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AN OVERVIEW OF SELECTED METHODS FOR THE IDENTIFICATION AND  
QUALITATIVE ASSESSMENT OF RISK FACTORS

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PRZEGLĄD WYBRANYCH METOD IDENTYFIKACJI ORAZ OCENY  
JAKOŚCIOWEJ CZYNNIKÓW RYZYKA

**Abstract**

The problematic nature of the identification and assessment of the risk factors is a familiar subject area. As a result of this, many scientists are continually attempting to modify existing methods and develop new approaches to achieve this objective. Therefore, it is recommended to periodically review the methods used – this reveals areas of knowledge in this area which remain undeveloped and also determines which methods can complement or verify each other. In this article, current methods for the identification and qualitative assessment of risk factors are described and compared in a tabular manner; the author also proposes potential approaches for the modification and improvement of these methods.

**Keywords:** risk management, qualitative analysis

**Streszczenie**

Identyfikacja oraz ocena jakościowa czynników ryzyka jest szeroko znanym zagadnieniem. Przekłada się to na częste modyfikowanie istniejących oraz opracowywanie nowych narzędzi do tego służących. W związku z tym wskazane jest, aby co pewien czas dokonać przeglądu stosowanych metod. Pozwala to wydzielić jeszcze niezagospodarowane obszary wiedzy w tym temacie, a także określić, które metody mogą wzajemnie się uzupełniać lub weryfikować. W artykule omówiono i porównano tabelarycznie obecne stosowane metody identyfikacji oraz oceny jakościowej czynników ryzyka, a także przedstawiono potencjalne kierunki modyfikowania i ulepszania tych metod.

**Słowa kluczowe:** zarządzanie ryzykiem, analiza jakościowa

## 1. Introduction

The identification and assessment of the risk factors are among the first processes in the whole procedure of risk management (Fig. 1). These processes enable the identification of potential risks associated with a given project and aid the process of performing an initial risk assessment. As a result of this identification and assessment of risks, appropriate preventive actions can be taken to eliminate these risks or minimise the consequences of their occurrence [1, 13, p. 47–53].

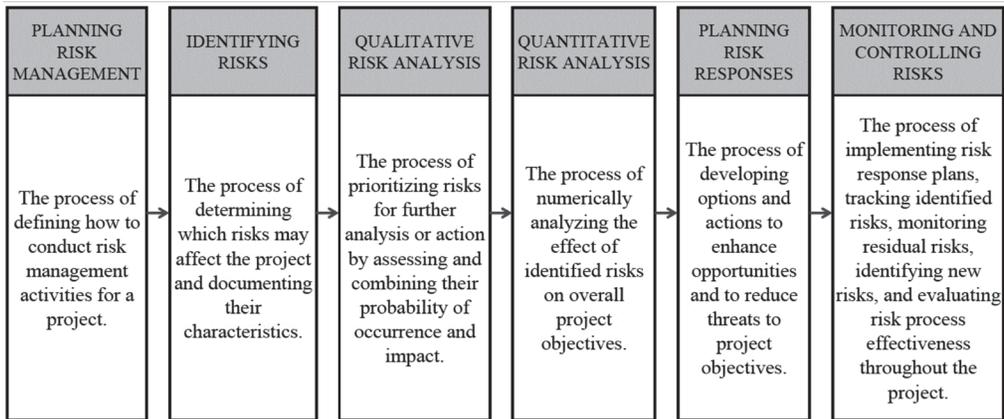


Fig. 1. Consecutive processes in risk management by PMBoK (based on [1])

The first methods of project management, as well as risk management, date back to the year 1942, when the relevant documents were prepared for the American program for the production of an atomic bomb (Manhattan Engineering District Project). Since then, the topic of risk management has been very popular among both theoreticians and practitioners around the world. Simplicity and ease of use of tools for the identification and qualitative assessment of risk factors results in a large number of modifications to them or the development of new, innovative solutions. Therefore, there is a need to periodically review the methods that are used. This enables the progression of the current level of knowledge, and also makes it easier to identify areas that remain undeveloped and that require further work and analysis. In addition, knowledge of the advantages and disadvantages of each method can help to evaluate which of these methods can be used to verify or complement others. The purpose of this article is to describe the currently used methods of the identification and qualitative assessment of risk factors, to present their comparison in tabular form and to suggest possible further directions for modifying and improving these methods.

