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THE ROLE OF KNOWLEDGE IN THE PROCESSES OF CREATING AND IMPLEMENTING INNOVATIONS

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Summary

The dynamics of changes in the environment of the organizations stimulates them to design and implement internal changes leading to a balance between organizations and their environment. These changes refer to the formulation of the main objectives of the organization, structural and process solutions, management concepts, relations with customers, another look at the resources, the use of knowledge as a source of innovations etc.
One of the conditions for the functioning and development of modern organizations is the systemic use of knowledge to solve emerging problems, including creation innovations. The fulfilling of this condition requires the including of knowledge to the management.
The paper emphasizes the discussion of four interrelated issues:

1) systems of value creation in organizations,
2) essence of knowledge and its classification,
3) knowledge as a source of innovations,
4) knowledge management.

The aims of this publication is showing that knowledge plays a fundamental role in processes of generating and implementing innovations, that is why the process of its creation must be rationally managed according to the proposed models.

Keywords: organization, management, knowledge, knowledge management, innovation, innovation management, value.

Value creation systems

The economy of every country consists of a particular number (changing in time) of organizations generating products, providing services, regulating the functioning of the economy and a particular number of consumers purchasing goods produced in manufacturing organizations and taking advantage of services provided by service organizations. Thus, it is possible to talk here of the formation of mutual interactions between the participants of the market play. The processes of mutual interactions between manufacturing and service-providing organizations and consumers, taking place on the market, are subject to particular social, cultural, legal, organizational, financial conditions determined by regulatory organizations.

Organizations participating in the market play can be described as a part of a surrounding reality, distinguished according to the goal and resources needed to achieve it. The main goals setting the direction for the development of every organization may differ. Most often these are:

1) generating possibly highest profit,
2) the development of the organization in terms of the stage of progress,
3) creating value,
4) co-creation of value.

The choice of the main goal depends on many factors of exogenous and endogenous character. One of them is the concept of management pursued by the management of an organization, mentally focused either on its past, or future. In the traditional management concept the dominant focus of management is on generating maximum profit and in this concept are treated as passive providers of economic value. Further goals are a better inspiration for shaping the future of an organization by creating and implementing changes of an innovative character and profit is treated as a means to achieve the goal. What also grows is the understanding for engaging clients in the implementation of the main goal, taking into consideration particular ways to satisfy their individual needs. These points are emphasized in the concept of manager focused on co-creation of value[1].

Every organisation creates a particular value and delivers it to the interested clients through particular distribution channels. In practice two value creation systems[2] have been formed:

1) traditional, in which products are the basis of value (goods, or services). At the same time consumers represent demand for the offer of an organization, on technological innovations (product and process). The role of clients is limited to creating the demand for the offer of an organization, buying products and providing the organization with economic value,
2) modern, based on co-creation of value by organizations and clients. What becomes the basis of value is the experience of co-creation, in which an individual person play a crucial role. That's why organization managers focus their attention on the quality of interaction between an organization and its clients, as well as on introducing innovation to the so-called experience environments and their networks. Interactions constitute a new place for the co-creation of value. Thus, organization can shape within them new abilities allowing them to not just improve the quality of products and processes, but also the quality of experiences of co-creation. It is necessary to build flexible networks of experiences allowing units to co-create and individualize own experiences. As a consequence, individual interactions become the basis for co-creation of value, special for every individual. At the same time the market is changing from the sphere of demand for the offer of an organization into a forum of dialogue between the consumer, the organization, networks of organizations, communities of consumers.

Creating value as the main goal of an organisation requires a new look at the resources used to achieve this goal. In the traditional value creation system the central focus is on acquiring, allocating and using material resources (machines, equipment, materials, energy etc.). At the same time in a modern value creation system non-material resources held by the organization and existing in its environment (people together with their knowledge, experience, professional skills, relations with clients etc.) play the central role[3]. The process of value creation inspired by changes in technique and technology and by changing expectations of the consumers

requires radical reconstruction of business, basing management on two assumptions which in essence are about[4]:

1) realizing that an individual consumer is becoming the center of value creation, which requires the change of managers' mentality focused on understanding of expectations, needs, behaviours, qualifications of individual consumers and engaging them in the co-creation of values unique for each of them. Thus, it is necessary to create infrastructural conditions making it possible to focus the attention on individuals and using their experiences to create values,
2) learning to rationally use a broad base of resources held by many organizations dispersed around the world for co-creation of value. Nowadays resources are global in character, that's why it is necessary to focus attention not on ownership and control, but on access and influences.

