PROPOSAL OF SUPPORT SYSTEM FOR CREATING INNOVATION STRATEGY IN TRANSPORT BUSINESS

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1 Introduction

The current period is marked by many changes. Competition is constantly sharpening, transport businesses feel effects of global economic crisis, constantly developing new products, customers, primarily through the Internet have a lot of information on which the decision to buy. Customer focus has become part of a corporate approach of many companies. Efforts to identify customer requirements and transferred to the new product is the task of today's marketers. Most companies today just do not understand innovation as a necessity, but as a matter of course. To maintain its competitive position it is constantly developing by innovative activities (Varmus, 2010).

Transport businesses are trying to exploit these changes and turn them into their own competitive advantage. Innovation activities are essential to the survival and growth of the company. They significantly affect to its performance, market position and market power. They are a key business process, because through these companies are trying to achieve some competitive advantage. The basic precondition for the creation and use of innovation in the enterprise is well-worded innovation strategy.

2 Innovation strategy and its making procedure

Innovation strategy is understood as innovative business approach to the choice of objectives, methods and ways to fully utilize and develop the innovative potential of the company (Lendel, Varmus, 2010, p. 49). This is the direction of its boundary, which determines the potential of innovative strategies. Innovation strategy is closely linked with corporate strategy, therefore, must reflect the basic features of this strategy. Corporate strategy defines the scope of the enterprise within the meaning of the industry and markets in which the enterprise operates (Kislingerová, Nový, 2005, p. 106).

Innovative potential of the strategy can be defined as a measure of innovation strategy, which would have been achieved in the optimal utilization of all sources of innovation strategy (Lendel, Varmus, 2010, p. 49). The level of innovation potential of
the strategy depends on the level and quality of the components of the innovative resources strategy.

Innovation strategy, we understand the sources of innovative opportunities, skills, knowledge, experience, invention and innovation, the firm available, or is unable to obtain in time. Innovative resources of strategy consist of four basic, interrelated modules, namely: (Lendel, Varmus, 2010, p. 49)

- Bank of inventions,
- Bank of innovative opportunities,
- Knowledge base,
- Bank of innovation.

The process of innovation strategy is a complex process that contains six main parts. This is a defining vision and mission of the company, identifying strategic objectives, detailed analysis of the enterprise environment (internal and external), strategy formulation itself, its implementation and subsequent evaluation associated with the control.

The most important process of creating an innovation strategy we considered the formulation of strategy. The process to generate the different variants of innovation strategy, its analysis and evaluation according to established rules and criteria specified. Based on past performance of activities may be to select an appropriate solution to an optimal variant innovation strategy for the company. Strategy formulation process is marked by more intensive computations occurring mainly in the selection of appropriate solutions. Even generating different options strategies requires innovative use of information technology. For subsequent evaluation of the various options it is necessary to interim results be imposed in an area for the purpose of subsequent confrontation and comparison with current outputs. It should also be based on more data and knowledge, which must be stored in transparent database. This will avoid the emergence of common situations where they are being confused, searching, lost and resting mainly due to absence of awareness of their existence within the enterprise. All of these prerequisites and requirements for successful development of innovative strategies can be achieved by introducing a support system that will provide to senior managers detailed information necessary for decision-making.

For these reasons, we consider for purposes of creating a successful innovation strategy for the introduction of appropriate support system that will ensure effective work with knowledge and innovation-related data. Knowledge-based systems using artificial intelligence solution allow arbitrarily complex problems. Used knowledge is
considered crucial for high-efficiency innovation strategy. These systems are used in solving the problem of expert knowledge.

3 Empirical research – the situation in the Slovak transport businesses

In the first step solution of selected problems is necessary to define the concept of innovation activities, to map the current innovation activities of Slovak businesses in selected services and highlight the major innovations in transport and logistics.

The basic innovation activities of businesses, which are defined and detected by the Statistical Office of the Slovak Republic may include:

a) *internal research and development* (*R & D*) - a creative work within the business in order to increase knowledge for the development of new and improved products and processes

b) *external research and development* - to the same activities as in internal research and development but made by other businesses,

c) *provision of modern machinery, equipment, computer hardware and software to produce new or significantly improved products and processes*

d) *procurement of external expertise* - to the acquisition of patents and unpatented inventions, know-how and other knowledge necessary for the development and / or introduce new or significantly improved products and processes

e) training for innovation activities (both internal and external)

f) activities leading to innovation to market

g) other activities - this is primarily a feasibility study, testing, software development, improvement of tools ...