## **2. Methods for the identification and qualitative assessment of risk factors**

The identification and qualitative assessment of risk factors is usually prepared before the implementation of a given project. However, during works, analyses may be conducted again when new data is available [5, p. 4–15, 19, p. 43–49]. As a result, managers who direct works always have current data about the real risks that may potentially appear on the construction site. The advantages of the vast majority of tools used in this type of analysis are its simplicity of use and clarity of results; often, the main disadvantage is the analyses having a very subjective nature. Additionally, various methods have their own characteristic strengths and weaknesses [6, p. 76–77, 8, p. 307–324].

### **2.1. Surveys of expert opinions**

Surveys of the opinions of experts are often used by academics [3, p. 963–972, 4, p. 1205–1213, 9, p. 59–62, 10, p. 107–111, 11, p. 157–166, 14, p. 332–339, 21, p. 120–129], this is mainly due to the chosen risk assessment method having a low level of complexity. To obtain the required results from surveys of experts, an appropriate set of questions needs to be produced – these are most often closed ended. The questionnaires are often clearly divided into two parts – the first group of questions concerns the respondent and is mainly related to their experience. This shows the respondent’s professional practice and can confirm that the opinion of the person is in fact an expert opinion. The second group of questions concerns a problem which constitutes increased risk. Due to the closed nature of the questions, completing the survey takes only a short amount of time – this has a positive impact on the willingness of respondents to participate in the research.

The main difficulty related to using this method is obtaining a group of respondents that can be described as being representative. Furthermore, each group of experts should not be used too often as this may discourage them from participating in subsequent studies. The time required for survey is quite difficult to estimate and depends primarily on the time needed to supply questionnaires to people participating in the research. Depending on the intermediary in the supply of questionnaires (usually professional associations), it may take from a few days to even several weeks (in the case of strongly hierarchical structure of an organisation with a lot of stages in the decision-making structure). The main advantage of the method is the fact that due to way in which the questionnaires are supplied to the experts (usually electronically) it takes only a few hours to obtain a representative group of respondents.

### **2.2. Planning meeting for project stakeholders**

The method requires the involvement of representatives of as many stakeholders as possible (Fig. 2) [8, p. 307–324]. They discuss the risks and the degree of their possible impact on the given project. The main advantage of this method is the fact that it uses the knowledge and experience of a group of experts which is advantageous because of their cooperation. Moreover, each stakeholder is made aware of the entire list of risks associated with the project from the

beginning. However, the method requires very well-developed soft skills (e.g. the use of mediation, negotiation, discussion, etc.) from the person chairing the meeting – this enables the efficient progress of the whole process of risk assessment. If the leader does not have appropriate skills, the meeting may get out of control and take a turn for the worse. It is possible that there will be conflict on the assessment of some of the risk factors between holders of different opinions. It may also be difficult to determine who is responsible for each factor. One should also keep in mind that different individuals and they may try to reduce their own responsibility, rather than care about the whole project. The time required for analysis depends primarily on the goodwill of the team and the predisposition of the chairperson. Under favourable conditions, only one or two meetings may be required; however, in the absence of cooperative attitudes, it is possible that the analysis will be prolonged or may even totally fail.

