

## **KNOWLEDGE MANAGEMENT AND ITS IMPACT ON THE INNOVATIVE CAPABILITY OF COMPANIES – DATA ANALYSIS**

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### **ABSTRACT**

The aim of the paper is to present the concept of the analysis focused on the evaluation of the affect at knowledge management to innovation capability of companies. This qualitative research examined the links between knowledge management (KM) and innovation capability as well as the links between KM to innovation performance in 166 Polish companies: manufacturing, commercial and service organizations. A review of the literature indicated the contributions of knowledge management to innovation capability and innovation performance. Using a multiple cross-case analysis methodology and applying a framework of innovation capability, in depth interviews were held with managers of the companies. It has been found that it is the knowledge management and skills of employees of organizations and cooperation between entities of the industry, effect on the level of innovation of the company

## 1. Introduction

Innovation, in its complexity, is often differently understood and defined. For the first time the concept of innovation was introduced to economic sciences by J.A. Schumpeter. He associated innovation with the first application of the certain solution, such as the introduction of a new product, a new method of production, launching a new market, getting a new source of raw materials or the introduction of a new industrial organization (Schumpeter, 1960).

Referring to Schumpeter's thesis, an interesting concept of innovation was introduced by C.M. Hall and A.M. Williams, conceiving it as a relational activity, within the innovation system<sup>1</sup>, if these relationships occur between individuals, units and technology, companies and individuals, companies and other companies, research institutions, or state institutions.

The article shows that innovation is, on the assumption, beneficial, creative and original change in different areas of the organization, which brings novelty and progress in relation to the status quo, positively assessed in the light of the organization effectiveness criteria.

In contrast, the innovation is understood as both the potential for innovation companies, as well as its capability for innovation.

It should be noted that this approach to the innovation essence as well as company innovation is based on an interdisciplinary and multi-faceted approach, engaging the cause-effect impact of various phenomena and processes on innovation development.

The research on the system of organizations innovation requires a new perspective on this subject. Namely, the analysis field extension of the innovation problems, understood as the potential for innovation on the one hand and at the same time, issues of innovative activity, ie. the ability of innovation, invention and innovation diffusion, on the other hand.

The potential of innovative enterprises was defined as a set of socio-economic features, shaped during the development of the company, which are the basis for its innovative activity. In particular, these are the resources, processes, structures and factors inherent in the company. Those of them, that are regularly used effectively for the development of commercial innovation are the company's ability to innovate.

Innovative potential is also determined by the environment sector, mainly the market and therefore the company with customers, competitors, suppliers and co-operators (including in particular the relationships that link the company with its key stakeholders), because the innovations particularly appear at the market, are discovered at the interface with the market.

Finally, the mentioned above resources developed in the past (potential of innovation) decide about the effectiveness of the company in terms of innovation (innovation performance), as well as the appropriate methods, skills and abilities of their current use (innovative capacity).

While presenting the innovative capability issue, it is worth to emphasize the importance of knowledge in its creation. It is, above all, the knowledge accumulated by the company during organizational learning, the knowledge of deliberate creation which allows the effective use of innovative potential (resources) for its innovation activity, knowledge and knowledge management included in the patterns and economic pragmatism which is the major causative agent of progress and favourable changes. They all create the ability of an innovative company.

Modern organizations, however, still search for significant and lasting links between knowledge and knowledge management and innovative capability, and there are even some attempts made to identify and determine the impact of various forms of information and knowledge on a certain kind of innovation.

According to the Australian Knowledge Management Standard (Standards Australia, 2005) the management of knowledge is understood as the design, implementation and dissemination of social and technological tools, processes and relationships in order to enhance creativity, knowledge creation, sharing and use of knowledge. Referring to that, mentioned above, definition A. Van Riel, J. and H. Ouwersloot Lemmink (Van Riel, Lemmink, 2004) emphasize the importance of information diffusion within the organization and activity of the process, and primarily the development of the knowledge contained in human resources, especially for senior managers, to obtain information and knowledge from customers and technology as well as sharing of information.

