



# Risk Management: Risk Analysis Methods

An Online Continuing Education Course for Engineers

**Course Number: BS-1021**

**Credit: 1 Hour / 1 PDH / 1 CPD**

# Risk Management: Risk Analysis Methods

William "Bill" A. Hein, P.E.

## Introduction

This course is designed to build on the Risk Analysis component outlined in the basic concepts of *The Risk Management Process* course. The analysis of risk is the second step in the risk management process, and this course will provide a deeper understanding of the methods and applications used to analyze risk within a project or an organization.

This course will provide an understanding of:

- How to initiate the risk analysis process,
- Methods used to analyze identified risk, and
- Determining the most effective method for handling identified risk factors.

Upon completion of this course, the reader will be able to effectively complete the risk analysis process for the business organization's risk management program in preparation for the application of the appropriate risk control method or methods.

## Overview

After the completion of the risk identification and classification step in the risk management process, the next step is risk analysis. The risk analysis process includes the consideration of the possibility of occurrence of each identified risk factor and the analysis of the consequences of each of these risk factors.

Risk analysis assists with the logical selection of which risk factors are of more significant impact or magnitude of financial



consequence and need to be addressed first. This step in the process will prioritize the sequence in which each risk factor will be addressed.

Risk analysis is frequently referred to as risk assessment. The objective of this step is designed to assess the potential impact of risk exposures to the organization. It is essential to understand that the impact can be either positive or negative.

Risk factors with a positive impact are those that are capable of providing a financial benefit to the organization's cash flow or net value. When these types of risk factors are identified, they should be evaluated for their potential of being successfully exploited to provide a benefit to the company's bottom line.

Negative risk factors are those that could result in a financial loss to the organization. These risk factors will generally require greater attention during the risk assessment process to reduce or remove the potential impact of a financial loss should the risk factor occur.

This step in the process is not to be taken lightly since it is the method of prioritizing risks for future handling within the overall risk management process. Risk analysis is also one of the most difficult and time-consuming to complete when performed correctly.

The assessment of the identified risk factors must include both qualitative and quantitative analysis of the impact of each of the identified risks.

Qualitative analysis is designed to evaluate the potential probability or impact of exposures to the company for each of the identified risk factors. This type of analysis will include an assessment of the risk factors in general, a review of the potential financial impact of the risks and an evaluation of any available loss data for the risk factors being analyzed. This method of analysis is most likely to be used for decisions with a low level of risk and that do not warrant more extensive analysis methods.

Quantitative analysis is designed to project the magnitude of a loss that could occur as a result of the exposures of the risk factors. This type of analysis assists with evaluating

and determining acceptable loss values for identified risk factors. This is accomplished through forecasts or projections of losses that could potentially occur for resulting losses. Quantitative analysis may also include the use of net present value analysis for risk factors, cost-benefit analysis to identify "go-no go" decisions, and the analysis of the total cost of risk concerning each risk factor.

Through the risk analysis and assessment process, it is possible to begin to consider the impact of each risk and thereby identify the potential methods of dealing with each risk factor. This eventually results in reducing exposures from each risk factor and minimizing any negative impact of identified risks.

During the risk analysis process, the level of risk will become more evident. This allows for the prioritization and assignment of each risk factor by those most qualified to develop and implement the most effective control method or methods.

Some risk can be handled or absorbed as being routine costs of business while others will require alternative methods for the most efficient handling of the risk. When performed diligently, the outcome will assist with an improved financial and survival opportunity for the organization.

This step in the process will also identify any risks that may need to be handled immediately. Some risk factors may present too great of a potential financial impact on the business operations to be handled as the risk management plan is developed. They should be addressed on a priority basis before a completed risk management plan is finally rolled out throughout the organization.

To assist with the determination of the level of each risk, one can utilize a risk matrix. With a risk matrix, the risk level is identified by intersecting the likelihood and consequence levels on the risk matrix and prioritizing each based on their potential impact from high to low.

As the complexity of a risk increases, the analysis methodology also increases in sophistication. This may be the case for the assessment of risks associated with large acquisitions of assets.

