

PERSPECTIVES OF KNOWLEDGE MANAGEMENT SYSTEM APPLICATION IN INNOVATION PROCESSES

A Study based on Experience of Polish IT Company

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Abstract: The article focuses on knowledge management system (KMS) as a support in innovation management. It presents one aspect of the research carried out in NetLine Group, a Polish IT company. IT market is highly competitive and constantly changing, often rapidly and unpredictably. For this reason, the company's development strategy must be directed at the implementation of the idea of 'continuous innovation'. An original approach to innovation management process, based on Theory of Constraints has been proposed in order to implement this strategy. This approach provides a conceptual base for the elements, which are constitutive of the system of innovation management. One of them is the KMS, which relates to this article. Based on the experience of NetLine Company, the importance of KMS in the context of problems of innovation management is pointed out. Assumptions and concept of KMS development in an innovation area was defined. Article also highlights the expected benefits of the implementation of KMS and identifies potential threats associated with it.

1 INTRODUCTION

Nowadays, we can see a growing interest in knowledge and innovation. The reason for this is the awareness that only the constant development of the company can ensure the survival in the global competitive world. Changeability of the social and economic environment, which results mainly from technological progress, primarily information technology. The only way for companies is therefore to follow the strategy of 'continuous innovation'. However, it requires a change in approach to the organization's resources, and consideration of knowledge as a part of them. In the context of innovation process knowledge is a strategic corporate asset that needs to be gathered, retained, updated, disseminated and applied to future organizational problems (Drucker, 1994).

Control of the effectiveness of the innovation process and shortening the cycle of innovation are the main objectives of innovation management. In the literature there are many different terms grouped under the notion of innovation. In the literature concerning the management, it is understood in a broad sense, as a process of activities resulting in a

'something new' (Tidd, 2005). Here the term "innovation" will be understood similarly – as the process leading to changes in organization. The changes can be associated with different functions of a firm and they can feature not only a various degree of improvement but also diverse levels of management as well. A common attribute of the changes is observed in their purposefulness because they are organized and intended in a way that leads to benefits for a company.

In the article the following concepts: 'innovative project' and 'innovation process' are used. It is assumed that the innovative project is a part of the process of innovation. The project has a clearly defined target, this occurs only part of the innovation process.

In the case of the innovation process comprehensive and solid knowledge recorded and analyzed by a computer system is so far unavailable. However, this is the basis for the proper management, understood as a sequence of decisions. Continuous innovation is already a part of everyday life in the companies in IT sector. Their experiences can offer a perfect field of research focusing on issues around innovation.

Decisions regarding innovative processes in various phases require structured knowledge and access to information. These resources are therefore treated as a key in pro-innovative organizations. Unfortunately, it is expensive to acquire and keep it. Therefore, companies are looking for ways to most effectively manage knowledge in innovation processes. Efficiency is understood as the provision of information and knowledge that is adequate for the realization of the innovation process, in due time, to the right person.

Exploration in this direction has also been undertaken by one of the leading Polish IT companies, NetLine Group. This article presents a part of the wider research into the management of the innovation process. Subjects discussed here can be represented by the following questions:

- why Knowledge Management System (KMS) is important in the innovation process,
- how Knowledge Management System is connected to the success of the innovations,
- how Knowledge Management System should be designed to support the innovation process.

The first point of the article, based on experience NetLine Group, has identified major problems in managing innovation projects. They are related to the needs regarding knowledge and information. The model of the knowledge management system, which is proposed in this article corresponds to the original concept of innovation management. That approach is based on the concept of Theory of Constraints and special classification of innovation in respect of their duration and scope. The idea of this approach is presented in the second section of this article.

The third section presents the basic principles for the KMS, which is being established. They correspond to the approach to innovation management presented in second section. The fourth part of the paper indicates the expected benefits from application of KMS. It also contains obstacles that need to be aware of to maintain utility of the KMS. Conclusions refer to the impact of KMS on an innovation culture of the organizations and inversely.

2 PROBLEMS IN THE MANAGEMENT OF INNOVATION PROJECTS

Analysis of various innovation processes, which have been undertaken in NetLine Group, allowed the authors to identify the main problems in their

management.

