

# INFORMATION SUPPORT FOR INNOVATION MANAGEMENT

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## Abstract

Innovation activities of business companies are currently the significant development potential especially for those businesses that do not have sufficient capital or technological power to succeed in a competitive contest with business members of the European Union. Its competitiveness must therefore build the rapid and flexible response to developments in the market. In this area, small and medium-sized companies dominate, unless they can effectively evaluate their innovative potential. There we see a place for the proposal of a system for work with innovative ideas, innovations and opportunities in the companies to ensure effective use of market opportunities arising through innovation.

**Key words:** Innovation, system, management, information, potential

## Introduction

The issue of the proposal of a system for work with innovative ideas, innovations and opportunities in the companies is interesting for several reasons. In business practice there are encountered more errors among managers and marketers in this area. It is mainly a misunderstanding of the concept of innovation and the lack of innovation potential of a company. Successful marketers are characterized mainly by their ability to assess the innovation potential of the company, determine the correct marketing activities, resources and tools to achieve it. As a result of their activities, it is the successful application of innovation in the market.

Managers and marketers of companies operating in Slovakia are increasingly aware of constantly increasing demands and requirements of customers who ask for designing, performing the quality products, but also services. The system works with innovative ideas, opportunities and innovations, which are an efficient tool to create a place and space in the company to ensure the proper implementation of innovation and effective alignment for the purpose of satisfying customer needs. An important role in this process is management.

The main aim of the chapter is to acquire new knowledge in the field of innovation management focusing on the area of marketing and showing the possibility of creating a system for work with innovative ideas, opportunities and innovations. Proposal of a system for work with innovative ideas, opportunities and innovations in companies can significantly help identify weaknesses of a business in this area and identify space for further improvement. The chapter contains recommendations for the trouble-free operation with innovative ideas, opportunities and innovations in company as well as the proposed system. These recommendations should serve mainly to marketing managers like a valuable tool in the use of innovation in marketing management. The chapter also identified areas of potential problems the managers have to focus on achieving a seamless work with innovations and knowledge of the business enterprise. Solution of the examined issues in the chapter requires the use of several methods depending on the character of each part of the solution.

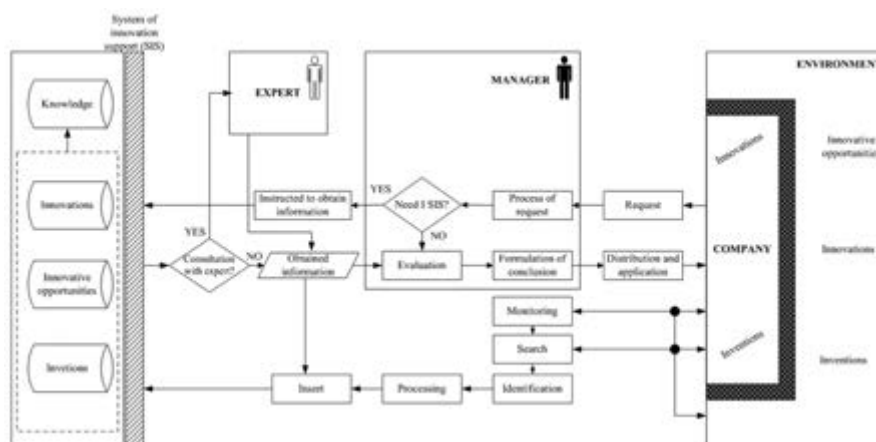
## **1. Proposal process model for effective work with innovations and knowledge in the enterprise**

Innovations are essential presumption for competitiveness. At present, successful companies invest in R&D and implement innovations. The basic precondition for the creation and usage of innovation is the existence of the system: collection, record and distribution. Only then, effective work with innovations and knowledge in the company can take place.

Successful implementation of innovations in management is a subject of the existence of effective work with innovation and knowledge. The process model is designed to ensure the smooth flow of necessary information required by business managers in real time. Its main objective is to eliminate most common problems arising in the work of innovation process (figure 1).

