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Corresponding author: jelena.grujic@fpssp.edu.rs

IMPACT OF RISK FACTOR ON THE EFFICIENCY OF INDUSTRIAL SUPPLY CHAINS

Jelena Grujic

Faculty of Information Technology and Engineering, University „Union - Nikola Tesla“,
Beglrade, Serbia

Mirjana Puharic

Faculty of Information Technology and Engineering, University „Union - Nikola Tesla“,
Beglrade, Serbia

Ivana Ilic

Faculty of Information Technology and Engineering, University „Union - Nikola Tesla“,
Beglrade, Serbia

Abstract: The subject of this paper is the study of industry efficiency and the risk factors that occur during supply chains. This research includes employees from four industry that operate in Republic of Serbia. The study of risk in different industries aims to provide high quality and maintenance continuity of management of supply chains, efficient management of supply changes in the companies environment. Ineffective and risky supply chain can directly affect all participants in the distribution processes. This in regard, the essence of the paper is to identify factors which influence effectiveness and risks in industrial supply chains and to classify factors in four categories and assess their impact using the Delphi method. The paper will present the guidelines for the supply chain management of risk factors in different industries.

Keywords: risk factor, industrial, supply chains, efficiency, enterprises.

INTRODUCTION

The worldwide market is a high tech and profitable market that is constantly evolving. Changes in enterprises are intense, the competition is great, which carries a huge risk, and companies have no choice but to adapt its operations to market demands and change their business in accordance with the needs of their users. supply chains operate across more legal jurisdictions and economic systems; and deal with labour pools with different talent levels, work rules, and wages. They also operate with transportation systems varying in efficiency and cost; and face different risks in economic stability (Walter &Goldsby, 2020). Enterprises faces some of the tough challenges in the supply chains.

Supply chains are complex and compiled from entities such as enterprises and employees, logistic organizations, distributors, costumers, governmental institutions and others. Risks are present at all levels, when new supply channels is going to be made in some processes, also when we try to improve those who already exists and then after all to place new product into the market for final customers. Products can be made, distributed out of ingredients sourced from different countries and organizations. We can conclude, that if we have larger amount of participants in industrial supply chains, much more risks will occur. The quintessence of the paper is about the assessment of the potential risks in the industrial supply chains. Risk management is a critical concern to supply chain professionals, and in recent years it has taken on an even greater significance (Hadway, 2018). This research is based on risk management which is extremely important for enterprises as they face many challenges in the market especially when it comes to supply chain. Improving cooperation within a supply chain, should be grounded on the eliminating factors, that have negative influence in industrial supply chains. Consequently, the beginning of research is to identify the risk factors from literature review. Then, thankfully with an experiences of employees from industries, we can evaluate these factors for their future analyses and treatment. The entities that are the subject of research are employees in different industries. The essence of this study is in identification and solution of problems caused by the negative impacts, before an incident occurs. Besides business and financial problems, identified risk factors directly affect the supply chain and we must gather them to make improvement and solve problems in industrial supply chains.

1. EXAMINATION OF INDUSTRIAL SUPPLY CHAINS

Survey of the industrial environment, which took place inside and outside their enterprises, is necessary for consideration about the product supply channels of enterprises. The information is obtained from data, facts, trends and attributes from active supply chains and their elements, process, people, environment. It is important to critically examine both the internal and the external environment of enterprises, and above all the organization's abilities, in terms of resources and expertise, established business processes, knowledge of the objectives of the company, accepted values and culture, accepted standards and reference models of industrial supply chains.

Enterprises also face many risks when it comes to research and development of new products. The projects of supply chains that are mostly represented in industries are oriented to the introduction of new products on the market. Innovation is creating the required new products, processes and systems for adapting and changing technologies, markets and models of competition (Dougherty & Hardy, 1996). Industries need to constantly launch innovations, and consequently improve their

technological development. The thing that mostly follows most enterprises is the uncertainty in the field of new technologies, markets and competition. Enterprises should go in step with the development of technologies, to answer for demands and quality, provide security, so it is necessary to develop efficient supply chains.

Some of the risk factors that influence the industrial supply chains are poorly prepared plan of activities, problems with costumers, qualified staff in enterprises, hasty decision making, poor allocation of time and resources, lack of discipline, unrealistic and incomplete assessment regarding the market, poor communication between stakeholders and managers of companies, insufficient control of product. It is not enough to manage the risks, but it is important to detect potentially hazardous on time (in planning activities phase), and thus it is possible to change the existing targets of enterprises. Many characteristics of employees may be important in this regard, including individual skills and abilities, knowledge, influences, behaviour, and other processes. Therefore, the performance outcome of chain members depends on the nature of exchange patterns that emerges from their chain participation (Kataike et al., 2019).

