

RISK-MANAGEMENT OF INVESTMENT PROJECTS

Tatyana Savko, Andrey Temichev
Belarusian National Technical University, Minsk, the Republic of Belarus

Abstract

The article is devoted to the questions of risk management. The necessity of investment projects risk analysis is conditioned by the fact, that cash flows, built during the investment project creation, apply to future periods, and, therefore, have predictive character. Hence, the importance of investment projects risk-management is increasing, as just comprehensive risk management will make it possible to implement the project with minimum costs and maximum effectiveness. In the article the definition of the category "risk", "investment", "risk management" is given. The authors consider components of the risk management process and the risk classification of investment projects. The main methods and tools for risk management of investment projects are identified.

Key words: risk, risk management, investment project, investment.

Introduction

Experience of market relations development showed, that investment is one of the most significant economic growth sources. However, it is necessary to use science-based investment management techniques that provide all influential risks registration, undertaken measures effectiveness analysis and optimal decision making during the investment projects implementation. Against the limited resources background, responsibility during investment decision making is increasing, which requires creation of effective risk-management system, based on principles of complexity and continuity.

Sense of categories «investment», «risk», «uncertainty»

Considerable quantity of scientific studies describes risk-management issues. Some of them discover theoretical management problems and give definition to categories «risk», «investment», etc. Others are dedicated to practical aspects of risk management, notably they examine mathematical models creation issues, risk analysis, presence of uncertainty quantitative characteristics, however, issues of risk-management system adoption, risks map forming, risk-management methods are not practically studied.

Risk-management is connected with examination of a particular object– investment or investment project therefore it is necessary to give its distinct definition. There are a great number of category «investment» definitions. Thus, W. Sharpe, G. Alexander and J. Bailey interpret investment, as refusal of certain value at present for (possibly, uncertain) value in future [1]. According to «Investment Code of the Republic of Belarus» investment means any property, including cash assets, securities, equipment and intellectual activities results, which belong to an investor in the capacity of ownership or other real right, and proprietary interests, that investor puts into objects of investment activities on purpose of receiving profit (income) and (or) obtaining other significant result [2]. On the basis of analysis of the category «investment» definitions it is possible to

conclude, that presence of time lag between investment moment and moment of probable cash assets return, is one of the essential investment features.

Any investment project is implemented in uncertainty conditions. Shapkin A.S. gives the following definition: «uncertainty is incomplete or inexact notion about the meaning of different parameters in future, engendered by various reasons, and, first of all, by incomplete or inexact information about decision implementation conditions, including costs and results, connected with them» [3]. Uncertainty appearance can be connected with economic, political, natural, temporal and other sources. It can be generated by external and internal environment, conflict situations, interest divergence, etc. Results of uncertainty display can be:

- positive (profit, income, other benefits);
- negative (loss, overhead, damage);
- zero or neutral (break-even).

Uncertainty factors influence in the investment project process leads to:

- non-fulfilment of assigned project purposes;
- change in scheduled terms;
- deviation from project results.

Uncertainty, connected with possibility of deviation from purpose, for which subjective decision is made, is characterized by the term «risk». Thereby, risk is subjectively estimated uncertainty. Risk can be evaluated with the help of terms «risk level» и «risk measure» [4].

Risk level is evaluation of possible consequences of considered decision, which in aggregate form reflects possibility level of occurrence of either favorable, or unfavorable consequences, as well as size of loss or benefits, that can appear.

Risk measure is risk level quantification according to a certain number scale, determined with the help of rules.

The scheme of risk factors impact on the investment project is shown in figure 1.

