RISK MANAGEMENT MODEL IN THE FORMULATION PHASE OF THE TECHNOLOGICAL PROJECT

***Ludmiła Walaszczyk*[1]**

Abstract

In the 2014-2020 perspective, the calls for proposals are mainly directed to the entrepreneurs. It provokes the necessity to prepare the project applications to the consulting company by the entrepreneurs themselves or to sub-contract it. However, the preparation of the proposals by the applicants is more rationale, because they know best what will be developed and how to justify it. On the other hand, while writing the applications, it is indispensable to consider all risks that might happen during the preparation process and which can influence the further phases of the project execution. The author of the article presents the theoretical background how risk can be managed. The main aim of this article is to design the model for risk management, which is dedicated to the formulation phase of the technological project. In the process of the model design, the author used direct interview and modelling methods. The application of this model enables the entrepreneurs to prepare the project application with all necessary aspects taken into consideration, which should be fulfilled; otherwise, the project application can be rejected.

Keywords: *risk, risk management, formulation phase, the 2014-2020 perspective, model for risk management.*

1. Introduction

One of the ways to fulfil strategic aims of the enterprise is the execution of projects; thus it is important for the organization to apply for public funds in order to be able to launch projects and to manage them effectively. The project management is related to different kinds of initiatives (Trocki, Grucza & Ogonek, 2003). Taking into account the definition of Kisielnicki, the project management is "a set of tasks logically organized, which are not completely defined and sometimes only outlined." The project management aims at "the execution of the planned aim, which is the increase of the intellectual capital.

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The result is the development of the theoretical and practical assumptions and plans to design a new product or service" (Kisielnicki, 2013).

According to the European Guide to the Evaluation of Socio-Economic Development (2004), the process of the project management includes the following phases: programming, planning, formulation, monitoring, closure of the project and the evaluation of the final results. Other authors also consider these phases, among others, Mingus (2002), Lewis (2007), Kerzner (2009), and Kanda (2011). In this article, the author considered the formulation phase and focused on the risk aspect, which should be taken into account during the development of the project proposal. Due to the fact that the entrepreneurs should analyze the risk criteria in the formulation phase, the author has developed the model for the risk management[2], which is a supporting tool for the design of the project idea. The author has considered the elements important for the 2014-2020 perspective.

2. Assumptions and research questions

In the article, the following research questions were given:

1) What can be the reasons that the risk appears in the formulation phase?
2) How to assess the risk most effectively in the formulation phase of the technological project?

The research was conducted between 2015 and 2017. In the research, the direct interviews and CATI interviews with entrepreneurs, who would like to apply for the European funds, were applied. Before conducting the research, the author contacted 150 enterprises (micro, small, medium, and big), among which 108 (72%) of them decided to take part in the research. The author presented to the entrepreneurs the groups of the criteria, which can occur in the formulation phase of the project (formal, content, financial, legal). Later on, each criterion contained detailed sub-criteria. The task of the entrepreneurs was to indicate these criteria, to which they must pay attention during the preparation of the project proposal.

3. Risk management – theoretical foundations

In the literature, it is possible to find many approaches to the project management, among others, P2M (2009), PRINCE2 (2010), TenStep (2012), PMBOK (2013), Six Sigma (2014), which also include the aspects of the risk management. Moreover, the methodologies dedicated only to the risk management can be found (Table 1).

