

RISK MANAGEMENT SYSTEM IN A MANUFACTURING COMPANY – CASE STUDY

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Purpose: The purpose of this paper is to present a case study in the development and implementation of a risk management system in a medium-sized manufacturing company. The first part discusses the basic concepts related to the enterprise risk management process. A five-stage model of this process is briefly characterised which was used to build the system in question. This is followed by a presentation of the procedures developed for use in the practical implementation of the enterprise risk management system at each of the three distinguished levels of risk management. An example of one of the procedures developed and used is presented, together with a checklist for the analysis and assessment of risk factors for the identified risks. The risk management system developed for the company in question was implemented for practical use in the company over several months. At the end of the successful implementation of the system, the minor shortcomings identified have been rectified and it is being used by all, distinguished owners of the identified risks in the enterprise.

Design/methodology/approach: This paper presents a new and original approach to the practical application of risk management in a medium-sized manufacturing company. Risk owners were distinguished for all processes carried out in the company and risk types were identified for them. Checklists were established to analyse and assess the risks for each distinguished risk type.

Originality/value: The results of the conceptual and implementation work on the analysis and risk assessment of the implementation of processes in the enterprise obtained and presented in the paper can be addressed to those involved in company management, both in a practical and theoretical sense.

Keywords: enterprise management, risk management, enterprise risk management.

1. Introduction

The risk of failure is associated with any human activity, and in particular with business activity. In this case, it concerns all the basic areas of business activity, that is, it concerns the enterprise, namely: production, trade and the financing of its activities. We can therefore say that the risk of business failure relates to three aspects:

- a. Risks in production activities.
- b. Risks in commercial activities.
- c. Risks in financial activities.

Business failure risk, or more briefly business risk, is generally understood as the possibility of an uncertain event occurring that may adversely affect the achievement of the objective of a particular activity, cause a loss as a result of that activity, or fail to achieve the objective of a decision made with respect to that activity. Risk in business can therefore be treated as:

- a. Likelihood of not achieving the intended purpose of the activity.
- b. Potential for loss as a result of the activity.
- c. Likelihood of the effect of the decision taken being different from that intended, relating to that activity.

The uncertain events referred to in the above definition of business risk are threats or sources of risk. They are also called risk factors and this is the term we will use later in this discussion. The possibility of an uncertain event occurring is determined by the probability of its occurrence.

Adverse impact in the above definition means the severity of the consequences of the risk factor.

In the face of business risk, a certain strategy is usually adopted in a company, known as the strategy towards business risk. This can include the following:

- a. Risk analysis, assessment and prevention, i.e. business risk management, cannot just be a dedicated task for the risk manager.
- b. Business risk management is a process and should therefore be integrated into the business management process.
- c. Risk management should be an integral part of the company's planning, management and reporting process.
- d. Actions against risks in the company should be written into the responsibilities of the company's management and middle managers.
- e. In order for the company's management to effectively manage its risks, an early warning system of risks, i.e. risk factors in relation to established risks, is necessary.
- f. Business risk management is a complex process and should address all aspects and areas of the business. Therefore, a business risk management system (RMS) should be developed and implemented for effective management of this process.

2. Business risk management

Business risk management can be defined as the process carried out by both its management and middle managers to identify potential risks, and to reduce their impact or eliminate them in order to maintain the level of a given risk at an agreed level.

The following stages can be distinguished in the risk management process (Jonek-Kowalska, 2019; Kaczmarek, 2006; Karbownik, 2017):

- a. Risk identification - involves identifying the risks for the established levels of risk management and identifying the risk factors for each risk.
- b. Risk analysis - involves analysing the risk factors in view of the likelihood of their occurrence and describing the consequences of their occurrence.
- c. Risk assessment consists of - determining, on the basis of the risk analysis, the level of risk for each type of risk in relation to the risk level scale adopted in the company and determining the acceptable level of risk for each type of risk. The risk level scale should be developed in advance, taking into account the likelihood of the risk occurring and the severity of its consequences.
- d. Risk response planning - involves establishing a strategy for dealing with each type of risk in order to reduce it to an acceptable level, taking into account the following options for doing so:
 - risk avoidance - through inaction,
 - risk acceptance - the level of risk here is not high and it is possible to accept it while monitoring the risk factors,
 - risk transfer - the level of risk here is high and unacceptable and action is needed to reduce it, for example through appropriate provisions in the commercial contract and through insurance,
 - risk mitigation - the level of risk here is also high and unacceptable; efforts should be made to eliminate or reduce the impact of specific risk factors.