NetLine Company assesses and analyzes all innovation processes which were finished. This is done by project manager whose task is to complete a special form. The form mainly consists of standard questions meant to indicate one of several responses. This allows to automate the analysis from different perspectives e.g.: time periods, types of projects, contractors, etc. Detailed analysis is conducted only for selected problems, which under given conditions, seems to be significant. They overlap to a large extent, the barriers that are referred in publications relating to innovation management (Van der Panne, 2003).

Increasingly shorter Duration of Innovations Projects. This applies to all phases of the innovation process: front-end, development, and commercialization phases. The response from the company to emerging needs of innovative solutions has to be fast to ensure its comprehensiveness.

Changeability of environmental Conditions during the Course of realization Innovation Projects. Changes can be very violent and often not indicate any symptoms. It happens that they are so extensive that it is necessary to adjust the fundamental assumptions of the project.

The Difficulty in Controlling the Course of Implementation of Innovative Projects. First of all, it is about the possibility of identifying the progress of work, the measures involved in it and the signals regarding the disruptions in the event of any. Especially in the early phase of innovation processes. The difficulty of monitoring the innovation process increase along with the involvement of partners from outside the company.

Establishing Priorities for Innovation Process. This is connected mainly to the lack of possibility for the determination of their profitability. The degree of the impact of innovation project in the strategic objectives of the Company would be helpful in this respect.

Difficulties in Staff Motivation. Symptoms of the smaller involvement of staff in innovative projects are being noticed. Employees take into account the need of considerable autonomy in decision making and a higher probability of failure. They also realize the need of demonstrate the high organizational skills. It is difficult to properly assess these factors, especially in the case of an adverse end of an innovation process.

Problems of Communications and Decision-making. NetLine Company demonstrates an innovative culture. This company has implemented and has operating procedures and routines in the

management of the innovation processes. Despite this, it situations are noted where:

- next steps are not taken, because information about the completion of the previous stages of the innovation process has not been transferred,
- the required analysis has not been carried out in due time,
- making decisions are delayed or are left for the consideration of the team,
- two different task teams solve the same or a similar problem concurrently.

All of these obstacles could be at least minimized by the efficient functioning of the knowledge management system in innovation processes.

The concept of such a system is presented later in this paper. The presented model is linked to a specific approach to innovation management. The idea of this approach is defined in the next section.

3 CONCEPT OF INNOVATION MANAGEMENT

The effective innovation process management system should primarily provide effective management of appropriate innovations.

The word 'appropriate' means such innovations which in given conditions will contribute to the development of the company in accord with its strategy. From the perspective of the experience of NetLine Company it follows that the allocation of resources in the appropriate innovation is a key factor of their success.

A popular and commonly used concept in management that is based on continuous improvement is the Theory of Constraints. It applies an algorithm of continuous increasing of system throughput based on five steps run repeatedly. (Goldratt, 1986). Theory of Constraints is successfully employed in various areas of management (Mabin and Balderstone, 2000). Apart from successful employment of TOC in management, it also provides another advantage which is worth mentioning and it is a possibility to focus on an effect of an innovation in relation to the whole system. Such a broad view on the whole system provides a good perspective for evaluating a success of an innovation. One of barriers for innovations to be implemented is uncertainty concerning outcoming results and doubts whether investments are accurately directed.

This is the first base of the proposed approach to innovation management. Its application enables the identification of areas of the operation of a company, in which innovative solutions will contribute to the true development of the company (increase the system throughput).

The second basis of the presented approach to innovation management involves the distinction between three categories of innovation processes (Jurczyk, 2011). The reason for introducing this classification is the use of tools and methods relevant to the requirements of the particular category of innovation processes.

This distinction had its origin in innovation processes analyses which were carried out to show that some problems are typical for one category of projects, and not so common for others.

In this way, three classes of innovative processes in every organization are identified:

- innovation of current needs horizon, which is implemented in the short term (funded from current budget) and focuses on a single area of activity;
- innovation of potential development horizon, middle term (covering 2 or 3 business periods) having an impact on a few associated activities creating a part of process or whole process;
- innovation of creating new business horizon, long term range (associated with strategic financial decisions), which could create new possibilities for whole business e.g. a new product or technology.

