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.

JEL classification: D30, L20, G32.

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 (Czubała, 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:

\[
WPR = Z_n \times C_z \times W_y
\]  

(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:

\[ WPR = Zn \times Cz \times Wy \]  

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.

| Indirect Distribution Process | Risk factors of goods distribution |
|-----------------------------|-----------------------------------|
| 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 | Zn | Possible causes of the defect | Cz | Preventive actions | W | Y | WPR |
|-----|---------------|------------------|-------------------------------------|----|-------------------------------|----|---------------------|---|---|-----|
| 1   | Submit an order | Incomplete documentation | Delay in implementation | 6  | Incorrect flow of information | 1  | Documentation verification | 2 | 12 | 24  |
|     | 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 | 38  |
| 3   | Order picking | Out of stock | No order fulfillment | 6  | Incorrect flow of information in the supply chain | 1  | Inventory control | 3 | 18 | 30  |
|     | 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 | 16  |
|     | 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 | 55  |
| 4   | Shipment of the complete 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 | 26  |
|     | Shipment of the complete 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 | 49  |
| 5   | Transport | Incorrect estimate of driver driving time | Financial penalties | 3  | Traffic accidents | 4  | Preparation of alternative routes | 6 | 72 | 78  |
|     | Transport | Incorrect development of the | No means of external transport | 5  | Employees aren’t qualified | 2  | Development of algorithms for delivery routes | 4 | 40 | 44  |
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  |    | 5   |
|     | System failure                                | Improving the functioning of the network infrastructure | 5  | 1  | 1  | 5   |
| 2   | No information about the location of the goods | Improving the functioning of the warehouse system | 6  | 2  | 1  | 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 | 1  | 2  |    | 6   |
|     | Breakdown of machines and equipment for picking | Stock monitoring                             | 5  | 2  | 3  | 30  |
| 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  |
| 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 | 18
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 | 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.

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