Оценка и пути снижения рисков инновационного проекта. Метод дерева событий

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Аннотация

Данная статья посвящена рассмотрению проблем управления инновационными рисками и способам их снижения. Исследование содержит статистические данные по развитию в секторе инноваций. Выявляются источники появления инновационных рисков, ключевые методы управления рисками и проблемы использования этих методов. Исследуется сущность метода дерева событий, как одного из элементов управления инновационным риском.

Ключевые слова: риски, стартап, инновации, управление рисками, дерево событий, инновационный риск, методы снижения инновационных рисков, инновационные бизнес-риски.

Ways to reduce the risks of an innovative projects. Event tree analysis

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Abstract

This article is devoted to the consideration of the problems of management of innovative risks and ways to reduce them. The study contains statistics on development in the innovation sector. The key methods of innovation risk management and the problems of their use are

identified. The essence of the event tree method is investigated as one of the elements of innovative risk management.

Key words: risks, start-up, innovation, risk management, event tree, innovation risk, methods of reducing innovation risks, innovative business risks.

Innovations are becoming increasingly important for improving competitiveness and sustainable economic growth. Countries developing an economy of innovation demonstrate efficiency and high rates of economic development. Innovations at the enterprise are not only new products, processes and technologies, but also the use of new methods and models for managing the innovation process. At the same time, the environment for the development and adoption of management decisions, determined by the elements of the internal microstructure of the enterprise in combination with external factors, is characterized by the existence of risks and uncertainties. Therefore, the assessment and analysis of risks, as well as their minimization in the innovation process, become an important element of management.

Over the last decade, average innovation expenditures worldwide have, in fact, been growing faster than Gross Domestic Product (GDP). According to our 2020 estimates, in 2017 and 2018, research and development (R&D) grew by 5.0% and 5.2% respectively—in line with the strong growth of the pre-crisis period and significantly stronger than global GDP growth. This growth in R&D expenditure—the highest over a six-year period—was sustained by growth in key emerging markets, such as China and India, and by leaders in high-income economies.

Risk in innovation is the danger of not achieving the goals set in the innovation project. Companies launch because of interesting ideas and at the same time, there are few serial entrepreneurs who already have experience in selling a business and are building a new one with the same aim.

The level of innovation risk is evidenced by the fact that, 64% of Russian startups have a negative experience of project failure or business closure because they did not pay enough attention to the risks. High risk is accompanied, as a rule, by its high compensation: the possible rate of return from the implementation of innovative projects is much higher than the usual one obtained in the implementation of other types of entrepreneurial activity. This is what allows the innovation sphere to exist and develop. The risk of innovation activity is the higher, the more localized the innovation project; if there are many such projects and they are dispersed in the sectoral plan, then the total risk is significantly reduced. The effect of a successful innovation usually outweighs the costs of other unsuccessful developments. 42% of startups in Russia consider their product to be

innovative and unique, and 19% believe that there are no analogues not only in the domestic but also in the international market.

In general, the risk in an innovative business can be defined as the probability of losses arising when a firm invests in the production of new goods and services, in the development of new equipment and technologies that may not find the expected demand in the market, as well as when investing in development managerial innovations that will not bring the expected effect. Simple risks are defined by a complete list of non-overlapping events, each of which is considered independent of the others. For example: lack of necessary workers and lack of their qualifications; imperfection of the information support system; remoteness of technical networks; late delivery of equipment; possible deviations in the course of work. Innovative risk arises in the following situations:

a) the introduction of a cheaper method of producing a product or providing a service in comparison with those already used. Such investments will bring the firm temporary super profits as long as such a firm is the sole owner of this technology. In this situation, the firm is faced with only one type of risk - a possible incorrect assessment of the demand for the product produced;

b) creating a new product or providing a service using old equipment. In this case, the risk of inconsistency in the level of quality of the product or service due to the use of equipment that does not allow ensuring the required quality is added to the risk of an incorrect assessment of the demand for a new product or service;

c) the production of a new product or the provision of a service using new equipment and technology. In this situation, innovation risk includes the risk that a new product or service may not find a buyer. The risk of non-compliance of new equipment and technology with the requirements necessary for the production of a new product or service; the risk of the impossibility of selling the created equipment, since it does not correspond to the technical level required for the production of new goods.

To conduct a better analysis, it is necessary to highlight the components that affect the values of the cash flow to the greatest extent. These components often include the cost of materials and raw materials, the selling price of the product and the volume of sales. It is also possible to highlight other parameters: the exchange rate, if the activity of the project is with foreign markets or foreign equipment. For each project, it is necessary to determine a certain set of influencing components, which will help to conduct a better assessment and risk analysis.

Most often, when analyzing an investment project, the probabilities of various options for implementing a project are assessed. However, the question arises about the degree of objectivity of this assessment. The objectivity of the assessment is most often associated with the nature of the

risk. Production risks can be realistically assessed using statistical information, which means that such an assessment can be considered quite objective. But most often, risk assessment can only be carried out subjectively. For this, various methods can be used that help to somewhat reduce subjectivity, but they do not allow you to get rid of it completely. This should be taken into account when analyzing the results. However, assessing the probabilities of realizing certain situations can be quite difficult. This is largely due to the huge number of situations that can occur. In such conditions, even expert assessments may not be reliable enough.

