

TENDENCIES AND PROSPECTS OF RISK AND UNCERTAINTY MANAGEMENT OF ENTERPRISE INVESTMENT PROJECTS

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Abstract. Under the current market conditions, an enterprise like any other institution or organisation is exposed to various risks. If risks are not managed, they can strongly affect enterprise activities, therefore, one of its main tasks is not only to reduce or minimize risks caused by various activities but to develop an effective system of risk management ensuring an optimal risk-to-profit ratio. The purpose of an article is review of the basic tendencies of risk management. The authors come to the conclusion about importance of consideration of the delivered problem basing on understanding of management by risks of investment projects of an enterprise, as systems of heuristic rules and receptions for decision-making in the conditions of risk and uncertainty. These rules include the positions described by the authors.

Keywords: risk, risk management, enterprise, investment project, decision-making.

Jel classification: G32, D81

1. Introduction

Under the current market conditions, an enterprise like any other institution or organisation is exposed to various risks (Merna, Al-Thani 2010). If risks are not managed they can strongly affect enterprise activities, therefore, one of the main tasks of an enterprise is not only to reduce or minimize risks caused by various activities but to develop an effective system of risk management, ensuring an optimal risk-to-profit ratio (Chapman 2010, Léautier, 2010).

Environmental risk assessment and decision-making (Ciegis *et al.* 2009) strategies in business over the last several decades have become increasingly more sophisticated, information-intensive, and complex, including such approaches as expert judgment, cost-benefit analysis, and investment risk assessment. Business is a continually changing area, strongly influenced by the environmental changes (Zavadskas *et al.* 2010). To predict these changes is as difficult as to predict the future. This causes a feeling of risk and uncertainty. Many enterprises lack the knowledge required for managing risks professionally. Taking into account these facts, it can be stated that the problems of risk assessment and management are of paramount importance. Effective risk management requires the use of the methods of risk assessment and analysis. The results of their implementation are very im-

portant for choosing the particular management methods.

Globalization of the financial markets, as well as intense competition between enterprises and social and technological development are the main factors influencing the use of the latest risk assessment methods. Technological achievements stimulate the researchers and practitioners to apply analytical methods for evaluating enterprise performance and its risky aspects, in particular. Traditional (quantitative and qualitative) methods of risk assessment can usually provide incomplete information based on one or a few criteria, which can hardly be involved in risk assessment process because their evaluation causes various problems. These are primarily qualitative criteria which cannot be expressed numerically, and, therefore, are taken into account or evaluated intuitively. Usually, most of risk assessments are based on life experience of managers.

In practice, most of uncertain events are not predicted and controlled (Léautier 2010). Therefore, even good decisions may cause losses. Risk can hardly be avoided because when you try to avoid one particular kind of risk, you can experience another, and so on. Even if you do not take any actions, you are exposed to the risk of missing the potential possibilities in business (Hubbard 2009). It has been proved by the economic theory that you cannot get any profit if you do not take

risk (Jones 2009). If risk is completely eliminated, which is hardly possible, you would lose possible profit obtained by performing a transaction. Now, the most important problem is risk assessment and proper choice of risk management method (based on the respective criteria and the determined risk level).

The appropriate decision-making, taking into account the tasks specified, has always been and still is one of the most significant problems for modern economy and finances. Businessmen, realizing the tremendous importance of this problem, make investments into the development of artificial intelligence and other advanced technologies as well as into the creation and development of new innovative multicriteria evaluation methods. They know that the product created by their enterprise based on these innovative technologies can raise their competitiveness on the continually changing market as well as providing them with the financial profit and other benefits.

2. Risk and its management

Risk is a natural result of any activities. People cannot accurately predict the future events, therefore, none of the market players can be 100 % sure that the business chosen by them will be 100 % profitable. More attention is paid to the events occurring more often and which are more obvious, while others remain out of the focus of people's attention. Some managers have erroneous views on risks, believing that:

- they can completely avoid them;
- unfavourable consequences of taking risks result from wrong decision-making;
- any person, not depending on the actual situation, is prone to take or not to take risk.

The above opinions are wrong, which can be proved by three facts relating to manager's activities:

- the management capacity of a manager is limited;
- a manager lacks the required information;
- a manager lacks the required time.