A consequence of management based on the highlighted rules should be the transformation of the traditional business model into a modern model, focused on creating value for the individual client and using for this purpose the resources held by other organizations, including scientific and research-development organizations. The process of such transformation of organization management should be based on their ability to systemically create innovations in all areas of activity. Thus, a new logic of value creation emerges. It is based on the ability to ask questions and creatively look for answers, which constitute the basis of acquiring knowledge constituting the source of every innovation. A feature of contemporary organizations focused on co-creation of values materialized in innovations is high saturation with knowledge contained both in products and solutions, which means that the source of values is shifting from physical products to solutions and personalized experiences.

Thus, the purpose of this work is to signal the direction of changes taking place in organization management, starting from traditional management aimed at generating maximum profit to management aimed at co-creation of value for an individual client. The particular goal of this work is showing that knowledge plays a fundamental role in the

processes of generating and implementing innovation, that's why the process of its creation has to be rationally managed according to the proposed models.

The essence of knowledge and its classification

According to the theory of resources, every organization can be treated as a collection of exceptional resources allowing it to carry out the assumed tasks in an efficient way. One of such resources is knowledge, which is a new, replacement factor of production. Knowledge is regarded as the key resource of every organization, confirmed by the fact that the actual value of many organizations depend more on the knowledge contained in the minds of employees than on the number of machines, devices and other physical resources that an organization has at its disposal. That's why a phenomenon accompanying the processes of development of revolution in management., in which knowledge has been reflected by the creation of knowledge itself and its creative application. In this kind of management knowledge has become both a cost and a result.

The basic features of knowledge as a resource of an organization are:

1) comparably high cost of generation,
2) low cost of dissemination,
3) growth of income along with the utilization of knowledge,
4) growth of value together with further utilization.

Taking into consideration the fact that knowledge is regarded as the only significant resource of an organization, it is worth explaining what this term means. The simplest definition is that knowledge constitutes the basic need of every human distinguishing him from other individuals, allowing him to interpret the environment, minimize the uncertainty in his life, shape his attitude towards the surrounding reality. This definition doesn't always match the descriptions formed in literature on the subject. We should emphasize that in literature on the subject there is no uniform definition of knowledge, as confirmed by the following examples:

1) knowledge is a personal and organizational resource, or utility, a means to achieve social and commercial results[5],
2) knowledge is a collection of beliefs and individual values which are not easily accessible for the third parties[6],
3) knowledge is a canonical collection of facts and rational rules[7],
4) knowledge is processing data and information[8],
5) knowledge is confirmed conviction[9],
6) knowledge is the totality of information and skills used by individuals to solve problems[10].

In this publication knowledge is understood as the ability to interpret data and information and giving them new, creative significance in the processes of creating and implementing innovations, in the processes of managing innovations and managing through innovations[11].

The concept of knowledge is connected to other concepts such as: data and information. Data are residual, not ordered signals coming from primal sources (e.g. direct measurement), possibly from secondary sources (written) internal, or external. At the same time information is an organized set of data presented in a particular context. Arranging and integrating data leads to giving them an appropriate meaning[12].

In literature on the subject there are many classifications of knowledge. According to one of commonly accepted classifications we can distinguish[13]:

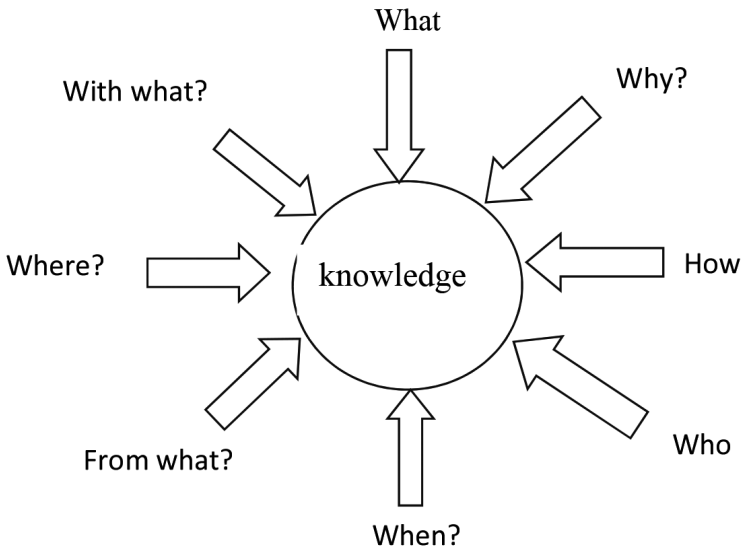
1) hidden knowledge, embedded in the minds of individuals, rooted in individual activity and experience, in individual ideals, values, or emotions. This kind of knowledge can be defined in the technical dimension (non-formalized abilities, or skills) and cognitive dimension (schemes, mental models, convictions and observations),
2) available knowledge, that is, codified knowledge, which can be conveyed by means of a formal and systematized language. It is easy to process, send and store knowledge of this category.

What is closely associated with this classification is the division into individual and organizational knowledge. Individual knowledge is hidden knowledge. At the same time organizational knowledge is the effect of

deliberate transformation of hidden knowledge into accessible knowledge and later into hidden knowledge.