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<sup>1</sup>Innovation system is organized and positioning of actors, ie. Companies and other organizations that participate in the generation, diffusion and use of new (foreground) useful and bringing economic benefits in the manufacturing process (Hall, Williams, 2008).

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In numerous literary positions describing the nature and importance of knowledge management concept, at least three different approaches to the study of management structure are distinguished. They depend on what the author believes, contributes to the development of knowledge management, namely: IT Instruments, the organizational context (methods-processes) and human approach based on the man-culture relationship (Gloet, Berrell, 2003). Understood as “cross” management concept, is strongly linked to innovation management, human resource management, network management, relationship management, human-oriented techniques, especially IT, as well as financial management and management of material resources (Bessant, Venables 2008; Laperche, Uzunidis 2008; Quintas, Lefrere, Jones, 1997; Kavoura 2014).

Significant indications of this concept are:

- the need to create and maintain benefits from an increase in competitiveness through the use of knowledge and increasing the scope of cooperation (Darroch, 2005)
- increase the organization’s ability to reduce the complexity of the environment (Du Plessis, 2007);
- integration of internal and external sources of knowledge (Du Plessis, 2007);
- development of the organizational learning concept.

Of course, there are numerous critical opinions about the usefulness of the concept. Many of the surveyed managers, especially senior, believe that knowledge management is of no benefit and discredit it as a method, but this way of management is rather considered as a unique competence (Steward, 1997), as the pragmatics of knowledge management. The results of the study indicate a significant part of the lack of connection between knowledge management and performance of a company (business performance) (Gloet, Samson, 2013). Therefore, the managers are constantly looking for ways to develop knowledge management, and in particular the development of new forms of knowledge acquisition, how to apply that knowledge in the organization, new information management tools, the use of tacit knowledge (tacit knowledge), or knowledge based on experience.

E-Learning becomes more and more effective instrument and a method of organization’s knowledge and information. It allows to overcome collection barrier, organization, use of knowledge, storing all possible data (big data, “Information cloud”), creating a modern outsourcing of information and knowledge, is one of the most effective ways of communication with customers, audiences or stakeholders education and inspiration. The availability of digital content and services are more and more widespread. You can get an answer (response alternatives), eg. on economic indicators, and risk assessment. Without proper communication within the organization, its resources are completely useless, or used in a sufficient manner. The pragmatic knowledge management and its effectiveness are problematic and moot. Without communication network it is not possible to simply function in science or in management practice (Koziol, 2012)

Similarly, without significant capital development of relations activity and cooperation with stakeholders, the idea of knowledge management would be very difficult. That is why, it is an e-learning which increases the activity of relational and creates new relationships within the knowledge management system; through the use of e-learning has become a real knowledge management in large, geographically dispersed organizations. Hence, according to practitioners, e-learning is regarded as one of the most important and most frequently implemented knowledge management instruments.

## 2. Concept theses

The aim of the article is to present the concept of analysis aimed at assessing the impact of knowledge management on the innovative capability of firms (innovation capability) and the presentation of the empirical research results. The basic problem described in this paper is the recognition of knowledge management tools and evaluation of their effectiveness as a prerequisite for the development of the innovative capability of enterprises and formulation of a knowledge management model in the enterprise. An important research tool is the analysis of the relationship between the instruments (elements of) knowledge management and innovative capacity (inventiveness and innovation diffusion), which shows a causal relationship between these categories. In the thesis here presented the following concepts were adopted:

- Innovative capability is, at the same time, a function of assessing the results of the company (companies, business performance), as well as the possibility of stimulating the development of the company projection.
- Tools and knowledge management processes are important determinants of the sphere of change and development innovation capability of enterprises.
- Knowledge and knowledge management, which are the major causative agents of progress and positive changes, enable efficient use of the innovation potential (resources), constitute of innovative capability of companies.

- Knowledge management can be seen in the partial forms, which correspond to the size (area) of management and can be included in aggregate form for the company or the whole industry branch.

The value of the innovation capacity can be classified at the following levels of quality: low, medium and high, using for this purpose of the categorization method.

