
Analysis of Risk Factors in an Indirect Distribution Channel

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Abstract:

Purpose: The article aims to present an analysis of risk factors in an indirect distribution channel.

Design/Methodology/Approach: The research methodology used are indicators that enable the analysis of risk factors in the distribution channel. The results obtained by the FMEA method enabled the use of the preventive mechanisms method in the enterprise. The purpose of using the FMEA method is to characterize the most dangerous risk factors in the surveyed entities, which will be most felt by the organization in enterprises.

Findings: Numerous risk factors can arise in a network of indirect distribution channels. The applied FMEA method identified which risk factors are the most dangerous for the organization regarding probability, detectability, and significance of the risk factor. The results obtained from the FMEA method made it possible to develop preventive mechanisms for the examined company and thus reduce the possibility of risk factors.

Practical Implications: Over time, new risk factors may appear, so you should constantly monitor and analyze disturbances using the FMEA method that allows you to manage risk factors. Enterprises that are part of an indirect distribution channel should develop preventive mechanisms to ensure an efficiently functioning organization.

Originality/value: The studies showed that the magnitude of the effect and the probability of risk factors depend on the first activity performed in the distribution network up to the last link of the supply chain. It is also influenced by the continuity of the consequences of a given occurrence of a risk factor. The obtained data is the basis for risk management for distribution entities.

Keywords: Analysis of risk factors, FMEA method, indirect distribution channel.

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Paper Type: Research study.

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1. Introduction

Each company wants to have the appropriate clout and gain a stable position on the market. Managing an enterprise belonging to an indirect distribution channel is a complex process. Finding qualified employees, finding reliable suppliers, and acquiring regular customers is key in creating a well-functioning company.

This article aims to present an analysis of risk factors in an indirect distribution channel. The applied FMEA method identified which risk factors are the most dangerous for the organization regarding probability, detectability, and significance of the risk factor. The results obtained from the FMEA method made it possible to develop preventive mechanisms for the examined company and thus reduce the possibility of risk factors.

Risk is a crucial part of every project performed in logistics companies. In the indirect distribution network, the probability of a risk factor occurrence is high. Therefore the key aspect in dealing with threats is their constant analysis, which enables the management of risk factors.

2. Indirect Distribution Channel

The greatest goal of every enterprise is to make a profit and have a stable market position. Achieving both of the above goals is a long-term process that is influenced by many factors. In most cases, production is located in a location other than that of the final buyer. Then there is a problem with ensuring the availability of products at the place and time required by the consumer (Kauf *et al.*, 2006). To counteract this type of problem, a solution was found, which is the creation of distribution centers, which enable the presence on the market of manufactured goods and services, as well as their sale (Frankowska and Jedlińska, 2011).

According to Philip Kotler, distribution is a profit-oriented activity that includes planning, organizing, and controlling the way of moving finished products from their production places to the places of sale to final buyers (Kotler, 1994). The main tasks of distribution include delivering goods ordered by them to customers in predetermined places and times, at terms and prices acceptable to both parties (Czubala, 2001).

Easy and possibly quick product availability is a key factor influencing the volume of demand. Distribution channels create paths and routes through which products and all services can go from the producer to the final buyer. Distribution channels allow companies to reach customers while maximizing revenues and reducing the number of transactions to the required minimum.

The distribution channel's main goals include the elimination of discrepancies in place and time, quantity and range, quality, and price that separate products from

their end consumers (Śliwczyński and Koliński, 2014). The basic streams in the distribution channel are (Śliwczyński and Koliński, 2014):

- market information,
- sale,
- negotiations,
- orders,
- products,
- payments,
- ownership,
- risk.

Distribution channels are all links through which the flow of goods and information between their producer and the final consumer is possible. The selection of the appropriate channel is a key-value that may determine the shaping of the market position and its strategies.

We distinguish between direct and indirect distribution channels. An indirect distribution network channel is composed of the producer, broker, intermediaries, and the customer. Thanks to them, it is possible to reach a wider audience through their own products in a greater number of distribution and sales points. The key tasks of intermediaries include transforming the produced material into a commercial product. The producer can achieve significant profits while limiting the number of transactions and the continuity of sales, which he achieves thanks to intermediaries' use (Czubała, 2001).

