RISK ANALYSIS IN RESEARCH ACTIVITIES

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Rezumat. *Articolul evidențiază importanța procesului de evaluare a riscurilor în cadrul lucrarilor de cercetare. Emergența unor noi tipuri de riscuri generează nevoi din ce în ce mai complexe în domeniul managementului riscului, dar și implicații în ceea ce privește gestionarea acestora la nivelul institutiei. În acest context apare necesitatea utilizării în domeniul managementului riscului a unui proces coerent de analiză, astfel încât să fie posibilă identificarea riscurilor cu impact major. Sunt prezentate scopul și principalele obiective ale metodologiei de evaluare a riscurilor la nivelul institutului. Fara a avea pretenția abordarii tuturor problemelor referitoare la riscurile în cercetare, articolul este un semnal pentru evitarea unor situații care pot rezulta dintr-o abordare superficială a analizei riscurilor și asigurarea unor practici sigure pentru cercetători.*

Abstract. *The article highlights the importance of the risk assessment process in research works. The emergence of new types of risks generates increasingly complex needs in the field of risk management, but also implications regarding their management at the level of the institution. In this context, the need to use a coherent analysis process in the field of risk management appears, so that it is possible to identify risks with a major impact. The purpose and main objectives of the risk assessment methodology at the institute level are presented. Without pretending to address all issues related to risks in research, the article is a signal to avoid situations that may result from a superficial approach to risk analysis and to ensure safe practices for researchers.*

Keywords: risk, risk assessment, risk management

1. Introduction

Transport Research Institute - INCERTRANS S.A. is a prestigious institute, which aims to satisfy the most demanding requirements regarding the quality of works in the field of activity, aiming to achieve customer/beneficiary satisfaction and legal requirements.

The institute and the top management understood that the future in business is closely related to the development and implementation of international standards, namely the effectiveness and efficiency of the management systems of quality, environment, health and safety at work, is a condition of ensuring the competitive advantage.

The commitment of the institute's management to implement management systems based on ISO standards was an important premise for the promotion of sustainable business models.

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ISO 9001:2015 focuses on creating added value for the organization and its customers through the process approach to the management of opportunity-generating risks or "positive uncertainties".

Risk management is now a core component of any quality management system.

ISO 9001:2015 introduces the importance of "risk-based thinking" and risk management now extends to the "delivery of goods and services" and not just to core processes.

The risk-based thinking and process approach of the ISO 9001:2015 standard offers the opportunity for better risk management in research work.

In the research risk management activity, it is essential to implement risk-based thinking and the framework necessary to create the risk management system.

Risk management in the field of research involves a complex activity that is regulated within INCERTRANS at the level of procedures.

Risk-based thinking, being part of the procedural approach, makes preventive action an integral part of processes.

Although risk-based thinking has as its main objective the prevention of risks, by operationalizing it, opportunities (positive risks) can also be identified.

Research is exposed to numerous risks arising from operational activities.

All research-related activities involve some degree of risk.

Risk management is a process of identifying the risks taken and then managing those risks in the most appropriate way.

Risk management in research is important because it can reduce or increase a risk depending on the risk profile of the research activity.

The research institute INCERTRANS promotes a climate of attention to risks, the free market also means the emergence of new types of risks for research works.

Regardless of the size of the company or field of activity, profit maximization remains the most important objective and ISO 9001: 2015 brings an improvement and strategic integration of processes to the core of the organization's activity.

In order to achieve its objectives and policy, INCERTRANS carries out its activities of research - development, design, consultancy, expertise, technological and socio-economic studies, environmental studies, regulations, European harmonization, technical approvals, technological procedures applicable in road

and rail transport , naval and aerial, laboratory tests for construction products, including works of art and infrastructure, consulting services in the fight against noise, within an integrated management system of quality, environment, health and safety at work, in accordance with EN ISO 9001:2015, EN ISO 14001:2015, EN ISO 45001:2023, integrated system adopted, implemented and maintained, the effectiveness of which is continuously improved.[16]

2. Risk management[9]

The research activity always assumes the existence of some risks (considered negative aspects) but also some favorable circumstances - opportunities, which represent positive aspects. The risks but also the opportunities must be identified and reported for the preparation of the risk and opportunity management plan, a plan that is applied throughout the duration of a research work. The risk management standard provides guidelines for managing the risks an organization may face. The general scope of ISO 31000:2018 was not developed for a specific industry or line of business, but rather to provide any type of organization with a structure and best practice guidance for all risk management operations. At the same time, it provides in a simplified way risk management directions for public and private organizations and emphasizes the identification, assessment and treatment of risks and encourages a culture of risk management between organizations and a better integration of risk management in decision-making processes.