The event tree method is widely used. It is based on the assumption that events can develop in different ways, and each possible outcome has its own probability. Most often, the event tree is presented graphically. It shows that the branches indicate the probability of the corresponding outcome and at the ends of the branches - "leaves" - the corresponding value of the desired indicator is indicated.

The ETA analysis helps to identify all possible scenarios for the development of an adverse event (highlighting the branches of success or operation and failure or failure of a protection factor in the event tree), the design of the object being developed, and identify weak points of the procedure. The success branch is a model of conditions in which a protection factor acts in accordance with its purpose (triggers). As in the case of other analytical methods, special attention should be paid to modeling the dependence of events, given that the probabilities used in the event tree are conditional on the sequence of events that occurred before the implementation of the event in question.

Methodology of the event tree analysis:

1. Define the system: define what needs to be involved or where to draw the boundaries.
2. Identify the accident scenarios: perform a system assessment to find hazards or accident scenarios within the system design.
3. Identify the initiating events: use a hazard analysis to define initiating events.
4. Identify intermediate events: identify countermeasures associated with the specific scenario.
5. Build the event tree diagram
6. Obtain event failure probabilities: if the failure probability cannot be obtained use fault tree analysis to calculate it.
7. Identify the outcome risk: calculate the overall probability of the event paths and determine the risk.

8. Evaluate the outcome risk: evaluate the risk of each path and determine its acceptability.

9. Recommend corrective action: if the outcome risk of a path is not acceptable develop design changes that change the risk.

10. Document the entire process on the event tree diagrams and update for new information as needed.

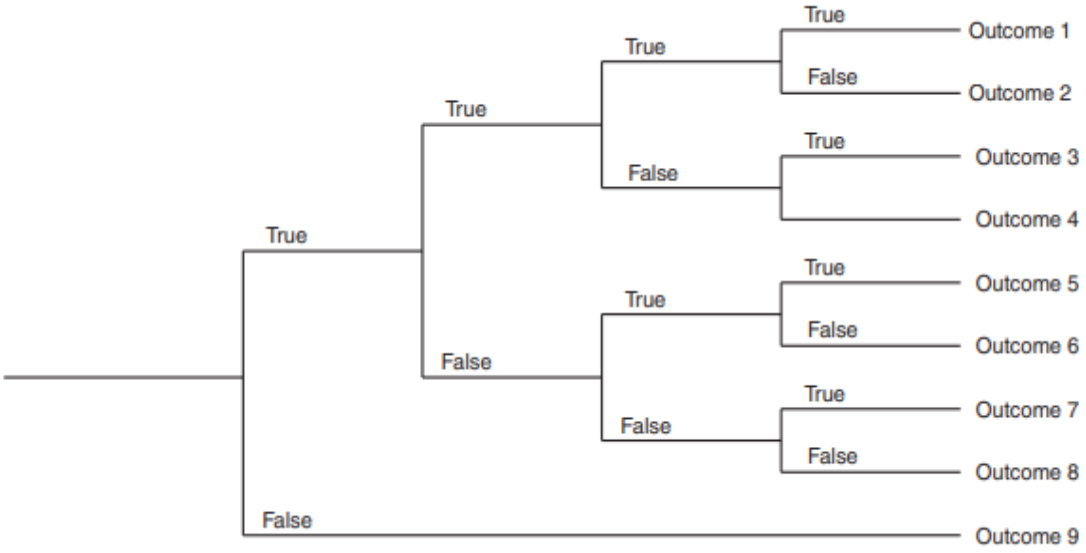

Fig. 1. The event tree analysis

Figure 1 shows the initiated event (e.g. fire) and the activation or failure of three subsequent systems (e.g. firefighting) that normally occur in the event of an event. Each system may or may not work (somewhat unrealistic, since in some cases something may work in part). Due to the many success or failure combinations of each system, there are several possible outcomes (shown in the diagram from a to h). The diagram also shows how to measure event trees. Usually, the initiating event is reported as the expected annual frequency (for example, 2 times a year), and the success / failure for each system.

The benefits include of event analysis:

- Thorough initial analysis of scenario options makes it possible to make better decisions based on the analysis.
- Scenario approach allows to limit the number of options considered, which helps to reduce the amount of analyzed information.
- It is possible to select for analysis those scenarios that are interesting to the investor himself or those that are most likely.

- The following features can be identified as disadvantages:
- Possible fluctuations in certain components that directly affect the cash flow are not taken into account in this approach, although such fluctuations are quite natural, due to the consideration of the project over a long time period.
- Possible errors in the initial consideration and selection of scenarios lead to errors in calculations and erroneous conclusions regarding the implementation of the entire project.

Disadvantages of the event tree-based risk assessment method:

— hidden system dependencies can be missed, which leads to overly optimistic estimates of reliability and risk indicators;

— the need to identify all possible initial events;

— situations where the presence of an object in a certain state for more than a specified time can lead to a failure, it is difficult to simulate using the event tree;

— application for only two states of systems;

— often provides only an optimistic risk assessment.

Overall, should work independently over its innovative potential, take into account the existing innovation climate at all stages of the innovation life cycle, which is impossible without an innovation risk management. A quantitative analysis is most useful in considering the suitability of controls. It is most often used to simulate failures in cases where a variety of safety measures and means are applied. ETA can be used to model initiating events that can cause harm or benefit. However, the circumstances under which the search for optimal paths from the point of view of benefits is carried out are more often modeled using a decision tree.

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