It is also possible to divide knowledge into the following categories: know — what?, know — why?, know — how? know — who? know — when? know — from what?, know — where?, know — with what?, which is illustrated by picture 1.

Picture 1. Kategorie wiedzy w kontekście tworzenia innowacji



Source: Own materials.

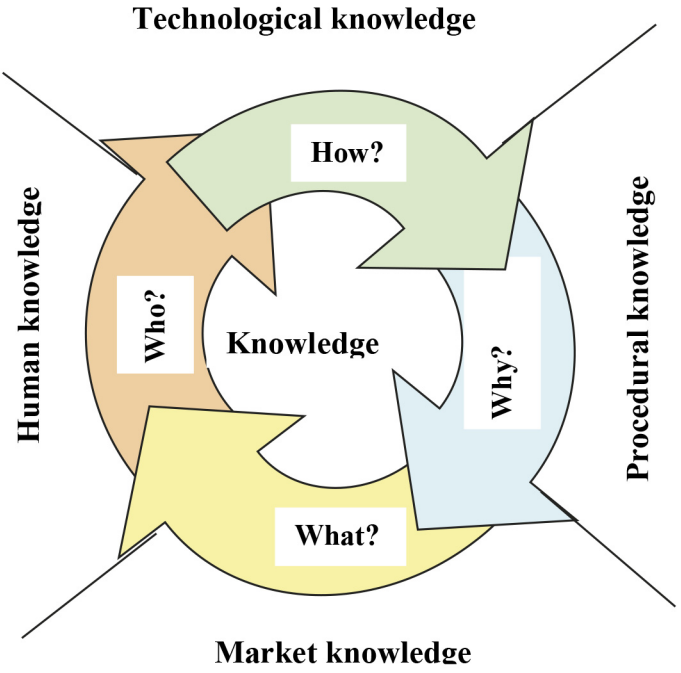
Knowledge of the kind: what?, why?, when?, from what?, where?, with what? are kinds of knowledge bearing the features of market products. At the same time knowledge of the kind who?, how? contains features of hidden knowledge, which is hard to measure, but is most valuable. Knowledge of the why? kind concerns scientific knowledge about the rules and laws governing nature which are the foundation for the progress of technology.

Knowledge can also be divided into (picture 2)[14]:

1) market knowledge — concerning mutual relations between an organization and the elements of its environment,

2) social (human) — embedded in each human, taking the form of his qualifications, experience, creativity, competences, etc. It constitutes a basis for the creation of further knowledge and innovations,
3) technological — constituting a part of key competences both for the whole organization and its elements. To develop innovation it is necessary to reveal it, harmonize and develop it,
4) procedural — showing how to achieve an intended target, constituting support for the infrastructure of other categories of knowledge, as it concerns process and structural solutions and mechanisms.

Picture 2. Basic categories of knowledge in the context of creating innovations



Source: Own materials prepared on the basis of Fu Q.Y., Chui Y.P., Helander M.G. (2006). Knowledge and Management in Product Design. *Journal of Knowledge Management*, Vol. 10, No. 6, p. 53.

It is justified to expand the above-mentioned categories of knowledge to managerial, economic, organizational and methodological knowledge. Managerial knowledge makes it possible to skilfully apply modern management methods to creating innovations. Economic knowledge makes

it possible to subject innovative activity to the criteria of efficiency, similarly as other forms of an organization's activity. Organizational knowledge makes it possible to rationally connect scientific, research-development activity with manufacturing, marketing and financial activities (creating structures facilitating mutual interactions between various organizations and units). Methodological knowledge facilitates the choice and utilization of methods of management optimizing the course of innovative processes[15].