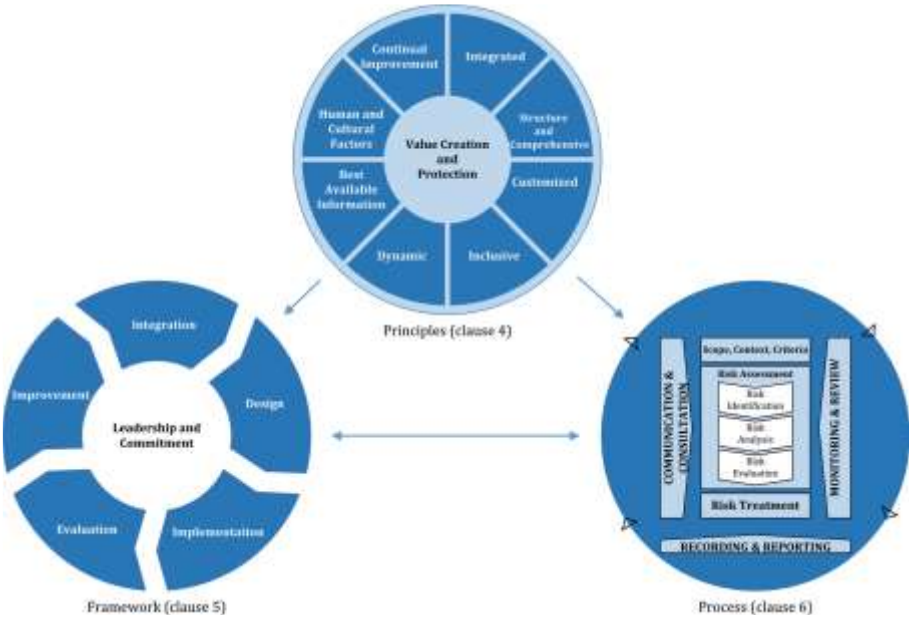

Fig. 1. Principles, framework and process

Risk management is based on the principles, organizational framework and process steps as shown in Figure 1.

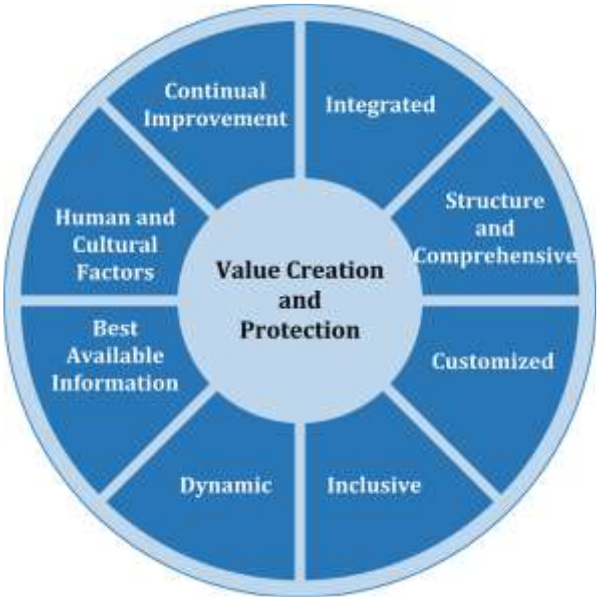

Fig. 2. Principles.

The principles outlined in Figure 2 provide guidance on the characteristics of effective risk management, communicating its value and explaining its intent and purpose.

The principles are the foundation of risk management and should be considered when establishing the organization's risk management framework and processes.

Effective risk management requires elements from Figure 2 with the following explanations:

a) integrated: risk management is an integral part of all activities of an organization;

b) structured and comprehensive: a structured and comprehensive approach to risk management contributes to consistent and comparable results;

c) customized: the risk management framework and process are customized and proportionate to the external and internal context of the organization, relative to its objectives;

d) inclusive: appropriate and timely involvement of stakeholders allows their knowledge, opinions and perceptions to be taken into account;

e) dynamic: risks can appear or disappear as the external and internal context of an organization changes. Risk management anticipates, detects,

recognizes and responds to these changes and events in an appropriate and timely manner;

f) best available information: inputs for risk management are based on historical and current information as well as future expectations. Risk management explicitly considers any limitations and uncertainties associated with such information and expectations. Information should be current, clear and available to relevant stakeholders;

g) human and cultural factors: human behavior and culture significantly influence all aspects of risk management at every level and stage;

h) continuous improvement: risk management is continuously improved through learning and experience.