Two basic actors will act in the proposed process model: the user and the expert. The user is a person who uses the ability of innovation and supports system in practice. These are the top managers and marketers. Expert is a source of knowledge from innovations sphere.

Figure 1. The proposed process model for effective work with innovation and knowledge in the enterprise



Source: Lendel, Varmus, 2011a.

The process model performs three basic functions, namely the collection, recording and distribution of information and knowledge in the innovations sphere. These are the inventions, innovations, and innovation opportunities that come from external or internal environment of a company.

The company must be ready to capture this information, suitably process it and then take advantage of. For this purpose, it is the proposed process model, which aims not only at collecting but also actively seeking for opportunities and innovative ideas that can bring the company an advantage in future market. Its essential core is the system of innovation support (SIS), which consists of:

- *Knowledge base*: provides space for the collection of knowledge that can be used in the innovation process,
- *Data base*: contains all the unique information relating to innovations. It consists of Bank of inventions, Bank of innovative opportunities, Bank of innovations, which represent the space to record and work with the identified innovation opportunities, inventions and created innovations.

## 2. Proposal of system for work with innovative ideas, opportunities and innovations in company

An essential prerequisite for the success of innovation management in a company can be an effective system to work with innovative ideas, knowledge and innovation. Our proposed system (figure 2) is based on the market-

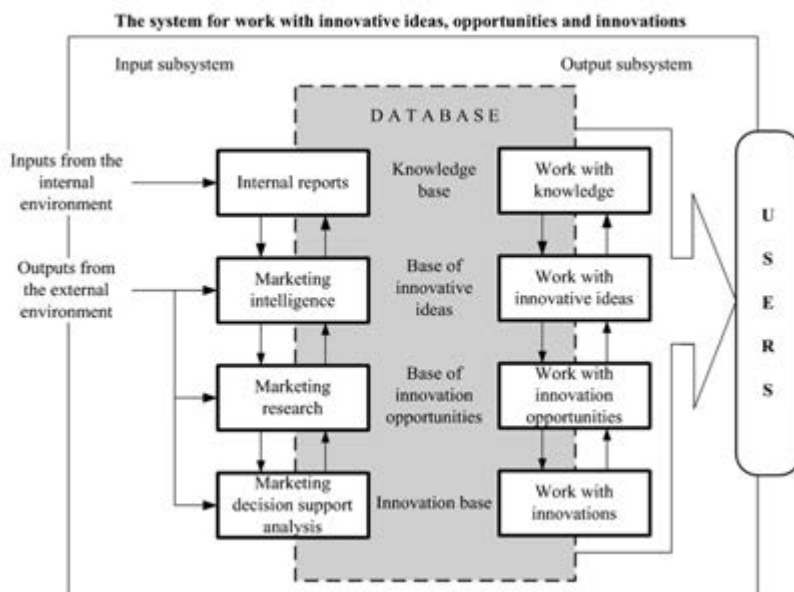
ing information system, which includes four main modules (Kotler, 1998):

- Module: Internal reports,
- Module: Marketing intelligence,
- Module: Marketing research,
- Module: Marketing decision support analysis.

The proposed system uses the following modules of marketing information system, which is extended by four basic modules:

- Module: Work with knowledge,
- Module: Work with innovative ideas,
- Module: Work with innovation opportunities,
- Module: Work with innovation.

Figure 2. The proposed system for work with innovative ideas, opportunities and innovations



Source: Lendel, Varmus, 2013.

Interconnection of modules ensures the smooth flow of the necessary information required by the marketing staff of the company in real-time. Each module includes a database as a basic building block. The main objective of the proposed system is to eliminate the problems in working with innovation in the company.

Users of the proposed system are marketers, managers of marketing departments who have the authority to work with databases of individual modules. Business executives can set access privileges for marketing staff (full

authority, limited authority). Users of the proposed system are individual marketers who use knowledge and innovative ideas in their work.

