QUALITATIVE RISK ANALYSIS AS A STAGE OF RISK MANAGEMENT IN INVESTMENT PROJECTS: ADVANTAGES AND DISADVANTAGES OF SELECTED METHODS – THEORETICAL APPROACH

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Abstract: The qualitative risk analysis is an integral part of a risk management process in investment projects. In business practice the analysis should be combined with the quantitative approach. Only this combination can ensure that risks, which occur in an investment project are viewed comprehensively. People responsible for risk management must be able to use both qualitative and quantitative methods. They also need to know the advantages and disadvantages of these methods as their scope of applications may differ, depending on a project type. These problems are addressed by the paper, which aims to discuss the qualitative risk analysis in investment projects, with the focus on the strengths and weaknesses of specific methods and the differences between them. The paper outlines the most important issues in this area.

Keywords: risk, risk management, qualitative risk analysis, qualitative methods

1 Introduction

To perform a comprehensive assessment of investment project risks in business practice, both quantitative and qualitative methods should be employed. The knowledge of methodology in this area is the prerequisite for accurate risk evaluation, i.e. the combined use of quantitative and qualitative methods ensures more accurate risk estimation. Sometimes better results are rendered by qualitative methods. This is, first of all, due to the type of a specific investment project and the industry in which the project is going to be executed. In general, if quantitative results are supplemented by the qualitative approach, we have a better overview and decision makes are able to manage project risks more effectively. In particular, risk managers should be aware of advantages and disadvantages of quantitative and qualitative methods. The knowledge of their strengths and weaknesses is required to appropriately respond to any business needs in this respect and apply the methods correctly in business activities. This knowledge is also vital for the accuracy of such methods in specific cases and types of projects. These problems are addressed in the paper, which is aimed to discuss the qualitative methods used in investment project risk analyses. In particular, the paper draws attention to advantages and disadvantages of specific methods and shows the basic differences between these methods. The deliberations in the paper are mainly theoretical, and the problems are presented in a synthetic way. It should be noted, however, that the authors also indicate the practical value of some of the methods in question. The authors draw on the knowledge and experience gained from their long-term research into investment risk. In order to ensure accurate presentation of the problems, the literature review and the method of deduction were used.

1.1 Qualitative risk analysis as a stage of risk management in investment projects

Both in theory and in practice, there are various definitions of risk management. The literature tends to define risk management as all the activities connected with risk identification, assessment, selection of appropriate responses and risk monitoring. Within the international risk management standards, there have been developed a general risk management scheme, which comprises a few key stages, namely:
1. establishment of an enterprise's strategic goals, its risk appetite and risk tolerance,
2. risk assessment, including risk identification, risk analysis, risk evaluation,
3. risk treatment[1].

In business practice, however, risk is analysed not only for risk management at the corporate level, but also for a specific project. Therefore, a risk analysis process is made up of three phases, i.e. planning, risk assessment and risk treatment. Risk assessment is of particular importance here. The scientific literature summarises it by means of the following quotation: risk assessment = risk analysis + risk evaluation[2]. The key aim of risk analysis is to identify the specific risk levels by establishing the relationship between the likelihood of a given event and consequences of its occurrence[3].
The flow of the risk analysis process is presented graphically in Fig. 1.

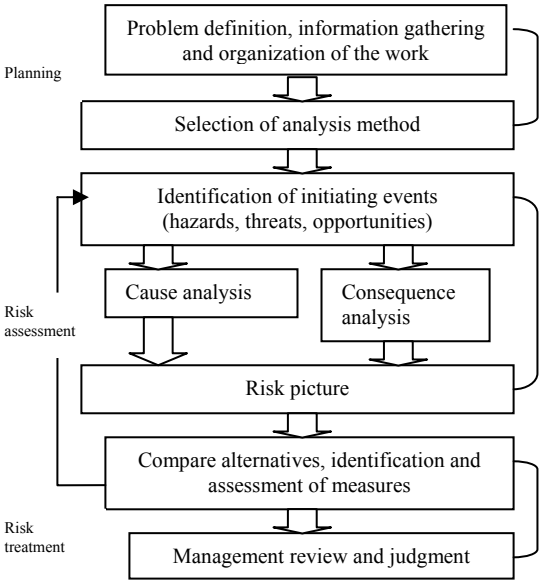

Fig. 1. The main steps of the risk analysis process

Source: Avent, T., Risk analysis. Assessing…, op. cit., 9 p.