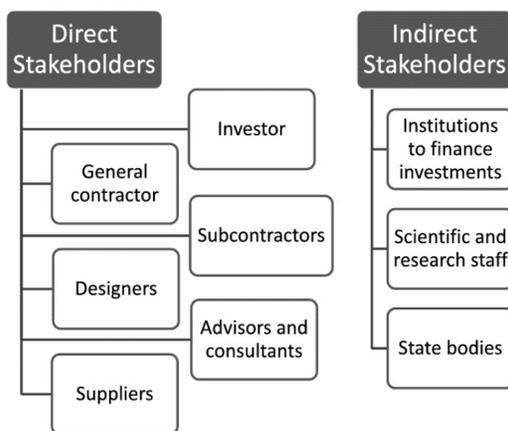


Fig. 2. Stakeholders involved in the process of investment and construction [own work]

### 2.3. Analysis of the documentation from completed projects

If the managing body conducts a qualitative analysis of a sufficiently large base of documentation from completed projects, it is possible to determine the risk factors and their potential impact on the project under analysis [7, p. 112–113, 16, p. 55–60]. While using this method, the size of the body of data available and the quality of its constituent documents is very important. The main documents are primarily construction logbooks – these should contain details of serious problems which appeared during the construction. The advantage of this method is its simplicity – one only needs to take a look at the problems that occurred in each project and then assess whether there is a risk of similar problems occurring on the planned construction. Moreover, the documentation may contain information on how to solve some of the problems. Unfortunately, for the method to be used effectively, it is necessary to obtain a sufficiently extensive body of data. Organisations with shorter industry experience do not have the opportunity to benefit from this tool. The duration of the analysis of the documentation of completed projects depends primarily on the size of the body of data and can range from just a few to several days.

## 2.4. The Delphi method

The Delphi method is a method very similar to surveys of expert opinions. It also uses external experts who share their knowledge and experience through questionnaires. The difference mainly concerns two aspects. Firstly, the Delphi method usually requires a series of several surveys; this is due to the fact that the experts who present different points of view to the majority are asked to verify their opinions again – these opinions can then be either modified or maintained. In situations where extreme opinions are maintained, the questionnaire is excluded from the research; as a result, the final product of the method is a single opinion of the group of experts. In surveys of expert opinions, discrepancies in results may be far greater. Extreme opinions are always eliminated in the Delphi method. The problem appears in the situation in which the extreme opinion is correct. The organisational aspect of surveys can also be problematic. The respondents can remain anonymous in typical surveys of expert opinions. In the Delphi method, it is required to collect contact details (usually e-mail addresses) of the respondents in order to verify their potential extreme positions. The time required for conducting the method is the time needed to supply the experts with the questionnaires plus the duration of subsequent iterations [18, p. 150–159].

## 2.5. Interviews with experts

This is one of the most time-consuming methods; however, the results can be very useful [15, p. 127–136]. The process requires organising a series of meetings with experts in the subject area. These meetings are organised individually, there is also the possibility of meeting experts again after obtaining information from other experts. This method enables a very high level of interaction with each expert as a result of one-to-one conversation – each issue is discussed in detail and uncertain issues are thoroughly explained.

## 2.6. Direct observation

With this method, the person or team assessing risk uses their own experience and knowledge [20, p. 5670–5677]. During analysis of the data received on a specific project (mainly design documentation, *contractual* agreements, information about stakeholders, etc.), the evaluator prepares a list of risk factors and the level of risk that they pose to the investment. The advantage of this method is the short duration of the study, depending upon the performance of the individuals or team conducting the analysis. The disadvantage is that it is subjective, relying upon unverified points of view on particular issues; therefore, this method is recommended to be used as an addition to other methods (e.g. interviews) for the purposes of verification.

### 3. Comparison of described methods

The described methods are used to obtain data that is necessary for qualitative analysis – their comparison is presented below in tabular form. Items that are included in this comparison are: the number of people involved in the research; the duration of data collection and analysis; the organisational difficulties; the quality of the results. The selection of these features stems from the basic limitations related to scientific research; these are mainly the time and the available human resources. Moreover, the methods with smaller organisational difficulties are recommended for people with a lower level of soft skills. Finally, the quality of the results may indicate that they should be verified by using another method.

