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APPLICATION OF MODELS AND METHODS OF INTEGRATED RISK MANAGEMENT OF STAKEHOLDERS OF SCIENTIFIC PROJECTS IN CONDITIONS OF UNCERTAINTY AND BEHAVIORAL ECONOMICS

The object of research is the processes of integrated risk management of stakeholders of scientific projects, including the project team, the main executors of the project (scientists) and other stakeholders, in conditions of uncertainty and behavioral economics. Today, scientists work in difficult conditions of uncertainty about the prospects for the development of science, technology and engineering. Therefore, it can lead to personnel risks, conflicts and behavioral economics and have a negative impact on the planning and implementation of scientific projects. The main hypothesis of the study is the assumption that the success of scientific projects depends on the effective management of their stakeholders in order to achieve their goals. It is necessary to systematically approach the analysis of stakeholders of scientific projects, the use of integrated risk management of stakeholders of scientific projects in conditions of uncertainty and behavioral economics. Based on the analysis of risk management methods in different areas of activity and taking into account the conceptual model of integrated risk management of scientific projects, a method of integrated risk management of stakeholders of scientific projects in uncertainty and behavioral economics was proposed. For the practical application of the developed models and methods of integrated risk management of stakeholders of scientific projects in conditions of uncertainty and behavioral economics, the scientific project was considered. Their use, even at the stage of initiating scientific projects, allowed the project manager and his/her team to calculate the indicator of «toxicity» for each alternative stakeholders and compare them with each other. It is based on data obtained in the process of assessing personnel risks, conflicts and factors of behavioral economics, which was conducted using the method of expert assessments. The indicator of «toxicity» is limited and should be close to zero. An example of choosing a stakeholder for the supply of stationery is considered. This result allowed to increase the efficiency of inclusion of stakeholders in the participants of the scientific project.

Keywords: *scientific project, method of integrated risk management, increasing the efficiency of stakeholder management, «toxicity» indicator.*

1. Introduction

The implementation of the project approach in the world has shown its success. Today requires the use of effective and efficient tools for project management. The success of any project, including a scientific one, depends on the ability to meet the needs and requirements of its stakeholders. Project stakeholder management is to identify all project participants who may have an impact on the project and the project on them, analyze their expectations and their impact on the project. In addition, the development of appropriate management strategies to effectively involve stakeholders in decision-making and project implementation [1, 2].

The proposed models and methods are based on:
– theories of stakeholders [3];
– identification of stakeholders [4];
– anti-risk project management [5];
– emotional intelligence [6];
– behavioral economics [7];
– cognitive modeling [8];
– human resource management [9];
– integrated risk management [10];
– risk management [11, 12];
– integrated risk management of scientific projects [13, 14].

Thus, the application of models and methods of integrated risk management of stakeholders of scientific projects in conditions of uncertainty and behavioral economics is an urgent task.

The object of research is the processes of integrated risk management of stakeholders of scientific projects, including the project team, the main executors of the project (scientists) and other stakeholders, in conditions of uncertainty and behavioral economics.

The aim of research is the practical application of the developed models and methods of integrated risk management of stakeholders of scientific projects in conditions of uncertainty and behavioral economics.

2. Methods of research

The research is based on the application of models and methods proposed in [4, 15]. The main hypothesis of the study is the assumption that the success of management of scientific projects depends on the effectiveness of management of their stakeholders. This cannot be achieved without taking into account personnel risks, conflicts and factors of behavioral economics. Based on the analysis of risk management methods taking into account the conceptual model of integrated risk management of scientific projects [13, 14], the method of integrated risk management of stakeholders of scientific projects is developed in conditions of uncertainty and behavioral economics (Fig. 1).