3. Risk in the Distribution Network

Risk is a critical part of human life. There may be a risk factor at any time when we perform a logistics activity. When doing new activities, consider what to do and what to do to choose the best solution and get the highest possible benefits. The word risk comes from the Italian "risico." According to the dictionary of foreign words, the risk is defined as "the danger that something bad or unpleasant will happen in a given action" and as "responsibility for obligations, especially financial ones." According to Frank Knight, the risk is a measurable uncertainty (Knight, 1921). He believed that the statement that risk may occur when we have the possibility to estimate the probability of the occurrence of certain events was correct (Kulińska, 2011).

The risk may arise from the result of certain actions or the uncertainty of future events. As the uncertainty of the future situation increases, the risk level also increases (Crane *et al.*, 2013).

Risk management consists of several stages for the comprehensive management of factors (Kulińska, 2016). Risk management should be deliberate and planned.

Proceed systematically and in the long term. An important factor is integrating all undertakings into a comprehensive organization management system (Kulińska, 2011).

Risk factor categories can be distinguished according to the processes in which they occur, e.g., in the network of an indirect distribution channel. Take-offs are incurred due to improperly defined procedures, absence, or non-compliance (Bourque, 2003). According to Brown and Chong, the risk management system consists of four stages (Brown and Chong, 2000):

- identification,
- classification,
- analysis,
- risk response.

The main problem in risk management is to characterize the location of the risk factors and their characterization (Giera and Kulińska, 2019).

4. FMEA Analysis of Risk Factors

The FMEA (Failure Mode Effect Analysis) method is a method that analyzes the causes and effects of defects, the possibilities, and the effects of defects. The purpose of FMEA analysis is (Folejewska, 2010):

- preventing faults,
- detection of probable threats,
- selection of research control measures,
- establishing cause and effect relationships in the defects,
- minimizing the effects of defects,
- selection of alternative solutions,
- improvement of security,
- action allowing for continuous improvement of processes.

The FMEA method can be performed for the entire technological process or a particular operation. The tests are performed at the design stage before starting production. An interpretation can be made for the entire product or its individual components and after use. The analysis can be performed in any product life process (Rusecki, 2018).

To perform FMEA analysis, errors, effects, and causes of their occurrence must be identified. Each of these factors must be scored with an appropriate score on a scale from 1 to 10. It will be used to calculate the risk level ratio known as the WPR:

$$WPR = Z_n * C_z * W_y \quad (1)$$

Where:

Zn - the significance of the error to the customer,

Cz - the probability of the risk factor,

Wy - risk factor detectability.

5. The Research Company

A logistic audit was carried out in a company dealing with the production and distribution of parts for trucks, vans, trailers, and buses. The order fulfillment process for automotive equipment parts is distributed through several links in the supply chain. One of the domestic branches placed an order from the central warehouse located in Wieluń, and the final recipient of the order is an individual customer. The conducted logistic audit aims to indicate risk factors that may occur during the execution of the contract. Statistical data of the audited entity were used in the logistic audit. The basic assumption is to calculate the risk level factor:

$$WPR = Z_n * C_z * W_y \tag{2}$$

The following criteria were adopted to assess the level of risk factor occurrence:

- low risk – (WPR: 1-17),
- medium risk – (WPR: 18-50),
- high risk – (WPR: more than 51).

Based on the logistic audit, 14 most negatively influencing risk factors in the audited entity were identified. The table (Table 1) shows the risk factors in the distribution process.

Table 1. Risk factors of goods distribution

Risk factors of goods distribution	
Indirect Distribution Process	Risk factors
	Incomplete documentation when placing the order
	System failure
	No detailed data regarding the location of the goods
	Out of stock
	Shortage of workers
	Failure of the order picking machines
	Breakdown of the car transporting the goods to the next link in the supply chain
	Downtime due to waiting for external transport
	Incorrect analysis (estimation) of the driver's driving time
	Incorrect development of the driver's route
	There is no warehouse space to accept the goods
	Incomplete warehouse documentation
	Delivery of an incompletely realized order
	Damage to the goods during the distribution of the product

Source: Own study based on data from the enterprise.

Table 2 presents the statistical data analysis results after applying the FMEA method in the studied enterprise. The starting point is the identified risk factors in the organization. Ratings were given for individual determinations: the significance of the error, the detectability, and the probability of a disturbance for the indicator of the risk occurrence level.