In the research procedure following steps can be differentiated:

1. Identification of the subject and scope of the analysis.
2. Formulation of dimensions (areas) knowledge management.
3. Presentation of the enterprise knowledge management model
4. Measuring of the innovative capabilities quality level:
5. Evaluation assessment
  - a) the categorization of companies,
  - b) verification.

### 3. Empirical research

The study involved 316 economic entities from Malopolska (Lesser Poland) Region. The study was conducted by a questionnaire. The questionnaire contained mostly multiple-choice questions on the characteristics of the business, assessments and organization innovativeness as well as the evaluation of its sector environment. The study was conducted within the years 2012-2013. Among the surveyed companies, the largest group, 48% were small enterprises employing up to 50 workers, including micro-enterprises - up to 10 employees - 15%. Approximately 31% are medium-sized companies (50-250 employees). Large companies (250-500 employees) is only 7%, and very large (over 500 employees) - 14%.

Half of the enterprises are engaged in trading and manufacturing, the remaining companies provide services. Analysing the group of companies in term of their business, one will find that almost 40% of them have limited their activities to the tested region, 33% of them work in the domestic market and 29% internationally.

#### *(1) Defining the object and scope of the analysis*

In light of the above remarks, innovation was analysed in partial and aggregate form. Aggregate innovation is a synthetic criterion of enterprise innovation (of the system) evaluation, which merges into a single formula partial innovation figures indicated in Table 1.

Among various approaches to the study of knowledge management, two of them were adopted, namely IT instrumental approach and the organizational context - with a focus on methods and processes within and beyond the organization, and staff competencies and organizational learning. The emphasis is placed mainly on "hard" forms of knowledge management to support innovation, less attention was paid to the behavioural elements of knowledge management, e.g. man-culture relations, which also stimulate innovation activity.

#### *(2) The formulation of knowledge management (areas) dimensions*

The issue of the innovative capability company development is seen in the dimension of knowledge management. The correlates of this dimension are the spheres of change and development, i.e. areas that contain a specific reference to the form of innovation and business development. Table 1. shows the areas and components of knowledge management, that can be used efficiently and effectively for creating innovation. In the area of innovation capability, innovations whose detailed figures are: the number and innovation types, e.g. product innovations, process, organizational and marketing, are a characteristic class and innovation results are achieved in the short and long term or others. The given areas and knowledge management components were isolated during the tests using for it the analysis of the influence factors. On this basis, the components that may remain and will remain in significant cause-effect relationships with innovative capability and performance of the company were indicated.

These, mentioned above, areas and components of knowledge management are the specific forms of the change and development innovation ability of enterprises spheres can also be considered as criteria for the spheres evaluation.