Stages of integrated risk management of stakeholders of scientific projects in conditions of uncertainty and behavioral economics (Fig. 1) will increase the efficiency of stakeholder management of scientific projects. This is ensured by calculating «toxicity» indicators for each stakeholder alternative and refining them by implementing measures to respond to their impact. The obtained result will increase the efficiency of inclusion of stakeholders in the participants of scientific projects.
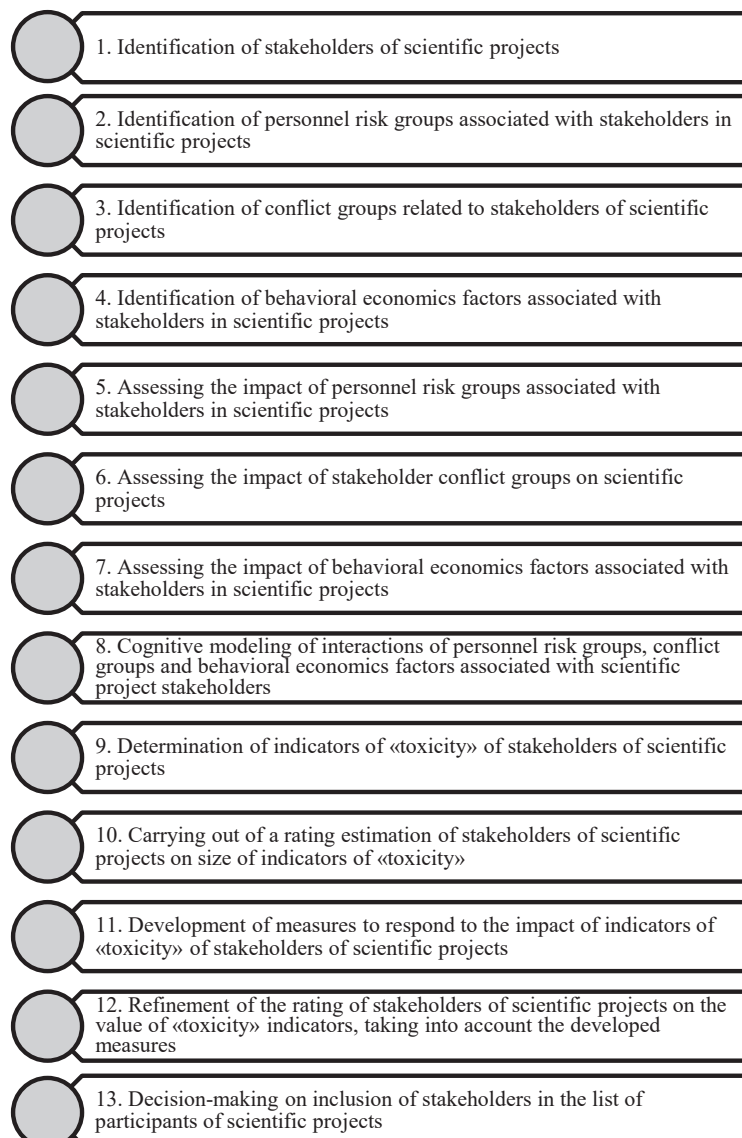
Fig. 1. Stages of integrated risk management of stakeholders of scientific projects in conditions of uncertainty and behavioral economics

3. Research results and discussion

For the practical application of the developed models and methods of integrated risk management of stakeholders of scientific projects in conditions of uncertainty and behavioral economics, it is proposed to consider a scientific project (SP) implemented by the state enterprise «Ukrainian Scientific Research Institute of Radio and Television» (SE «UNIIRT»), Odesa, during 2018.

The practical application of the method of integrated risk management of stakeholders of scientific projects will include the steps shown in Fig. 1.

Name of SP: Research work (RW) «Development of a draft national standard of Ukraine, harmonized with European and international».

The purpose of RW is to develop a draft national standard ETSI EN 301 430 (ETSI EN 301 430: 2016, IDT). Satellite earth station stations. Portable earth stations in the frequency range from 11 GHz to 12 GHz, from 13 GHz to 14 GHz, satellite news collection system. Technical requirements and test methods. Development of a national regulatory document to replace DSTU ETSI EN 301 430:2009.

Project product: DSTU ETSI EN 301 430 (ETSI EN 301 430:2016, IDT).

The developed standard will be implemented in the economy of Ukraine through its use in relevant industries, which will stimulate domestic producers to produce world-class products and increase its competitiveness. The national standard will be developed to meet the requirements of the Technical Regulation on Radio Equipment in order to implement Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonization of the laws of the Member States relating to the supply of radio equipment and repealing Directive 1999/5/EU.

