

The level of utilization of innovative activities of transport businesses in the Slovak Republic

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Abstract

The purpose of this article is to identify the primary difficulties of implementing innovative activities in Slovak transport businesses and to propose some recommendations for minimizing the occurrence of these problems, based on the analysis of literary sources and carried out research. This article summarizes results of the authors, who conducted research on a sample of 53 respondents in order to show the current situation in the Slovak transport business that use innovative activities. This article also contains recommendations for successful implementation of innovative activities in business. These recommendations should be a valuable tool for business managers in their attempts to implement innovative activities.

Keywords

innovation · transport · innovative activities · business · research

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1 Introduction

At present the innovation plays an important role. Only those businesses that invest money to research and development can be successful in the current global market [15]. Innovative activities enable businesses to gain competitive advantage by applying innovation into their products, services, processes, marketing methods, or organizational changes. This is necessary in order to ensure pro-innovative climate in the business, support from top management, and employees' identification with the business's corporate philosophy of innovation [11].

The basis of innovation is a new knowledge, generated mainly through research and development. An example of successful innovation is rail travel, which is shown in the results of ENV-ICRACK cluster (cluster of alternative energy sources), which deals with reducing energy consumption (more [4]).

2 Objectives and Methodology

The main purpose of this article is an effort to gain new knowledge in the field of innovation management with a focus on the area of innovation and to show opportunities for their successful implementation. By proposing appropriate recommendations we aim to significantly contribute to the success of applying innovative activities in the transport business.

Researching the problem in the paper requires the use of several methods, depending on the nature of the individual parts of the solution. The method of analysing documents was used to obtain and gather information (when current and historical data relevant to the issue were analysed), along with the questionnaire method and the method of semi-structured interviews (data collection in empirical research).

To collect the necessary information the method of quantitative evaluation (formation of statistical averages, percentages, application of statistical tests and other statistical methods) as well as the comparative method (comparing the relevant data obtained from empirical research and the collection of data from the analysis of secondary sources) were used.

To solve the given problem we used the methods of induction, deduction, synthesis (in formulating recommendations for the transport business managers), abstraction, and modelling.

3 The Current State of Dealing with the Issue

The word innovation comes from Latin and means “renewal”. *Despite the fact that its meaning has been constantly updated and reviewed, terminological and methodological apparatus have been developed, in understanding the nature of the term “innovation” is a consensus in academic and also in professional circles.* The basis of innovation in most scientific disciplines refers to a planned and controlled change of achieving new or better conditions.

At present, in domestic and foreign literature the term “innovation” may be encountered with the use of multiple definitions, in which the following characteristics dominate: application of new ideas; a new idea; a change for the better, and invention [17]. From the wide spectrum of opinion marketing theorists and practitioners can be chosen the most accurate definition of innovation. Table 1 summarizes the definitions of the term innovation.

The first step towards solving of this problem is to define the concept of innovation activities, to map the current innovation activities of Slovak businesses in selected services and to show 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, involve: [16]

- **internal research and development (R & D)** – a creative work within the business in order to increase knowledge of the development of new and improved products and processes,
- **external research and development** – the same activities as in internal research and development, but made by other businesses,
- **provision of modern machinery, equipment, computer hardware and software to produce new or significantly improved products and processes,**
- **procurement of external expertise** – the acquisition of patents and unpatented inventions, know-how and other knowledge necessary for the development and / or **introduction of** new or significantly improved products and processes,
- **training for innovation activities (both internal and external),**
- **activities leading to innovation to market,**
- **other activities** – this **primarily involves** a feasibility study, testing, software development, improvement of tools ...

The Statistical Office of the Slovak Republic (SO SR) has published a report on 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 service businesses in the market grown considerably. However, there is still a number

of service businesses, 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 [*in favour of the latter*]. While in 2001 there were two businesses with innovative activities for every five businesses without innovation activity, in 2008 there was one business without an appropriate innovative activity to one business with innovative activities.

The most important factors hampering innovation activities according to the Statistical Office include: [16]

- **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.