The Statistical Office of the Slovak Republic (SO SR) published the development of businesses in the Slovak market. Survey of innovation in businesses is carried out with the biennial international methodology based on OSLO.

In the last period, the number of services businesses in the market had grown considerably. But there is still the number of market services business, applying innovative activity, lower than businesses that these activities do not apply. However the ratio of non-innovative to innovative businesses is starting to change in favour of innovation. While in 2001 there were two businesses with innovation activity for the five businesses without innovation activity, and in 2008 to a business without an appropriate innovation activity of businesses with innovation activity.
The most important factors hampering innovation activities according to the Statistical Office include:

- **Economic factors:** lack of funding sources, too costly to upgrade.
- **Internal factors:** lack of qualified staff, lack of information on technologies, lack of information on markets, difficulty finding a partner for cooperation in innovation.
- **Other factors:** market dominated by established businesses, uncertain demand for innovative goods or services.

We conducted research from May 2009 to end February 2011. The primary role of research was to obtain and interpret information testifying to the rate of application of innovative activities by large and medium-sized transport businesses operating in the Slovak Republic. The target groups were medium and large businesses operating in Slovakia dealing with transport. Research objects (the final respondents) were the senior managers and middle level management of transport businesses. To research were involved 53 respondents of medium (92.45 %) and large (7.55 %) transport businesses operating in Slovakia.

The research was approached with different transport businesses dominating the business concept. Most were involved in transport businesses with customer orientation (67.92 %), which can be regarded as a positive fact. Transport businesses take into account when providing their services to customer needs. He plays a key role in planning their business activities.

49.06 % of respondents from transport businesses recorded any innovative ideas and if necessary use what is a positive fact - 43.40 % surveyed managers of these businesses reported that their innovative ideas in business are always generated from scratch if necessary. 11.32 % of respondents used in the analysis of innovative ideas generated by groups. The negative fact may indicate that none of the interviewed transport businesses has developed a system of evaluation of innovative ideas, which is necessary for successful implementation of innovative activities.

Among the innovative activity that transport businesses most involved include training for innovative activity (64.15 %), obtain of modern machinery, equipment, PC hardware and software (49.06 %), obtain of external knowledge (35.85 %), internal research and development (26.42 %). On the contrary non-applied innovative activities include activities aimed at innovation to market and external research and development (only 1.89 %) (Figure 1).
Up 84.91 % of transport businesses identified as a major problem in the application of innovative business activities the technical and organizational complexity. Other problems include lack of necessary funds (64.15 %), insufficient use of available resources (37.74 %) and lack of appropriate environment conducive to development of innovation (30.19 %). For the smallest problem considered managers addressing the lack of trust between management and other departments (16.98 %), lack of information on technologies and markets (18.87 %), inefficient work with innovative ideas (3.77 %) and lack of qualified personnel.

Business strategies that do not recognize the presence of complexity and uncertainty with related and future changes will be inflexible and unlikely to be correct. If they are implemented, could be destructive. (Varmus, 2009)

4 Proposal of the support system for work with innovation strategy

Support systems can be understood as a knowledge system in which expert knowledge is used in a very specific problem area. The main objective of the proposed support system will achieve the best response to the real data on innovation, thereby ensuring high quality decision-making innovation strategy. Creating a support 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 support systems (Návrat et al. (2007); Spalek et al. (2005); Kelemen & Liday (1996)) and after careful examination of the issue of innovative strategies (Horňáková & Zaušková (2008); Dupaľ & Molnár (2002); Kováč (2007); Tidd et al. (2007); Dupaľ et al. (1997); Zaušková (2006); Zaušková & Loučanová (2008)) proposes that we a support system

![Fig. 1 The level of realized innovation activities](image-url)
system to work with the knowledge needed 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 basic precondition for the successful operation of the proposed support system is the existence of actual knowledge base module and the module data base. Kelemen and Liday (1996) emphasize the need to strictly distinguish the data structure representing generally applicable and accepted evidence from the data structure. This is due to the different requirements of access and manipulation.

**Fig. 2 Proposal of support system architecture to work with innovations**

The proposed support system will perform two basic actors: the user and the expert. User is a person who, in practice the support system 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.