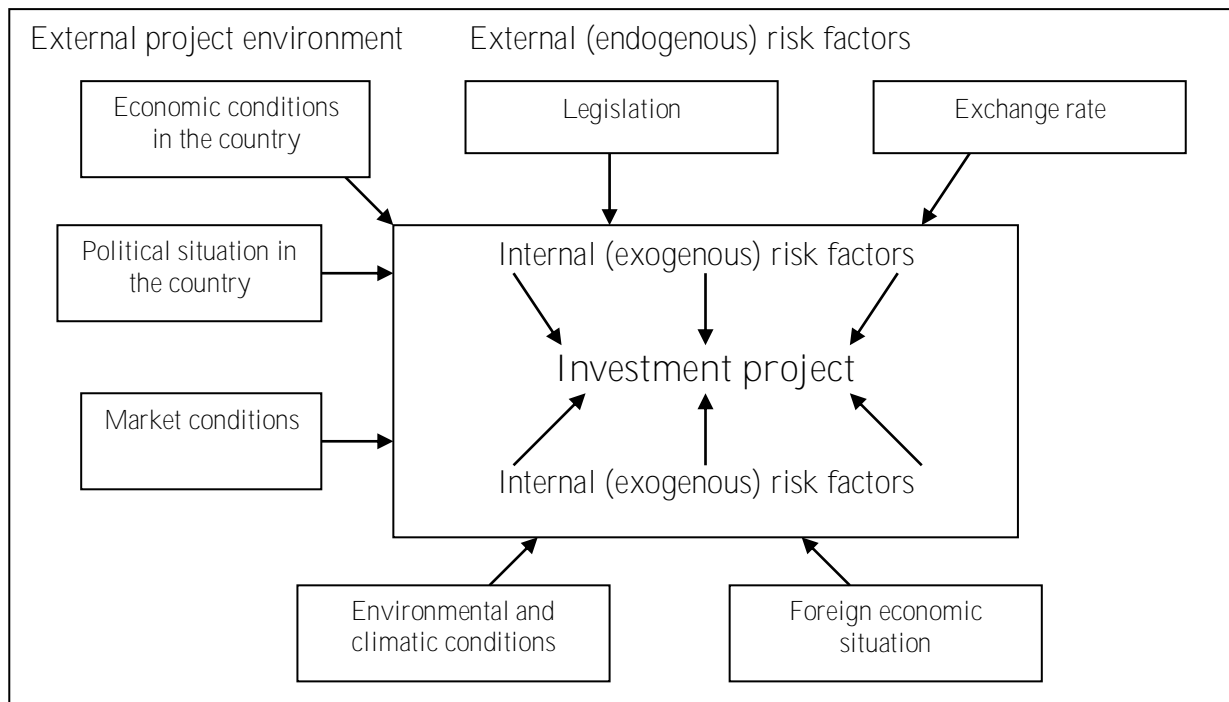


Fig. 1. Risk factors of the investment project

Methodical base for solving such problems as investment risks identification and evaluation is risks classification. Classification means grouping risks into concrete divisions according to a particular characteristic that underlines the classification. There is no unanimity of classification criteria definitions in economic literature, devoted to risk problems. It is connected with

the existence of specific risks, which are inherent in particular projects. In literature the most widespread risk classification criteria are: project scale, investment type, loss extent, sphere of demonstration, appearance sources. Possible classification according to given criteria is shown in table 1.

Table 1. Common risks classification

Classification criterion	Risk types
According to appearance sources	1 External (market, exogenous, systematic) are risks, which aren't connected with a particular enterprise or project activity, all participants of investment activity are influenced by them. Particular examples of this type are risks, connected with political, legal and regulatory, market, environmental and climatic circumstances of project implementation. 2 Internal (endogenous, unsystematic) are risks, which are connected with project participant's activity . Such risks can be connected with insufficient personnel competence, mistakes in construction documents and other factors, which can be averted with the help of effective risk-management.
According to loss extent (financial losses level):	1 Acceptable project risk is risk, financial losses of which will influence project implementation insignificantly. 2 Critical project risk is risk, financial losses of which will influence project implementation significantly, that can dispute positive financial results. 3 Disastrous project risk is risk, threatening project implementation.
According to investment type	1 financial risks 2 investment projects risks
According to spheres of demonstration	1 economic, connected with economic factors change 2 political, connected with country policy change 3 social, connected with social complications 4 ecological, connected with environmental disasters, calamities 5 regulatory, connected with legislation and regulatory framework changes

2 Theory of investment projects risk-management

Risk analysis is connected with an approach, which determines risk not as static, invariable parameter, but as manageable, level of which can and must be influenced.

Investment projects risk-management is a complex of management processes, which are connected with identification, risk analysis and decision-making, leading to negative consequences minimization and its positive influence maximization if risk event comes. Risk-management means identification of potential deviations from predesigned results and management of these deviations in order to heighten prospect, reduce loss and improve validity of made decisions. To manage risks means to determine prospects and defect opportunities for activity improvement, as well as to eliminate or reduce the probability of undesirable development of events. In order to minimize project investment risks during the process of its implementation, investment project manager must constantly identify (determine) investment risks and develop methods of reaction to them. Primary risk-management function is to develop measures for reduction of unfavorable risk consequences and to manage risk on purpose to receive strategic advantages.

According to Project Management Institute researches, risk-management system includes six procedures:

1. Risk-management planning;
2. Risk identification;
3. Risk qualitative evaluation;
4. Quantitative evaluation;
5. Risk reaction planning;
6. Risks monitoring and control [5].

In risk-management planning stage investor decides on methodology, makes decisions concerning organization, peopleware for project risk management procedures, data source for risk identification, etc. This stage can be considered as preparatory.