In many cases a man bases his interests and benefit formation on economic information, and he also understands the mechanism of his interest realization as a complex of economic means oriented to that goal. That's why the risk of non-adequate economic and financial information influence human decisions risks directly, which, in turn, can influence physical risk factors (Rutkauskas 2008).

In practice, the majority of undefined events are unpredictable and uncontrollable. Therefore, even effective decisions may result in losses, and

risks cannot be avoided completely. Even if an enterprise does not take any actions it is exposed to risks of missing the existing possibilities (Hopkin 2009). For example, not investing into a project, the investor loses a possibility to get profit.

Risks should not be considered as an absolute negative factor in business. Without risking there would be no profit or any other benefit (Fig. 1). If risks could be eliminated (which is hardly possible), a part of profit for a transaction would be lost.

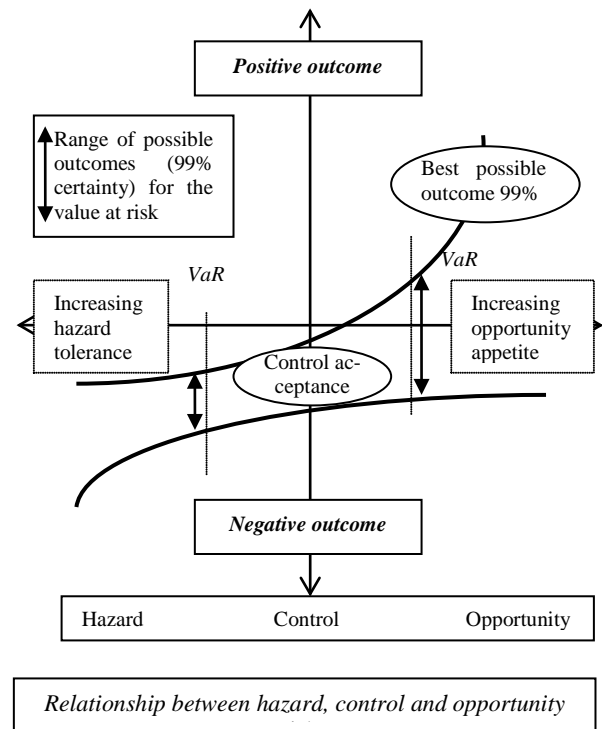


Fig.1. Risk and Uncertainty (Source: Hopkin 2009)

Therefore, risk may be either a positive or a negative factor (Fig. 1). At the present stage, the main problem is associated with risk management and the search for a respective risk management method in accordance with the type of risk and depending on the environmental conditions. It may be stated that some particular activities are associated both with common as well as specific types of risk. Basis of the theory of management of risks are the general principles, models, methods, ways, receptions evolution of arising risks (Fig. 2).

Risk management is a process embracing identification, assessment, monitoring and control of all possible risks (Haimes 2009). It consists of the clearly defined steps whose strict implementation helps an enterprise or individual to make effective solutions. Risk management is associated with following the specific rules and attempting to reduce or avoid losses.

