

Risk Management in a Logistics Company

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1. ABSTRACT: The current paper presents the risk management process applied to a Romanian logistics company, one of the most prominent Romanian railway operators. The company was presented, then ten main risks were identified and described. The risks were assessed based on the risk index and risk matrix methods. Their probability of occurrence and their impact were assessed, thus computing the risk index. The generic risk management strategies were generated after plotting the identified risks on the risk matrix. Following the risk analysis, more specific mitigating solutions were advanced, aiming at eliminating the critical risks and attenuating and treating the most tolerable ones. The authors discussed the results and presented relevant conclusions for the analysis. This risk management process can be applied to virtually any logistics company, irrespective of its area of operations.

Keywords: *Risk, Risk management, Risk mitigation, Risk analysis, Logistics.*

2. INTRODUCTION

Risk assessment and modeling is a complex, multidisciplinary process that encompasses several fields, such as technological, economic, sociological or political. The results obtained through this process significantly influence the decisions and strategies taken by companies at the macro and microeconomic levels (Kaplan, Mikes, 2012).

The risk concept underwent changes, as the notion evolved from signifying damage, adverse events or losses, to that of the probability of an event that could impact the organization, and then to the uncertainty regarding the company's objectives (Aven and Renn, 2009, 2010).

Therefore, according the International Organization for Standardization (2009), the risk is an uncertain event that, if materialized, can have positive, negative, or uncertain effects on the objectives of the company's activities. It arises either because an unforeseen event occurred during that activity, or because an event that was planned did not unfold as planned. However, the opinion of experts and specialists regarding these three risk connotations (threats - opportunities - uncertain consequences) differ (Deselnicu, 2019, p. 12-14).

3. THE RISK CONCEPT

According to the Merriam - Webster Dictionary, the term "risk" originates from the French word "risque" and the Italian "risco", which signify "a possibility of ending up in a danger, of facing a trouble or suffering a loss". Other authors say that the term risk has another meaning in economicactivity, namely: "a wide range

of uncertainties regarding the future activity of an economic agent". It is highlighted that the risk is nothing but the inability of the organization to adapt, in due time and at the lowest costs, to the variations of the environmental conditions (McNeil, Frey, Embrechts, 2015).

Forecasting and managing situations under risk conditions are the most important functions of risk management (Dumitrescu, Deselnicu, 2018). Risk management is represented by a process of identifying, analyzing, and evaluating risks, as well as advancing mitigating actions to control them (Institute for Risk Management, 2022). In situations where clear decisions must be taken, the manager must assume the decision-making role and outcomes, even if the circumstances or the necessary data are partially known. After this decision is made, some uncertainty remains as to the expected results.

The first stage of risk management is identifying the risky events. This activity involves creating a list that includes the risks that can affect the organization, followed by the revaluation, and finally their assessment. The process of managing these risks must be a permanent one because new risks can constantly appear and they need to be controlled in order to allow the normal development of the company's activity (Wiengarten, Humphreys, Gimenez, McIvor, 2016).

2. RISK MANAGEMENT IN A ROMANIAN RAIL FREIGHT TRANSPORT COMPANY

2.1. Company description

Eastern Europe presents itself as one of the growing European markets. Based on this development, many international companies, such as those in the automotive industry, have decided to develop their production units in this area. Deutsche Bahn Cargo (DB Cargo) is the European number one company in the freight industry and the largest operator in terms of volumes transported in Europe. It established its own transport operator in Romania, as part of the European DB Cargo network.

Deutsche Bahn Cargo Romania has been active in Romania since 2000, initially operating as Logistic Services Danubius (DB Cargo, 2022). From February 2003 to February 2009, the organization also carried out railway shunting activities in Bulgaria. In September 2003 and July 2004, two more important contracts were signed for the railway shunting, determining the construction of two more work points established in Deva and Alesd (Romania). In August 2006, the

company obtained a railway carrier license in Romania, and since December 2006, it has been carrying out train towing activities for domestic traffic. The company continued to develop: in 2009, the office in Bucharest was established. In May 2011, the name of the organization changed from Logistic Services Danubius to DB Schenker Rail Romania SRL. Aiming to offer customers a superior service, in the summer of 2012, DB Schenker Rail Romania built its own depot in Turceni, Romania.

Supporting its upward trend, DB Schenker Rail Romania's vision is to be a railway operator that provides superior quality services, is reliable for customers, safe for employees, economically viable and sustainable for the environment, owns a fleet of wagons and locomotives impressive in number and performance.

In Bucharest, all transport and local delivery services are managed and planned in a dedicated control center, by the company's staff. The focus is on national and international traffic, working with companies in industries such as construction materials, metallurgy, automotive, and grain. Deutsche Bahn Cargo Romania possesses the important safety certificates to operate on most of the Romanian railway networks.