The risk matrix also assists with the ranking of the frequency of the risk factor occurring relative to the severity of the occurrence of the risk factor. This too will facilitate a method of prioritizing actions needing to be taken for each identified risk factor.

Risks with the highest severity and highest frequency would be given the highest priority while those with the lowest severity and lowest frequency would be given the least priority for handling during the risk management process.

The application of the risk matrix can be somewhat subjective so a numeric value would be assigned to each risk factor. The frequency generally extends from zero (no loss frequency) to a number that would be above the currently identified most substantial known loss or identified and expected number of occurrences. The severity line would be developed in a similar manner starting at zero (no cost for a loss event) out to a number that would be above any known paid loss or expected financial cost expected for a loss.

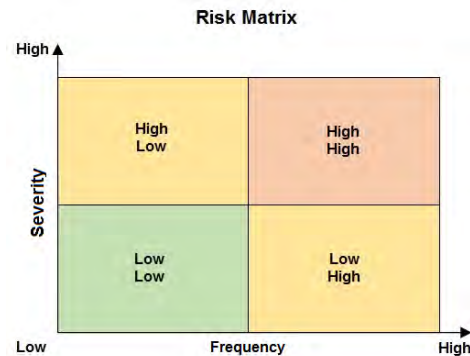
Risk matrix tables can be developed based on a variety of metrics. For example, they could compare loss probability instead of frequency and impact instead of severity. The matrix selected for the organization's risk analysis should be designed to mirror the needs of the organization or overall format of the possible loss or expected loss data for the company.

The impact line can vary depending on the magnitude of the anticipated financial loss. For example, if the maximum anticipated loss for an organization is estimated to be \$1,000,000, then that could be the top of the line's value. This value will change with the risk involved with the business' operations. A good example to demonstrate this point is for an organization that provides satellite launch services for their customers would be exposed to a greater magnitude of anticipated financial loss due to the hazards,

exposures, and values of their launch equipment and vehicles as well as the value of their customer's satellite.

No matter what numerical ranking is given to each identified risk factor, they all need to be addressed by the end of the process.

There are a variety of risk matrix formats that can be used in this process, and they can be as simple or as complex as needed for the business' operations. A typical example of a risk matrix chart can be seen in this illustration.



Typically a group approach would be used to assign these numerical values. Those employees with the best experience relative to the factor's value and probability should be used to develop the most appropriate risk matrix for this step of the risk management process.

Based on their priority level, identified risks can then be treated with one or more of the following techniques; risk control, risk avoidance, risk transfer, and risk retention. The last three of these techniques can be considered as risk financing techniques.

It is a good rule of thumb to use the analyzed data accurately. Do not attempt to force the data to conform to any preconceived ideas. When analyzing the risk factors, develop future actions based on what the analyzed data dictates, not what seems to match a particular position or belief. Avoid torturing the data to make it confess to the desired outcome. Let the data lead the way in the purest method possible.

## Risk Analysis Methods

Through useful qualitative and quantitative analysis, the most effective risk handling method or methods can be identified.

It is essential to have a full understanding of the various risk analysis method available to achieve the most effective risk management plan. Failure to achieve a full understanding of the available risk analysis methods can lead to missed opportunities which could result in financial loss to the organization.

The analysis of risk must involve the identification of the source or sources of risk, the potential impact on the organization of the identified risk and the probability that the risk factor will occur. Once these parameters have been established, the risk analysis process can project the level of inherent and unprotected risk (those with controls) that can be anticipated. This involves the determination of the most appropriate risk control methods as well as their expected effectiveness with the selected risk control methods in place. The result is that some risk may be retained as is while others are treated with risk control methods in place.

Qualitative and quantitative analysis techniques are applied based on each risk factor, and the most appropriate risk analysis technique depends on each risk factor and the available data for each risk factor.

**Qualitative Analysis** is the method of determining the level of the risk factor, financial impact associated with the risk factor, and the probability of the risk factor. The assessment of each risk factor is based on the level of each risk factor and the accuracy, efficiency, and effectiveness of the risk control methods.

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**Case studies** are a popular qualitative methods utilized for the analysis of data. The case study method will attempt to provide an in-depth

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