Currently providers of logistics services try to improve their operational efficiency through the continuous introduction of information and automation technologies. In this process, the innovation is viewed as the innovation process of changing opportunities for new ideas and implementation of new procedures. According to Chieh-Yu [2] the technological innovation in the logistics field can be divided into four categories: [7]

1 Data acquisition technologies

The actual data collection and exchange of information plays a crucial role in information management. Good quality data enables providers of logistics services to deliver goods more efficiently to the customers. The system can even use bar-codes and radio frequency identification (RFID).

2 Information technologies

Their main contribution is an efficient provision of information flows within the organization and between organizations themselves. Additionally it includes electronic data interchange (EDI) over the Internet, value-added network (VAN), point of sale (POS), electronic ordering systems (EOS), logistics information system, Computer Telephony Integration, portals and business information systems [7].

3 Warehousing technologies

Their main aim is to ensure an effective system for warehouse management, e.g. to achieve fast and efficient way to search and move products in stock. Among storage technologies there are used mainly automatic storage and retrieval system (AS/RS), automatic sorting systems, computer-aided picking system, and thermostat warehouse.

4 Transportation technologies

Transport technologies are focused on moving product from their/a point of origin to destination with minimal costs and damages. In this process must be fully taken into account

Tab. 1. Definitions of innovation

Author	Definition
<i>Valenta (1969)</i>	Innovation should be understood as any changes in the original structure of the production organism, i.e. transition to a new state of the internal structure and the effects can be considered as any changes in the behaviour of the production organism [20].
<i>West & Farr (1990)</i>	Innovation is the intentional introduction and application of ideas, processes, products or procedures in the role, groups or organizations that are new to the relevant department and have significant benefits for the individual, group, organization or wider society [21]
<i>Green Paper on Innovation (1995)</i>	Necessary step towards putting (perhaps better application) of new and improved products, services and processes on the market. It includes not only the technological part, but also organizational, managerial, commercial and training requirements that contribute to the economic competitiveness of the company and thus the regional economy, to which it belongs [5]
<i>Crawford & Di Benedetto (2005)</i>	Common understanding of the concept of innovation; "changes in the industry, particularly in the technological development and their application in products, production processes and services" [2]
<i>Christensen (1997)</i>	Innovation is a condition that goes from disturbing existence to somewhat amicable environment [9]
<i>Tureková & Mičieta (2003)</i>	Innovation is the practical transfer of ideas into new products (goods and services), processes, and systems of social relations [19]
<i>21st Century Innovation Working Group (2004)</i>	Innovation transforms insight and technology into new products, processes and services that create new value for stakeholders to drive economic growth and improve living standards [10]
<i>Hamel (2006)</i>	Innovation is a deflection from traditional management principles, processes and practices or a deflection from customary organizational forms that significantly change the way management [6]
<i>Wright (2010)</i>	Innovation is the successful exploitation of new ideas to increase customer value and create wealth for society [22]

customer requirements on delivery of the item. Among the technologies used in transport include transportation information system, global positioning system (GPS), geographical information systems (GIS), radio-frequency communication system, and transportation data register [8].

Innovation transport technologies are used primarily by intelligent transport systems. New sensors, GPS, satellites and other technological innovations help to effectively manage traffic in the town and the region.

According to Schlosser [14], intelligent transportation systems (ITS) are defined as systems that facilitate efficient use of road and urban communication network by using information, communication and control technologies. ITS enables effective pooling of resources and objectives and provides information about the transportation process and integration of multiple modes of transport into a single system. In terms of transport, their field of application is quite broad. For example it involves safe management, electronic assistants uniform speed, progressive navigation systems, on board telematics, and electronic toll systems [14].

With the use of intelligent transport systems security of traffic-transport process, efficiency, quality of transport infrastructure and transport (reducing traffic congestion, preventing accidents, improving the flow of traffic...), access of transport information for individual administrators of infrastructure and transport operators, are all increased. Their application also results in productivity improvement activities of commercial entities using the transport infrastructure. Those areas will contribute positively to the reduction of negative impacts on the en-

vironment, energy demands of transport, the cost of building new transport infrastructure, developing economies of the transit period, ensuring rational decisions making and subsequently better traffic management. All of these contributions of intelligent transport systems were reflected in operators in the region and create a suitable environment for tourism, inward investment into the region, new workforce, improve the quality of services provided, whether for transport or trade.