Table 2. Risk factors in a research company

Lp.	Process steps	Potential defect	Potential consequences of the defect	Z _n	Possible causes of the defect	Cz	Preventive actions	WY	WPR
1	Submit an order	Incomplete documentation	Delay in implementation	6	Incorrect flow of information	1	Documentation verification	2	12
	Submit an order	System failure	Order not received	5	IT network problems	1	Redundancy	2	10
									22
2	Warehouse	No information about the location of the goods	No order fulfillment	6	Employee mistake	2	Staff training	3	36
									36
3	Order picking	Out of stock	No order fulfillment	6	Incorrect flow of information in the supply chain	1	Inventory control	3	18
	Order picking	Shortage of workers	Extending the order fulfillment time	3	Failure to adjust the number of employees to a particular warehouse process	1	Work schedule analysis	4	12
	Order picking	Breakdown of machines and equipment for picking	Delay in implementation	5	No technical inspections of machines and devices	2	Machine maintenance	5	50
									80
4	Shipment of the completed order	Failure of the vehicle executing the order	Delay in delivery	6	Failure to check the technical condition of the vehicle	2	Technical inspection of the vehicle	2	24
	Shipment of the completed order	Time delays caused by waiting for a new means of transport	Untimely execution of the order	3	Incorrect estimate of the time of transport of the goods to the recipient	2	Constant contact with the driver	7	42
									66
5	Transport	Incorrect estimate of driver driving time	Financial penalties	3	Traffic accidents	4	Preparation of alternative routes	6	72
	Transport	Incorrect development of the	No means of external transport	5	Employees aren't qualified	2	Development of algorithms for delivery routes	4	40

		driver's route							
									112
6	Delivery	No space for storing the order being processed	Delay in unloading the delivery	2	Inventory management malfunction	3	Assortment rotation	3	18
	Delivery	Incomplete warehouse documentation	Delay in order fulfillment	3	An employee makes a mistake	4	Documentation control	7	84
									102
7	Control	Incomplete order	Reclamation	8	Incorrectly performed control	1	Order control in terms of quantity and quality	2	16
									16
8	Return to warehouse	Damage the goods	Reclamation	7	Improper securing of goods during transport between the various links in the supply chain	1	Lack of qualifications by employees	2	14
	Return to warehouse	Incomplete documentation	Incorrect document flow	5	Incorrect flow of information	2	redundancy	2	20
									34

Source: Own study based on data from the enterprise.

According to the assumptions, the risk factors for which the risk level ratio exceeded 18 points, the probability of the disturbance, and the negative effect size are high. Table 3 shows the impact of implementing preventive mechanisms on the company to minimize risk factors.

Table 3. Risk factors in a research company with the use of preventive mechanisms

Lp.	Potential defect	Actions to improve the detection of the defect	Zn	Cz	Wy	WPR
1	Incomplete documentation	Supervision of an appropriate unit	5	1	1	5
	System failure	Improving the functioning of the network infrastructure	5	1	1	5
						10
2	No information about the location of the goods	Improving the functioning of the warehouse system	6	2	1	12
						12
3	Out of stock	Control of individual links in the supply chain	6	1	2	12
	Shortage of workers	Staff rotation between individual warehouse processes	3	1	2	6
	Breakdown of machines and equipment for picking	Stock monitoring	5	2	3	30
						48
4	Failure of the vehicle executing the order	Penalties for failure to meet the technical requirements of vehicles	6	1	2	12
	Time delays caused by waiting for a new means of transport	Implementation of a system improving the functioning of the distribution process	3	2	4	24
						36
5	Incorrect estimate of driver driving time	Use of transport systems	3	2	4	24

	Incorrect development of the driver's route	Heuristics	5	2	2	20
						44
6	No space for storing the order being processed	Implementation of WMS class systems	2	1	3	6
	Incomplete warehouse documentation	Use of EDI systems	3	4	4	48
						54
7	Incomplete order	Improving the functioning of the supply chain	8	1	1	8
						8
8	Damage the goods	Trainings on the proper securing of loads intended for transport	7	1	1	7
	Incomplete documentation	Coordination of document flow using the EDI system	5	1	2	10
						17

Source: Own study based on data from the enterprise.

Table 4 compares the probability, significance, and detection of the risk factor occurrence before and after applying preventive mechanisms, using the FMEA method.