2 A model is a simplified presentation of a selected part of the reality in order to understand it better.

Table 1. Methodologies for the risk management

Methodology	Description
ISO 31000 Risk management – Principles and guidelines on implementation - International Organization for Standardization	ISO 31000 gives basic information on the risk management. The standard can be applied in the enterprises of different types (private and public), for group tasks as well as for individual tasks. It is not dedicated to any specific sector or service. It can be used in strategies, decisions, operations, projects, products, services.
A Risk Management Standard – IRM/ Alarm/AIRMIC 2002 – the Institute of Risk Management	The standard includes the following sections, which concern risk: definition, management, assessment, analysis, evaluation, decision-making process to minimize or eliminate risk, monitoring of undertaken steps.
COSO 2004 - Enterprise Risk Management - Integrated Framework - Committee of Sponsoring Organizations of the Treadway Commission	The standard aims at the identification and the selection of risk, which could influence most the decision process and it includes the following aspects: the linkage of the risk with the strategy, the proposition of the objectives and the mechanisms for the risk management, decision-making process.
RAMP (Risk Analysis and Management of Projects) - Institution of Civil Engineers and the Institute and Faculty of Actuaries	As far as it concerns the RAMP methodology, the risk analysis includes four stages: the initiation of the RAMP procedure (1), the risk identification (2), the risk management (3), the final management phase (4). The second and the third phases are especially important as they include the following activities: the identification and the assessment of risk and the use of the methods enabling minimizing or eliminating risk; the control of risk and the observation of any possible changes.
PRAM (Project Risk Analysis and Management) – the Association of Project Managers	The methodology enables the users to analyze and to manage the risk, which is linked to the project. The methodology, if applied correctly, increases the probability of the project success.
M_o_R (Management of Risk) – British Cabinet Office	The methodology is used at different levels of the organization – strategic, program, project, operational level. The aim of the methodology is to identify the risk management, policy and adequate strategies, plans for programs, projects and systematic identification, analysis, and management of risk.
Risk Management Methodology – European Union Agency for Network and Information Security	The risk management methodology can be used in the long-, medium- and short- term perspectives. It aims at the definition of the scope and the frames of the risk management, the risk assessment, minimizing or eliminating risk and making the staff aware as far as it concerns the probability of the appearance of risk and its results.

Source: Walaszczyk (2016, pp. 34–43).

In this article, the key element is the linkage of the risk with the formulation phase of the project. The formulation phase enables the applicants to analyze deeply the needs, which are the basis of the project launch, to analyze potential problems, to precise aims of the project, to estimate time

of the project execution and its budget, and to identify the results, which are planned to be achieved. The formulation phase includes several steps (5Ws + H rule) (Shiba & Walden, 2016; Hicks, 2004; Andler, 2016):

- *Why* – why is the project needed? What are the reasons for its execution?
- *What* – what activities will be undertaken and what results are planned to be achieved?
- *Who* – who will be the executor, the sub-contractor and the end users of the project?
- *When* – when will the project be executed?
- *What for* – what benefits will be received after the execution of the project?
- *How* – what are the assumptions of the project, how high is the level of the risk.?

The primary element of the formulation phase is the development of the project proposal in such a way that the proposal should be accepted by the organization financing the project.

The entrepreneurs are aware that the preparation of the project proposal is not simple and many criteria must be taken into account. Having conducted more than 100 interviews with entrepreneurs and people responsible for the elaboration of the project proposals in the areas of technologies on different barriers, which make the preparation of the project proposal difficult or impossible, the author listed the reasons, which can be met the most often:

- difficult language of the project documentation;
- lack of skills for interpreting legal acts;
- lack of skills for the execution of individual tasks;
- lack of experience in the preparation of the project proposal;
- too much information, which must be included in the project proposal;
- lack of skills for the organization of work during the preparation of the project proposal.

The barriers indicated above, increase the probability of risk during the project evaluation and the project execution. Moreover, there are presumably other kinds of risks, which should be considered. The need for the elimination or the minimisation of risk induced the author to the design of the model, which will be the tool supporting the formulation process of the technological project. The model includes elements, which must be considered during the formulation phase. In the model, the author included the criteria, which is typical for proposals in the 2014-2020 perspective as well as own propositions.

4. The assumptions of the model for risk management in the formulation phase

The aim of the model is to be an effective tool supporting the preparation of the project proposal at the formulation stage. The author considered many criteria, which are relevant for the 2014-2020 strategy.
The assumptions of the model are the following:

- the model can be applied in the formulation phase of the project proposal;
- the model includes the following criteria: formal, content-related, financial and legal, which are included in the 2014-2020 perspective;
- qualitative and quantitative methods for the risk management are included in the model;
- the model should be mainly used by the entrepreneurs;
- the model can be applied by other institutions (e.g. research organizations) if needed;
- the model is open; therefore, it can be complemented with additional elements.