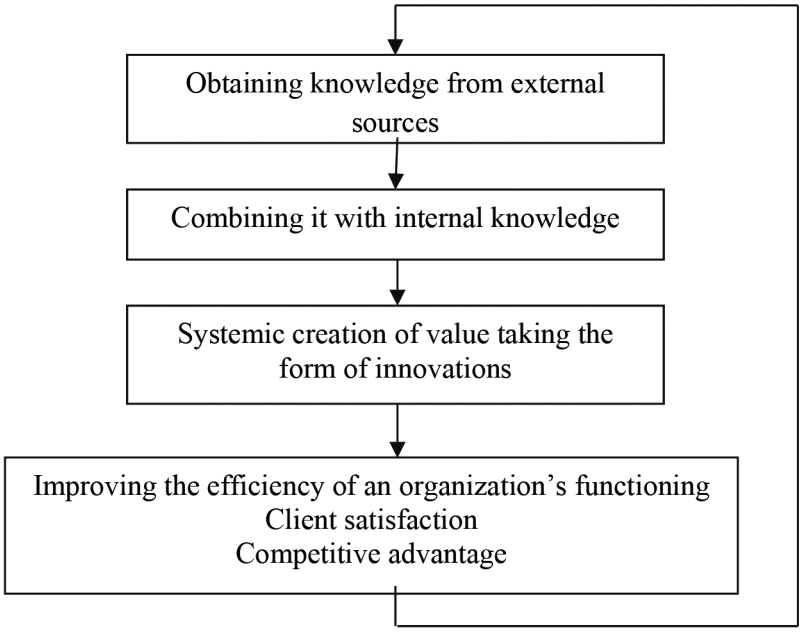
Knowledge as a source of innovation

Every contemporary organization should conduct innovative activity leading to product, process, organizational and marketing innovations[16]. This thesis is reflected by one of the priorities of the "Europa 2020" strategy namely smart growth, that is, development based on knowledge and innovations[17]. The Community is drawing particular attention to the so-called triangle of knowledge including: education, knowledge, research and innovations. These assumptions should constitute a basis for the creators of development policies on all levels of the management structure, especially in the context of weak points of the systems of creating and implementing innovations. One of these weak points is marginal treatment of the systemic formation of the demand for innovations, creation of an innovation market by appropriately educated people and institutions having appropriate resources for this at their disposal. Communities' susceptibility to innovations, their knowledge about innovations, interest in innovations, consumers' inclination to co-create innovations, inclination towards sharing knowledge needed in the innovative processes constitute an uncharted sphere of research[18].

Instability of the environment in which organizations operate encourages them to look for knowledge outside their borders (among suppliers, clients, distributors, government agencies and non-governmental organizations, scientific and research-development organizations. In the information/decision-making processes there has to be room for building a connection between the inside of an organization and its environment, for acquiring, disseminating and gathering external knowledge, which — in combination with internal knowledge — should be treated as the main component of organizational

knowledge used for creating innovation. It is a peculiar process of conversion of external knowledge into internal knowledge and again into external knowledge taking the form of innovations, as shown by picture 3.

Picture 3. The model of acquiring knowledge and converting it to innovations



Source: Own materials.

The relation between knowledge and innovations results from the definition of innovation itself. However, many authors provide very broad definitions of innovations, which makes it impossible to notice the relation in a direct way. The following definitions can serve as an example:

1) innovation i san implementation of a new, or substantially improved product, process, marketing method, or significant organizational change[19].
2) innovation is generating and implementing new ideas[20].
3) Innovation is a new product service, idea, technology, process and structure. It covers their formation, approval, adoption and implementation[21].

4) Innovation is the implementation of new, or substantially improved product (goods, or service, or process, new marketing, or organizational method in business practice, organization of the workplace, or relations with the environment[22].

The common trait of these definitions is the novelty of the proposed solution. However, these definitions don't explain what effects a particular change should have. Nevertheless, proposing a particular novelty suggests that a condition for its appearance is a particular body of knowledge. In literature there are also definitions pointing to a direct relations between knowledge and innovation, for example, innovation is defined as a process of transforming knowledge into value through the application of new, or improved products, processes and systems[23]. One of such cases is the following statement: innovation can be understood as a process, in which an organization creates and defines problems and later actively develops new knowledge, which can be used to solve these problems[24].

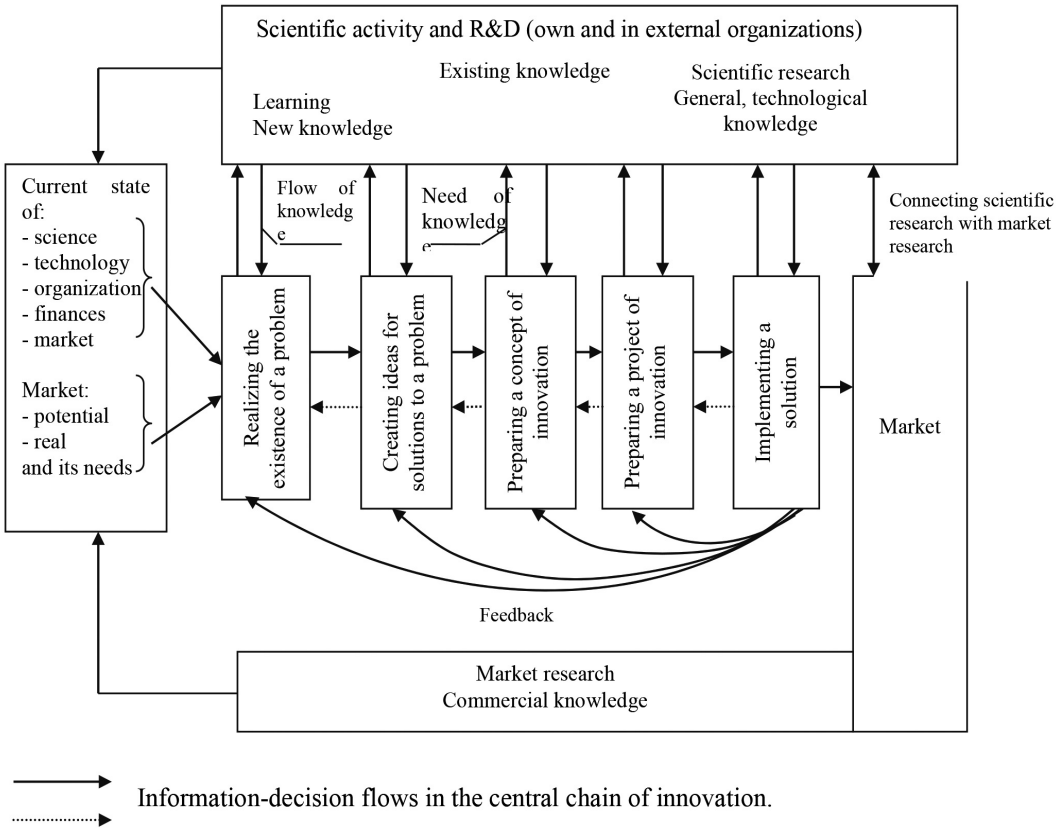
It is easier to explain the relation between innovations if we consider the process of their creation and implementation (see picture 4). Every innovation is an effect of a particular process of generating innovation and its implementation, including these conventionally distinguished stages: realizing the existence of a problem, generating ideas for a solution, working out an innovation concept, preparing an innovation project, implementation of the prepared solution.