5 Characteristics of fundamental elements of the proposed support system

The proposed support 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 support system is essential to ensure coherence and seamless communication between modules. Figure 3 briefly characterized by its main elements.

*Fig. 3 Characteristics of the essential elements of system of innovation support*

<table>
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<tr>
<th>Element</th>
<th>Brief description</th>
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<tbody>
<tr>
<td>Knowledge Base</td>
<td>Provides space for the collection of all knowledge that can be used in the innovation process.</td>
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<tr>
<td>Data Base</td>
<td>Contains all the unique information relating to innovation. It consists of Bank of inventions, Bank of innovative opportunities and Bank of innovations. Bank of inventions is a space for the search, creation, evaluation and storage of inventions (suggestions, ideas, thoughts), which may be in the next phase in the shaping of innovation strategy. Bank of innovative opportunities is a space to store and work with the identified innovation opportunities. It also serves to store the innovative opportunities for business is not immediate importance. The bank of innovations keeps all the created innovation and creating an environment for their effective management and their conversion into a successful innovation strategy.</td>
</tr>
<tr>
<td>Working memory</td>
<td>Provides space for storage of intermediate solutions and the timing of action to working out.</td>
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<tr>
<td>Inference mechanism</td>
<td>Allows finding the required knowledge in a knowledge base, data base and using them to create an innovation strategy.</td>
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<tr>
<td>In-put / Out-put module</td>
<td>The interface between system and its surroundings, which is mainly represented by top managers and workers involved in the process of innovation strategy.</td>
</tr>
<tr>
<td>Explanatory module</td>
<td>Clarifies, explains and justify decisions which are the output of the system.</td>
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### Protocol
Stores the history of the solution.

| **Editor of Knowledge Base and Date Base** | Ensure continued updating, completion and dissemination of the knowledge base. |
| **Module of learning** | Its main objective is to support knowledge acquisition. |
| **Generator of results** | Summarizes partial results in a reasoned and integrated whole, without unnecessary information, the requested form and intelligible form. |
| **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. |

Source: Lendel & Varmus, 2011

### 6 Conditions for successful work of the proposed support system

That the proposed support system to work effectively, it is necessary to ensure that the following conditions:

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

The quality of the implementation of input / output module can substantially multiply the performance generated by the system (Návrat et al., 2007, p. 259). These are the creation of executive comfort interactions with support 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 a support system we consider a detailed and thorough analysis of the enterprise environment. In a first step, the undertaking must determine its innovation capacity. It consists of the sum of knowledge, experience, resources, assets and managerial capabilities and skills in business available, or 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 transport 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 translate into specification of
innovative requirements. These are the selection of the main operators, i.e. areas in which are interesting for the transport 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 the proposed support system. An important part of innovation is to define requirements, system of evaluation. The company must have clear criteria by which consider innovation strategy chosen, respectively according to which attributes to monitor its implementation over time. These attributes will form the basis for continuous evaluation of innovative strategies that will indicate the timeliness of an innovation strategy and the measures for its upgrade.

7 Future work – real applications of support system for strategic planning in practice

Support systems are now using modern technology such as fuzzy logic, neural networks or genetic algorithms. They have their advantage in the field of strategic management, knowledge management, marketing, quality management and logistics. Systems are developed and used for quality assessment of the supplier (Kwong et al., 2002), to develop and formulation of marketing strategies (Davies et al., 2002). Liebowitz (1998) emphasizes that support systems must be an integral part of knowledge management. Only then can the senior management to obtain the necessary output for its decisions.

Azadeh et al. (2009) deal with the creation of a support system for strategic planning. Their proposed support system allows the assessment of strengths, weaknesses, opportunities and threats. It is based on information inputs consisting of external and internal factors. The output of system is the proposal of strategies to eliminate bottlenecks and improve the system itself.