The overall structure of the model is presented in Figure 1.

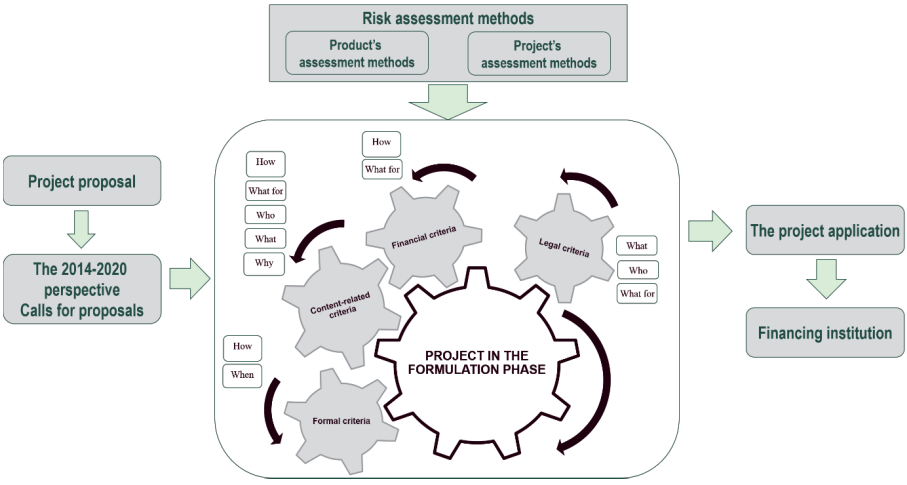

Figure 1. Model for the risk management in the formulation phase

In the formulation phase, the entrepreneurs, who wish to submit the project proposal, should perform the *ex-ante* evaluation. Its aim is to minimize the probability of the proposal rejection by the financing institution.

The aim of the *ex-ante* evaluation is to assess, among others, the needs of the launch of the project; the potential problems; the project objectives; the time

of the project execution; the budget; the results planned to be achieved. The main assumption of the *ex-ante* evaluation is to assess the potential project in such a way in order to prove that financing is justified and the development of products will contribute to, among others, the increase of the competitiveness of the company on the market.

4.1. Formal criteria

The first step in the risk management in the formulation phase is to check formal criteria. The author indicated these, which appear most often in the calls for proposals offered by national organizations within the 2014-2020 perspective, and which should be significantly considered by the applicants.

They are the following:

- the submission of the project proposal in a relevant institution;
- the submission of the project proposal within an adequate activity;
- the submission of the project proposal in a relevant time, which is indicated in the call for proposals;
- the preparation of the project proposal according to the instructions and other requirements;
- the relevance of the budget with the rules of projects' financing. This catalogue of criteria is not closed. It includes the criteria, which appear in most calls for proposals, and which are proposed at the national level. The formal criteria concern the project as a whole, and therefore, they should be checked with the use of the document analysis method (rules and other documents, e.g. annexes). As far as it concerns the formal criteria, the entrepreneurs make the following mistakes:
- the submission of the project proposal within irrelevant activity;
- the omission of some requirements;
- irrelevance of the budget with the requirements of the call for proposals.
- The formal criteria are indispensable to be checked, as the lack of the verification can contribute to the immediate rejection of the project proposal.

4.2. Content-related criteria

The content-related criteria are linked to the product, which is planned to be developed in the project. Regardless of the type of the product, the author proposed to assess them with the use of the following methods: the method for the assessment of the implementation maturity level, the method for the assessment of the commercial potential, the method for the assessment of the innovativeness level. In Table 2 the author described the methods above.