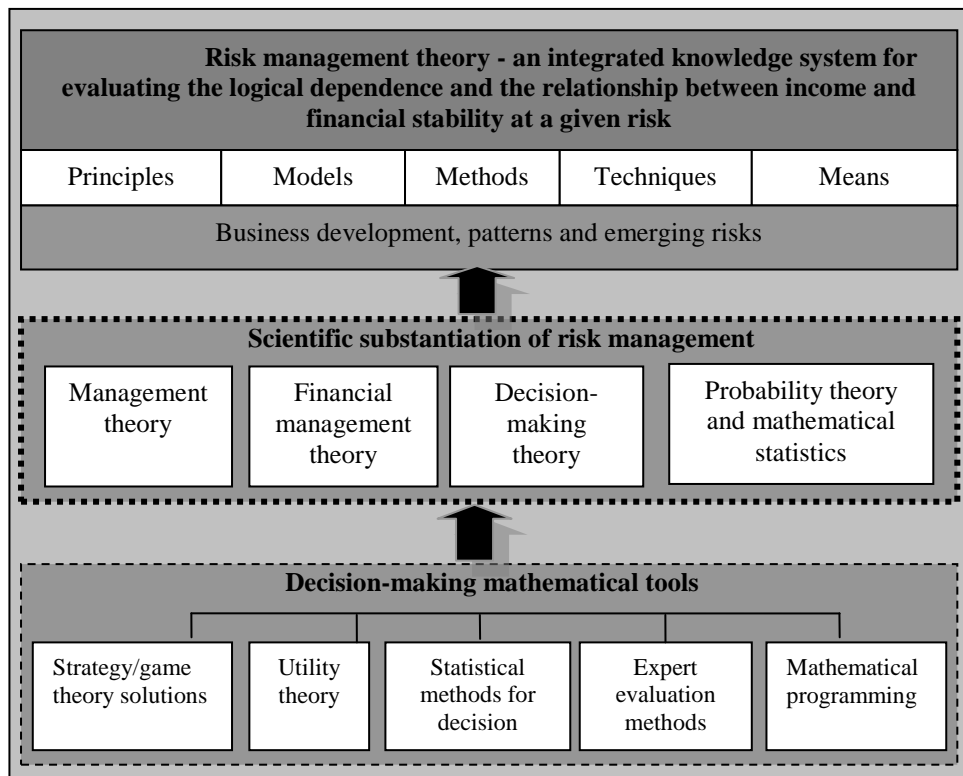


Fig.2. Risk management theory structural scheme (Source: compiled by the authors)

Though various risk management systems (processes) may be found in the literature (Fig. 3) (Chapman 2010, Hubbard 2009; Sadgrove 2009; Minasowicz 2008; Petravičius, Tamošiunienė 2008), however, one of the best defined systems is the system consisting of the following six issues: risk identification, risk measurement/analysis, the creation of risk management methods, the application and control of risk management methods and the provision of an account of the steps taken. Each of the above steps is closely related to the others, and all steps should be taken in the consecutive order (Fig. 4).

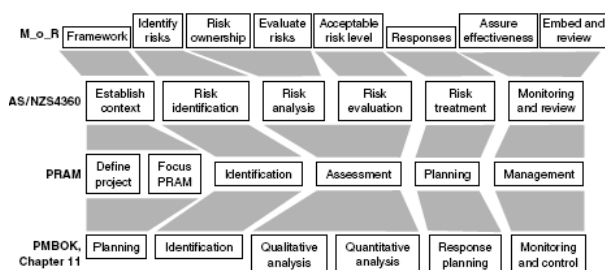


Fig.3. Project risk management processes comparison (Source: Petravičius, Tamošiunienė 2008)

An enterprise can make an effective solution only when it takes into account all kinds of risks. Then, it can reduce risk level. In addition, the accounts of the methods and means of management

used should be provided because it helps to maintain the feedback and make decisions faster in similar situations in the future. The provided information should be stored for this purpose. Effective risk management can be achieved only if it is made a part of general enterprise policy and strictly followed.

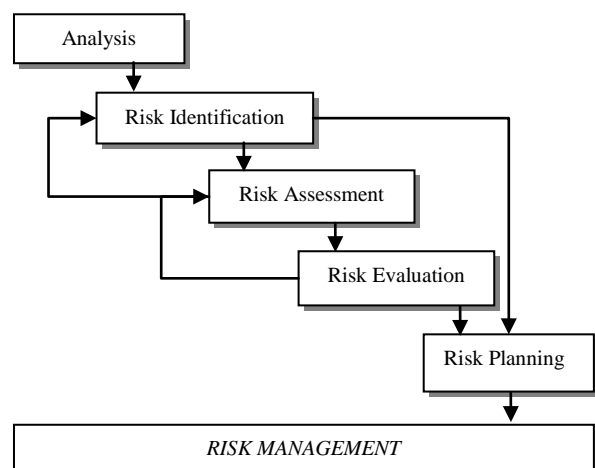


Fig.4. Stages in risk management process (Source: Chapman 2010)

The adopted policy may vary, therefore, enterprise managers should be able to adapt to the changes.

Poor risk management (the procedures specified) may lead to (Shevchenko *et al.* 2008):

- spontaneous decisions;
- higher risks;
- inappropriate distribution of responsibilities;
- ineffective use of the available resources (e.g. labour, time, equipment and money).