#### *Module for work with knowledge*

The main task of this module is to ensure effective working with knowledge. Marketers process knowledge as needed. It is important that all the knowledge is registered in one database, from which it will be possible, if necessary, to request for the knowledge.

#### *Module for work with innovative ideas*

Innovative ideas are considered to be essential, but not the necessary condition for the establishment of innovation opportunities and thus the creation of innovation. It is necessary for the company to maintain detailed evidence of their innovative ideas in a central database directly for this purpose.

#### *Module for work with innovation opportunities*

An innovative idea in this module is further processed. It is subjected to rigorous analysis. This will create a group of ideas, which are subjects to assessment of their feasibility. If innovative ideas are not used at present they are transferred back to the database of innovative ideas as hold off ideas.

#### *Module for work with innovations*

Innovation opportunity is a subject to rigorous analysis. It is then evaluated and applied. In this process it is important that the company uses and relies on the knowledge stored in the database. Product innovation created is stored in the innovation. Here it is a detailed registration of all innovations that company has (in service, in reserve...). If it is required, the marketer can receive the necessary information about the product innovation.

#### *Module for internal reports*

This module is designed to collect and create knowledge and innovative ideas coming from the internal environment of the company. This is particularly the use of the innovative potential of the company, which depends on the use of its innovative capacity. It is all about knowledge, experience, marketing, leadership and skills held by employees

#### *Module for marketing intelligence*

This module aims at providing marketers with the information on every day and expected developments in the marketing environment of the company. The module is designed to collect and create knowledge and innovative ideas coming from the external environment. The external environment is made up of mainly business customers who bring new ideas, new needs that create the necessary pressure to innovate. Research institutes,

experts, universities, consulting organizations are also part of the external environment.

*Module for marketing research*

This module allows marketers through marketing research to solve specific business problems and opportunities. It is all about getting to know the behaviour and actions of customers, competitors and identify the changes that occur in the area of the product innovation.

*Module for marketing decision support analysis*

This module gives marketers decision support systems. Its mission is to create and provide a variety of ideas for future development by the award of any variant of input conditions. For better decision making it provides the marketers with a model of a decision support.

*Implementation of proposed system*

The basic prerequisite for the successful operation of the proposed system for work with innovative ideas, opportunities and innovations is a detailed analysis of the innovation activities of the company. For this purpose, a company can use several marketing analysis (SWOT, SPACE, STEEP, Porter, etc.) by means of which the sub-problems are emerged, (Lendel and Varmus 2011a).

In the absence of a registration system of inventions, innovation opportunities and innovation there can be undertaken its innovative ideas, innovation opportunities and innovation of records in the relevant databases related to information systems. The prerequisite for the application of lateral marketing can be the work with innovative ideas. Everyone in the company must exactly know to load it. This will be only reliable evidence on the state of inventions, innovation opportunities and innovation. A company may be advised to register all the innovative ideas (invention), i.e. and those that are not currently applied.

Alone it is *not a sufficient evidence of innovative ideas*. It is necessary for the business to ensure effective work with innovative ideas. To achieve this, the company manager can be recommended (Lendel, Varmus, 2012):

- A system to work with innovative ideas, knowledge and innovation,
- Creation of knowledge base, which will include a summary of the knowledge, experience, abilities and skills useful in developing new products for new target groups of customers,
- Connection of the system to the marketing information system,
- The expert consultations.

When the *applying narrowly defined innovation policy* is based on the principles of vertical marketing manager of the company it may be suggested that the company begins to use lateral thinking. This thinking causes

that business marketers are happy to invent something new. A solution will often use unconventional methods. Managers must explain the benefits for marketers, resulting in the application of lateral thinking. This will enable a smooth transition to the use of lateral marketing.