Risks, which can influence the project significantly, are detected (identified) within the scope of risk identification procedure. Maximally complete list of risks, which influence project results, must be made, as a result of identification procedures. It should be noted, that it is necessary to carry out risk identification regularly over a period of project implementation. It is connected with continuous changes of both, external and internal project environments. As a result, some risks can be excluded from consideration and others can be included in it.

Risk qualitative evaluation involves identified risks analysis from the position of their appearance sources and their possible influence on the project. Different methods and means are used for this analysis implementation. They depend on the risk peculiarity. Major task of qualitative evaluation is risks gradation

according to their importance degree and decision-making concerning methods of reaction to each particular risk.

Risk quantitative evaluation involves identification of risks appearance possibility and risks consequences influence on the project. Quantitative evaluation is closely connected with qualitative evaluation, and can be considered as its element. Moreover, risk quantitative evaluation must be continually reviewed, considering changes of both external and internal project factors.

Identification, investment risks qualitative and quantitative evaluations provide risk-manager with necessary information for making rational decision about influence measures on project risks.

Risk reaction planning means to identify and develop methods and instruments of risk reaction on purpose to reduce its negative influence on the project. Planning is one of the most significant risk-management functions. The lack of clear procedures formalization and defense mechanism leads to management quality deterioration and negative consequences for project financial results. It should be noted, that if the external environment of the project changes continually, only dynamic risk reaction planning can be effective.

Risks monitoring and control procedure allows tracking identified risks regularly, providing implementation of defensive measures from identified risks and evaluating their effectiveness. The result of monitoring and control procedure is accumulation of information, which is necessary for alternative strategies implementation. This information must be continually evaluated with the help of qualitative and quantitative methods. The project can be amended in order to achieve assigned goals. As project external environment changes continually, monitoring and control must be conducted over the whole period of project implementation.

According to [6], there are 7 risk-management stages, which are aggregated into 2 main groups: the group of risk analysis stages and the group of management stages. Risk-management schematic circuit is shown in figure 2.

On the basis of complex risk analysis, which includes both qualitative and quantitative analysis, complex of measures for reaction to identified risks must be elaborated. There are 4 alternative methods of risks reaction: risk avoidance, risk transference, risk mitigation, risk acceptance [5]. Each method has its own instruments and strategies.

Risk avoidance means change of the project plan in order to avoid risk negative consequences. Risk avoidance methods include renunciation of untrustworthy partners, rejection of risk projects, etc.