In many countries, private and public organisations, striving to help enterprises to apply effective risk management methods, created risk management models suitable for them.

Effective risk management allows the organisations to protect themselves from negative effects of risky undertakings. However, it is a complicated problem. When risk analysis is made at an enterprise, an important management stage is the choice of an appropriate management method. Various types of risk require various management methods. This depends not only on the particular type of risk but on its extent as well (e.g. a high or low threat of the event to take place). At this risk management stage, the important role of risk evaluation becomes evident because the accuracy and the exhaustive character of risk analysis as well as the evaluation of risk level determine the choice of risk management.

3. The some major aspects of risk management

Under conditions of objective existence of risk and connected with a financial and other losses, there is a need for a certain mechanism which would allow to take risk while making decisions.

Management of an company's investment project risk has it's own system of rules and heuristic methods of decision – making. These rules are as follows (Petravičius, Tamošiunienė 2008; Ustinovichius *et al.* 2008a):

- Do not risk more than your equity allows.
- It is necessary to calculate the consequences of the risk.
- Do not risk much (of what you have) because of the low success.
- The positive decision is taken only when there is no doubt.
- In case of doubt the negative decision must be taken.
- Do not assume that there is only one decision.

Enforcement of these rules means that at first before making a decision on the venture capital investment, the financial manager must perform a step by step analysis:

1. First, identify the maximum possible loss of the potential risk;

2. Compare the loss with the size of invested capital;

3. Compare the loss with all own financial resources and determine whether this loss of capital leads to an company bankruptcy.

The loss of an invested capital might be equal to the amount of the invested capital. It also can be lower or higher than the amount of the invested capital. This provision stems from the description of the investment project risk, when the occurrence of the risk may be useful, detrimental or have no results at all. The maximum possible amount of loss is equal to the amount of invested capital, when the direct investment is chosen. When the funds are invested in the mutual projects, which makes up the investment portfolio, the maximum possible loss is usually less than the invested capital. It might be caused of diversification. In situations where it first seems, there is only one solution (positive or negative) is recommended try to find alternative solutions. It is likely, that they really exist. If the analysis shows that there are no other solutions it is advisable to make the negative decision.

Simplified model of all previously discussed risk management aspects and trends is presented (Fig. 5). The risk management process steps (that are shown in the scheme) divide into several major components – a risk identification, analysis and risk elimination and response measures.

Risk analysis consists of data collection and processing of risk, qualitative and quantitative risk analysis. The measures of risk elimination and reduction are: substantiation of a maximum allowable level of risk; the choice of risk reduction methods; formation of risky capital investment options. Optimization based on their evaluation compared the expected rate of return (income and other things) and the size of the risk.

Data of the risk collection and processing is one of the most important phases of risk management, because management of the process firstly enables a variety of information acquisition, processing, transmission and practical use.

Information at the process of investment risk management is in primary place. Top-managers of an any company often have to take risky decisions when capital investment results are not well defined and based on the limited available information.