Table 2. Descriptions of the methods relevant for the product assessment

Method	Description
Method for the assessment of the implementation maturity level	The method enables the users to assess the following categories of technical products: devices, materials, systems, and technologies. The method aims at the identification of the advancement phase of works on the product, and it indicates the implementation maturity level of the product. The assessment includes two stages: preliminary and detailed assessment, which contains a set of control questions relevant for these types of the products. The preliminary assessment is performed by the experts, and it aims at quick identification of the implementation maturity level and preliminary identification of one of 9 levels, which concern the progress of the product development. The detailed assessment contains 180-200 control questions, depending on the product type. The effectiveness of this method has been confirmed in undertaken innovative initiatives financed either from public or private funds.
Method for the assessment of the commercial potential	The method is a complex character, and it contains 32 detailed assessment criteria for the following types of products: devices, materials, systems, and technologies. The use of these criteria will enable the users to apply the method to selected stages of the product development and to compare achieved results from different periods of time.
Method for the assessment of the innovativeness level	The method is a systemised character, and it contains ten detailed assessment criteria for the innovativeness level. The use of these criteria will enable the users to apply the method at next stages of the product development and the comparison of the achieved data in different periods of time.

Source: Walaszczyk (2015, p. 177).

Not all proposed methods can be applied to all kinds of products. The type of the product and the adequate methods are presented in Table 3.

Table 3. The application of the assessment methods for the products depending on the production scale

Type of the product	Method for the assessment of the implementation maturity level	Method for the assessment of the commercial potential	Method for the assessment of the innovativeness level
Individual unique product	√	–	√
Individual repeatable product	√	√	√
Serial product	√	√	√
Mass product	√	√	(√)

Source: Walaszczyk (2015, pp. 185-186).

In the assessment of all types of technology, regardless of the fact that they are financed by public or private funds, the method for the assessment of the implementation maturity level is the key method. Its aim is to verify if the products achieve planned technological level.

Analyzing the possibilities of the commercial potential, in the case of the unique products, which are individual, the assessment of the commercial potential is not necessary as these products are usually designed for an individual client.

In the case of the individual repeatable products as well as serial and mass products, it is desirable to perform the assessment of the commercial potential in order to verify if the products could be favourable to potential clients. The evaluation of the commercial potential is necessary in this case due to the financing institutions demand that the product should be implemented on the market.

In the case of individual products design (unique and repeatable), serial and mass products, if their development is financed from public funds (national or the European Union funds), it is necessary to perform the assessment of the innovativeness level. It is also one of the criteria which must be fulfilled when applying for funds (product or process innovations).

As far as it concerns the products financed from own funds (an individual client or the development of the product for own needs of the research organization), the assessment of the innovativeness level depends on the preferences of the contractor.

4.3. Financial criteria

Other elements, which must be taken into account during the risk assessment, are the financial criteria, which seem to be crucial since in most cases finances are a kind of barrier. These criteria make the application for funds from public institutions impossible, or they hamper the launch of planned activities from the capital.

Therefore, in the case of the application for funds from public organizations, the applicant must analyze the following aspects: (1) own funds, (2) the catalogue of qualified costs, (3) the form of payment.

Own funding is understood as the difference between the total amount of qualified costs and the amount of co-financing. The significant aspect is the verification if the applicant can afford to put own funds in cash or non-cash form (e.g. buildings, staff, etc.).

The catalogue of qualified costs is the key element in the group of the financial criteria. In each call for proposal. it can be different therefore, the applicants must analyze each position carefully. It enables them to avoid the

situation in which, e.g. the entrepreneur would like to buy a machine, but the cost of the machine turns out to be non-qualified.

Funding is almost often given in the form of the advance payment or re-funding. It is obvious that the advance payment is much more beneficial as the entrepreneur is not obliged to dispose of his or her own funds, which must be used to pay to the sub-contractor. However, very often funds are given in the form of re-funding. In such case, the entrepreneur must pay for service first and afterward the financing institution gives this amount of money back to the entrepreneur based on the invoices delivered. The option of the re-funding is thus a big problem, mainly for micro and small enterprises, which are not able to dispose of such high amount and this is a significant barrier for them.