In business practice, a highly significant stage within the risk analysis is the selection of an analysis method, i.e. when we choose a method, which allows us to analyse the predefined risk. The main categories of risk analysis methods, which are used by companies, are presented in Tab. 1.

Table 1. Main categories of risk analysis methods

Main category	Type of analysis	Description
Simplified risk analysis	Qualitative	Simplified risk analysis is an informal procedure that establishes the risk picture using brainstorming sessions and group discussions. The risk might be presented on a coarse scale, e.g. low, moderate or large, making no use of formalised risk analysis methods.
Standard risk analysis	Qualitative or quantitative	Standard risk analysis is a more formalised procedure in which recognized risk analysis methods are used, such as HAZOP and coarse risk analysis, to name a few. Risk matrices are often used to present the results.

[1] See: ISO 31000:2009 Risk management-Principles and guidelines, Risk Management Standard AIRMIC/ALARM/IRM 2002, COSO II - Enterprise Risk Management – Integrated Framework 2004.
[2] Avent, T.: Risk analysis. Assessing uncertainties beyond expected values and probabilities. New Jersey: John Wiley & Sons, Inc., 2008, 8 p.
[3] ISO 31000:2009 Risk management-Principles and guidelines: Op. cit., 18 p.

Model-based risk analysis	Primarily quantitative	Model-based risk analysis makes use of techniques such as event tree analysis and fault tree analysis to calculate risk.

Source: Avent, T.: Risk analysis. Assessing…, op. cit., 4 p.

As emphasized in the introduction, qualitative and qualitative methods are equally useful for an investor in the risk analysis. In addition, in the scientific literature this point is often stressed as well. According to D. Frame „(...) the two approaches address different things. (...) The qualitative approach recognizes that experience coupled with hunches and good judgment enable people to develop insights that they cannot develop if they are constrained by the requirement that they work only with measurable phenomena. (...) This is particularly true with a range of situations, including first-of-a-kind experiences, circumstances where politics reign, and situations where outcomes are determined through negotiations"[4].

1.2 Selected qualitative methods of risk analysis – their advantages and disadvantages

The main aim of a qualitative risk analysis, carried out for an investment project, is to identify risks with low, moderate or high significance for the given project and prepare information for the subsequent stage of the risk assessment process, i.e. risk evaluation. The value of likelihood and consequences of a specific event are given by description. In business, risks can be divided into high, moderate and low risks. Unlike the quantitative ones, the qualitative methods don't express the size of likelihood or consequences by means of figures. An investor has a variety of quantitative methods to choose from. The risk management standard of *ISO 31000:2009 Risk management-Principles and guidelines* recommends that checklists and questionnaires, SWOT analysis, physical inspections, analysis based on records of the operation, flowcharts or event trees are used for qualitative risk assessment[5]. D. Frame, in turn, gives such qualitative methods as: scenario building, the likelihood-impact matrix, attributes analysis, delphi forecasting[6].
In general, in the entire risk management process, following the identification of risks, which are significant for an investor's objectives, the risks are assessed, which means that the most significant risks, as well as the risks which are less important for the project, are indicated. This can be done by using the methods given below:
- Delphi method: this method uses the knowledge and experience of experts representing various areas, which are relevant to the research. The experts may be an enterprise's staff members but they can also come from outside the company. One of the assumptions underlying this method is the fact that the experts invited to participate in the research don't know who else belongs to the panel and they don't interact with one another. They receive questionnaires containing statements, which are the predictions about the long-term development of a given event. Their task is to choose and indicate the course of the event, which they find most likely. After that, using statistical methods, most frequently the median, average responses are identified. The collective replies are then presented to the experts, who are asked to give their opinions. This stage may be repeated a number of times, so that the experts can achieve consensus[7]. The delphi method belongs to expert methods.
- Brainstorming: this heuristic method was created by A.F. Osborn. It involves, in particular, the assembling of a group of people, who are presented a specific problem that needs to be solved. These people express any ideas of how to solve the problem they are able to come up with and these ideas are written down. At the final stage, a host needs to sum up the ideas by conducting an analysis and evaluating all of them. The basic assumption behind the brainstorming method is the fact that even the most unrealistic ideas cannot be criticised during the discussion. It should be added that a method, which is similar in usage is the nominal group technique. The key differences between the Delphi method, brainstorming and the nominal group technique are outlined in Tab. 2.