Han (2003) dealt with a neural support system approach to designing an intelligent strategic planning system. The proposed neural support system could Providence 'goal-seeking "functions, which prove to be very useful for unstructured decision-making problems, specifically in strategic planning. He created a prototype of this system called StratPlanner, which was experimentally tested on data from the Korean automobile industry. The results confirmed that the neural support systems approach is useful for performing competitive analyzes. Neural support system prototype was designed to diagnose strategic problems and design appropriate strategic alternatives for the current competitive situation. Han (2003) dealt with using neural networks and support systems techniques.
In practice, it may meet with several applications of support systems, which are designed to support strategic planning. In most cases, however, they are focused solely on creating a marketing strategy. For example, Quick Insight is a support system for the assessment of market opportunities and business ideas. It evaluates the product (service) in comparison with its competitors and sets the probability of success of the product on the market. In evaluating and assessing using the expertise on which a decision can be made in relation to the product (innovation, withdrawal, replacement ...). Quick Insight is used by more than 500 companies such as 3M, AT & T, Caterpillar, Equitable Life, General Electric, IBM, Pillsbury and many others [12]. The main benefit of this support system is the possibility of rapid and accurate analysis of market potential for products and services of the company. The basic objects of analysis include product, service, price, market, competition and environment. Quick Insight helps measure the company's ability to achieve its goals and plans. It allowed make the experiment when entering different input values, which result is in the generation of alternative strategies. As an output the system provides arguments. Each claim contains a list of key factors to be considered in the analysis. Support system interprets the results in terms of good business models, including the Boston Consulting Group Matrix, GE Business Screen, Competitive Advantage and over 30 more in a comprehensive evaluation report [12].

Business Insight is a support system designed to assess and develop marketing and development of marketing strategies for larger businesses. It provides a unique insight into complex relationships between multiple business concepts. It examines individual allowable strategies that can be modified and improved before making a decision. An important part of support system is knowledge base for product and services. Business Insight offers cooperation with experts in areas of strategic planning. It also allows comparison of alternative strategies based on their strengths and weaknesses, explore market opportunities and critical assessment of key success factors. It uses several methods such as strategic management (Michael Porter's Five Competitive Forces, GE Business Strategy Matrix, Boston Consulting Group Matrix, SWOT Analysis, Product Life Cycle Analysis, Pricing Strategy and dozens of other models) [13]. The results are compared with a knowledge base of best business strategies and evaluated several marketing and business concepts relating to the problem. The results are reflected in the form of analysis to include a statement about the problems of the proposed marketing strategy. Business Insight generates a comprehensive report based on which managers can plan and justify their strategic choices [13].

Those cases mapped develop problems using support systems in terms of strategic planning. Most applications are focuses exclusively on issues of competition,
marketing and product portfolio. Innovation and innovative strategies has not yet been charted in detail. Therefore, our design support system for creating an innovation strategy can be considered as a first step towards the use of support systems in this area. The proposed support system includes several new features which will allow the necessary information for policy-making.

Our aim was to develop a proposal for a comprehensive support system for creating an innovation strategy. Show a comprehensive proposal to site the elemental and relational. Name and define the basic building blocks of this system in detail and describe relationships outputs of the system. In the next steps in our future research, we want to focus on the compilation of this prototype system using appropriate programming language in collaboration with our colleagues at the Faculty of Management and Informatics, Faculty of Electrical Engineering and the University of Žilina. We plan to set up a prototype to test in real conditions of medium or large company operating in the region of Žilina.

8 Conclusion

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 gone and come again to revive the economy if re-distribution markets. Successful companies are the ones that have implemented an innovative strategy to invest in R & D and innovation. The proposed support 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 support 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. The author seeks to create a relatively universal support system for creating an innovation strategy, which it is possible to modify (adding or reducing) the individual modules.

This publication is the outcome of the project VEGA 1/0992/11 2011-2013
"Cooperative management - effective approaches to gain competitive advantage"

This publication is the result of the project implementation:
Centre of excellence for systems and services of intelligent transport, ITMS 26220120028 supported by the Research & Development Operational Programme funded by the ERDF.

"Podporujeme výskumné aktivity na Slovensku/Projekt je spolufinancovaný zo zdrojov EÚ"

References


Resume

The process of innovation strategy is a complex process. The formulation of innovation strategy requires more intensive calculations make it possible to select the optimal variant of innovation strategy for transport business. Similarly, generation of different options strategies requires innovative use of information technology. It has to be allocated a place to hold intermediate results. Work with larger amounts of data and knowledge, which must be stored in transparent database, thus avoiding loss, confusion and searching. The paper deals on the base of conducted research with a support system for creating an innovation strategy as the appropriate means to ensure the above requirements for creating an innovation strategy for transport businesses. The paper characterized in detail the various modules of the proposed support system, as well as the preconditions for its successful performance.

Key words

innovation, innovation strategy, expert system, knowledge, management, transport

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