This distinction offers a development of the concept, which appeared in (Moore, 2007). In the paper, the author points out the importance of each category of innovations for companies development. He also offers examples of the need for a different approach to the management in the particular categories of innovations in marketing. Following the proposals submitted by G. Moore an assumption is made in this paper that innovative processes in each of the three categories should be realized simultaneously. Figure 1 illustrates the concept of innovation management approach modeled on the basis of TOC five-step algorithm. This algorithm is identical for each category of innovation. However, methods and tools used in various steps will be different.

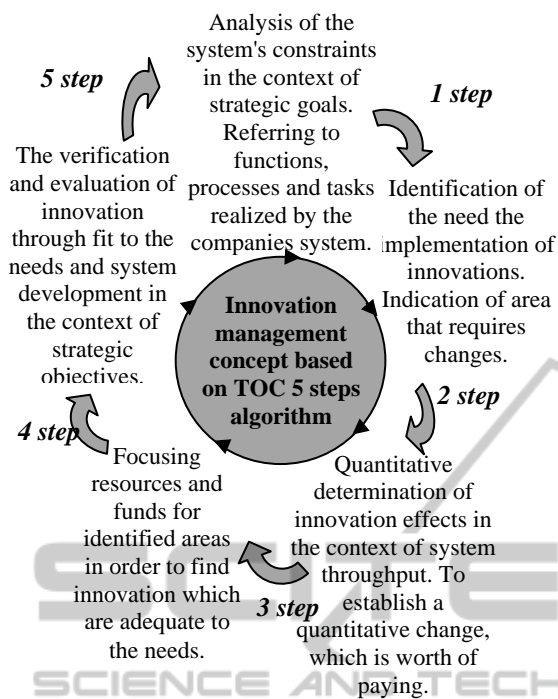


Figure 1: Base for innovation management approach modeled on TOC '5 steps'.

The essence of the proposed approach involves the identification of an area ('innovation area'), in which innovation is needed. It is determined by the constraints on the achievements of the goals assumed by a company'. This constraint is indicated based on an analysis of the internal and external environment in the context of increase the system throughput in a short, medium and long perspective. The exploration for innovative solutions should focus around such a specified area.

It should be noted that each of the categories of innovation will be associated with:

- another detail for the indication of the innovation area,
- various tools used in the implementation of management functions, such as for example environmental analysis, estimating the duration of the process, etc.,
- different meaning the purposes for company development,
- different levels of decision-making,
- different approaches to risk management,
- etc.

The designed knowledge management system has to be compatible with the presented concept of innovation management. Therefore, three presented categories of innovation processes it should be taken

into account in carrying out the functions of knowledge management.

4 KNOWLEDGE MANAGEMENT SYSTEM FOR INNOVATION PROCESS MANAGEMENT

Knowledge in an organization enables one to undertake such processes of innovation that are consistent with a company's strategy. Following the warning 'Don't blindly copy best practices.' (Loewe, 2006), NetLine Group develops its own system of management of innovation process and the associated knowledge management system (KMS).

Knowledge management includes various processes such as acquisition, creation, renewal, archivization, dissemination and application (conversion of new knowledge into action or behavior modification) of knowledge. The processes of collecting, organizing, classifying and disseminating information are served well by the searching, indexing, collating, archival and transmission capabilities of new technologies.

Each of the functions of knowledge management is carried out for a specific phase of the innovation process. Figure 2 shows that the knowledge management system has to support each stage of the innovation process including the identification the input and output parameters and their measurement.

It is assumed that the KMS will enable one to apply the knowledge developed in innovation processes conducted concurrently with it. Accelerating the process of learning, so important in managing innovation.

Knowledge is the basis for rational decision making. In the context of decision-making March (March, 1999) lists the following aspects of knowledge: knowledge of alternatives, knowledge of consequences of alternative actions, consistent preference ordering, and a decision rule by which to select a single alternative of action.