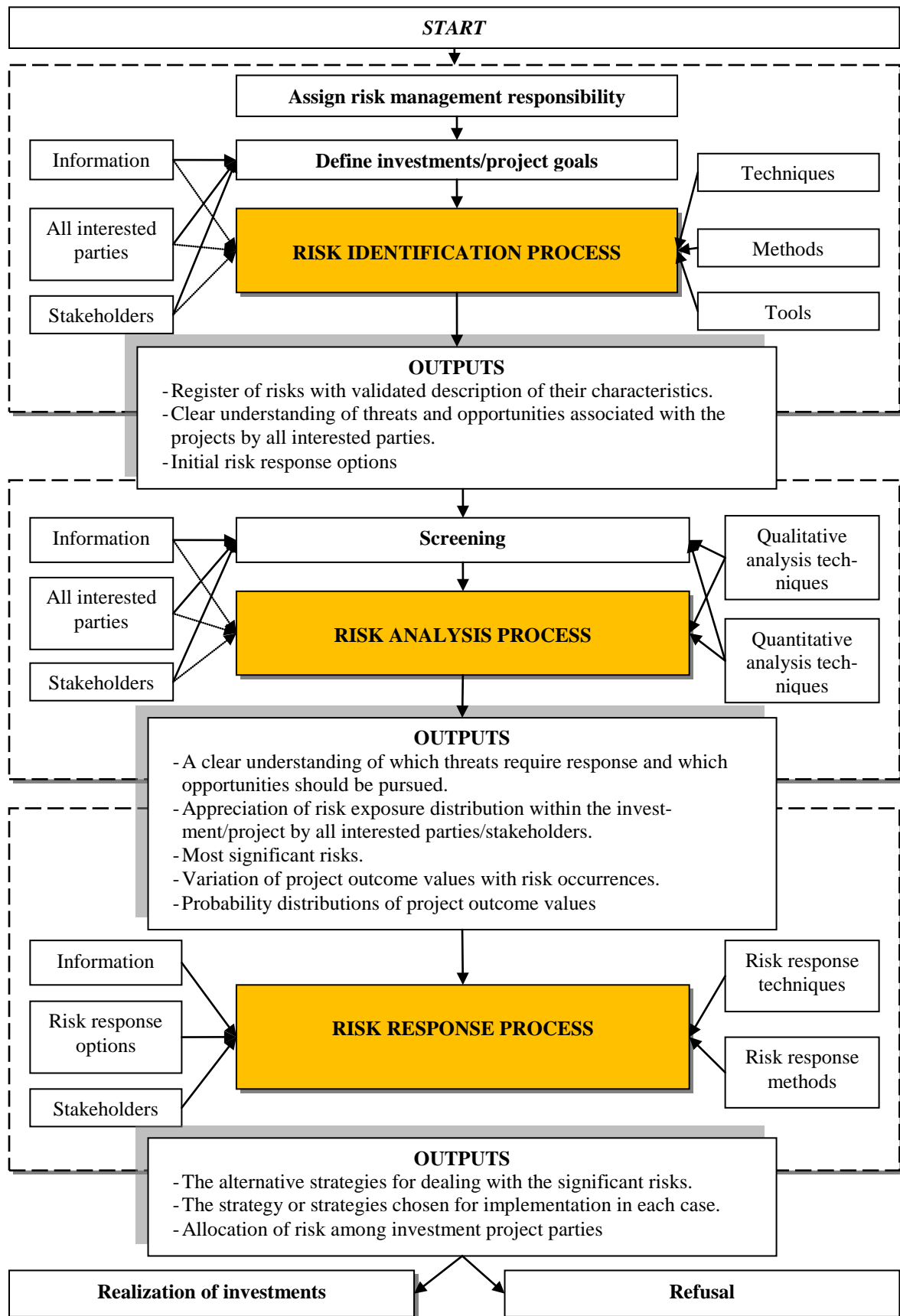


Fig.5. The some major aspects of risk management (Source: made by the autors)

If the company's managers had more comprehensive information they could make more accurate forecasts and reduce risk (Olson, Dash Wu 2008). This makes the information a very expensive commodity. In some cases, a company is willing to pay for full information. It depends on investment project realization expected profitability. Value of the full information may be a difference between the value of something purchased or capital investment when there is full information and the expected value when incomplete information is used.

At this stage, the information that was gathered must be reliable, high – quality, full – fledged and timely. Depending on the nature and the objectives of invested capital risk the information that is gathered may be: about the probability of a risky event; about partners, customers or competitors financial stability and solvency; about the foreign partner country's political and economic situation, certain goods and services in market status, insurance terms and conditions...The sources of such information include: data on investment implementation of ongoing projects in the past, expert opinion, various types of analytical overview, the data that special companies presents...

It should be noted that the collection and processing of the information is a critical step of the management process, whatever it's specific content. The extremely high demands are made for the quality and completeness of the information in the investment project risk management process.

Under these conditions, the provision of information for the risk management process is not only the data source for risk analysis. It is also a risk mitigation measure in the company's investment projects.

To describe a modern risk management trends and prospects for the collection and treatment process, it is necessary to obtain to obtain and use appropriate and accurate information. In addition, keep in mind that a large amount of data collection can be expensive, the reduction of inaccurate information costs additional money. The time factor must also be taken into account – the collection of complete and reliable information is time – consuming process. In most cases, the decision should be made within the provided period of time. Much of the information constitutes a trade secret; receiving of this information may not be possible or may involve significant additional costs.