2.2. Products and services offered by the company

DB Cargo Romania operates nationally and internationally in the field of freight transport by rail. It has a fleet of approximately 60 locomotives (Diesel, Diesel-Electric, Electric) and over 2000 wagons. The services offered by the company are related to rail freight transport. Customers benefit from the following modes of transport:

- Insulated wagons and locomotives;
- wagon groups of: between a minimum of 5 wagons and a maximum of 10 physical wagons;
- multigroup trains comprising more than two groups of wagons, they travel together on an important segment of their established routes;
- complete trains, they are composed of wagons that run between the same dispatch station and the same destination station, comply with route-specific minimum tonnage or minimum length conditions and have a single fare payer.

DB Cargo Romania works with approximately 55 active clients, of which 20 have high volumes and constant activity. They are from several industries such as automobiles, containers, grain, cement, and metallurgy. The transported products are different;

therefore, the transport is carried out differently, using certain types of locomotives or wagons. The transported products include construction materials, chemicals, fertilizers, industrial and consumer goods, metals, and coal, but also components and vehicles.

2.3. SWOT analysis of the company

As far as this analysis is concerned, all the real elements will be scored, which actually add to the company or can harm it. The strengths of the organization will be presented are:

- Low operations costs;
- Effective, customer-oriented management, due to the reduced hierarchical levels;
- Reliable and well-known collaborators, for which transport services are provided (Ford, Dacia, Renault, ArcelorMittal etc.);
- Qualified, efficient and passionate staff;
- Good financial situation;
- The fleet is composed of different types of locomotives and wagons, thus the transport can be carried out differentially, serving a varied market segment;
- Strong organizational culture;
- Own fleet;
- Own depot that ensures the maintenance of rolling stock.

The identified company's weaknesses can be summarized as follows:

- Accommodation is not provided for the trains staff;
- There is not enough transport capacity in the grain season;
- Maintenance of diesel locomotives is carried out by partners;
- The need to adapt the rolling stock;
- Lack of specialized wagons for transporting petroleum products;
- Reduced possibilities of external financing.

Opportunities from the external environment that can influence the company's activity are as follows:

- The permanent consolidation of the industry has opened up new prospects for business on new routes;
- Rail freight is the cheapest compared to other modes of transportation;
- Customer loyalty by offering discounts depending on the desired services.
- Companies are increasingly interested in rail freight transport;
- Increasing demand for grain transportation, and the company is able to offer these services.

The threats that can affect the organization's activity are:

- Market entry of other railway transport companies;
- Certain important railway transport companies have opted for low-cost transport in an attempt to reposition themselves in the railway transport market;
- Exposure to the infrastructure regulations and to the compensation requested by the clients;
- The infrastructure usage fee generates large costs;
- The electricity grid connection increasing fee generates higher operating costs;
- Railway regulations and regional policy.

Following the SWOT analysis, it can be concluded that DB Cargo Romania benefits from numerous important strengths and favorable opportunities. However, it is also confronted with internal weaknesses and external threats that can become vulnerabilities and risks that the company must clearly identify and overcome.

3. RISK MANAGEMENT OF THE DB CARGO ROMANIA

3.1. Risk identification

One of the most important incipient stages of the risk management process is risk identification (Cioca

et al., 2018). Based on the previous experience of managers in the company, ten relevant risks have been identified and described:

- **R1. Axle breakage in motor or towed railway vehicles**

Causes: failure to carry out or superficially carry out the planned overhaul for locomotives, carrying out the control with an unverified metrological device, not introducing the wagons for the overhaul when due, improperly carrying out repairs during the overhaul of the wagons.

Responsible: Maintenance department and dispatch department through supervisory actions.

- **R2. Exceeding regular traffic speed**

Causes: fatigue due to exceeding the maximum service allowed on the locomotive.

Responsible: Dispatch Department, training and control staff.

- **R3. Overcoming stop signals**

Causes: lack of concentration when following the route due to fatigue and exceeding the work schedule, human error, deviation of attention from following the route, and off-duty discussions with the assistant mechanic.

Responsible: Dispatch Department, training and control staff.

- **R4. Failure to follow the line and course in traffic**

Causes: tiredness/low attention due to exceeding the maximum allowed service on the locomotive, off-duty discussions with the assistant mechanic.

Responsible: Training and control staff, Dispatch Department.

- **R5. Failure to adapt traffic speed to visibility conditions**

Causes: Locomotive staff ignore safety precautions under the pressure of delivering the goods to the consignee.

Responsible: Dispatched Department, training and control staff.