Information technologies are a key component of modern knowledge management systems. However, we cannot expect the capability of artificial intelligence systems of creating knowledge that is indispensable to carry out innovation processes. Opinions that the use of IT in knowledge management may even impair the ability of an organization to create knowledge are encountered in the literature of the subject (Gill, 1995). One has to take these observations into account when the formation of a knowledge management system is

undertaken around process that require creative approach by its very specific features. Use of IT solutions in this case seems to be necessary because of the complexity of innovation processes. They cover the whole organization, and are stretched across time require a high coordination. In addition, the speed of access to knowledge is also important.

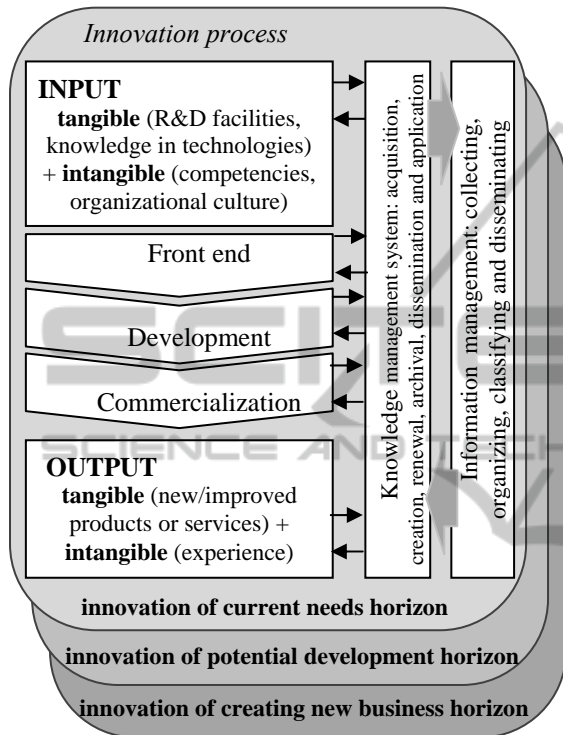


Figure 2: Location of knowledge management system and information management system to innovation process.

Key tasks to be fulfilled by a system of knowledge management in innovation processes are as follows:

The Application of Knowledge and Information for Identification of Appropriate Areas of Exploration, followed by Implementation of Innovation. This feature follows from approach based on the Theory of Constraints which has been described in section 2 of this paper. For each of the three categories of innovation processes, this function will be performed using other tools of environment analysis.

Drawing up of Plans for the Innovation Process and the Alternatives to any Emergencies. KMS is designed to enable faster and more accurate planning by providing the required knowledge about the framework of the plans in relation to a particular category of innovation processes.

Appropriate selection of information to ensure proper picture of the decision-making situation. Indication of decision-making criteria for each of the categories of innovation processes.

The Possibility of early Detection of Disturbances based on the Experience in Similar Projects over the past Period. Allowing for estimating cost and duration of the innovation process. An assumption of different level of detail for each category of innovation is possible and necessary.

Storage of Knowledge on the rejected Proposals for Solutions in the Subsequent Stages of an Innovation Process. This will enable one to more efficiently realize innovation processes by supporting non-linear models of management. This is particularly important in the early stages of the innovation process. Examples of such procedures are offered by Cooper's Stage Gate model (Cooper, 2009) vs. Koen P. front-end of innovation model (Koen, 2001). In the process of the concept development, there may be a need of a return to the solutions proposed in the earlier stages of the innovation process.

Assisting the Distribution of Knowledge inside the Organization and in Collaboration with External Partners. This will lead to faster and more efficient learning process. In this field, it is also important to indicate the generators and consumers of the particular categories of information.

5 EXPECTATIONS REGARDING KNOWLEDGE MANAGEMENT SYSTEM IN INNOVATION PROCESSES

It is quite costly to create, implement, and maintain knowledge management systems. Therefore, the potential benefits in the operation of KMS and the potential barriers in obtaining them should be examined. The benefits and obstacles of KMS referred to in this section are taken from experience of NetLine Group Company, where the research was conducted. However one can predict that they will be similar in other companies as well

The key benefit is to *reduce the hazard of losing knowledge*. IT companies have to expect high staff turnover. This applies particularly to Poland, where the salary conditions differ from world-top. The next group of benefits focus on the *improved efficiency of innovation processes*. In this field one should take into consideration the following factors:

- providing relevant knowledge at the right time and to the right people,
- faster access to knowledge and, as a consequence, faster problem solving,
- offering the inspiration to create new solutions,
- more efficient management of resources in innovation processes,
- non-confrontational division and allocation of tasks between team members 'knowing who is doing what' and connected with it the increasing sense of responsibility,
- determination of levels for decision-making with regard to various categories of innovation processes,
- allowing the control of output of the particular phases of innovation process.