2. RESEARCH DESIGN AND METHOD

Two methodologies were used within the research of industrial supply chains. One is a systematic literature review and other is Delphi method. To categorize and prioritize risks in supply channels, two methods were used. Systematic literature review and the Delphi method were used for acquiring employees judgement for importance of identified risks.

2.1. Identification of risk factors

Due to a market surroundings, enterprises are required to analyses dependency between supply channels and identify potential risk factors. In this research, first significant step is identification of risk factors in the supply channels of companies. It is necessary to determine what risks may have an impact on the current industry channels, or on the realization of activities during the establishment of new and improvement of existing supply channels and which may not.

Identifying risk factors is done on the basis of research of literature and through the practical consideration of the work process in agricultural, automotive, electrical and textile industries that do business in Serbia. Risks are identified based on research of the business environment of four industrial supply chains. Analysing the environment of enterprises has obtained information about the internal and external threats, so on that basis the risk categories have been made up. A total of 32 risk factors in the industrial supply channels have been identified, after which they were classified into categories. Risk identification involves risk factors and their grouping by category to which they belong is shown in the tables 1. and 3.. The categories that

serve as a conceptual framework for classifying risk factors are process management risks in enterprises, risks of law, economic and legal structure, risks of logistics, risks of safety standards.

The problems which appears in the distribution of goods and services are very well documented in the available literature. So, literature that covers a wide range of topics related to supply chains was included. Employees judgment is an fundamental step in the process of validation risk factors related to supply chains, there are issues related and covering industry in four areas. Risk factors that are directly related to supply channels will be identified and confirmed through the Delphi method.

Table 1. Risks grouped by categories

RISK CATEGORIES	DESCRIPTION OF RISKS
Process management risks in enterprises	Effectiveness of the organization's structure and processes, and management strategies (Akerboom & Beyond, 2007).
Risks of law, economic and legal structure	Top management initiatives and compliance with laws, economy and legal structure must be the main drivers to supply management functionality efforts and procurement of licenses (Giunipero et al., 2012).
Risks of logistics	Logistics is all about managing the flow of materials and information from source to customer across the entire range of materials handling and movement functions and throughout an organization and its supply channels (Hughes et al, 1998).
Risks of safety standards	Management of safety standards refers to the development of the work plan of risk management related with Safety and Health at Work (Niles, 2013).

2.2. Delphi method

Examination of the risk factors in this study is done by Delphi method in four industry sectors. Examination of the environment of enterprises in agricultural, automotive, electrical and textile sector has been done firstly, then identification of risk factors, which is the basis for further research in industries and application of Delphi method, which is the main mean of risk examination in this study. Application of Delphi method by which the data from employee staff in enterprises is collect, is

about the impact of risk on the industrial supply chain. Implies preparation of the questionnaire, survey of professional associates via e-mail and verbal consultation regarding the results obtained, summarizing the data obtained, and removal of non-conformities in the obtained data, the preparation of a new questionnaire and consultation with associates, obtaining the final results, the creation of a register of risk factors.

All participants in the present study of estimation of the risk factors in the enterprises have years of experience in work. The Delphi technique is useful for studying a wide range of research questions; it has been utilized for cultivating data and information about a topic by documenting expert or stakeholder views, recording or exploiting collective knowledge that is shared among groups of professionals, and facilitating new ways of thinking about problems and potential solutions (Franklin & Hart, 2007). Employees who did the questionnaires had higher education and the necessary skills. Participants have been selected to participate in the study of risk assessment in the supply channel, as they correspond to the set conditions by their qualities, and can contribute to the development of this research field by their knowledge and experience. In this step, a questionnaire was used as a means of collecting data, because it was the most suitable for the assessment of risk factors in four industrial supply chains. This way data were obtained from various sector that operated in Serbia. The questionnaire consists of 32 risks divided into 4 categories. The questionnaire was answered by employees of enterprises in the range from 1 to 5, where a score 1 indicated that a risk factor does not affect the supply chain, and a score 5 that risk factor has a very large impact on the supply chain. Explanation for each assessment is in table 2.