In the absence of a conducive environment to the development of innovative company, a manager recommends focusing on creating pro-innovative business culture with appropriate settings incentive program. In addition to the above mentioned recommendations, the application of the ways of improving the work environment of innovation, it is necessary to focus on the marketing staff. Top management should seek for stimulating their activity by creating appropriate environment that will ensure open communication, discuss innovative ideas and work in teams. Marketers must transmit their enthusiasm to new solutions.

### **3. Proposal of expert system for work with innovation and creation innovation strategy**

Expert systems can be understood as a knowledge system in which the expert knowledge is used in a very specific problem area. The main objective of the proposed expert system will achieve the best response to the real data on innovation ensuring high quality decision-making innovation strategy. Creating an expert system is a complex process as the project site, as well as for programming.

Based on the analysis of the literature on the creation of knowledge and expert systems (Návrát et al. 2007; Spalek et al. 2005; Kelemen, Liday 1996) and after careful examination of the issue of innovative strategies (Horňáková, Zaušková, 2008; Dupal', Molnár, 2002; Kováč, 2007; Tidd et al. 2007; Dupal' et al. 1997; Zaušková, 2006; Zaušková, Loučanová, 2008) it is proposed that we need an expert system to work with the knowledge necessary to create an innovation strategy consisted of the following basic parts:

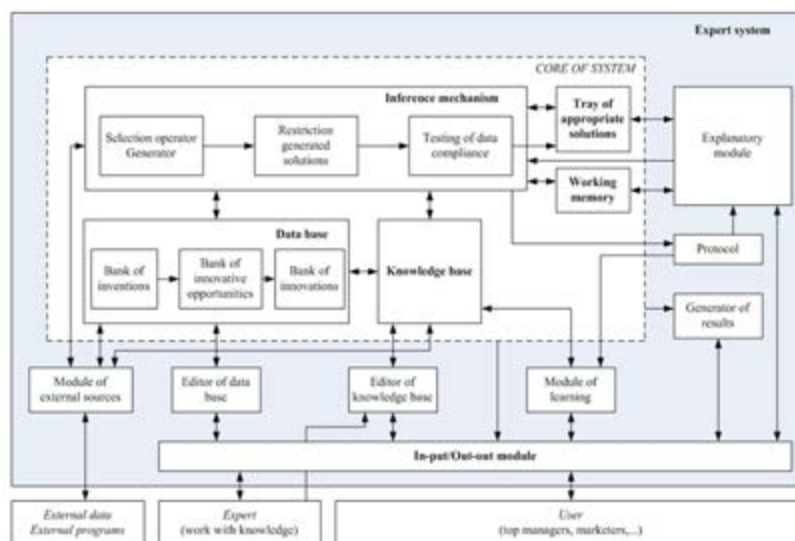
- The core system (knowledge base, data base, working memory, and stack mechanism inference appropriate solutions),
- Input/output module,
- Explanatory module,
- Protocol,
- Other components of the system (knowledge base editor, editor of the database module learning outcomes generator module external sources).

The proposal of an expert system for work with innovation creation and innovation strategy (Figure 3) was, in addition to learning foreign and domestic literature, created (processed) on the basis of previous research. The purpose of the research was to identify readiness of selected Slovak com-

panies for the deployment and use of innovative marketing strategies on the base of the identification of key elements, work with innovative ideas, opportunities, innovation and application of lateral thinking. Research was conducted on the sample of 236 senior managers of medium and large enterprises operating in the Slovak Republic. Most managers were contacted through an electronic questionnaire (93,2%). 6,3% of top managers have personally reached out through semi-structured interview.

The results obtained from research formed the basis for the development content of the various elements of the proposed system. In particular, interviews with top managers helped gain a more comprehensive view of the implementation of innovation strategy in the company. Figure 3 shows the architecture of the proposed expert system for dealing with innovation in the development of innovative strategies. This is a complex system whose components must interact with each other and provide the necessary knowledge in real time.

Figure 3. Proposal of expert system architecture to work with innovations



Source: Lendel, Varmus 2010c.