4 Empirical research – the situation in the Slovak transport businesses

Our research was conducted from May 2009 to March 2011. The primary purpose of the research was to obtain and interpret information by 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 and dealing with transport. Research objects (the final respondents) were the senior managers and middle level management of transport businesses. The research involved 53 respondents of medium (92.45%) and large (7.55%) transport businesses operating in Slovakia.

To the research were involved transport businesses with different dominating business concept. Most of them were 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. Customer plays a key role in planning their business activities.

49.06% of respondents from transport businesses record some

innovative ideas and if necessary use them, what is a positive fact. Moreover, 43.40% of surveyed managers of these businesses reported that their innovative ideas in business are always generated from scratch if necessary. Lastly, 11.32% of respondents used to analyse innovative ideas generated by groups. As a negative fact may be regarded that none of the interviewed transport businesses have developed a system of evaluation of innovative ideas, which is necessary for successful implementation of innovative activities.

Among the innovative activity that transport businesses are most involved in include training for innovative activity (64.15%), obtaining of modern machinery, equipment, PC hardware and software (49.06%), obtaining external knowledge (35.85%), as well as doing internal research and development (26.42%). On the contrary, unapplied innovative activities include activities aimed at innovation of market and external research and development (only 1.89%) (Figure 1).

Up to 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 the lack of appropriate environment conducive to development of innovation (30.19%). As a minor problem managers considered 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.

5 The level of preparedness of transport businesses for the implementation of innovative activities

We investigated the level of preparedness of transport businesses in the use of innovative activities, by developing Preparedness Index. For internal purposes (monitoring of improving innovative processes, marketing staff motivation, reward system . . .) it is very useful to have a value that represents the overall level of preparedness for innovative activities.

In determining the index of preparedness we used calculation methodology. It is a same principle that is applied in the calculation of the customer satisfaction index. Two measured values (importance and performance) are entered into the calculation. The proposed methodology in preparedness index is suitable not only for assessing the level of preparedness for the implementation of the transport innovative activities but also for assessing the level of implementation.

The first step of measuring the preparedness of transport businesses for the implementation of innovative activities is the formulation of the appropriate elements (criteria). Based on these criteria, their importance and assessment of compliance, it is possible to ascertain to what level the transport businesses are ready to implement where the areas for improvement are, what the priorities are, and which elements are most important from the perspective of managers in the application of innovative ac-

tivities. The key elements are: work with innovation and knowledge, organizational structure, pro-innovation environment (climate), innovation management and managers, lateral thinking and innovation strategy.

To calculate the index of preparedness of the transport business for the implementation innovative activities requires the calculation of weights (v).

In calculating the weights based on the degree of importance:

$$v_i = \frac{w_i}{\sum_{i=1}^N w_i} [in \%] \quad (1)$$

where:

v_i – weight of the i -th element

w_i – rate of the importance of the i -th element

N – number of elements affecting the successful implementation of innovative activities

Rate of the importance of the i -th element (w_i) represents the importance that managers attach to the concerned element due to its impact on the use of innovative activities.

Weight of the i -th element (v_i) is the significance / power with which the element contributes to the total length of the importance of all elements.

The level of preparedness for the implementation of the transport business innovative activities (preparedness index) is calculated by the following formula:

$$Ip_i = \frac{\sum_{i=1}^n v_i x_i}{10 \sum_{i=1}^n v_i} \quad (2)$$

where:

Ip_i – preparedness index i -th transport business

v_i – weight of i -th element

x_i – performance achieved in the i -th element

10 – refers to the use of scale (scale of 1 to 10)

n – number of elements affecting the successful implementation of innovative activities

Index of preparedness i -th transport business (Ip_i) refers to the degree of preparedness of business in implementing innovative activities, what is due to the current state of the business situation and the scope of the key elements in the use of innovative activities.

Performance achieved by the i -th element (x_i) is the level of fulfilment / achievement of a key element in the business. The overall preparedness index is the average of all individual indices of preparedness.

Using preparedness index aims to achieve gradual improvement by reducing the difference between the degrees of importance of various elements and evaluating their performance.