Tab. 2. Differences between nominal group technique, brainstorming and Delphi

Characteristic	**Nominal group technique**	**Brainstor-ming**	**Delphi**
GROUP			
Group size			
• Equality of participation/participation inhibited/member dominance	Member equality	Member dominance	Respondent equality
• Degree of cohesion	Contribution and participation reduces with an increase in group size affecting cohesion	Cohesion reduces with group size	Sense of belonging, strength of commitment and cohesion reduced by isolation of respondents
Member characteristics			
• Degree of group compatibility	Social needs of members may affect members responses	Social needs of members may affect members responses	Unaffected
• Emotional `blocks`	inhibited participation, but likely to be less than brainstorming	inhibited participation	Uninhibited participation, not self conscious
• Level of experience/professional training	inhibited participation	inhibited participation	No reticence to fully participate
• Personality characteristics	self conscious participation but less than brainstorming inhibited participation	self conscious participation inherent pressures	Unaffected
• Company position imbalance/status incongruities	affected	affected	Freedom not to conform
Individual objectives and roles	affected	affected	Unaffected
• Potential for task oriented effort to be drained by pursuit of hidden agendas	affected, participation directly encouraged by the sequence of steps in the technique	affected if long meeting participants may be distracted, lose interest	Unaffected
• Potential for task oriented effort to be drained by pursuit of social needs	affected	affected	Unaffected
• Interpersonal behaviour	may arise	may arise	Unaffected
Stage of development			
• Informational pressure			Unaffected
• Normative pressure			Unaffected
THE TASK			

[4] Frame, J.D.: Managing risk in organizations. A guide for managers. Washington: Jossey-Bass, 2003, 69 p.
[5] Knight, K.W.: ISO 31000:2009. New risk management standard. The materials from a workshop held at the 4th International Conference of Risk Management Association of POLRISK, Warszawa 2010, (slides: of qualitative analysis and examples of quantitative analysis).
[6] Frame, J.D.: Managing risk..., op. cit., 70 p.
[7] See: Frame, J.D.: Managing risk..., op. cit., 79-81 pp.

Nature of the Task unclear criteria for effectiveness Salience of the task Poor definition of the task • Written material needs to be created and/or considered • Requires a high level of technical expertise	Group meetings directly affected by clear explanation of determinates Dependent on clear and persuasive argument at the outset Meeting preparation time required Structure required Discipline skill required	Group meetings directly affected by clear explanation of determinates Dependent on clear and persuasive argument at the outset Meeting preparation time required Minimal preparation Discipline skill required	Effectiveness entirely dependent on the content of the questionnaires Dependent on clear and persuasive argument at the outset No opportunity for clarification, maximum preparation time Extensive preparation Discipline skill required
ENVIRONMENT			
norms and expectations – unstructured method of working leader position-poor morale poor inter-group relations physical location	Structured Strong leader required for group sessions Affected affected	Strong direction required Strong leader required Affected affected	Highly structured Unaffected Unaffected unaffected

Source: Chapman, R.J.: The effectiveness of working group risk identification and assessment techniques, International Journal of Project Management, Vol. 16, No. 6, 1998, 341 p.