In accordance with the proposals submitted to the National Standardization Body, a contract was concluded for the provision of services for the development of regulatory documents.

SE «UNIIRT», as a scientific institution and a member of the Technical Committee for Standardization, has experience in implementing similar SP since 1996.

Based on this, the company has an information base of SP management, which includes information about stakeholders of the SP, personnel risks, conflicts and behavioral economics factors associated with stakeholders.

This information was considered in more detail in [14], so this study proposes an abbreviated list of stakeholders, personnel risks, conflicts and behavioral economics:

1. At this stage, the identification of SP stakeholders is performed using the method described in [4]. SP stakeholders can be:

– S1. Project manager (head of scientific institution);

– S2. Project team (scientists, economist, accountant);

– S3. Initiator, customer, owner and investor of the project (central and local executive bodies, in particular in the field of science and education);

– S4. Project competitors (Academy of Sciences of Ukraine, branch academies of sciences, scientific institutions);

– S5. Authorities (interested central and local authorities);

– S6. Licensors (central executive body in the field of science and education);

– S7. Supervisory Board (domestic and foreign scientists, representatives of central and local authorities, employers, business);

– S8. Public groups and organizations, population (public scientific associations, scientific institutions, population);

– S9. Contractors (public scientific associations, subcontracted scientific institutions);

– S10. Suppliers (suppliers of goods and services);

– S11. Consumers of the final product of the project (state, population).

2. The groups of personnel risks of state of emergency include the following:

– R1. Risks associated with personnel policy;

– R2. Organizational risks;

– R3. Risks associated with an ineffective system of motivation and incentives;

– R4. Risks associated with the confidentiality of information in the project;

– R5. Socio-psychological risks;

– R6. Spiritual and intellectual risks;

– R7. Risks associated with technical literacy.

3. SP conflict groups are as follows:

– K1. Conflicts over personal relationships;

– K2. Conflicts due to holding several positions (roles) in the research team;

– K3. Conflicts that arise due to the use of resources of a scientific institution;

– K4. Conflicts arising due to material and financial interests;

– K5. Conflicts arising from the involvement of stakeholders in activities outside the main scientific organization;

– K6. Conflicts of obligations that arise in relation to the ratio of time spent and responsibilities and obligations in a scientific organization.

4. Factors of behavioral economics are the following:

– BEF1. Epistemic self-confidence;

– BEF2. «Anchoring»;

– BEF3. Dunning-Krueger effect;

– BEF4. Procrastination;

– BEF5. Emotional condition;

– BEF6. Mistakes of optimism and pessimism;

– BEF7. «Illusion of objectivity»;

– BEF8. Perfectionism;

– BEF9. Conflict of interest;

– BEF10. Excessive funding of tasks;

– BEF11. Revaluation of monetary resources;

– BEF12. Scattering of goals;

– BEF13. Unproductive communications;

– BEF14. Egocentrism.

The list of SP stakeholders considered in this study includes the following:

– S1. Project Manager (Director or Deputy Director for Research of SE «UNIIRT»);

– S2. Project team (scientists from the scientific department in the number of 3 people), economist and accountant of SE «UNIIRT»);

– S3. Initiator, customer, owner and investor of the project (National Standardization Body (State Enterprise «Ukrainian Research and Training Center for Standardization, Certification and Quality», Kyiv, Ukraine (SE «UkrNDNC»);

– S4. Competitors of the project (State Enterprise «Odesa Scientific Research Institute of Telecommunication», Odesa, Ukraine (SE «OSRIT»), Private Joint-Stock Company «Ukrainian Institute for Design and Development of Information and Communication Infrastructure «Diprozvyazok», Kyiv, Ukraine (JSC «Diprozvyazok»);

– S5. Authorities (Administration of the State Service for Special Communications and Information Protection of Ukraine, National Commission for State Regulation of Communications and Informatization);

– S6. Suppliers Coral Limited Liability Company, Odesa, Ukraine (Coral LLC), Shtapmservice Limited Liability Company, Odesa, Ukraine (Shtapmservice LLC) or Chancellor Limited Liability Company, Odesa, Ukraine (Chancellor LLC);

– S7. Consumers of the final product of the project (telecommunications operators and the population of Ukraine).