Table 2. Explanation of impact assessment of risk factors on industrial supply chain

Risk impact	Observations of the risk impact	Risk assessment
No impact	The risk has no impact on industrial supply chain	1
Small impact	The risk has small impact on industrial supply chain	2
Middle impact	The risk has a moderate impact on industrial supply chain	3
High impact	The risk has a high impact on industrial supply chain	4
Very high impact	Risk has a very high impact on industrial supply chain	5

After interviewing professional associates of four industrial sectors we obtained the results of the assessment of risk factors in supply channels, which are then reconciled, and a final score of each individual risk was obtained. With the correction of non-conformities that have arisen in obtaining the results of the first questionnaire. Repeated questionnaire was filled in by employees from all industry. Reconciliation of the results implied that the respondents who at particular risk assessment gave the assessment that dramatically differed from other subjects, should fill in an additional questionnaire that would serve the purpose of correcting and reviewing of their opinions. Risk factors with approximately the same ratings did not have further examinations. This procedure is repeated twice. After adjustment results, the final summarizing of the results was done. The final results were obtained by calculating the average values of each risk (results shown in table 3.). The average value was calculated on the basis of the assessment of risk factors of the employees associates.

3. RESULTS AND DISCUSSION

This research used Delphi method to investigate 38 employees in four industries. Purpose of research was to get opinions from experts about impact on factor of risks at supply chain, what is accomplished through interviews and questionnaires that were conduct. Result of research brings separate assessment for all risk factors in categories (table 3.). After data were summarized it is need to explain results and they will show which risk factors have biggest influence at distribution of drugs. Risk factors that have been rated above 4.5 (very high impact) are:

- (i) Lack of product quality control (4.73)–Risks of law, economic and legal structure
- (ii) Badly built network of supply chain (4.73)–Risks of logistics
- (iii) Long time product delivery (4.64)–Risks of logistics
- (iv) Problems with inventory (4.64)–Risks of logistics
- (v) Brand unrecognizable (4.55) – Process management risks in enterprises
- (vi) Changing regulations (4.55)–Risks of law, economic and legal structure
- (vii) Political influences in the country (4.55)–Risks of legal, economic and legal structure
- (viii) Non-existence law of safety and health at work (4.55)–Risks of safety standards

The research has shown that companies face mostly the problems of lack of product quality control and badly built network of supply chain, so that these risk factors have great influence on industrial supply chain. Enterprises in those industries follow strict legal and economic framework, and therefore are faced with a multiplicity risk factors in the distribution of products related to lack of product quality control. Quality is one of the most important factors in a company's relationship between suppliers and customers. In a supply chain, the product quality

depends on not only its manufacturer but also the suppliers that offer the raw materials (Yan, 2020). The responsibility of enterprises should be in an extremely high level, when it comes to law enforcement, especially when it comes to lack of product quality control, changing regulations, political influences in the country and bad financing of marketing campaigns. Industrial supply chains are faced with many competitive and economic risks that affect the social environment, like different lobbies from many companies, breaking to market with lower price of products, making sure of keeping information safe from foreign influence. Market offers many different variations of same products, that in fact has no effect to the problem but only lower price. Enterprises are faced with risks related to logistic and security. This implies the determination and implementation of safety protection at work, a policy of controlling the supply channels, as well as procedures that enable wellbeing of industrial supply chain. The purpose of security aspect is to improve understanding of risk factors from the point of probability of risk event emergence, and from the point of its size and scope of the impact to industrial supply chain. Logistics of companies is the process of planning, organizing and controlling the flow of materials and information from the company, through wholesalers and employees, to the users / consumers and there appears significant risks. Distributing products is of great importance, because without a well-developed supply network industry cannot thrive. Risks in this area vary depending on the stakeholders to which enterprises cooperates. Enterprises are faced with organizational risks such as lack interpersonal skills and competencies of employees. Organizational risks in the company include all those factors relating to organizational processes in enterprises. When we speak about organizational factors of risk, we think of about poor quality of stuff. If workers in companies have no knowledge and some skills for distribution product, it may happen problem: like stagnation in transport, bad communication with others participants of distribution, decreasing value of respect for company, misleading information of product, lack of training with other workers, not possible to present products and many others... It is necessary to improve employees' interpersonal competencies, skills in empathy, customer service capabilities, communication skills, problem-solving skills, product knowledge and perspective-taking skills to help employees attain customer trust and loyalty (Liao, 2007; Liao & Chuang, 2004). It is need to overview all organizational factors of risks which are parts of an interactive process and their influence on the environment.