- **R6. Breakdowns of the en route locomotive**

Causes: poor maintenance of locomotive sub-assemblies and circuits, the unauthorized intervention of locomotive personnel on locomotive sub-assemblies and circuits, locomotive leaving from the traction units with faults of the electrical equipment, the use of improvisations to remedy some locomotive defects, failure to carry out the planned revisions at the established and approved terms, carrying out revisions without respecting the guidelines included in the nomenclature of approved revisions.

Responsible: Maintenance department, locomotive operation service and staff, training center and staff with training duties.

- **R7. Movement of loaded goods in the wagons**

Causes: Inadequate verification of the insurance of the loaded goods, the use of non-compliant devices when securing the goods.

Responsible: Training and control staff.

- **R8. Theft of goods from wagons**

Causes: Failure by the transport operator to guard the train in stations or in some traffic sections.

Responsible: Guards of the trains operating on the problematic railway sections.

- **R9. Danger of fire at the locomotive**

Causes: Failures manifested under load operating conditions are not identified, not all static tests are performed in order to identify the operating parameters of the locomotive, tests are performed by unqualified personnel or under time pressure, and some checks are omitted.

Responsible: Maintenance department.

- **R10. Hitting vehicles during the shunting activity over the level crossing with the railway**

Causes: Personnel negligence, ignorance of regulatory provisions, ignorance of the characteristics of the maneuvering area.

Responsible: training personnel.

These risks cannot be tolerated, as they have very severe consequences, from damage to vehicles to significant material losses and even losses of human life.

3.2. Risk assessment

After the risks have been identified, their evaluation was carried out to find out their appropriate mitigation methods, but also to identify the precautionary methods by which their occurrences can be avoided. First, the risk index was calculated using the formula taking into consideration the probability of occurrence of the risk and its impact (Campbell, 2005; Hopkins, 2010). Values between 1 and 10 were assigned for Probability (where 1 represents the least likely and 10 very likely), and for Impact (1 signifying low/low impact and 10 a catastrophic impact). The Risk Index (RI) was calculated using formula (1):

$$(1) \quad R_I = \text{Likelihood} \times \text{Impact}$$

Table 1 shows the values assigned to each of the identified risks for probability and impact and calculates the corresponding risk index:

Table 1. Calculation of the risk index (R_I)

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Probability	3	7	7	2	6	7	3	3	2	6
Impact	8	7	8	10	9	4	8	7	9	10
Risk index (R_I)	24	49	56	20	54	28	24	21	18	60

Source: Authors' contribution

As can be seen, the highest values of the risk index are associated with R10 - Hitting automobiles during the maneuvering activity over the level crossing with the railway and R3 - Overcoming stop signals, while its lowest values are associated with R4 - Not following the line and the route in circulation and R9 - Danger of fire at the locomotive.

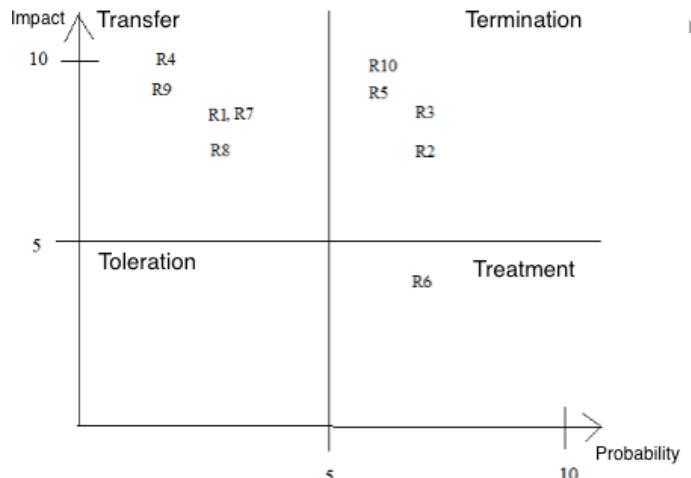


Figure 1. Risk matrix. Source: authors' contribution

As can be observed, most of the risks that the company is confronted with have a high probability and impact, making them hard to tolerate and calling for immediate action.