One of the objectives of the research was to determine the overall preparedness of the application of innovative business activities. Managers of transport businesses have at their

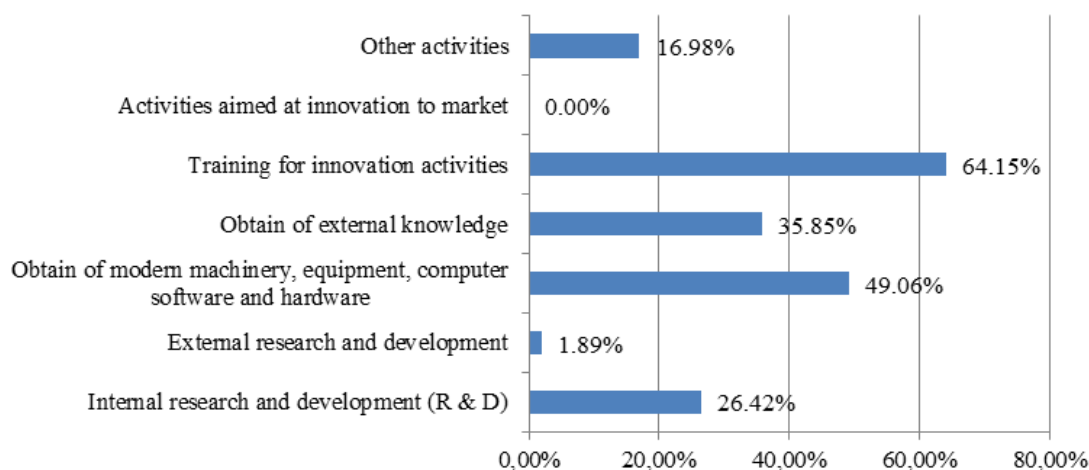


Fig. 1. The level of realized innovation activities (Source: own research)

disposal the following elements on which its performance is evaluated: working with innovation and knowledge, organizational structure, pro-innovation environment (climate), innovation management and managers, lateral thinking and innovation strategy.

They also have the option to assign to each element of the degree of importance, respectively set priorities. The highest priority was assigned by managers of transport businesses to lateral thinking elements (8.00), in working with innovation and knowledge (7.77), pro-innovation environment (7.66), in innovation management and managers (7.60). Conversely, the lowest priority they put to the innovation strategy (7.02) and organizational structure (6.85).

As it can be seen in Figure 2, no event exceeds the performance evaluation of managers' priorities of transport businesses, which we consider to be unacceptable, especially when it comes to implementation of innovative activities. In all cases, we can see areas for improvement. The most notable differences are the elements of lateral thinking, pro-innovation environment and innovation management. On the other hand, there is an element of the organizational structure of an ideal state.

The overall preparedness index of transport businesses for the implementation of innovative activities is 59.12%. The highest achieved level of preparedness was 82.79% and the lowest, in contrast, only 32.77%.

Tidd et al. [17] and Lesáková [12] believe that, based on research in organizations with existing systems support / development of innovation, it is possible to identify certain stages on the path to building a successful innovative organization. Tidd et al. [17] distinguish five basic levels from the unconscious involvement of business in innovation to the highest level of full, high involvement in innovation. In this case Tidd says about learning organizations the following

Every business is located at a different level of preparedness

in implementing innovative activities in business. When we were creating different levels of preparedness of business, we started from the breakdown, according to Tidd et al. [17]. However, other data sources were from scientific works of foreign authors working in the field of innovation management, knowledge management, and learning organizations.

Also, the basis for creating different levels were results obtained in own research of diagnosing the level of application of innovation activities in businesses operating in Slovakia, interviews with their senior managers, as well as discussions with experts at universities and colleges in Slovakia and the Czech Republic aimed in the field of innovation.

