

Multi-Criteria Analysis Models and Decision Support Systems in the Function of Managing Operational Risk in the Enterprises

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Abstract — Operational risk is defined as the uncertainty resulting from potential delays in business processes. This is the risk of direct and indirect loss caused by inadequate internal and external processes. This paper discusses the different types of operational errors, and sources where these errors occur. Multi-criteria approach to the analysis of this type of problem allows the formation of indicators, establishing a correlation between the sources and types of risk. In this way, using multi-criteria analysis, it is possible to determine the source of critical operational errors, as a key segment of operational risk management in enterprise. Solving this kind of problem involves the use of appropriate decision support systems. The most important software packages for supporting methods of multi-criteria analysis will also be presented in this paper.

Keywords - Multi-Criteria Analysis Model, Risk Management, Operational Errors, Decision Support Systems.

I. INTRODUCTION

Of all the types of risks affecting the enterprise's business, operational risk falls into the category of those most difficult to follow, and at the same time, operational errors are causing huge losses. That is a reason why operational risk is gaining more attention, by company's management and regulatory bodies, as far as the scientific community, initiating a continuous debate about the optimal method of its identification, measurement and management of this important category of risk.

Risk management in operating processes is not a new practice in enterprises. In fact, there was always an effort to prevent abuses, establish systems of internal control and reduce errors in the execution of business activities. In the past, however, companies have relied entirely on control of operational risk taken by operational management. The system of monitoring operational risk, in accordance with modern approaches, demands establishment of appropriate models, to supplement internal control for monitoring and managing operational risk. The aim of this way of managing operational risk is optimization of business operations and processes, which reduces the amount of losses arising from exposure to operational risk, and also increases their profitability.

II. IMPORTANCE OF OPERATIONAL RISK MANAGEMENT

Risk management in operating processes is not a new practice in enterprises. In fact, there was always an effort to prevent abuses, establish systems of internal control and reduce errors in the execution

Regardless of the importance of operational risk, there isn't its definition (in the literature) that could be uniquely applied to all companies regardless of the type of business. The term operational risk was defined in the last few years regardless the fact that this kind of risk exist for hundreds of years, from the period of manufacturing production and the first financial institutions. Initially, any risks which companies were facing were considered as operational risk. However, further analysis and research has led to much "refined" definitions of operational risk, which are contained in the current scientific theories.

Operational risk is defined as the risk of loss due to inadequate or failed internal processes (by employees or by systems), or loss incurred as a result of external events [3].

Starting from this general provision, the company can only adopt its own definition of operational risk, which would include all the individual characteristics of its operations, as well as some specific risk events. This definition actually gives the general meaning of operational risk, examines a number of operational errors, while each firm should specify own definition, in accordance with its own processes, in order to identify and monitor the most important causes of severe operational losses. So, to establish an adequate system of measurement and management and operational risk, the firm must identify the categories of operational error to which it is usually exposed, to determine where errors occur - so called "sources" of operational risk, to identify their causes and to analyze their characteristics [3].

Operational risk is the risk associated with daily company activities, including process management, managing employees and systems in order to achieve the expected business results and objectives [2]. Companies can improve their processes in order to reduce errors arising as a result of human factors and

operational failure, and adopt plans for the prevention of problems such as falls of operating systems that the company uses.

III. KEY SOURCES OF OPERATIONAL RISK IN THE ENTERPRISE

Each company has its own individual and unique characteristics of operational processes. Therefore, the ability to manage operational risk requires the adjustment of definition of operational risk to the specific needs of enterprise that the model is formed. Operational risk can occur due to business interruption, failure of controls, other errors, or external events, which can be classified, by place of emergence of operational errors, into five major categories of sources of operational risk (Figure 1.) [4]:

- (1) Organizational structure,
- (2) Business processes and implementing company policies,
- (3) Operating systems and technologies that benefit the company,
- (4) Competence of employees and
- (5) External events.

No matter what the reason for the change of business strategy, most of the major operational errors, and thus the losses, takes place during the period of change in business organization. The main reasons for that are staff changes, major changes in the volume of transactions, but also as a result of the merger, the introduction of new services, or introducing new computer programs. Past experience is full of cases where a change of strategy, and mergers (mergers, acquisitions, etc.), made significantly greater operational problems in relation than the benefits arising from integration.



Figure 1 Sources of operational risk in the enterprise

Considering other types of risk, it is evident that the causes of market risk originate outside the enterprise. In contrast, operational risk primarily stems from the company, other than the risk in the category of external events, as specified in the definition. The most significant causes of operational risk are shown in Figure 2 [5].



Figure 2 The causes of operational risk

Losses from external events, such as natural disasters that cause physical damage to property, defects in electrical power or telecommunications failures that interfere business, are some of the types of operational risk that enterprise is exposed. On the other hand, for successful operational risk management much more importance should be given to identifying and managing internal risk events, such as fraud and abuse of employees, a system error and non-compliance procedures in the execution of transactions or in communicating with clients [9].

Characteristics of operational risk are clearly distinct from other types of risk - market and credit risks are relatively objective categories, determinate by market movements or client ratings and it is possible to quantify their influence and consequences [7]. Operational risk usually does not arise from voluntary action and does not necessarily have its market valuation. Good credit and market risk prevention is not an occurrence of operating losses which can cause even more drastic cost, may affect the company profit or value of its shares on the stock exchange.