The basic precondition for the successful operation of the proposed expert system is the existence of actual knowledge base module and the module data base. Kelemen and Liday (1996) emphasize the need of strict distinguishing the data structure representing generally applicable and accepted evidence from the data structure. This is due to the different requirements of access and manipulation.

The proposed expert system will be performed by two basic actors: the user and the expert. A user is a person who uses the capabilities of working with innovation and creation of innovative strategies. These are the top managers and marketers. Expert knowledge is a source of innovation and innovation strategies.

#### **4. Characteristics of fundamental elements of the proposed expert system**

The proposed expert system consists of modules, which provide its functionality. Each module performs a specific task. Outputs from one module are inputs to the second module. The successful performance of the proposed expert system is essential to ensure coherence and seamless communication between modules.

##### *Knowledge Base*

*Knowledge Base* focuses on expert knowledge gained. It provides a space for the collection of all knowledge that can be used in the innovation process. Tidd (2007) points out that innovation is closely linked with knowledge. He states that “the issue is to create new opportunities by combining different sets of knowledge” (Tidd, 2007: 16). These are the knowledge of technological possibilities and the appropriate configurations to meet the needs of business and customers. This knowledge may take the form of experience accumulated by the company during its existence or the result of the review process (technology, market competition...). The main purpose of knowledge base is to provide space for an appropriate mix of skills into a successful innovation.

##### *Data Base*

*Data Base* contains all the unique information relating to innovation. It consists of Bank of inventions, the Bank of innovative opportunities and the Bank of innovations.

*Bank of inventions* is the search space, creation, evaluation and storage of inventions that may participate in the next phase in creating an innovation strategy

*Bank of innovative opportunities* is a space to store and work with the identified innovation opportunities. An innovative idea (invention) is a necessary but insufficient condition. The idea must be feasible and it has to satisfy the conditions for potential success.

Bank keeps all the innovation created by innovation and it creates the environment for their effective management and their translation into successful innovation strategy. Innovation is understood as the practical transfer

of new ideas to people's products, services, processes, systems and social relations.

#### *Working memory*

Working memory provides space for the solution of the problem. It will include three components: a solution, plan and agenda. Working memory can be seen as a place where solutions, intermediate data and arrange the activities of the solutions are stored.

#### *Input-Output Module*

*The main task of I/O module is to create an interface between knowledge-based system and its surroundings, which are represented by end-users. These are the senior managers and the staff involved in the process of creating an innovation strategy.*

#### *Explanatory module*

The basic module is a function of clarifying clarification, explanation and justification of the decision, which are the output of an expert system. Managers and marketers obtain the necessary justification for the final solution in the form of the chosen innovation strategy. Explanatory module offers managers and marketers the opportunity to browse the knowledge base, view and modify working memory.

#### *Inference mechanism*

It is allowed to find the required knowledge in the knowledge base, data base and to use them to develop innovative strategies. It can be derived from these bases for further information and knowledge. The work is based on a knowledge base and data base, which influence the choice of available to operators, limiting the number of tested solutions proposed generator and controls compliance testing solutions generated with the actual data. One of the important outcomes of inference mechanism is the *tray of appropriate solutions*. This module contains the appropriate solutions, which are rated according to their fitness level. Then they enter into explanatory module, through input/output module, which is given to a user (the senior manager or marketers).

#### *Other components of the proposed expert system*

Other important components of the proposed expert system are:

- Editor of knowledge base,
- Editor of data base,
- Module of learning,
- Generator of results,
- Module of external sources.

*Editor of knowledge base* provides a constant update, completion and dissemination of knowledge base. This change occurs not only during its development, but often also during the operation. The reasons leading to these changes may be different. The most common is the acquisition of new knowledge that may help in the process of innovation strategy of a company. Secondly, the manager can identify errors that must be removed (such as rules for generating variants of an innovation strategy, importance of amending the innovation process...). The same principle is based on the *editor of data base*, which, unlike the editor working from knowledge base information relating to inventions, innovative opportunities and innovations themselves. There may be reasons for changes such as incorrect identification of ideas and their subsequent translation into innovative opportunities...