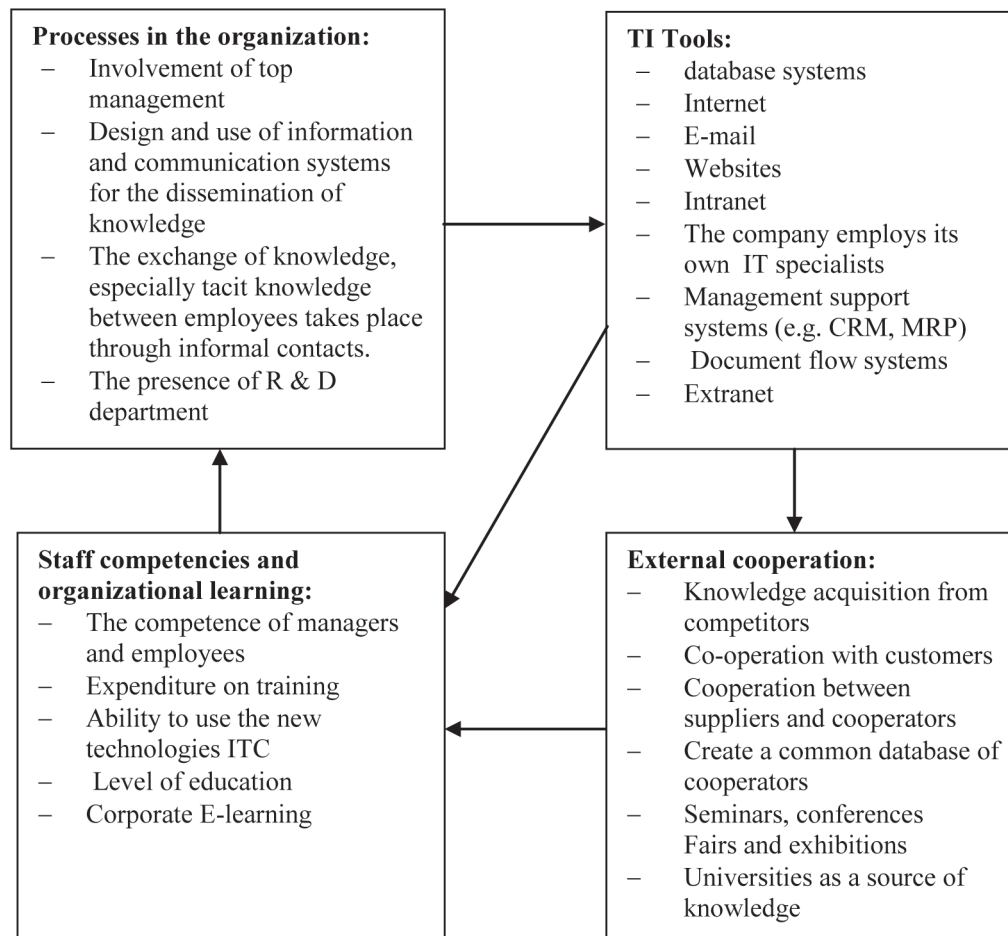
**Table 1. Areas and components of enterprise knowledge management**

Dimension (areas)	Components	Enterprises indications (in %)
IT Tools	The use of the IT structure	27
	The company employs its own specialists.	90
	Informatics, database systems.	47
	training and support systems to improve the competence of employees	
	workflow systems	80
	Internet	23
	Intranet	34
	E-mail	87
	Extranet.	54
	Videoconferencing.	73
Teleconference.	19	
Websites	7	
		8
		68
External cooperation	Cooperation with customers	55
	Cooperation with suppliers and co-operators	45
	Creation of common database of cooperators	30
	Knowledge acquisition from competitors	48
	Scientific institutions	7
	Universities as source of knowledge	16
	Fairs and exhibitions	38
	Seminars and conferences	40
	R & D units	5
technology transfer centers	4	
Processes in the organisation	Knowledge management is a strategic issue which is an essential part of the mission undertaken.	22
	Involvement of the top management	51
	Employed Staff are responsible or knowledge management	19
	Uses of the information and communication systems for the dissemination of knowledge.	47
	The exchange of knowledge between employees also takes place through informal contacts.	38
The presence of R & D department	24	
Staff competencies and organizational learning	Competences of managers and employees.	85
	The level of education.	42
	Expenditure on training.	83
	The time and development of training.	20
	The knowledge of foreign languages	42
	Ability to use the new technologies.	47
Corporate E-learning.	12	

**(3) Presentation of the enterprise knowledge management model**

In the presented model, 4 blocks (groups) of tools and knowledge management processes that determine the ability of innovative enterprises (see. Fig. 1) were included. Most of them are tools and processes moderating this ability, while those of them which belong to the group of organizational learning can be considered as mediators of innovative capability. They were determined due to the degree of significance, i.e. with the criterion of the impact on the capacity for innovation - indicated by the surveyed companies.

**Figure 1. Tools and knowledge management processes that determine the capability of an innovative company.**



Given configuration mechanisms and their influence on both the innovation and performance of the company depend on their characteristics and conditions of functioning (e.g. industry, company size, scope of business, etc.).