IV. MULTI-CRITERIA MODEL FOR MANAGING OPERATIONAL RISK

Multi-criteria analysis, as a scientific discipline, is dealing with the application of quantitative methods for ordering the final set of available alternatives based on defined relevant criteria. That is solving a problem of choice the one of the alternative A_i ($i=1,2,...,m$), based on established criteria C_j ($j=1,2,...,n$) [6]. The result of this analysis is to determine the indicator that shows the extent to which alternative satisfy all these criteria partially, but as well as collectively.

The aim of this work is the formation of multi-criteria model for operational risk management, in terms of establishing connections between the source and type of operational risk. In this sense, the alternatives that are assessed are actually sources of operational risk and the relevant criteria are types of operational risk. In the previous section are theoretical defined alternatives, as a set of sources of operational errors in the company. Below it will be present the relevant criteria for their evaluation.

Assuming that there are many different sources and causes of operational risk, as well as their characteristics, operational risk classification can be done into seven groups [1]:

(1) Errors in execution and operational management, which includes data entry errors, collateral errors, incomplete documentation, and so on.

(2) Interpersonal relations and safety at work, where employees are violating health and safety rules, discrimination at work (mobbing, nepotism ...)

(3) Errors in the relationship with customers, such as loss of confidential information of clients, unsuitable trades, money laundering, unauthorized sales, and so on.

(4) Physical damage to company property caused as a result of terrorism, vandalism, earthquake, flood, fire etc.

(5) Errors in enterprise systems, such as errors in hardware and software, telecommunication problems, errors made by electronic transfer, or electronic data processing...

(6) Internal fraud, like abuse of office and embezzlement of employees and

(7) External fraud such as theft, forgery, misuse, damage caused by computer hacking or business espionage.

Based on these elements can be formed multi-criteria model whose structure is given in Figure 3.

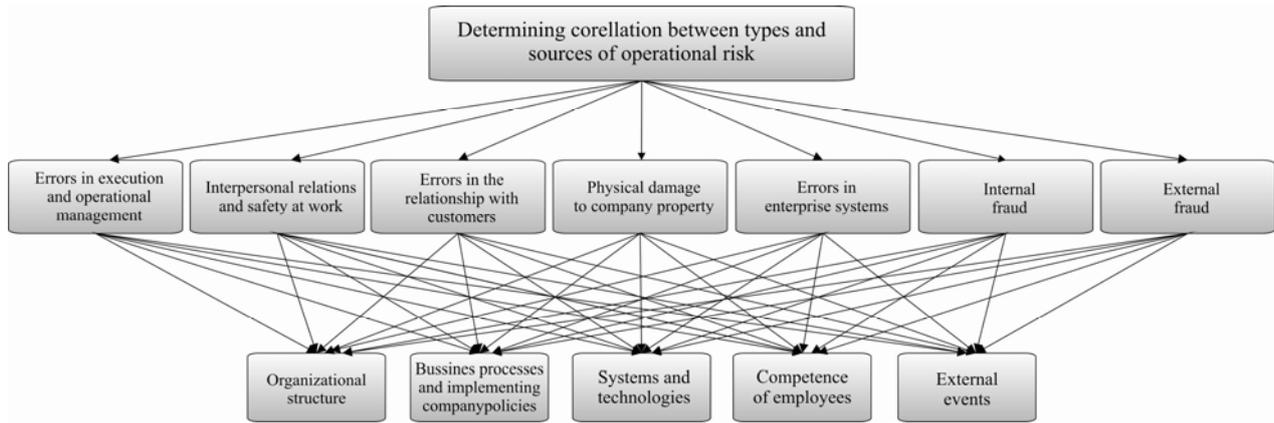


Figure 3 Multi-criteria model for operational Risk management in enterprise

Selection of multi-criteria analysis methods is based on the characteristics of the problem whose solution is intended. Before deciding on the selection of appropriate methods to be used, it is necessary to consider all available information about the problem, but also the characteristics of the algorithm and its application possibilities. The described model has a hierarchical structure, so that for its solution can use methods such as Analytic Hierarchy Process (AHP) or Analytic Network Process (ANP) [8].

The results of multi-criteria analysis models are the relative weights that are no different than the relative importance of sources, for each of the types of operational risk. In this way, it determines the impact of source to a type of operational risk. The significance of the analysis is reflected primarily in identifying critical areas of sources of operational risk in order to prevent it.

Operational risk, in addition to the seven listed species, includes legal risk, as well as the risk of reputation and strategic risk. The term "legal risk" means the cost of fines and penalties of inspection bodies, or indemnity costs in lost cases. Regulatory risk, which includes losses arising from changes in legislation, does not fall into the categories of operational risk. These categories may also be, if necessary, included in the model, with equivalent analysis of results as previously described.

V. CONCLUDING REMARKS

Operational errors are an integral part of business. On the other hand, as a result of operational errors, large losses can occur, which can cause negative effects on the financial result of the company. For this reason, it is important that the company performs continuous identification and measurement of operational risk, in order to mitigate its consequences at the greatest possible level.

The application of quantitative methods for operational risk management is a necessity in the modern approach. Possibilities of multi-criteria analysis in this regard are great. Multi-criteria model, described in this paper, provides an analysis of the emergence of operational risk, according to the type of operational errors. By establishing a clear relationship between occurrence and types of operational risk, it is possible to predict the appropriate measures to prevent operational errors.

This is primarily related to the occurrence of internal sources of operational risk, because then the company itself can prevent the formation of the same prescription of certain protocols and internal documents, as well as enhanced surveillance measures critical areas.

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