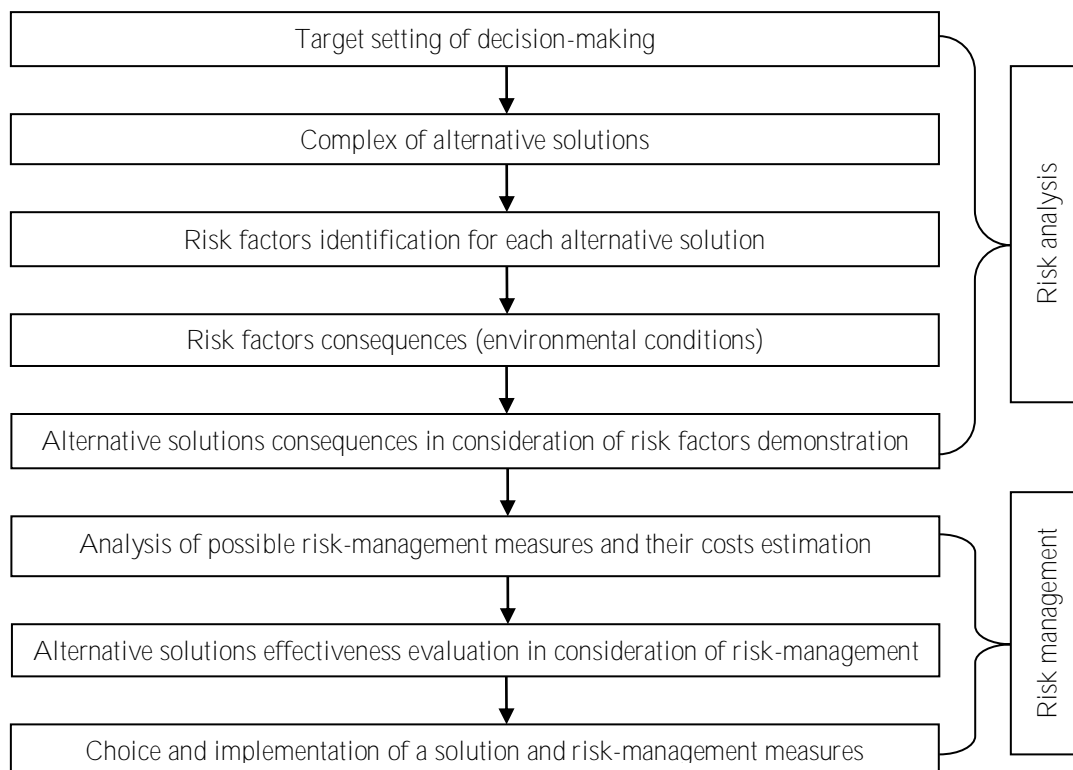


Fig. 2. Risk-management common scheme

Risk mitigation means reduction of either risk event probability, or risk event loss to acceptable level. In case of risk mitigation it is necessary to estimate costs of risk mitigation measures and measures, which eliminate undesired event consequences.

If risks can't be completely excluded, or risk event loss will be too large and event probability is low, then risk acceptance strategy is used. Under this strategy both passive management (it means that no actions must be taken before risk event comes) and active management (for example, creation of money holding, float time, etc.) can be used.

It should be noted, that risk identification and evaluation are base stages, which help to develop subsequent program of investment risk-management. Investment risks structure can be developed on the basis of a certain formalized list, while risk level analysis and decision-making about methods (ways) of investment risks reaction or avoidance in most cases are based on **manager's experience**. System of risk influence evaluation can be based on different methods of investment risks analysis, such as:

- discount rate updating; it represents an analysis, which shows, how **project's solvency criteria** depend on discount rate changes;

- confidence factors method; it means future cash flows updating, by evaluation of reliable equivalents of **the project's** uncertain cash flows. Mathematical expectation is used as reliable equivalent;

- sensitivity analysis; it evaluates changes of **project's possible** finance indicators, and, therefore, advisability of participation in the project, taking into account uncertainty factors;

- scenarios; it means creation of several project development alternatives (as a rule, three scenarios are developed: optimistic, the most probable, pessimistic). Investment risks are evaluated under each of chosen alternatives;

- probability distributions of cash payments streams; it helps to receive useful information about expected values **of client's solvency measures and net earnings**, as well as to conduct analysis of their probability distributions;

- decision trees method; it is used in order to analyze project investment risks, which have visible and reasonable number of possible outcomes. They are especially useful in such situations, when decisions, made at future moments, strongly depend on decisions, made previously, and by-turn determine further developments scenarios;

- Monte Carlo (simulation modeling); it represents a complex of numerical experiments. They must get empirical estimators that show how different factors (basic values) influence measures of investment project risk probability, etc. [7].

A particular method of risk reaction choice depends on the following circumstances:

– there are special analysis techniques for each type of risk, which is analyzed, and concrete peculiarities of their implementation;

– basic data volume and quality are of primary importance for risk analysis. Thus, the more information risk-manager has, the higher the opportunity to use simulation modeling is, if not, method of expert evaluations will be used (its accuracy depends on **involved expert’s experience and intuition**);

– evolution of measures, which influence investment risk, must be taken into account during risk analysis, as only continual risk-management can guarantee effectiveness of risk-management system;

– when analysis techniques are chosen, it is necessary to pay attention not only to design data, but also to prognostication level of measures, which

influence investment risk level, as the farther prognostication level is, the lower calculation accuracy will be;

– analysis urgency and technical feasibilities are of great importance, because time float influences calculation accuracy directly.

Hence, it can be concluded, that a whole complex of methods must be used regularly and continually, as only in this case risk management system will be effective. Principal differences between traditional and effective risk-management systems are shown in table 2.

Table 2. Principal differences of risk-management systems

Traditional risk-management system	Effective risk-management system
influence on separate risk types	influence on the whole risks complex
fragmentary management	regular and continual management
established system isn’t changed	management system is adopted to changes of external environment
indicated and evaluated risks are not revised	regular risk factors monitoring

Investment risk-management system must be able to modify with the use of management methods complex at each stage in compliance with processing data flows, notably to be adaptive to environmental changes, which appear in the course of investment activity.

Conclusions

Well-built risk-management system makes it possible to stabilize major strategic and tactical business activity measures (e. g. business value, profitability), to optimize resource placement and investment in compliance with risks evaluation, to prevent loss (e. g. by adoption of timely project abandonment mechanism), to prepare business for operation in the critical juncture **of things and to improve company’s reputation**. Successful risk-management indicators influence business investment appeal; expand amount of sources and investment projects financing schemes by attraction of new investors; reduce capital formation costs as well as costs, which are connected with projects

implementation, favouring further development of industry.

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Address for contact
 Belarusian National Technical University
 FMME
 Nezavisimosti ave., 65
 Minsk 220027
 Republic of Belarus

e-mail: atemichevbntu@tut.by, savtk@yandex.ru