Another group of factors is associated with long-term aspects of company development. They include following benefits:

- subordination of the innovation process to the company's strategy,
- orientation on creating a culture of 'continuous innovation', inter alia, by increasing the courage to undertake innovative projects,
- providing access to the knowledge generated throughout the organization, the motivation in order to create and share knowledge,
- access to the best solutions of the similar problems created inside and outside of the company,
- offering the basis for the creation and improvement of standards of cooperation within the company and with external partners,
- more advanced prioritization of innovation processes.

The main problem, which is seen in the context of knowledge management in innovation processes is associated with a considerable share of tacit knowledge. Its creation is to a large degree the result of social interactions. One must take into account the fact that the introduction of such a system does not reduce the growth of knowledge in an organization, paradoxically. This happens particularly when KMS design assumptions involve a large support of IT in the knowledge management system. This will occur in geographically dispersed organizations. On the other hand, we are better and better able to create the relationships only through online communication.

Another set of obstacles is considered in the context of functioning KMS within a company and in connection with external partners in the undertaking of an innovation process. First of all, you need to be aware of fears of some workers in the

company about losing their status. excessive concentration of on solutions brought forward in the past, without attempting to seek new and better solutions may also form a threat. Implementation of KMS can also reduce the incentive of staff to cooperate and work as a team. This could turn in the long term, to cause of conflicts between teams and within them.

Another threat that must be monitored is the weakening of the sense of responsibility for the final success and de-motivation in new skill development. In the contacts with external partners language is not an obstacle because in the case of IT companies, English is the standard. However, the question of cultural differences remains in place. Such differences may affect:

- selection of persons to teams, team building mechanisms,
- the possibility of using some solutions from other projects,
- communication standards.

6 CONCLUSIONS

The main resource used in the process of innovation is knowledge. Bearing in mind that innovation forms a key factor of competitive advantage a financial and organizational effort needs to be taken to develop a knowledge management system in the area of innovation.

The task of the KMS discussed in the article is to support innovation management at NetLine Company. Only the starting phase of this work was realized. The conclusions which can be drawn at this stage are as follows:

- Different categories of innovation processes require to focus one's attention differently according to certain management problems. For example, the variability of the environment is the most important factor for the innovation of potential development horizon. In relation to these kind of innovation processes, changeability must be monitored constantly and carefully. In case of innovation of current needs horizon any changes show up immediately without a special analysis whereas an innovation of creating new business horizon, monitoring of environment change is periodic and has a more general nature.
- The steps of management the innovation process will be the same for each category of the innovation process (figure 1). The differences appear in the used methods and tools.

- The similarity of tasks carried out in phases of the innovation process and in the type of information which are collected is high in one category of innovation processes. However, differs significantly among categories.
- The main threats that have been identified are associated with the process of implementation and use of KMS and less with the design of its structure.

The originality of created IT system supporting the management of innovation in NetLine Group, is related to two aspects.

1. The structure of KMS must comply with used management system, in this case important is the use of different methods and tools for each of the three categories of innovation process.
2. A Part of the KMS will constitute a decision support system that will identify areas of innovation, i.e. tasks, processes or functions in which is worth to implement innovative changes.

The primary motivation for the development of KMS was necessity for sharing of information between various employees and need to retain knowledge within the organization after the person who has created it leaves the company. However, long-term objective of KMS, is to create framework for a culture of 'continuous innovation' at the company. The achievement of this idea is possible only when organization is oriented on creation, acquisition and sharing of knowledge. As it is indicated in the article, despite some risks, it is necessary to support such a system with IT tools. The usefulness of KMS that is widely covered in the article will result from the efficiency of the system itself but also from the relationships within the organization and its policies. In this perspective it should be noted that KMS will support the creation of pro-innovation culture, while on the other hand, can not function properly without it.

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