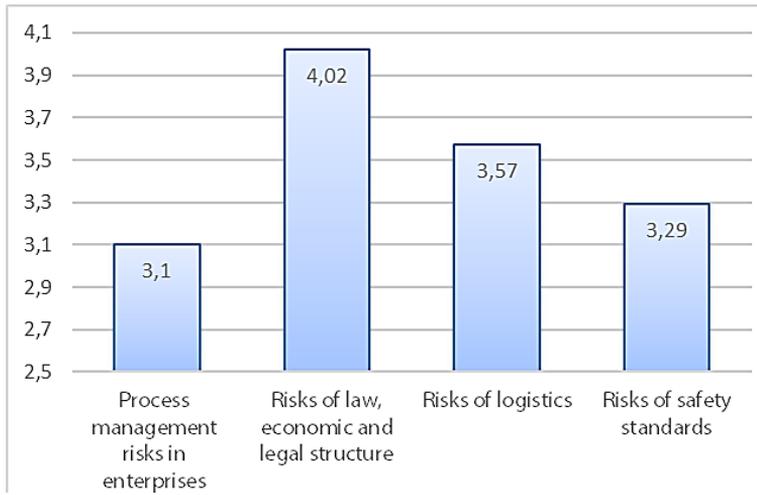


Figure 1. Results of the research of risk by category

Analyzing the areas in which the risk factors were grouped, we came to the conclusion that risks of law, economic and legal structure (4.02) were the subject to the successful supply chain management and that they should be given the highest attention. Category which also have received high coefficients is risks of logistics (3.57). Risk factors in Risks of safety standards (3.29), category have importance but not crucial significance for industrial supply chain. Risks grouped process management risks in enterprises (3.10) category are shown to have the least impact on industrial supply chain and they have minor influence. Results of the research of risk by category are shown on the figure1.

Table 3. Research results

RISK FACTOR	RISK ASSESSMENT	
1. Poor design of products	3.25	Process management risks in enterprises
2. The lack of ideas and innovations	2.18	
3. Inadequate coordination of professional staff	3.55	
4. Brand unrecognizable	4.55	
5. Lack interpersonal skills and competencies of employees	4.09	
6. Personnel change in team	2.18	
7. Poorly established channels of employees	3.00	
8. Personal conflicts between employees	2.00	
1. Lack of product quality control	4.73	Risks of law
2. Changing regulations	4.55	
3. Poor economic conditions of the individual	3.45	

RISK FACTOR	RISK ASSESSMENT	
4. Political influences in the country	4.55	
5. Lower price of competitive product	3.45	
6. Bad financing of marketing campaigns	4.09	
7. The appearance of substitutes	3.64	
8. The emergence of competing companies	3.73	
1. Unfavourable location	3.45	Risks of logistics
2. Problems with work at a particular location	2.00	
3. Inability to complain on the product	1.64	
4. The lack of the necessary amount of product	3.73	
5. Lack of necessary quantities of product	3.73	
6. Long time product delivery	4.64	
7. Problems with inventory	4.64	
8. Badly built network of supply chain	4.73	
1. Non-existence law of safety and health at work	4.55	Risks of safety standards
2. Not verified equipment and assets	3.43	
3. The use of unsafe means for work	3.27	
4. Injuries violations of employees	2.53	
5. Environmental risks	2.32	
6. Emergency management	2.00	
7. Lack of technical equipment	4.09	
8. Loss of access to information structure	4.09	

CONCLUSIONS

The paper analyses the risk factors that include the industrial supply chains. The strategy of introducing this concept is primarily designed to reduce as much as possible the negative effects of risk factors that are present industrial supply chains. In a study of supply channel the opinions of employees associates who are direct participants in the distribution of product on the market are obtained. Studying other possible influencing factors from the viewpoint of purchasing and supply management, as well as the overall influence of the purchasing and supply management function when compared with the other functions of a firm (Lintukangaset al., 2019) one of main topic of this research. The aim of this research is establishment of risk management which means identification, assessment of the intensity and scope of risk, monitoring and control and / or prevention of those risks fully or partially disrupt or may disrupt the normal functioning of industrial supply chains The essence of the management of risk factors in industrial supply chains is the effective management. The study of risk should be primarily to help the companies to gain insight into the industrial supply chains. Analyzing the risk factors

in industrial supply chains has advantages, such as reducing unnecessary losses, maintaining business continuity, flexible response to changes in distribution channels, maintenance of quality business.

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