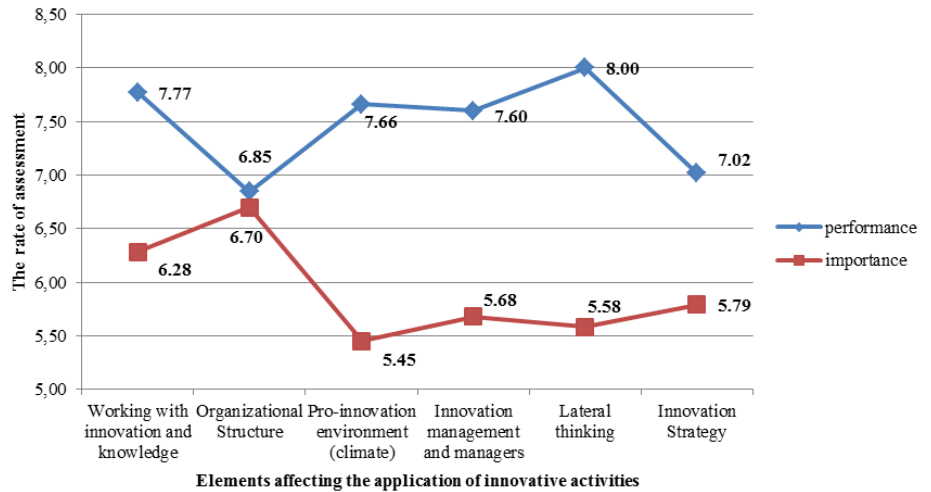
On the basis of the analysis and research, we propose five-speed breakdown levels of preparedness for the implementation of business innovation activities:

Chaotic level of preparedness is responsible to business that has not a primary interest in working with innovation and generates innovative activities. Management has no specific idea about the work of innovation in the business. A business does not register inventions and innovative opportunities. The business follows the usual routes and does not develop new initiatives. What often does not work is the communication in the business, and management staff does not know the vision of the future of the business either. This level also features an unsatisfactory organizational structure.

Insufficient level of preparedness is responsible for business, in which can be seen the inceptions of the efforts to work with innovation. The management has got a specific idea, but that is not included in long-term business plans. Invention and innovation opportunities are already recorded, but without a consistent approach. Employees are aimed at meeting the specified tasks. This level is characterized by organizational structure with a lack of information flow security.

Acceptable level of preparedness is responsible for business

Fig. 2. Profile of the performance of innovation activities in the transport business (Source: own research)



that meets the minimum level for the implementation of innovation strategy. The management of innovation involves long-term plans and commitment of necessary resources for their search. New innovative ideas are registered in the business. Otherwise employees try to find a solution. In terms of organizational structure, there are still problems in sphere of secure business communication.

High level of preparedness is responsible for business, which is on track to become the top innovator. Management supports the work of innovation and determines the future direction of innovation. The business will keep reliable registers on the state of inventions, innovative opportunities, and innovation. Employees make full use of their imagination and creativity. Within the organizational structure works there is a secure flow of information as well as effective business communications.

Excellent level of preparedness is responsible for business, which we can move to a group of top innovators. In some key elements of an innovation strategy they achieve the best value. Innovation management fully supports the work of innovation and is actively engaged in the work of employees. In the business, there is sophisticated system of work with innovations, including their recording. Lateral thinking is most often applied to solve the problems. Pro-innovative corporate culture and organizational structure creates a favourable environment for further progress in the field of business innovation.

To determine the level of preparedness, we used a comparative table. The following table expresses a clear way to point intervals required for inclusion in the transport business into one of five levels of preparedness.

As it is shown in Table 2, most of the businesses are located in an acceptable preparedness level (64.15%). These businesses have a good basis on which they may improve through systematic implementation of innovative activities. Large group of transport businesses are located in the chaotic (13.21%) and insufficient level (15.09%), which is perceived as a negative fact.

These transport businesses have to choose to hold strategy. Firstly, It is necessary to take action that will lead to higher,

acceptable levels. We have identified the measures leading to higher levels in the following chapter.

On the bright side 7.55% of surveyed transport businesses showed a high level of preparedness.

6 Recommendations and discussion

The carried out analysis and empirical research can now proceed to the formulation of the main recommendations, which aim to help managers of transport businesses to the successful implementation of innovative activities in their businesses. To managers of transport businesses can be recommended:

- carry out detailed analysis of the current situation in the transport business,
- good mapping of innovative potential and correct specification of the innovative requirements,
- correctly set up an evaluation system and rules,
- ensure regular communication with employees,
- identify and constantly update innovation processes,
- (show) evidence of innovative ideas and opportunities, including those which the business currently does not apply,
- ensure a smooth flow of required information for innovative ideas, opportunities, and innovations in real-time,
- consider the use of IT applications for gathering and storing important data in a common database,
- carry out detailed analysis of the business's innovative capacity,
- develop an incentive program to encourage the use of innovative potential of employees,
- improve the conditions of the working environment to create pro-innovation climate,
- (adopt) staff training in the use of creativity,
- (adopt) a clearly defined set of metrics and enable better set of measurable goals and allow for more efficient management of the relevant parts of the business that affect its innovative approach,