**(4) Measurement of the innovative capabilities quality level**

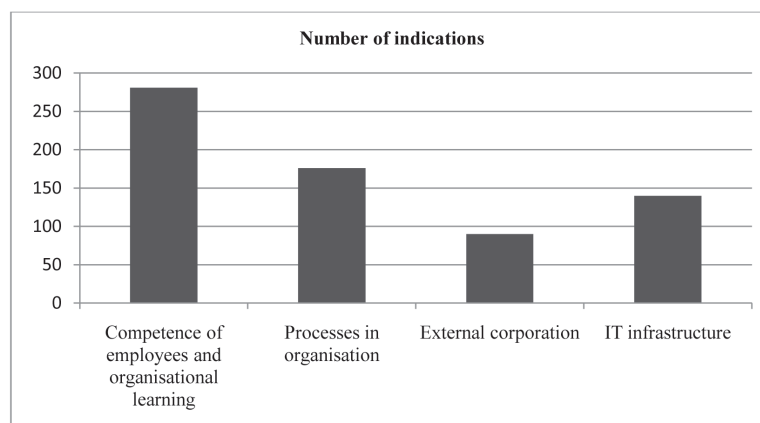
Rating of evaluation is to indicate to what extent the company meets the objectives (functions) and certain requirements. The formula of evaluation is expressed by the relation of the factual state of the enterprise (S) to the pattern (M) – model state. Defined in this way, assessment is also a tool for verifying the standardization of evaluation criteria by which the aggregate assessment is also possible. In the process of knowledge management, normalization of aggregation type was used. It was assumed that the standard score for each sub-criterion assessment (component) is 1 (positive scale) and 0 (negative scale). If the score of most sub-criteria (s) in the area of knowledge management is positive (positive scale, i.e. 1), the qualification of the area and also the determinants of innovation capacity of the company is positive. (figure 2)

The analysis of the collected data shows that all the surveyed enterprises employ properly qualified staff, but 89% of them emphasized that their staff have got special qualifications in the field of innovation (Fig. 2). As the second important determinant of innovation surveyed companies, 56%, indicated methods and processes in the organization. The fact that cooperation in knowledge management is considered as important in 28% of enterprises, while TI tools and e-learning indicated 43% of the companies.

Further analyses have established that an important differentiating factor configuration of individual determinants of innovation potential is, among others, industry, company size, operating range and others.

**(5) The verification of evaluation**

**Figure 2. Determinants of innovative capacity**



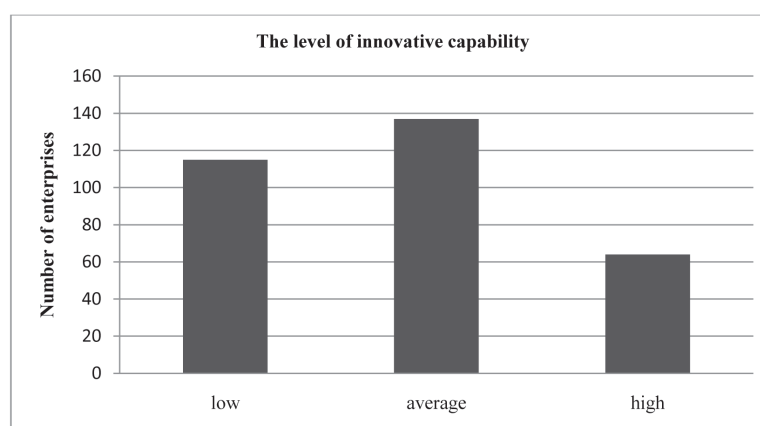
**a) Categorization of enterprises**

Categorization is a research procedure, which aims to establish a quality level of innovative capability of the company. In the course of further consideration, it is important to determine how the surveyed companies use their capability for innovation, whether in practice it translates into the creation of their innovation. The starting point to determine whether the surveyed companies effectively use their innovation capability is to determine their level of the population study. The collected results and analyses allowed to make the categorization of surveyed companies by the level of their innovative capacity. Three categories of companies were established:

- With the low level of innovation capability (it included those companies that meet the criteria in the range from 0 to 1 of the determinants of innovation),
- If a company uses 2 or 3 factors affecting its ability to innovate, it can be concluded that such an undertaking has the ability at the secondary level,
- The last category of companies with a high capability for innovation create entities indicating the use of 4 factors among those listed.