The implementation of particular stages of the process of creation of innovation is determined by the possession of particular resources of general, technological, market and commercial knowledge, as well as managerial, methodological, organizational and economic knowledge, which are at the disposal of an organization and its employees, or which have to be generated in course of scientific research, or research-development works.

The starting point for the process of creating innovation is usually a particular (potential, or actual) need of the market. What supports the process of identifying the need are marketing research and knowledge about the market. Scientific research is necessary to generate particular ideas for satisfying needs. Ideas selected according to particular criteria are the basis for working out a concept for a solution to a problem. These concepts are subject to assessment. The best one of them is transformed into a project

(optionally). In the next stage the materialization of the chosen project, that is, creation of innovation, takes place. Every stage of the process is accompanies by: obtaining and using various categories of knowledge and the learning of employees and the organization.

Picture 4. **The model of connections in the central knowledge and the process of creating innovations**



Source: Own materials.

The basis of every innovative activity is the totality of existing scientific-technical knowledge. If the body of knowledge is not sufficient, it is necessary to take up research and development works to expand knowledge. Thus, the success of every innovation requires the involvement of an organization in the search for access to sources of knowledge located

within itself and in its environment(research-development activity, employees, universities, research-development organizations). That's why contemporary organizations can be treated more like systems of acquiring, processing, storing, transfer and utilization of knowledge, than as systems of transformation of resources into ready products, according to particular technologies and delivering them to the client[25].

Carrying out such a process and its particular stages is based on the recombination of existing knowledge (facilitating innovations), or requires obtaining new knowledge (radical innovations) generated in course of systemic scientific and research-development works, which can be called "knowledge environments". Every innovation is formed on the basis of existing knowledge gathered in a particular period, constituting the beginning of the innovative process. This is both hidden knowledge, obtained as a result of experiences, contained in competences, as well as available knowledge — generated and transferred through training, education, research works, publication of results etc. In this context innovations can be regarded as the product of learning taken up in the process of solving a particular problem on the basis of existing knowledge or enriching it with new knowledge.

Organizations making the decision to carry out processes of innovation have to have an easy, cheap and fast access to the current body of own knowledge and the knowledge of other organizations. In this context generation of knowledge, its distribution, diffusion and absorption gain fundamental importance. In the process of absorption the fundamental role is played by hidden knowledge, stored in people's minds, or in informal procedures of particular organizations, as opposed to formalized knowledge recorded in a particular system of signs preserved in documents (patent registrations, scientific articles, textbooks, etc.).

Distribution of knowledge is closely related to mobility, training, mutual, often informal ties of employees holding hidden knowledge. At the same time, diffusion of knowledge, in particular, quantified knowledge, is associated with the system of intellectual property rights protection, with the competences of an organization to use new IT and communication technologies, with the system of financing innovative activity etc. The main character in this system is human as the creator, owner and disseminator of knowledge.

We can conclude here that innovations are strongly associated with the creation of new knowledge and its exchange between people and organizations, which have to systemically develop and renew their structural knowledge in order to prevent its potential outdating, especially in case of the most radical innovations.

Mutual relations between the participants of the market depend on many factors: political, technical, social, cultural, organizational, financial etc. Undoubtedly, knowledge and data, as well as information forming its foundations is such a factor.