Fig. 3. Framework

The purpose of the risk management framework is to help the organization integrate risk management into research activities. The effectiveness of risk management depends on its integration into the organization's governance, including decision-making. This requires the participation of stakeholders, especially top management.

The development of the framework encompasses the integration, design, implementation, evaluation and improvement of risk management within the organization. Figure 3 illustrates the components of this framework.

The organization must assess existing risk management practices and processes, assess any gaps, and address those gaps within the organization. The components of the framework and how they work together should be tailored to the organization's needs.

The risk management process involves the application of policies, procedures and practices of communication and advisory activities, setting the context and assessing, treating, monitoring, reviewing, recording and reporting risk. See figure 4.

The risk management process is an integral part of management, decision-making and an integral part of the organization's structure and operations.

There can be many applications of the risk management process within an organization, customized to achieve the objectives and fit the external and internal context in which they are applied. The dynamic and changing nature of human behavior and culture must be considered throughout the risk management process.

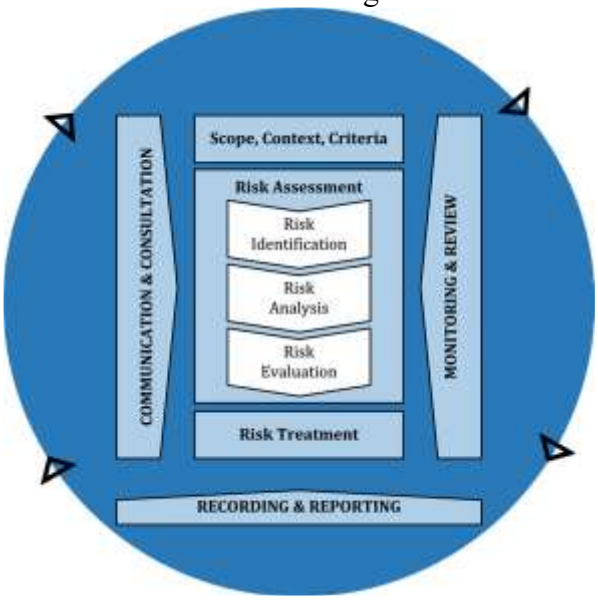

Fig. 4. Risk management process

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3. Types of risks in research works[11]

In the case of research works, internal/external factors of a subjective or objective nature can produce consequences that go beyond the effects they have on deadlines or costs, these factors can affect the quality and the achievement of the final objectives of research work.

The risk of affecting the quality – is the partial fulfillment of the objective of the research work, non-compliance with the requirements of the client/beneficiary, the result or the research product. According to its nature, the risk of affecting the quality in research works is the most frequent and can lead to the cancellation of the research work. The factors leading to this result are subjective and can be controlled by measures such as the development of a quality management system with the application of standards as a method of prevention.

The risk of interrupting the research work - occurs in cases of obtaining a negative result and the research work cannot be completed. The research works are applied in nature and have as their objectives the realization of a new technology or a new product, the obtaining of quality performance indicators, the modernization of processes, etc. In the structure of activities, the main role is played by experimental development activities with subcomponents such as experiment planning, methodologies, tests, calculation techniques, modeling and optimization, simulations, etc. The risk involves repeatedly obtaining negative, unrepresentative experimental results that do not correspond to the predetermined objectives.

In road construction, applied research generally requires laboratories, pilots, and sometimes industrial experiments. The main risk-generating factors in this field, which are the most common in this practice, are:

- insufficient expertise and experience of the personnel responsible for carrying out the research work and especially in removing the risks or reducing their probability and impact. The expertise and experience are reflected in the quality of the proposed objectives, the techniques and methodologies chosen, in the establishment of parameters and indices, in the adaptation of the research strategy, in the evaluation and correct interpretation of the experimental results, etc., which are found in the applied "know-how" of research. The degree of knowledge of technologies, techniques, and industrial practice is also reflected in decision-making and in the quality of the choices involved in the act of research.
- inadequate know-how, low level in applying active experiments or not applying them. The methods of "experiment design" assume control of variable factors within the limits of acceptance of statistical criteria, ensuring representativeness of experimental batches, materials, repeatability of samples,

parallel experiments, control of concordance of models, etc. Correct and detailed planning of experiments ensures lower exposure to research risks.