The risk assessment in the relation with financial criteria should be performed with the use of the financial analysis or cost-benefit analysis. Moreover, the analysis of the financial documentation can be used.

4.4. Legal criteria

The next criteria are of a legal character. It is important to take into account the following problematic aspects: (1) the division of property rights; (2) the ways of the transfer of the property rights.

In many initiatives, the moment of signing a preliminary agreement with the entrepreneur, there is a need of the indication how the property rights will be divided. The movement of ownership rights can be the following: the agreement of the transfer of author property rights or the license.

As long as the transfer of the author property rights is obvious, the form of the transfer can be much more complicated. The form of the transfer should depend on the interested parties, however, for example, in the initiatives financed by the public organisations (the National Centre for Research and Development), the interested parties are forced to transfer the rights *'as the remuneration, which is relevant to the market price of these rights'*. This interpretation, which was developed by the Danish Agency of Science, Technology and Innovation (2016), was accepted in the NCBiR in the projects.

The formal, content-related, financial and legal criteria described above are the elements, which must be carefully analyzed at the *ex-ante* stage. Depending on the needs, there is the possibility to include some additional criteria to the assessment process.

5. Verification of the model for risk management in the formulation phase

The designed model has been applied by 80 entrepreneurs. Figure 2 presents the criteria, which have been considered most often. The justification was that the oversight of these criteria could result in the rejection of the project proposal.

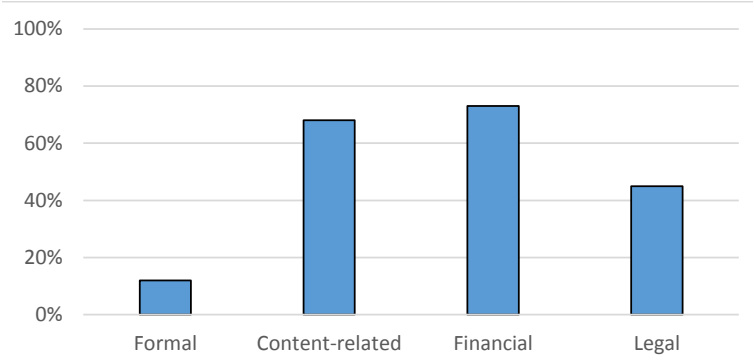

Figure 2. Criteria considered the most often by the entrepreneurs in the formulation phase of the technological project

As it is shown in Figure 2, the entrepreneurs considered most often the financial criteria (73%). It comes from the fact that they were afraid of the incorrect understanding of financial rules, which would cause not to get financing or to get the received funds back to the financing institution. They paid the least attention to formal aspects as most of the entrepreneurs were familiar with formal rules, which concerned any individual call for proposal. Having analyzed all the criteria in detail, in Figures 3-6 the author presents the elements, which were analyzed regarding the criteria.

In the relation with formal criteria, the entrepreneurs paid attention to the preparation of the application according to the instructions (84%). It comes from the fact that they are afraid of omitting some important information included in the instructions and therefore the project proposal could be rejected.

In the case of the content-related criteria, the entrepreneurs mainly paid attention to assess the commercial potential economic level (76%) of the products planned to be developed. A few entrepreneurs have not realized that the assessment of the market competitors and the economic demand must be included.