The obtained results confirmed the researchers' conjecture that there are no companies that would not have the innovative capability (Fig. 3).

**Figure 3. Categorization of enterprises according to the level of innovative capability**



Low levels of enterprises innovation ability is characteristic for 115, and the average for 137 (this is the dominant category of enterprises). The category with a high level of innovation ability was reached by 64 entities. In the process of assessing the innovative capability of Malopolska Region enterprises it has been established that any company (including those with a low level of innovation capability), is able to create and conduct innovations (Tab. 2).

**b) Verification**

Verification involves comparing the qualitative level the innovative capability of the company (category) with a number of innovations and their generic structure.

**Table 2. Number of innovations according to the level of innovative capabilities**

Type of innovations	The level of innovation capability						Total numer of innovation
	low		average		high		
	Number of innovation		Number of innovation		Number of innovation		
	Total	for 1 entity	Total	for 1 entity	Total	for 1 entity	
Product innovation	2	0,02	15	0,1	23	0,4	40
Process innovation	28	0,2	38	0,3	39	0,6	105
Organizational innovation	73	0,6	79	0,6	56	0,9	208
Marketing innovation	34	0,3	87	0,6	57	0,9	178

In terms of the number of deployed innovation, the highest efficiency on 1 company in the field of innovative activity was showed by companies with a high innovation capability, almost 3 innovation. Companies characterized by a medium level of innovation capability, put relatively more innovation (2 innovation) than companies with low innovation capability (1 innovation). Moreover, they had created a relatively more product innovation, estimated the most.

#### 4. Final remarks and conclusions

The paper presents the concept of analysis that aims to evaluate the impact of knowledge management on the innovative capability of companies (innovation capability) and their innovativeness (innovation performance). Moreover, it describes the procedure for measuring th quality level of innovation ability of enterprises and provides steps to verify that capacity. This analysis can be used, inter alia, to test the development ability of different objects, i.e. enterprises, industry, region, or the economy.

This study, exploratory in nature, is searching proven ways of knowledge management symptoms in various organizations and which of them affect the ability of an innovative organization. A further aim of these studies is to demonstrate of these determinants impact on systematic knowledge management support through various forms of innovation in enterprises.

The study highlights the importance of knowledge in innovation leading to increased competitiveness and growth. A desideratum has been formulated at managers, for whom an important competence is to find ways to develop new forms of knowledge, the application of this knowledge in the organization, managing the flow of information and sharing his knowledge and experience.

Many managers representing the surveyed companies, pointed at the instrumental context of promoting innovation , among others, through leadership, customer focus, the use of IT tools and other resources designed to support innovation, external cooperation in the field of knowledge, development of organizational learning with particular emphasis on e-learning, as well as improving the quality of these processes.

A new concept of enterprise innovation system, whose essential elements are innovative potential and innovative capacity of organizations as determinants of invention and diffusion of innovation, was presented. This approach enables innovation ,on the one hand, the assessment of the progress in all or selected areas of innovation companies, on the other hand it allows to program and plan its dynamics and shape in accordance with the strategy and business model of the organization. Moreover, these studies describe the procedure for measuring the quality level and innovation capability of the company and the verification procedure of this ability.



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Identified and proven, innovative abilities determinants create, together with the resources (potential for innovation), enterprise innovation system.

Current literature emphasizes the importance of innovation in the manufacturing sector, in contrast to the services sector. In these studies it is assumed that the appropriate resources stimulate innovations in both sectors in different ways, depending on the situation.

In this regard, the model of relationship between the determinants and innovation and efficiency level of the organization, i.e. the concept of mediating variables (mediators) and regulatory (moderators) was used.

In the light of presented here own, empirical results of research, as well as those of the predecessors, can be presumed that companies compete with each other for innovation, as well as innovative capability. The development of this particular capability rises to the rank of a fundamental determinant of survival and development of the company.

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