- Scenarios: the scenarios method involves the construction of a number of scenarios, which describe the potential future developments of a company, which carries out the investment project, or its surroundings. These should be best case scenarios, neutral scenarios and worst-case scenarios. They may come in form of descriptive reports, drawings, tables or event trees[8]. The event trees method, for example, comes in form of a graph (in shape of a tree), which presents the most important alternative events, in the chronological order, together with their likelihood.
- Risk rating matrices: this method identifies risks and places them on a coordinate system, where one axis shows the values of likelihood of a risk event and the other axis shows the consequences that the event may cause in a company. By placing every risk separately on the coordinate system we have to specify the size of its likelihood and consequence. We determine the scale for both these values on our own. The simplest scale is a three-degree one in which the values of the likelihood and the consequences are referred to as low, moderate and high. After placing all the examined risks we arrive at a so-called risk rating matrix, which is commonly known as a risk map. In order to make it clearer, the colours of traffic lights, i.e. red, yellow and green, are used. The fields marked in green signify the low likelihood risks but with different consequences or the risks with low consequences but different likelihoods. When constructing the matrix these risks are regarded as least harmful for the enterprise. In business practice, risk matrices are produced all the time so that the risk dynamics can be monitored on a regular basis. The fields marked in yellow, for instance, mean risks with low or high likelihood and moderate or major consequences. The risks, which are located in the red field are critical for the enterprise. These risks should be handled by the investor as priority ones because their likelihood is high and consequences highly significant. A sample matrix is presented in Fig. 2.

Consequence	Likelihood				
	Rare	Unlikely	Possible	Likely	Almost certain
Catastrophic	High	Very high	Very high	Very high	Very high
Significant	High	High	Very high	Very high	Very high
Major	Tolerable	High	High	Very high	Very high
Moderate	Low	Tolerable	Tolerable	High	High
Minor	Low	Low	Tolerable	Tolerable	Tolerable
Insignificant	Very low	Low	Low	Tolerable	Tolerable
Negligible	Very low	Very low	Low	Tolerable	Tolerable

Fig. 2. Risk rating matrix

Source: Knight, K.W.: ISO 31000:2009. New risk management standard. The materials from a workshop held at the 4th International Conference of Risk Management Association of POLRISK, Warszawa 2010, (slides: example of risk rating matrix).

In practical business activities, risk assessment based on a multi-degree scale, as presented in Fig. 2, may pose some difficulty. Therefore, from a practical point of view, more useful scales are three-, four- and five-degree ones. Table 3 lists the pros and cons of these methods, which may be directly used at the stage of the qualitative risk analysis in projects.

Tab. 3. Selected methods and techniques for performing a qualitative risk analysis

Technique	Strengths	Weaknesses	CSFs for Effective Application
Estimating techniques (applied to probability and impacts)	• Addresses both key dimensions of a risk, namely its degree of uncertainty (expresses as probability) and its effect on project objectives (expressed as impact)	• Difficult to calibrate if there is no historical database of similar events • Terms for probability (e.g. probable, almost certain) and for impact (e.g. insignificant, major) are ambiguous and subjective • Impact can be uncertain or represented by a range of values that cannot be put into a specific impact level such as "moderate impact on time"	• Agreed definitions of probability and impacts which reflect stakeholders' risk tolerances and thresholds • Values used in the definitions represent the same level of impact across objectives as perceived by the organization's management or project stakeholders • Consistent use of these definitions across all identified risks • Access to SMEs who have experience with the type of risk
Root-Cause Analysis	• Allows identification of additional, dependent risks • Allows the organisation to identify risks that may be related because of their common root causes • Basis for development of pre-emptive and comprehensive responses • Can serve to reduce apparent complexity	• Most risk management techniques are organised by individual risk. This organisation is not conducive to identifying the root causes • Can oversimplify and hide existence of other potential causes • There may be no valid strategy available for addressing the root cause once it has been identified	• Ability to identify if a risk is an outcome of a more fundamental cause • Willingness by management to accept and address the root cause rather than adopting partial workarounds
Post-project reviews/Lessons learned/Historical Information	• Leverages previous experience • Prevents making the same mistakes or missing the same opportunities twice • Enhances the Organisational Process Assets	• Limited to those risks that have occurred previously • Information is frequently incomplete: details of past risks may not include details of successful resolution; ineffective strategies are rarely documented • Creative generation of ideas	• Well structured project lessons learned database • Participation of previous project team members (ideally including the project manager)

[8] See more: Korombel, A.: Ryzyko w finansowaniu działalności inwestycyjnej metodą project finance, Difin, Warszawa 2007, pp. 106-107.