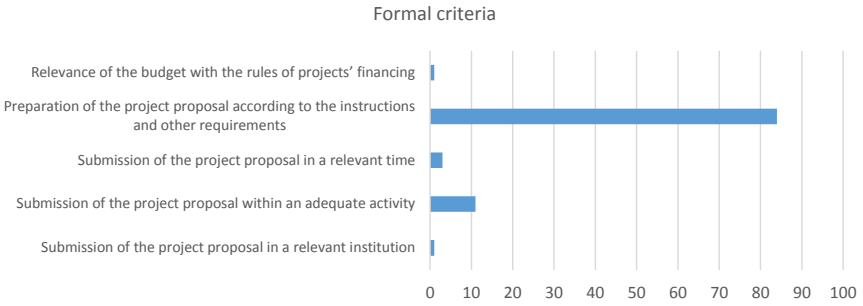

Figure 3. Formal criteria mostly considered by the entrepreneurs in the formulation phase of the technological project

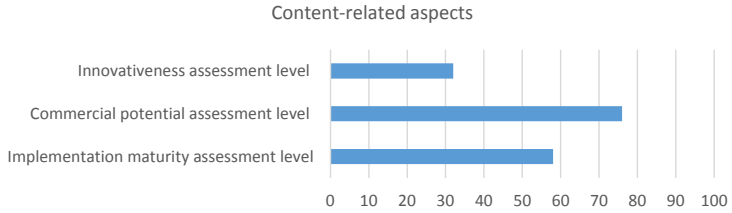

Figure 4. Content-related criteria mostly considered by the entrepreneurs in the formulation phase of the technological project

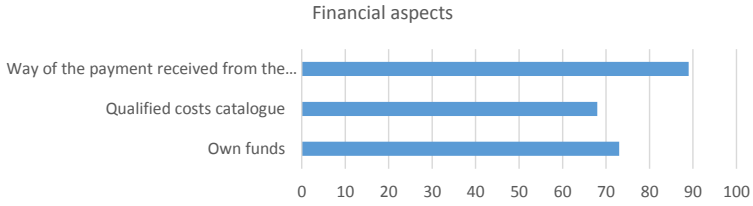

Figure 5. Financial criteria mostly considered by the entrepreneurs in the formulation phase of the technological project

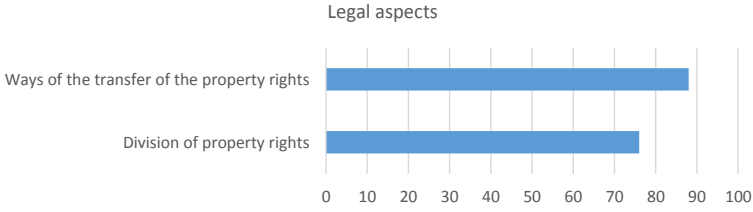

Figure 6. Legal criteria mostly considered by the entrepreneurs in the formulation phase of the technological project

As far as it concerns the innovativeness level, only 32% of the entrepreneurs paid attention to this aspect. It comes from the fact that they often wanted to get funds for a product, which was not innovative, but it helps to increase income in the enterprise.

Having analyzed the financial criteria, the biggest number of entrepreneurs (89%) stated that it is necessary to make a detailed analysis how the entrepreneurs get the payment. The funds may be paid in different forms. The advance payment and the re-funding are the most common forms of payments. They confirmed that the advance payment is more advantageous as they do not have to dispose any own funds in cash in order to pay to anybody, who is involved in the project.

The necessity for the verification of the catalogue of qualified costs and many own funds were at the similar level, relatively 68% and 73%, what means that these aspects are important for entrepreneurs as well.

The legal criteria concern the property rights, which are linked to the developed products. The entrepreneurs confirmed that the way of their division and the way of the transfer of the property rights are significant in the process of the project application because it is the entrepreneur, who usually wants to be the owner of the developed product.

6. Conclusions

The proposed model for the risk management in the formulation phase of the technological project is aimed at helping the entrepreneurs to fulfil the basic criteria, which are important during the preparation of the project proposal. The author considered the requirements of the financing organizations included in the 2014-2020 perspective (among other the National Centre for Research and Development, the Polish Agency for Enterprise Development, the Regional Operational Programmes), which are very similar in many calls for proposals. The entrepreneurs do not understand many criteria, which must be included in the project applications, therefore they often give up with applying for funds or their proposals are rejected.

The proposed model is a tool, which indicates, step by step, which aspects must be taken into account in order to comply with the requirements of the organizations, which finance initiatives.

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