3.3. Risk management

The placement of the risks on the matrix also suggests the most appropriate generic risk management strategies which need to be adopted for them (Bandle, 2007). As deducted from Figure 1, no risk can be tolerated by the company, as none of them fall in the lower left quadrant. Only R6 - Breakdowns of the en route locomotive falls into the Treatment quadrant. Risks R2, R3, R5, and R10 are positioned in the Termination quadrant, while all the other identified risks are plotted in the Transfer strategies quadrant. Table 2 the appropriate strategies to be addressed corresponding to each identified risk:

Table 2. Strategies for risk management

Risk	Risk management strategy
R1. Axle breakage in motor or towed railway vehicles	Transfer
R2. Exceeding regular traffic speed	Termination
R3. Overcoming stop signals	Termination
R4. Failure to follow the line and course in traffic	Transfer
R5. Failure to adapt traffic speed to visibility conditions	Termination
R6. Breakdowns of the en route locomotive	Treatment
R7. Movement of loaded goods in the wagons	Transfer
R8. Theft of goods from wagons	Transfer
R9. Danger of fire at the locomotive	Transfer
R10. Hitting vehicles during the shunting activity over the level crossing with the railway	Termination

Source: Authors' contribution

As generic risk management strategies are just an indication of the solutions to be applied, the authors further developed specific mitigation solutions for each of the identified and evaluated risks (Table 3):

Table 3. Solutions to mitigate the identified risks

Risk	Mitigating risk solutions
R1. Axle breakage in motor or towed railway vehicles	Ensuring contracts with repair entities
	Complying with the procedure for recording measuring devices, marking the measuring devices with the due date for checks
	Ensuring that repairs are carried out by qualified personnel
R2. Exceeding regular traffic speed	Daily verification of staff orders, in electronic format
	On-site verifications of compliance with rest, duty times, waiting times
	Ensuring that the locomotive staff is aware of this risk, establishing clear guidelines for controlling the communication in the locomotive cabin
R3. Overcoming stop signals	Permanent monitoring of speedometer strip records and establishing rules for with personnel who does not comply with traffic regulations;
R4. Failure to follow the line and course in traffic	Awareness of the staff of compliance with the duties of service, validation by attendants and control actions.
R5. Failure to adapt traffic speed to visibility conditions	Control actions to identify staff who tends to ignore safety measures;
	Strict actions to ensure that staff respects
	Staff awareness that when towing the train, the most important thing is to reach the destination safely, not in the shortest time.
R6. Breakdowns of the en route locomotive	Provision of spare parts and materials according to operating terms;
	Verification of the way of carrying out intermediate revisions;
	Permanent monitoring of locomotives and collaboration with the dispatcher for their withdrawal.
R7. Movement of loaded goods in the wagons	Staff awareness of not admitting wagons with uninsured goods to transport;
	Checking anchoring devices for their integrity and not accepting improvised devices that do not conform to established standards.
R8. Theft of goods from wagons	Identification by company management of CF stations or haulage sections that are flagged as having problems. Ensuring the security of these trains in the identified stations.
R9. Danger of fire at the locomotive	Entry in the log book of irregularities manifested in the operation of the locomotive;
	Checking the knowledge of the personnel performing the maintenance activity.
R10. Hitting vehicles during the shunting activity over the level crossing with the railway	Training staff not to deviate from all mandatory activities in a case.
	Instructing the staff to request a second agent in the event of a breakdown of the means of communication.

Source: Authors' contribution

As can be observed, for each risk solutions were offered to reduce its probability or reduce its impact. All the suggested mitigation methods aim at minimizing the probability of occurrence of the risky events and of the consequences that may arise in the event of their materialization.

4. CONCLUSIONS

The paper presents the risk management analysis

process for one of the most prominent Romanian logistics railway operators, DB Cargo Romania. The analysis included the identification and description of risks, and their evaluation according to the probability of occurrence and impact (consequences). Ten risks were identified, including axle breakage in motor or towed railway vehicles; exceeding traffic speeds; overtaking stop signals; not following the line and route in traffic, not adapting the traffic speed to the visibility conditions; breakdowns of locomotives en route; moving the loaded goods in wagons; theft

of goods from wagons; the danger of fire; hitting vehicles during the shunting activity over the level crossing with the railway. All these risk factors were analyzed and evaluated, and solutions were advanced to counteract them so that their probability of occurrence decreases, and the impact no longer affects the company in a disastrous way.

The most threatening risks identified were R10 - Hitting automobiles during the maneuvering activity over the level crossing with the railway and R3 - Overcoming stop signals. These risks are critical and cannot be tolerated. The lowest values are associated with R4 - Not following the line and the route in circulation and R9 - Danger of fire at the locomotive. Although dangerous in themselves, these risks are not as critical as the others, as they have a low probability of occurrence.

One of the main conclusions is that most of the risks that the company is facing have both a high probability and a high impact, making them difficult to tolerate and asking for urgent and efficient mitigation methods. Therefore, generic, as well as specific mitigation strategies were proposed for all identified risks in order to reduce both their probability and their impact. By implementing the recommended risk management solutions, the company can reach a tolerable residual risk level. This risk management process can be applied to virtually any logistics company, irrespective to its area of operations.

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