Table 4. Sum WPR before and after

Risk factor	Sum WPR before	Sum WPR after	Difference
Lack of detailed data on the location of the goods	36	12	24
Out of stock	18	12	6
Failure of machines and devices used in the picking process	50	30	20
Truck breakdown	24	12	12
Downtime in the distribution of goods due to the lack of an external means of transport	42	24	18
Incorrect estimation of the driver's driving time	72	24	48
Incomplete documentation of the goods	20	10	10
Incorrect route of the driver	40	20	20
No space in the warehouse for storing goods	18	6	12
Incomplete documentation of the distributed goods	84	48	36
Amount	404	198	206

Source: Own study.

In order to reduce the occurrence of the above risk factors, preventive measures have been developed. Appropriate prophylaxis has been identified:

- implementation of storage, distribution and supply chain management systems,
- staff training,
- ongoing technical inspections of the condition of machines, devices and means of external transport,
- use of advanced algorithms,
- use of EDI technology,
- control of distribution documentation in every link of the supply chain,
- development of alternative routes for external transport means.

The most important task of preventive mechanisms is to reduce the possibility of disturbances to a minimum. One way to control specific risk factors is to avoid the possibility of their occurrence. The indirect distribution channel network consists of many links, so it is so important to quickly exclude the possibility of a risk factor occurring in the first link of the distribution network.

6. Summary

Many risk factors can arise in a network of indirect distribution channels. The applied FMEA method indicated which risk factors are the most dangerous for the organization regarding the probability, detectability, and risk factors.

Research has shown that the magnitude of the effect and the likelihood of risk factors occurring depend on the first activity performed in the distribution network, up to the last link in the supply chain. It is also influenced by the continuity of the consequences of the occurrence of a given risk factor. The results obtained after applying the FMEA analysis constitute the basis for the development of preventive mechanisms for the examined enterprise, which will enable the efficient functioning of the organization. The obtained data is the basis for risk management for the distribution channel network.

One way to prevent risk factors from occurring is to avoid them. In most cases, less work and money are required when performing preventive actions than eliminating the negative consequences of risk factors.

New risk factors may emerge over time, so you should constantly monitor and analyze disturbances using appropriate risk factor management methods.

References:

- Bourque, W. 2003. Buy Side Operational Risk. Conference Society of Actuaries Conference Investment Risk: The Operational Side, Montreal.
- Brown, M.E., Chong, Y. 2000. Managing Project Risk. London: Person Education Limited.
- Crane, L., Gantz, G., Isaacs, S., Jose, D., Sharp, R. 2013. Introduction to Risk Management, Understanding Agricultural Risk. Production. Marketing, Financial, Legal, Human, Extension Risk Management Education and Risk Management Agency.
- Czubała, A. 2001. Dystrybucja produktów. Polskie Wydawnictwo Ekonomiczne, Warszawa.
- Folejewska, A. 2010. Analiza FMEA – zasady, komentarze, arkusze. Wydawnictwo Verlag Dashofer Sp. z o.o, Warszawa.
- Frankowska, M., Jedlińska, M. 2011. Efektywność systemu dystrybucji. Polskie wydawnictwo Ekonomiczne S.A., Warszawa.
- Giera, J., Kulińska, E. 2019. Identification and analysis of risk factors in the process of receiving goods into the warehouse. Foundations of Management, 11.
- Kauf, S., Płaczek, E., Sadowski, A., Szoltysek, J., Twaróg, S. 2006. Vademecum logistyki. Difin SA, Warszawa.
- Knight, F.H. 1921. Uncertainty and Profit. Schaffner & Marx, Boston.

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- Kotler, P. 1994. *Marketing. Analiza, planowanie, wdrażanie i kontrola*. Gebethner & Ska, Warszawa.
- Kulińska, E. 2011. *Aksjologiczny wymiar zarządzania ryzykiem procesów logistycznych. Modele i eksperymenty ekonomiczne*. Oficyna Wydawcza Politechniki Opolskiej, Opole.
- Kulińska, E. 2016. Model of axiological dimension risk management. *Foundations of Management*, 8.
- Rusecki, A. 2018. Praktyczne zastosowanie metody FMEA na przykładzie produkcji koła pasowego w wybranym przedsiębiorstwie. *Quality Production Improvement*, 1(8).
- Śliwczyński, B., Koliński, A. 2014. *Organizacja i monitorowanie procesów dystrybucji*. Instytut Logistyki i Magazynowania, Poznań.
- Tytuła, M., Okarmus, J. 2010. *Słownik wyrazów obcych*. Wydawnictwo Szkolne PWN, Warszawa.