Probability and Impact Matrix (P-I Matrix)	• Allows the organisation to prioritise the project risks for further analysis (e.g., quantitative) or risk response • Reflects the organisation's level of risk tolerance	• Does not explicitly handle other factors such as urgency or manageability that may partly determine a risk's ranking • The range of uncertainty in the assessment of a risk's probability or impact may overlap a boundary	• P×I matrix requires that the input data are clear and unambiguous in assigning levels of probability and impact • Effective estimation of impact and likelihood as outlined previously • Organizations should be careful to assess the combinations of probability and impact that qualify a risk as low, moderate or high risk so that the method used reflects the organisation's risk attitude • Definitions used to designate the levels of impact (L,M,H) for each objective should represent the same level of impact as perceived by the organization's management or project stakeholders as reflecting the organisation's utility function
Analytic Hierarchy Process	• Assists in developing a relative weighting for project objectives that reflects the organization's priorities for time, cost, scope and quality for the project • Assists the creation of an overall project priority list of risks created from the risks' priority with respect to individual objectives	• Organisational decisions are often made by committees, and individuals may not agree on relative priority among objectives • Difficult to gather the information about pair-wise comparison of the objectives from high-level management	• Expert facilitator in the process • Agreement by management that it is useful to develop a consistent set of priorities among objectives • Use of proper method or available AHP software

Source: Based on: Practice Standard for Project Risk Management. Project Management Institute, Inc., Newtown Square 2009, 72-76 pp.

The advantages and disadvantages of the specific qualitative analysis methods, which are outlined in Tab. 3 should always be taken into account, when managing investment projects. Since every project is different, a decision on which of the methods should be applied, depending on a situation and specific needs, has to be made on a case-by-case basis. The methods listed in Tab. 3 are just a few examples out of all the methods comprehensively described in the literature on the subject[9].

2. Conclusion

The qualitative approach to risk management in investment projects requires the knowledge of advantages and disadvantages of specific methods and techniques, which can be used in this area. This concerns, first of all, the risk analysis stage. The knowledge allows decision makers to choose the most appropriate methods, depending on the type of an investment to be carried out, and apply them correctly in business activities. By combining the expertise with the knowledge about the advantages and disadvantages offered by quantitative methods, we should be able to conduct a comprehensive assessment of risks related to a given investment project. Only such a formula may ensure appropriate risk estimation, i.e. accurate and effective risk evaluation. It should be added that a practical qualitative risk analysis may be performed throughout the entire risk management process and, in particular, at the risk identification stage, where the risk management process commences. This stage is vital for further successful risk evaluation, as any risks and risk factors ignored at this stage may ultimately lead to inaccurate risk estimation. Therefore, many of the qualitative methods outlined in the paper should be used comprehensively at various stages of investment project implementation and risk management. In business practice, it's the outcome, i.e. risks which are accurately estimated using all accessible resources and methods, that counts.

[9] See more: A Guide to the Project Management Body of Knowledge (PMBOK®) Guide Third Edition. Pennsylvania: Project Management Institute, 2004. 237 p.; Practice Standard for Project Risk..., op. cit.; Marcinek, K.: Ryzyko projektów inwestycyjnych. Katowice: Akademia Ekonomiczna im. K. Adamieckiego, 2001; Wideman, M.R.: Project & Program Risk Management. A guide to managing project risk & opportunities. Newtown Square: Project Management Institute, 1992. See also: Marcinek, K., Foltyn-Zarychta, M., Pera, K., Saługa, P., Tworek, P.: Ryzyko w finansowej ocenie projektów inwestycyjnych. Wybrane zagadnienia. Katowice: Uniwersytet Ekonomiczny w Katowicach, 2010; Tworek, P.: Methods of risk identification in companies' investment projects. 5th International Scientific Conference "Managing and Modeling of Financial Risks". VŠB-Technická Univerzita Ostrava, 8th-9th September 2010, 420-424 pp.; Tworek, P.: Ryzyko wykonawców przedsięwzięć inwestycyjnych. Katowice: Akademia Ekonomiczna im. K. Adamieckiego, 2010.

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