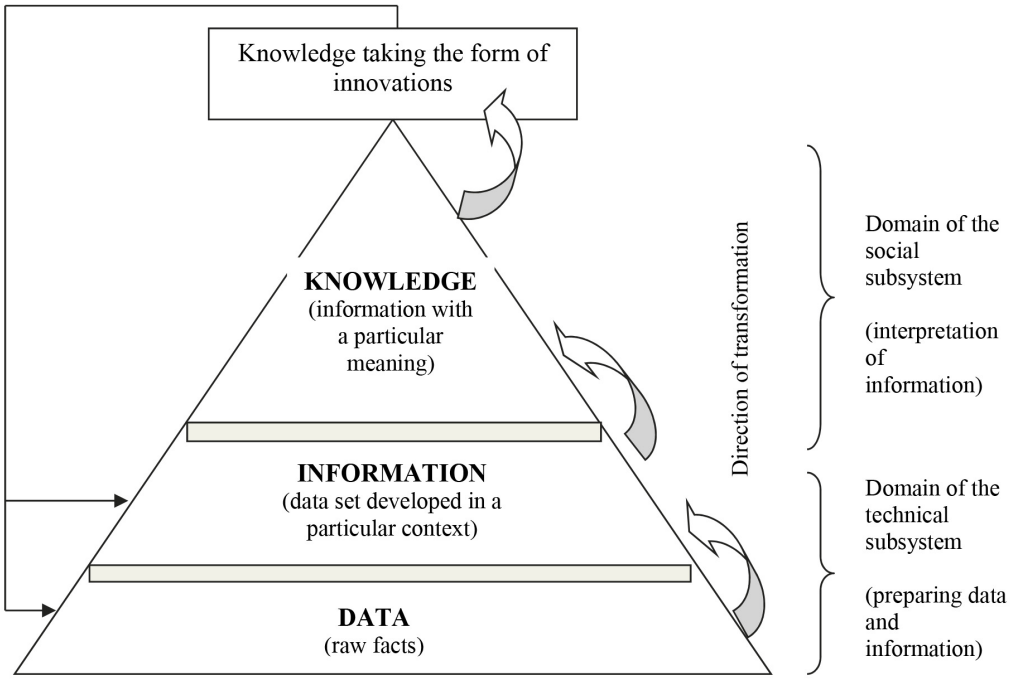
Knowledge management

As innovations constitute a basic factor of development of every organization, growth of its competitiveness and knowledge is a strategic resource determining the creation of innovations, the processes of creating, obtaining, storing, transfer and utilization of knowledge in innovative activity have to be stimulated and strengthened by managers. What may serve as an efficient instrument in this process is rational management of knowledge used in innovative activity. It is necessary to emphasize that knowledge management may be of key significance for the success of an organization only when it is connected to a dynamic environment. The concept of dynamic possibilities focusing on investigating and using both internal and external resources, plays a major role in raising the efficiency of knowledge management[26].

What may constitute a basis for all activities of managers in this respect is the model of integration of the social and technical subsystem presented on picture 5.

According to the structure of the model, every innovative process can be interpreted as a purposeful transformation of data into knowledge and the other way round. The course of such a process depends on the efficiency of the interactions between the social system and the technical system. In practice this is interaction between appropriately qualified and motivated people able to interpret information and the technology with the capacity to quickly process this information.

Picture 5. Model of integration of the social and technical subsystems as a basis for knowledge management



Source: Own materials.

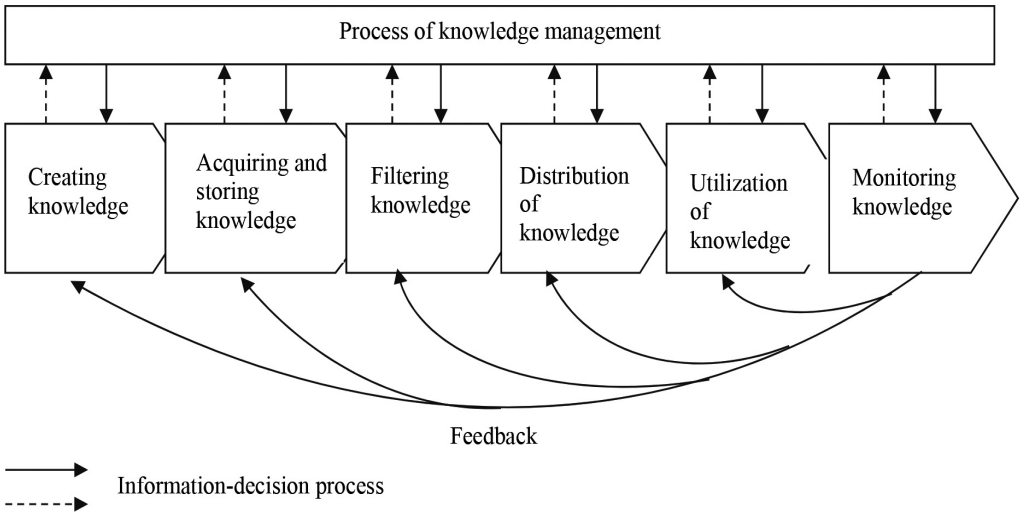
Knowledge management can also be treated as a set of actions leading to achieving goals resulting from the assumed strategy, which involves motivating employees and allowing them to prepare, increase and use the possessed abilities to interpret data and information and to give them a creative meaning, using available sources of information, experience, qualifications, culture, character, personality, feelings etc.[27]