The register can look like described in [14] and determine the set of SP stakeholders: $S=\{S_1,...S_7\}$, where the indices 1...7 – the number of groups of SP stakeholders.

The following groups of personnel risks and conflicts and factors of behavioral economy are characteristic of the indicated groups of SP stakeholders (Fig. 2).

Further calculations will be made on the example of LLC «Coral», which is one of the leaders in the supply of stationery in Odesa, and with which there is a positive experience.

5. Assess the impact of personnel risk groups on the stakeholder S6 (Table 1).
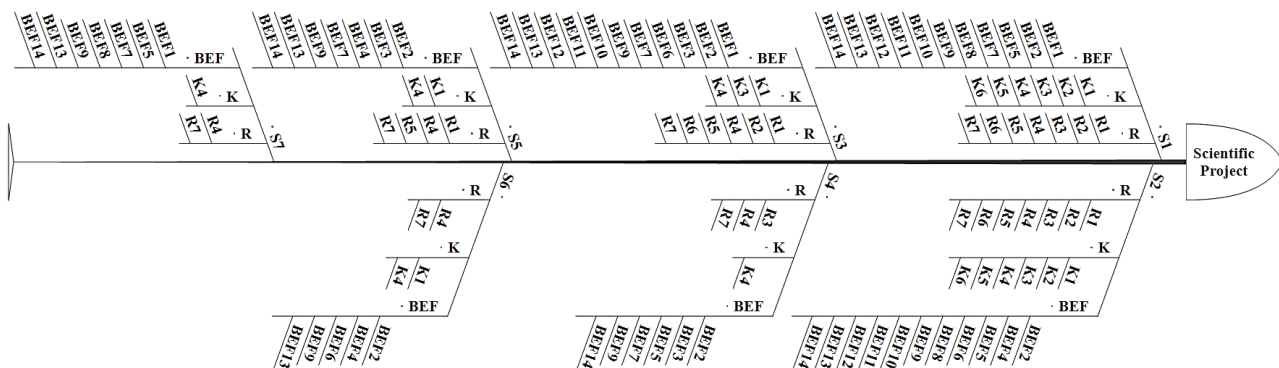
Fig. 2. Identification of scientific project stakeholder groups and groups of personnel risks, conflicts and behavioral economics factors associated with them

Table 1

Personnel risk groups for the S6 stakeholder of the scientific project

Groups of personnel risks of SP (R)	Probability of occurrence of the j-th group of personnel risk of the stakeholder SP, P_{ij}, (0÷1)	The degree of influence of the j-th group of personnel risk of the stakeholder SP, V_{ij}, (0÷1)	$P_{ij} \cdot V_{ij}$
R4	0.6	0.4	0.24
R7	0.4	0.7	0.28
R_{ij}			0.52

6. In the same way, determine the impact of conflict groups associated with the stakeholder S6 (Table 2).

Table 2

Conflict groups related to the S6 stakeholder of the scientific project

Conflict groups of SP (K)	Probability of the x-th group of conflicts related to the SP stakeholder, P_{ix}, (0÷1)	The degree of influence of the x-th group of conflicts of the SP stakeholder, V_{ix}, (0÷1)	$P_{ix} \cdot V_{ix}$
K1	0.6	0.2	0.12
K4	0.4	0.4	0.16
K_{ix}			0.28

7. Determine the influence of behavioral economics factors associated with the S6 stakeholder (Table 3).

Table 3

Behavioral economics factors associated with the S6 stakeholder of a scientific project

Factors of behavioral economics of SP (BEF)	Probability of occurrence of the y-th factor of behavioral economy associated with the SP stakeholder, P_{iy}, (0÷1)	The degree of influence of the y-th factor of behavioral economics associated with the SP stakeholder, V_{iy}, (0÷1)	$P_{iy} \cdot V_{iy}$
BEF2	0.2	0.9	0.18
BEF4	0.4	0.1	0.04
BEF6	0.8	0.7	0.56
BEF9	0.1	0.8	0.08
BEF13	0.4	0.4	0.16
BEF_{iy}			1.02