Table 1. A tabular comparison of the described methods

Method	The number of people involved in the research	The duration of data collection and analysis	The organizational difficulties	The quality of the results
1	2	3	4	5
<b>Surveys of expert opinions</b>	Large number of people involved	Relatively long, dependent upon the goodwill of external stakeholders and experts	Difficulties in involving professional institutions	High quality of results obtained thanks to a large number of experienced respondents
<b>Planning meeting of project stakeholders</b>	Small number of people involved	Relatively short, dependent on the goodwill of external stakeholders	Difficulties associated with an appropriate meeting time for all stakeholders	The quality of the results depends upon the level of cooperation between stakeholders
<b>Analysis of the documentation from completed projects</b>	Single person or small group involved	Relatively short, dependent on the scope of analysed material	Difficulties in obtaining adequate numbers of documents	The quality of the results depends on the scope of issues contained in the documentation
<b>Delphi method</b>	Large number of people involved, but extreme opinions are rejected	Relatively long, dependent upon the goodwill of external stakeholders and experts as well as the number of iterations needed	Difficulties in involving professional institutions	High quality of results obtained thanks to a large number of experienced respondents

1	2	3	4	5
<b>Interviews with experts</b>	Small number of people involved	Relatively short, dependent upon the number of experts involved	Difficulties associated with scheduling an appropriate meeting time for each expert	The quality of the results depends on the number and level of expert knowledge
<b>Direct observation</b>	Single person or small group involved	Short, usually one to a few days	No special organisational difficulties	Results are subjective, the quality of which depends primarily on the experience and knowledge of the analysing person or team

The developed comparison shows some dependencies – the highest quality results are related to there being a large number of people involved in the research. Additionally, the duration of data collection is the longest and the organisational difficulties are the largest when there are a large number of people involved. Methods that involve a smaller group of people usually require less time; however, with such cases, the results may need to be verified by another method.

#### 4. Tools for presenting the results of qualitative analysis

When data collection and analysis have been completed, the results of the qualitative assessment of risk factors should be presented [12, p. 545–550]. For this purpose, four basic tools are used:

- ▶ a list of the probability of the occurrence of different risk factors and their potential impact (a descriptive scale is used to achieve this, e.g. very high, moderate, low and very low);
- ▶ matrix assessments of the likelihood and consequences of the materialisation of risk factors (depending on the needs, linear or logarithmic scales are used.);
- ▶ presentation of the complexity of the project (the stability of the design assumptions and the possible effects of the impact of errors in their formulation is assessed);
- ▶ ranking of data accuracy (the accuracy and objectivity of the data used in planning are studied).

Matrix assessments of the likelihood and the consequences of the materialisation of risk factors are the most popular methods. This is mainly due to the fact that in addition to evaluation of the use of numerical or linguistic variables, the results are also presented in graphical form; as a result of this, the analysis of the risks is easily understood even for people without wide engineering or managerial knowledge. Furthermore, this method can be



easily modified; one of the options for modification is the inclusion of additional parameters that characterise the risk factor. For example, a threat to life or health of workers [17, p. 2073–2080] or a proximity of the possible date of materialization of a risk factors [2, p. 2179–2184]. However, the inclusion of additional parameters requires modifications to previously used models of qualitative assessment of the impact intensity of individual risk factors.

## 5. Summary and conclusions

The main advantage of the qualitative assessment of risk is its simplicity of use and the clarity of results. However, the disadvantage is the subjective nature of the obtained data. Understanding the strengths and weaknesses of each method enables the identification of which methods can complement or verify each other. A series of tools has also been developed to present the results of the qualitative assessment. Among these, Matrix assessments of the likelihood and the consequences of the materialisation of risk factors are the most often used – this tool can be continuously modified. One of the options for these modifications is based on considering additional parameters that take the risk factor into account. This enables a better understanding of the impact of a given risk factor on the outcome of the project, thus increasing the credibility and usefulness of qualitative risk analysis.

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