Most often knowledge management is defined from the procedural perspective as a set of activitis involving the creation, transfer and utilization of knowledge[28]. An extended concept of the procedural perspective of knowledge management is presented on picture 6.

This process is treated as a source of logical activities such as: creation of knowledge, acquiring knowledge from external sources (scientific, research-development organizations, other organizations, clients), storing, filtering and updating, distribution, utilization. An

important component activity is monitoring knowledge in terms of its sufficiency (knowledge gap) and whether it is up to date. The results of such monitoring affect the shape of further process of knowledge management.

Picture 6. **Diagram of procedural knowledge management**



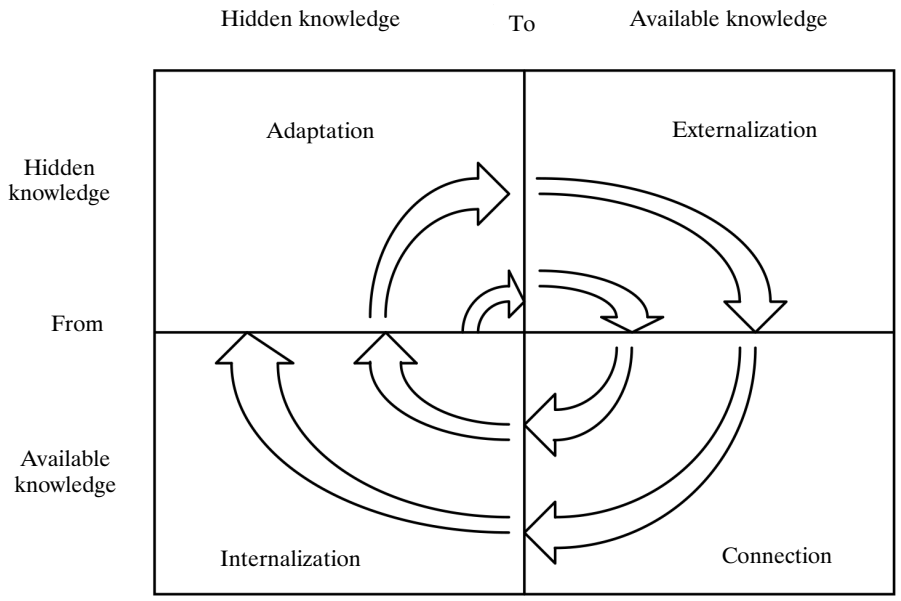
Source: Own materials.

One of the concepts of knowledge management is focused on the conversion of knowledge according to the model presented on picture 7.

The following are the methods of conversion[29]:

1) socialization (daily personal contacts) — from hidden knowledge to hidden knowledge,
2) externalization (formalization of a body of knowledge) — from hidden knowledge to available knowledge,
3) combination (combining existing theories, existing knowledge with new knowledge) — from available knowledge to available knowledge,
4) internalization (transferring theory to practice) — from available knowledge to hidden knowledge.

Picture 7. **Knowledge management according to the spiral of knowledge — methods of transforming knowledge**



Source: own materials prepared on the basis of Nonaka I., Takeuchi H. (2000). *Kreowanie wiedzy w organizacji*. Warszawa: Poltext, p. 96.