Risk monitoring and control

In order to be most effective in reducing the negative impact of risk factors on individual risks:

- develop a risk management system and build it into the business management process,
- identify all risks in the different processes carried out in the company,
- create and implement an early warning system for the possible occurrence of risk factors, i.e. monitoring risk factors and determining how to reduce their adverse impact, or eliminate them.

3. Elements of the 'S' company's risk management system

Company 'S' is a medium-sized company operating in the wood and metal industries. It does not produce its own market products, but obtains orders in both industries on the market, i.e. directly from the customers of its products. In order to improve the company's management and production efficiency, the company's management board decided to carry out a project to prepare and implement risk management principles in the company. Due to the complexity of the problem and the coverage of all production and ancillary processes by these principles, these principles were included in the company's risk management system (RMS).

The following three levels of company risk management have been adopted:

- 1 Level of company management. Risk owner: the company's management.
- 2 Level of processes carried out in the company. Risk owners: managers of production departments and functional divisions.
- 3 Project level. Risk owners: project managers.

The following procedures have been developed to implement each of the steps in the risk management process listed above:

a. Risk identification

- 1 At the company management level, risks should be identified that may adversely affect the achievement of the company's business objectives and the failure to achieve the expected results of management decisions. For each type of risk identified, risk factors should be identified and collated into checklists.
- 2 At the process level, for each of the processes carried out in the production departments (6 processes) and in the selected functional divisions (3 processes), risks should be identified that may adversely affect the achievement of the objectives of the implementation of the given process. For each risk type identified, risk factors should be identified and collated into checklists.
- 3 At project level, the following four risks potentially exist for each project (Karbownik, 2016; 2017):
 - failure to achieve the project objective,
 - discontinuing and abandoning the project,
 - failure to meet the deadline for completion of the project,
 - exceeding the project budget.

For each of the above risks, the project manager should determine the risk factors and ways to respond to the risks during the project implementation phase or use a checklist prepared for the system.

b. Risk analysis

For each type of risk, at the first and second risk level of the three above, the risk owner should analyse the relevant checklist to determine:

- whether a risk factor is occurring or is likely to occur (event),
 - what is the likelihood of its occurrence (probability),
 - what the consequences of its occurrence will be (severity of impact).
- c. Risk assessment
1. Within a given risk type, a risk measure should be read out for each risk factor based on the matrix for the risk level measure (Table 1).

Table 1.*Matrix for measuring the level of risk*

No.	Probability Effect	Low (1)	Medium (2)	Relevant (3)	High (4)
1.	Minimum (1)	1	2	3	4
2.	Moderate (2)	2	4	6	8
3.	Serious (3)	3	6	9	12
4.	Very serious (4)	4	8	12	16

To determine a measure of the level of risk based on the above matrix, the formula (Kaczmarek, 2006; Karbownik, 2004) was used:

Risk measure = probability assessment X impact assessment of the event.

2. For each type of risk, on the basis in Table 2, the level of risk should be determined.

Table 2.*The scale of risk in the "S" company*

No.	Measure of risk	Level of risk	Risk response
1.	1,2	1. Low risk	Acceptance
2.	3,4	2. Medium risk	Risk mitigation
3.	6,8	3. Significant risk	Transfer of risk
4.	9,12,16	4. High risk	Risk avoidance

d. Risk response

1. For all risks that may occur in the processes of the "S" company, it is proposed to adopt low risk as an acceptable level of risk ("1. Low risk", measure 1 or 2).
2. In certain, particularly justified cases, it is proposed to allow medium risk ("2. Medium risk", measure 3 or 4) as an acceptable level of risk, taking into account the provisions for the risk management strategy.
3. For risk measures 6 or 8 ('3. Significant risk') and 9 or 12 or 16 ('4. High risk'), follow the risk response notations in Table 2.

e. Risk monitoring and control

Risk monitoring and control should provide the information necessary to make decisions in advance of the occurrence of adverse events, i.e. risk factors.

The purpose of enterprise risk monitoring is to determine whether:

- a. Risk management system has been implemented and is functioning properly.
- b. Risk response strategy has been implemented and is being used.
- c. Results of the risk response strategy meet expectations.