Tab. 2. The level of preparedness of transport businesses for the implementation of innovative activities by comparative table

Level	Preparedness Index (range in %)	Number of businesses	In %
Chaotic level	0 – 40	7	13.21 %
Insufficient level	41 – 50	8	15.09 %
Acceptable level	51 – 80	34	64.15 %
High level	81 – 90	4	7.55 %
Excellent level	91 – 100	0	0 %

Source: own research

- the set of metrics must be based on the main priorities in the management of innovative business activities,
- place innovations into long-term plans of the transport business,
- set concrete ideas about working with innovations in the transport business, including how to achieve it.

The above recommendations were formulated based on the results of interviews of managers of successful Slovak businesses within the project VEGA 1/0992/11 2011-2013 “*Cooperative management - effective approaches to gain competitive advantage.*” These results were compared and supplemented by the results of scientific research and other work such as *Manual of evaluation of the innovation performance* made by experts from the Technical University in Brno, *The key attributes of successful innovative organizations* developed by prof. Lesáková from Faculty of Economics, University of Matej Bel in Banská Bystrica [12].

For the purposes of assessing the level of preparedness of businesses for the implementation of the innovation activities we developed a detailed methodology that can be used as a tool for further evaluation in other conducted research. On the other hand, we realize that it is a methodology that we developed based on our experiences and especially thorough the analysis and synthesis of knowledge in the area of the innovation activities derived from domestic and foreign scientific literature. Therefore, the characters can be subjective. For further application it will be required to verify the form of public debate and wide professional experience in innovation, marketing and management. For this purpose in the future we plan to speak with experts at universities and colleges in particular Poland, Lithuania, Austria and Germany. The correctness of the selected level can be checked and also a more detailed empirical research can be conducted.

Research results obtained the basis for creating the content of level and determination of scoring. Mostly interviews with top managers helped to obtain a more comprehensive view of the implementation of innovation activities in order to identify key areas affecting the creation of conditions (opportunities) for their implementation and realization in the business.

The different levels of preparedness have been designed to clearly state the different developmental statuses in reaching the highest levels of implementation of innovative activities. A similar approach can be seen even in the case of the maturity levels form model CMM (Capability Maturity Model), which emerged

in the Software Engineering Institute Carnegie Mellon University, Pittsburgh in the beginning of the nineties of last century [13].

Methodology developed represents a valuable tool for business managers in the implementation and subsequent application of innovative activities. It can also be used as tool for a self-assessment. Management gets the evaluation of the level of preparedness to be implemented in the innovative activities in the business, identify weaknesses in the business in this area and conducted to reveal the scope for further improvement. By using the proposed methodology, we can also see in the form of a control tool during the implementation of innovative activities. The aim of the business marketing should be continuous product improvement, transfer of new ideas, vision and emotion into them and enter them on the market yet unopened areas where they develop to meet new customer needs. For this purpose, it will help the innovative activities. For their successful implementation, at least an acceptable level that ensures the use of its key elements is still needed.

7 Conclusions

Transportation businesses are facing management problems of enhancing operation efficiency at limited resources [3]. Organisations – among them transport and logistics businesses – shall continually evaluate the costs spent on innovation and on the basis of these data then decide whether to continue with these innovations [1]. Currently, most transport businesses are aware of the significance and importance of innovation activities. Almost every business is forced to approach innovation, not just products and services, but most processes. Effective management of innovation processes encourages innovative activities in business and will bring it expected results in the future. New innovations from new technologies, methods and opportunities can bring significant benefits to any business [18].

The carried out analysis (literature, empirical research) brought the facts from which were showed the problematic areas that affect the use of innovative activities in the transport businesses. For smoother application of innovative activities we made recommendations, which represent a valuable tool for managers. Recommendations are to be deployed not only to reduce the likelihood of problem areas and to prevent them, but also as a tool for improving innovation processes in the transport businesses.

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