment is a set of conscious actions of the person or the decision-making procedure, this technique activates the entire set of competence components;

- preservation of organizational knowledge in an explicit form creates a fundamental basis for the further development of employees' competencies. Failure to create a single corporate knowledge base can increase training costs due to the irrational recurring need to find the required knowledge in internal and external sources when initiating each new training cycle.

Thus, the study substantiated the need to create a basis for building a system for developing employees’ competencies in the form of elements of the knowledge management system focusing on the formation of a corporate knowledge core and its further implementation as part of the process of improving the human capital of an organization through the implementation of key knowledge into the structure of professional competencies that determine the further effective behavior of an employee. It was revealed that the development of effective competencies based on the most valuable knowledge is not an unconditional natural process, but requires systematic management measures aimed at moderating and coordinating all elements of this process, including adaptation, training, development, diagnostics, scaling and maintaining competencies in conjunction with incentives.

4 Conclusion

Based on the study of the concept of knowledge management, which determines the principles of "self-learning organization" that rely on the permanent maintenance of the knowledge life cycle, the study proposed and substantiated an idea about the convergence of knowledge management systems and the development of employee competencies within the single general system management of human capital development enriching the competence-based approach.

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