The purpose of enterprise risk control is to provide:

- a. Observation and surveillance of identified risk factors.
- b. Identification of newly emerging risk factors.
- c. Implementation at the company management level of an early warning system for the possible existence of risk factors.

4. Implementation of the 'S' company's risk management system

For the implementation of the company's risk management system (RMS), the following preparatory activities had to be carried out:

1. Identify risks at each of the three established levels of risk management in the company.
2. Identify potential risk factors for each type of risk and compile them into checklists.
3. Develop procedures for the implementation of the RMS for: Company Management, heads of departments and divisions in functional divisions and project managers.

A sample procedure for a selected production department is shown below, together with a checklist (Table 3).

The Metal Department's risk owner, i.e. its director, carries out a risk analysis and assessment for all orders that meet the following conditions:

Table 3.
Checklist for the RMS at Metal Division level

No.	Risk factors	Occurrence of the risk factor	Probability of the risk factor	Effect of the risk factor	Risk measurement	Measuring the risk after risk response
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
1	Insufficient human resources in the quality control division					
2	No measurement of the first item					
3	Lack of new employees with the required skills on the labour market					
4	Lack of specialised measuring tools for products					

Cont. table 3.

5	Lack of sufficient equipment to work ergonomically and safely					
6	Staff errors					

Average risk level for the risk factors indicated:

Types of risk: a. Producing a defective product; b. Customer complaints about product quality

1. Acceptance of the level of risk: YES, NO

2. Risk response

The following actions were proposed to reduce the level of risk to an acceptable level:

1. Order has been obtained from a new customer, i.e. a new customer file has been created or this is the first order from the customer in question.
2. Order for a new product has been confirmed in the form of a new goods file.
3. Order has a value of more than PLN 50,000.
4. Co-op participation is required for order fulfilment in the Metal Division.
5. Non-standard materials are required to complete the order.

The following actions are taken by the risk owner to carry out the risk analysis and assessment:

- 1 For each type of risk (three risks are distinguished), analyse the risk factors (Table 1) on the corresponding checklist.
- 2 To do this, mark an "x" in column 2 as the potential occurrence of the risk factor in question during the execution of the order. You should also estimate and enter in columns 3 and 4 the probability and effect of the risk factor occurring.
- 3 On the basis of the risk factor analysis, determine the level of risk (Table 2) for each factor by entering its level (number from 1 to 4).
- 4 Once the risk level has been determined for the risk factors indicated in the checklist, the arithmetic mean of the risk factors should be determined and the result entered as "Average risk level for all risk factors".
- 5 On this basis, make an acceptance of the risk level (YES) or (NO) under the checklist.
- 6 Where there is an average risk level higher than ("1. Low risk") for a given risk type and there is a lack of acceptance of the risk level, analyse those risk factors that have influenced this risk level and propose specific actions to apply the risk responses given in Table 2 to reduce the risk level.
- 7 The proposed actions should be entered as "Risk response" on the checklist. Assuming that the proposed actions will have a positive effect on reducing the level of risk, enter 1 or 2 in column 6 of the checklist.
- 8 Potential risk factors and proposed actions should be communicated in the form of a memo to the company's Board of Directors once a month.

Note: The risk factors identified and included in the checklist may change. Their list may also change and a new checklist should then be drawn up.

5. Summary and conclusions

The risk management system developed at the 'S' company outlined above is currently being implemented for practical implementation by the risk owners. Three months after the start of implementation, it will be possible to assess its practical implementation and its effectiveness from the point of view of the company's management. There will then be time to remedy any shortcomings or deficiencies, i.e. to improve the system in order to achieve the objectives set out above in the following months of implementation. The following conclusions can be drawn from the current pilot implementation of the risk management system:

- a. In a medium-sized manufacturing company, it is expedient and possible to apply certain principles for managing the risk of business failure.
- b. The "S" company risk management system developed and presented above: covers all production processes carried out in the company and selected auxiliary processes.
- c. For the practical implementation of the system, it is necessary to determine, for each process included in the system, the types of risk associated with the scope of activities carried out within the process.
- d. For each type of risk, potential risk factors should be identified and compiled into checklists, which should facilitate risk analysis and assessment.
- e. For each risk factor that causes the level of a given risk to be higher than the company's acceptable level, propose specific actions that will cause the adverse impact of the risk factor to be mitigated or even eliminated, which in turn will reduce the risk in question to an acceptable level.

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