On the basis of block diagrams algorithm, quantity analysis consists of: clarification of the sources and reasons of risk; identification of phases and activities in which there is a risk – setting the potential risk zones; identification of all possi-

ble risks; clarification of practical benefits and possible negative consequences that may appear in the realization of risky decision.

To take a reasoned decision about participation in the investment project, it is necessary to know the type of risk businesses will face. The prevention is possible from the unpredictable but clarified risk (even refusing the project). Unfortunately, there is no possibility to prevent from unclear or ignored risk. At the process of quantity analysis it is very important to determine not only the all types of risk, that may face an investment project, but also to clear up any loss of resources, accompanied by potential high-risk events. Qualitative analytical results are used as a source of information in quantitative analysis

The process of quantity analysis consists of: determination of the number of individual risks and the business over all risk of the investment project identification. At this stage, it is recommended to determine the number of risky probability events and their consequences. It is also recommended to carry out a quantitative risk – assessment, to define the degree of risk in the specific surrounding.

At the process of qualitative analysis there can be singled out a wide group of risks, with which the company will face while investing. Such risks are: the risk of fire and earthquake; the risk of strikes and international conflicts; the risk of tax policy changes; foreign exchange risk; unfair competition, corruption, ratchet and staff abuse risk. For each type of risk is likely to differ as the amount of damages that it may bring. Quantification of the individual likelihood of the risk assessment and how it will occur allows to distinguish the most probable by the occurrence and most important by the magnitude of the losses risks.

Finally, analyzing the investment project risk (Fig. 5) allows you to get the view of all risky events, the possibility of their appearance and the consequences they may bring. The comparison of risk assessment data with the potential risks leads to the creation of risk management strategy of the project. According to this strategy the measures of avoiding or reducing the degree risk may be offered.

Investment project risk minimization and disposal measures are (Hubbard 2009):

1. Adequacy of the level of risk assessment;
2. Assessment of risk mitigation options or gains in the evaluation (in the case when the results of the risk assessment values are much smaller than permitted and the increase of risk degree leads to the increase of expected return);

3. The selection of risk reduction (increase) methods;

4. The formation of risk reduction (increase) options;

5. The selection of expediency and risk reduction (increase) options.

After selecting the set of risk elimination or reduction instruments, there is a need to decide the degree of adequacy of the measures chosen. If the measures are sufficient the investment project may be accomplished, otherwise it is appropriate to waive the investment project (the avoidance of the risk).

Investment project risk management is a modern process that consists of many stages. Its final result is the highest possible profit when the proportion of profit and risk is optimum for the company under uncertainty.

4. The methods of verbal analysis in the context of multicriteria evaluation methods

Risk analysis based on financial and non-financial criteria allows us to determine the prospects of enterprise activities. It has been proved by close cooperation of the finance specialists and researchers performing mathematical modelling. In most cases, technological solutions based on optimization, as well as prediction support systems, multicriteria analysis, artificial intellect and stochastic models and approaches, are used in financial analysis.

In recent years, a considerable number of decision-making methods which are widely known as multicriteria decision-making methods (Multi (ple)-Criteria Decision Making or MCDM) have been developed by the researchers all over the world (Zavadskas *et al.* 2010; Turskis 2008). This name was given to them because their quality or effectiveness criterion is a vector, while the realization of the model yields a rational decision or a subset of decisions.

In modelling a particular situation, the real processes are often simplified to facilitate their description, however, they still should reflect the considered situation. Therefore, to perform a multicriteria analysis for solving a particular problem, the selection of the appropriate set of criteria is required (Ustinovičius *et al.* 2010; Turskis 2008)

Making decisions in the area of management, decision makers are faced with various problems.

The main of these problems (Ustinovičius *et al.* 2009, 2008b) may be stated as follows:

1. it is required to generalize and evaluate management criteria of various projects or organizations;

2. the evaluation should take into consideration the interests of various interested parties;

3. the available alternative decisions should be thoroughly compared.