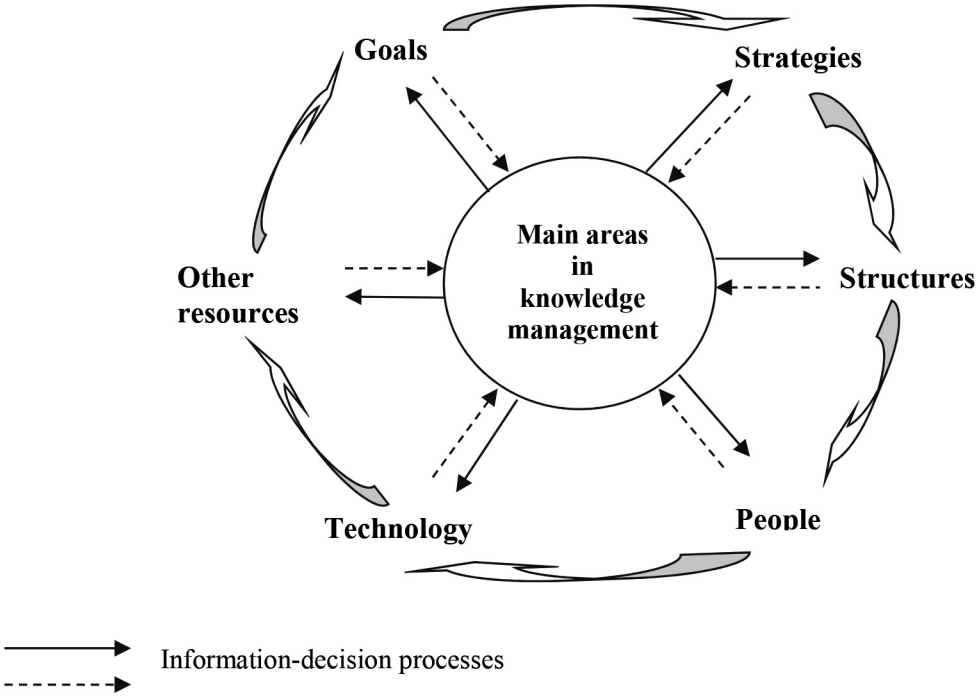
An interesting knowledge management concept is the concept based on systemic approach, in which the activity covering: acquisition of knowledge, storing, updating and using it is treated as a system consisting of certain elements: goals, strategy for achieving these goals, people, technologies and other resources (picture 8).

First logical activity which belongs to the structure of knowledge management is defining the target that is supposed to be achieved. Next, it is necessary to develop a strategy for achieving the assumed target. Preparation of the strategy involves: the choice of knowledge necessary to solve a problem, the choice of methods of acquiring knowledge (what sources of knowledge should be used, so that the benefits are as big as possible?), the choice of the ways of using knowledge.

Implementation of the assumed goals should be carried out under the most favourable conditions, that's why another element of the knowledge

management model is structure. It includes organizational forms (in the structural and procedural perspective) favourable for knowledge management, decision-making processes, division of power and the structure of roles, conflict solving, system of communication etc. The structure has to stimulate interfunctional, integrating communication.

Picture 8. Structural diagram of knowledge management



Source: Own materials.

One of the most important elements of the management model are people, who are the carriers of knowledge and their source. That's why the information-decision process has to be aimed at acquiring employees holding knowledge, able to share it with other people, able to expand this knowledge (learn) and materialize it in form of innovations.

The efficiency of functioning of the "people of knowledge" requires equipping them with modern technologies facilitating the creation of

knowledge and giving them the material form of innovations. This involves mastering the methods and techniques useful for the implementation of various stages of creation and utilization of knowledge. In knowledge management we cannot skip the next element, that is, "other resources". In this category there is everything that hasn't been included in the other elements: finances, technical assets, organizational culture, ability to cooperate, etc.

Conclusion

The main goal of this publication was to signal changes taking place in organization management, starting from traditional management focused on generating possibly highest profit, to management focused on co-creation of value for the individual client. In particular concepts of management the significance of resources used to achieve an organization's goals changes. In traditional management the dominant role is played by material resources. However, with the passage of time, non-material resources in form of human resources and knowledge have become more significant. Knowledge has become the key asset of every organization, a crucial source of its long-term stability, that's why it constitutes an important object of management[30]. It is for these reasons that in subsequent fragments of this publication the focus was on showing that knowledge plays a fundamental role in creating innovations and that's why it has to be covered by management inspired by the proposed models.

Strategic importance is attached to knowledge management, as it concerns the most valuable asset of an organization, namely knowledge, which in case of rational management makes it possible for an organization to function in a more intelligent way and to create added value. Thus, it is possible to conclude that knowledge management is a strategy of managing organizational knowledge, including the following component processes: creating and acquiring hidden and available knowledge, storing, presenting and disseminating knowledge, obtaining and using knowledge to solve various problems, including the creation of innovations. Knowledge should be treated as an important assets allowing every person to rationally use other organizational resources. The basic condition is covering knowledge

with systemic management. The practices of such management are becoming important factors of innovativeness and business efficiency[31]. What may make the work of knowledge managers easier are chosen models of knowledge management presented in this publication[32]. Thanks to following these models intuitive management can become rational management covering all factors influencing the efficiency of utilization of knowledge. This is one of important actions making it possible to introduce organization to a new level of development, in which managers refer to the intelligence of employees and clients expressed by the ability of critical assessment of reality, understanding, learning and using possessed knowledge for solving the emerging problems.

The role of the managers of contemporary organizations is to transform their organizations from technocratic organizations into organizations learning through the organized learning if its employees and using acquired knowledge to shape the future, co-create value together with clients, scientific and research-development organizations[33]. We can presume that the models presented in this work will become a methodical facility for the managers in the process of shaping strategy of knowledge, learning organization, intelligent organization.

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