An important part of the proposed expert system is a *module of learning*. Its main objective is to promote acquisition of knowledge. It ensures that is always based on the current situation. The obtained knowledge is stored back into a knowledge base and used for future proposal innovative business strategy.

Generator summarizes the results of partial results in a reasonably integrated whole, without extra information requested in a comprehensible form. His contribution is in providing effective, efficient, differentiated, comprehensive, current, serving mainly commercial information for decision-making in innovation. It communicates with input/output module to provide senior managers with the required information and understandable.

Module of external sources provides communication of the expert system with their environment. The main activity of this model is to work with external data and work with external programs. Inference mechanism in case of request certain data will be searched in the data base. If it is not found – the required information, the management is submitted to module external sources. It begins to search external data sources. In case of finding the required fact, it is allowed to insert it into the data base and send back to the management inference mechanism. Likewise it does it even in case of necessary expertise. When the inference mechanism does not appear – requisite knowledge in the knowledge base, submit the management to module of external sources. It begins to search external data sources. If it is successful, it will embed the acquired knowledge into a knowledge base, if it fails then it turns through the input/output module for expert, whose knowledge is supplemented by the necessary knowledge base editor. Then hand back control to inference mechanism.

## 5. Conditions for successful work of the proposed expert system

In order to make the proposed expert system work effectively, it is necessary to ensure that the following conditions are met:

- Efficient data acquisition,
- Implementation of quality input/output module,
- A detailed and careful analysis of the enterprise environment.

The quality of the input/output module implementation can substantially multiply the performance generated by the system (Návrát et al. 2007: 259). This is the creation of executive comfort interactions with expert systems. The aim should be to create an acceptable user interface allowing the creation of innovative communication strategies and appropriate business located as a result the interpretation of the innovation strategy.

The most important prerequisite for the successful operation of an expert system we consider as: *a detailed and thorough analysis of the enterprise environment*. In a first step, the undertaking must determine its *innovation capacity*. It consists of knowledge, experience, resources, assets and managerial capabilities and skills in business available, or it is unable to obtain in time. This is the basis for creating an innovation strategy. Then there is a *mapping of innovation potential*, the rate of innovation means business, it can reach the optimal utilization of all components of innovative capacity. The next step, the enterprise must assess and *identify the current level* of use of innovative capacity. This analysis will provide a realistic picture of the possibilities of innovation, which in turn it is translated into *specification of innovative requirements*. These are the *selection of the main operators*, i.e. areas in which are interesting for the enterprise in terms of its vision and mission and will form the essence of innovation strategy. It can be the innovative area in which a company makes in terms of innovative capacity using the best results. Another area that needs to be addressed is the establishment of *rules making* innovation strategy. The rules will operate in the proposed expert system. An important part of innovation is to define requirements, *system of evaluation*. The company must have clear criteria by which it considers the innovation strategy, respectively according to which it attributes to monitor its implementation over time. These attributes will form the basis for the continuous evaluation of innovative strategies that will indicate the timeliness of an innovation strategy and the measures for its upgrade.

## Conclusions

Innovations are currently a prerequisite for competitiveness. The economic crisis forced most businesses to savings in all business areas. On the other hand, it should be noted that the economic crisis for some time goes away and come again to revive the economy of re-distribution markets. Successful companies are the ones that have implemented an innovative strategy to invest in R & D and innovation. The proposed expert system is currently focused on facilitating the process of making innovation strategy. It provides senior managers with a tool to obtain information necessary for decision making.

The proposed expert system is an extended architecture for a complete solution of innovative strategies. However, there is scope for its further expansion as well as its reduction. It depends on the type of business, entering the quantity of data and knowledge, number of possible scenarios for the innovation strategy. Each firm is characterized by specific processes and areas.

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