8. Cognitive modeling of the interactions of personnel risk groups (R_i), conflict groups (K_i) and behavioral economy factors (BEF_i) associated with the S6 stakeholder is performed as described in [8]. Based on the results of cognitive modeling, it is possible to draw a conclusion about the influence of factors on each other and simulate different situations in the SP on the detailed nature of these influences, the dynamics of changes depending on changes in the situation, time changes.

9. Calculate the indicator of «toxicity» for the stakeholder S6 SP TI_{S6} according to the data given in Tables 1–3:

$$TI_{S6} = 0.52 + 0.28 + 1.02 = 1.82.$$

In the same way, the indicator of «toxicity» is calculated for other suppliers of stationery.

10. According to the indicators of «toxicity» form a rating of stakeholders SP:

$$TI_i, \ (i = 1; 7).$$

Due to the fact that the indicator of «toxicity» should be close to zero, so Table 4 shows that the minimum rate in Shtapmservice LLC, and the maximum in Chancellor LLC.

Table 4

Rating of the S6 stakeholder group of the research project on the indicator of «toxicity»

Name	The indicator of «toxicity»
Coral LLC	1.82
Shtapmservice LLC	1.65
Chancellor LLC	2.15

11. Development of measures to respond to the impact of indicators of «toxicity» of stakeholders SP. At this stage, a strategy for responding to the impact of indicators of «toxicity» of stakeholders of SP is selected and appropriate measures are developed, as proposed in [1, 4].

Based on the fact that Coral LLC, which has an average rate of 1.82, has developed positive relations in previous projects, as well as received a product of excellent quality, so it was proposed to apply a strategy to reduce the «toxicity». The strategy to reduce the indicator of «toxicity» was to conduct additional negotiations with Coral LLC by finding a compromise on the volume of supply, price and quality of goods, as well as the terms of payment for the goods. This strategy has reduced the impact of factors such as K4, BEF6 and BEF13.

12. The analysis of indicators of «toxicity» is carried out and on its results rating estimations of stakeholders on size of indicators of «toxicity» taking into account the developed measures are specified (Table 5).

Table 5

The rating of the S6 stakeholder group of the scientific project on the indicator of «toxicity» has been updated

Name	The indicator of «toxicity»
Coral LLC	1.62
Shtapmservice LLC	1.65
Chancellor LLC	2.15

13. Decision-making on inclusion of stakeholders in the list of SP participants.

Based on the updated rating of the S6 stakeholder group, it can be said that Coral LLC was selected as a supplier of stationery.

Thus, by implementing the stages of integrated risk management of stakeholders of scientific projects, the stakeholders of the scientific project and their personnel risks, conflicts and behavioral economics were identified, their impact was assessed and indicators of «toxicity» were determined. The proposed method has shown its effectiveness at the stage of initiating the state of emergency, in particular: during the selection of a stakeholder S6 (stationery supplier). These results will be useful to scientific project leaders and their teams in the process of their planning and implementation.

4. Conclusions

The issues of application of the developed models and methods of integrated risk management of scientific projects

in the conditions of uncertainty and behavioral economy are considered. Stages of integrated risk management of scientific projects in conditions of uncertainty and behavioral economics are developed. Their peculiarity is that at the stage of initiating scientific projects, the project manager and his/her team in the process of identifying stakeholders identify personnel risks, conflicts and factors of behavioral economics. A method for calculating the indicator of «toxicity» of stakeholders of a scientific project is proposed, the essence of which is that using the method of expert assessments is an assessment of personnel risks, conflicts and behavioral economics. Thanks to the obtained data, it is possible to calculate the indicators of «toxicity» for each alternative to stakeholders and compare them with each other. The indicator of «toxicity» is limited and should be close to zero. An example of choosing a stakeholder for the supply of stationery is considered. This result allowed to increase the efficiency of inclusion of stakeholders in the participants of the scientific project.

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