- inaccurate information. During experiments, we collect a large volume of information of various natures, such as - analyses, records, measurements, etc. In the practice of research, it is very easy to slip into deviation in the interpretation of the results if you do not have a system of control and selection of the retrieved information. We need precision and representativeness, important parameters to keep in mind. Obtaining higher quality data depends on the equipment used.

- incorrect transfer of experimental results, laboratory – pilot – industrial. In the laboratory, models are made to be transposed in the industrial process. Choosing an incorrect model leads to deviation of the results.

We need personnel with experience accumulated over time. A research paper based on an unverified model is at risk.

Conclusions

Even from the initial phase of approaching a research topic, it is important to establish the role and responsibility of the personnel who will be involved in the research work.

Consideration should be given to concluding detailed initial protocols to avoid and reduce subsequent risks.

A research topic must be based on real information and the recognition, from the beginning, of the existence of risks that lead to additional costs in the process of securing research expenses.

In planning research work in potentially risky contexts, research staff should address:

• cost issues and risk reduction strategies;

• concluding protocols for various risk situations, including plans for maintaining communication (for example, a defined daily, timed call, as time is often crucial in risk situations); for ensuring exit strategies; for establishing support / collaboration to not work alone where possible; and for the prior assessment of risks in specific situations.

• prior establishment of local contacts well informed about local situations and who can identify potential areas and types of risk.

• risk assessment and precautions as part of the research implementation protocol and budget.

• risk reduction requires a good knowledge of the resources available at the institutional, department and individual researcher level, as well as skills in implementing strategies to avoid and reduce risks.

• risk reduction procedures can be developed at the level of the institution, the research team and the individual researcher.

R E F E R E N C E S

[1] SR EN ISO 9001: 2015 - Quality management systems. Requirements.
[2] SR EN ISO 9004: 2018 - Quality management. The quality of an organization. Guidelines for lasting success.
[3] SR EN ISO 14001: 2015 - Environmental management systems. User guide requirements.
[4] SR ISO 45001: 2018 - Occupational health and safety management systems. Requirements and guidelines for use.
[5] SR EN ISO / CEI 17021-1: 2015 Conformity assessment. Requirements for bodies performing audit and certification of management systems. Part 1: Requirements.
[6] SR EN ISO / IEC 17025: 2018 - General requirements for the competence of testing and calibration laboratories.
[7] SR EN ISO / CEI 17065: 2013 Conformity assessment. Requirements for bodies certifying products, processes and services.
[8] SR EN ISO 19011: 2018 Guidelines for auditing management systems.
[9] SR ISO 31000:2018 Risk management — Guidelines
[10] Cişmaş I.D., Riscul, element în fundamentarea deciziei. Concept, metode,aplicaţii, Editura Economică, Bucureşti, Romania, 2003.
[11] Demi Perparim **,** Riscuri majore in cercetare**,** Fonduri struturale, Romania, 2009**.**
[12] Conf. Dr. Deselnicu Dana Corina, Contributions on increasing organizational performance through risk management in the context of sustainable developrment, (UP, Bucuresti, Romania, 2019, summary).
[13] Duran D., Managementul riscurilor, Sesiunea de comunicări ştiinţifice „Probleme actuale ale economiei româneşti", a VII-a ediţie a „Zilelor academice timişene", Timişoara, Romania, 25 mai 2001.
[14] Duran D., Aspecte privind evaluarea riscului ca sursă a deciziei la nivelul firmei, Teza, Universitatea "Politehnica" din Timişoara, Romania, 2007.
[15] Gaina Liviu, Risk management in the maintenance of radiolocation systems (UT, Brasov, Romania, 2022, summary).
[16] Mihail Ira, Flavius Cladoveanu, Monica Costei, INCERTRANS S.A. - Implementation and certification of management systems, Productica, Romania, 2021.
[17] Eng. Rusu Manuela, Quality and risk management applied in aerospace research, (UP, Bucuresti, Romania, 2022, summary).
[18] Sitnikov Cătălina, Claudiu George Bocean, Dorel Berceanu și Ramona Pîrvu, Model de management al riscurilor din perspectiva implementării standardului ISO 9001:2015 în cadrul companiilor de servicii financiare, Amfiteatru Economic, Romania, 2017.