Quite a few classifications of multicriteria decision-making methods (MCDM) may be found in the literature. However, in the present paper, we would like to suggest the most suitable (in our opinion) MCDM classification for solving risk assessment problems (see Table 1), based on the type of the available information.

One of the requirements to the results obtained by any method is their interpretation (explanation). For example, when making a decision, a decision-maker (DM) would like to know, why the alternative A turned out to be better than the alternative B, and both of them are better than C. To satisfy this requirement, a decision-making method should be transparent, i.e. it should ensure that the data provided by the DM should be consistent with the ultimate alternative estimate (Larichev 2002).

Very interesting and perspective method of the verbal analysis (Ustinovičius *et al.* 2009, Larichev *et al.* 2002). The decision-making methods of verbal analysis evaluate cognitive as well as behavioural aspects of the DM which will be described in the models considered below (Ustinovičius *et al.* 2010; Zavadskas *et al.* 2008). First, it should be noted that qualitative measurements allow us to obtain the definitions of unstructured problems which are close to the real ones. Second, following the decision-making rules conforming to the abilities of a human data processing system allows us to give psychological grounds to decision-making methods. Third, specially used procedures of checking the consistency of special information ensure the reliability of the obtained information, allowing the DM to gradually improve decision-making rules. Fourth, the availability of explanations increases the possibility of the successful use of the considered method in practice. Table 2 given below presents a brief description of the most common verbal decision-making methods.

Table 1. Classification of the methods based on the information available (Source: made by the authors)

Methods based on quantitative measurements	Methods based on the initial quantitative measurements	Methods including measurements based on several criteria	Methods based on qualitative measurements not including the conversion to quantitative variables
Multicriteria methods using utility function theory. Other methods	Analytic hierarchy method. Methods of fuzzy sets	Comparative preference methods	Methods of verbal analysis

Table 2. A brief description of verbal methods (Source: compiled by the authors)

<i>Name of a method</i>	<i>Application of a method</i>
ZAPROS	Ranking the whole set of alternatives
PARK	Searching for the best alternative in a set
ŠNUR (SNOD)	Searching for the best alternative in a set (more alternatives and criteria are evaluated than by using PARK)
ORKLASS	Expert classification of all the alternatives
CIKL	Expert classification of all the alternatives (performed faster than by using ORKLASS)

5. Conclusions

Globalization of financial markets, increasing competition between enterprises and social and technological development are the key factors determining the use of new risk assessment methods. New technological achievements help scientists and practitioners to understand the necessity and possibilities of using various analytic approaches to evaluating enterprise performance and the criteria describing its risky aspects.

The review and generalization of publications on questions of treatment the analysis, an estimation and management of risk slows the following:

- there is no standard interpretation of the term “risk” till this moment;
- the methods of the estimation of the generalized parameter of risk suitable for various theoretical and practical cases has not been worked out yet;
- features of risk analysis in the field of the enterprise investment evaluation have not received an appropriate reflection;
- there are no scientifically proved recommendations of borders of a risk level for concrete situations.

Under conditions of objective existence of risk and connected with a financial and other losses, there is a need for a certain mechanism, which would allow to take risk while making decisions.

Risk is a part of any business activities of an enterprise. Risk identification, classification, evaluation and management is a complicated problem because it depends on various factors, such as the

conditions under which risk manifests itself and uncertainty.

The premise that risk assessment and management must be an integral part of the overall decisionmaking process necessitates following a systematic, holistic approach to dealing with risk. Such a holistic approach builds on the principles and philosophy upon which systems analysis are grounded.

Most researchers of decision-making methods recognize and emphasize the difference between the existing standard methods and human perception and ability of information processing. The methods based on verbal analysis rely on scientific approaches, taking into account various disciplines and considering psychological criteria, which are particularly important.

The modern trends of risk management allows to get the expected results of the analysis of possible options. In individual cases it is possible to obtain results different from those projected. In spite of this, review methods shows that their practical use significantly improves the results of assessments and the degree of certainty. The use of the revised risk management trends and multicriteria evaluation methods leads to the better results of enterprise investment evaluation.

The management of risks as a non clear-cut structured system is especially complex and demanding new conception basis and absolutely new methods of risk factors evaluation.

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