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RISK MANAGEMENT AS A PROCESS SECURITY TOOL

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Abstract: The article presents the essence and significance of risk management processes in the project, as the key field for successful completion of the project, in the field of project management. Based on literature review, the methods and standards of risk management in the project as well as standards related to process safety were defined. The risk management process according to the PMBoK methodology was discussed as an example of an international project entitled 3DCentral – Catalyzing Smart Engineering and Rapid Prototyping.
Keywords: risk management, project management, PMBoK, 3DCentral

1. INTRODUCTION

Risk is analyzed in many areas of science – it takes place in economic domains, as well as in technical and medical fields. The need to carry out scientific research on risk management started the 20th century. This gave the opportunity to make professional measurements and monitoring of the risk (Kaczmarek, 2006).
In the beginning of the 20th century (during the evolution of school of project management), activities related to project management and thus risk management in the project were often underestimated and treated marginally. For some groups of entrepreneurs, the evolution of school of project and risk management, was strongly challenging. With the passage of time, and with mistakes from previous projects being repeatedly repeated, the advantages of implementing project management tools and techniques were appreciated. The benefits of project management according to specific guidelines and risk analysis were observed, in the initial phase of a new project – analysis based on the experience that had already been gained. It turned out that risk management is extremely important for correct implementation of project tasks in its subsequent phases and constitutes a significant part of the entire project leading to its success (satisfying both sides of the project: customer and producer). Hence, effective risk management, as well as non-probabilistic approach to uncertainty (Kozień and Kozień, 2017; Pietraszek et al., 2017), gives good chances for the success of the project (Nowakowska-Grunt and Mazur, 2015; Nowakowska-Grunt and Mazur, 2016; Cierniak-Emerych et al., 2017). It may be observed in many industrial (Ulewicz, 2016; Nowakowska-Grunt and Mazur, 2017; Maszke et al., 2018) and research activities (Skrzypczak-Pietraszek and Pietraszek, 2009; Goroshko et al.,

2014; Pietraszek and Goroshko, 2014; Filo et al., 2018; Skrzypczak-Pietraszek et al., 2018). One of the international standards defining high standards for managing various types of resources is the ISO 31000 standard, which is responsible for risk management – the factor with significant impact on business development, regardless of the industry.

The ISO 31000 (ISO 31000, 2018) standard owes its effectiveness to future-oriented direction. This allows many entities to reach for a set of tools that provide them with stable and long-term development regardless of external factors, as well as changing market situation. One of the main objectives of its creation was the integration of the risk management process with: organizational management processes, strategy and planning, management, policies, values, culture, as well as reporting processes. The general approach set out in ISO 31000 provides principles and guidelines for managing different types of risk in a transparent, systematic and reliable manner (within any scope and context).

The dynamics and volatility of the market, which regulates economic processes, requires entrepreneurs to manage risk. Currently, all organizations manage risk. Some attempt to predict the future and take such actions, whose effects will be the most advantageous for the organization. Risk management can be *ad hoc* tackling case to case. However, in such a situation it is more about risk identification than proper risk management. What is risk and what does risk management mean? Risk is a part of uncertainty, supported by a specific event, which may lead to negative fulfillment of a goal. In practice, remedial measures such as increased control of specific factors, second control or complete supervision over particular aspects are introduced. However, it must be properly defined, identified so that it can be analyzed. Risk identification allows for the determination of causes and possible effects of the threat (Kaczmarek, 2006).

Nevertheless, risk management is part of the planning process. It identifies key threats and develops plans to prevent them and/or reduce their consequences. According to the ISO 31000 standard, it covers processes such as risk identification, risk assessment and evaluation, risk management as well as its monitoring and related communication (ISO 31000, 2018). The safety of these processes is effective prevention of losses in the organization / project, combined with the highest care for human and material resources, the natural environment as well as quality, scope and time in the project. That is why proper and detailed identification of hazards, validation of technical risk reduction measures and clear definition of acceptable risk are of particular importance.

2. METHODS

There are many management standards in the literature and practice of project management risk. The most popular are:

– ATOM (Active Threat and Opportunities Management) – the most important feature of this method is scalability (used for small and very large enterprises) (Hillson and Simon, 2007),
– RAMP (Risk Analysis and Management for Projects) – is a tool emphasizing the strategic level of project management, with particular emphasis on the financial aspects of the project; and also for estimating uncertainty in the project (RAMP, 2005),

– M_o_R (Management of Risk) - methodology used to manage risk at all levels of the organization – strategic, operational and projects (principles are the key elements of the methodology, i.e. twelve rules referring to the corporate governance) (Murray-Webster, 2010).
– PMBoK (Project Management Body of Knowledge) methodology – developed by the Project Management Institute. The methodology distinguishes 10 areas of a knowledge and one of them is the area of a risk management (A guide to the project, 2013). The risk management in PMBoK was divided into six processes (Fig. 1), which are analyzed in details later in the article.

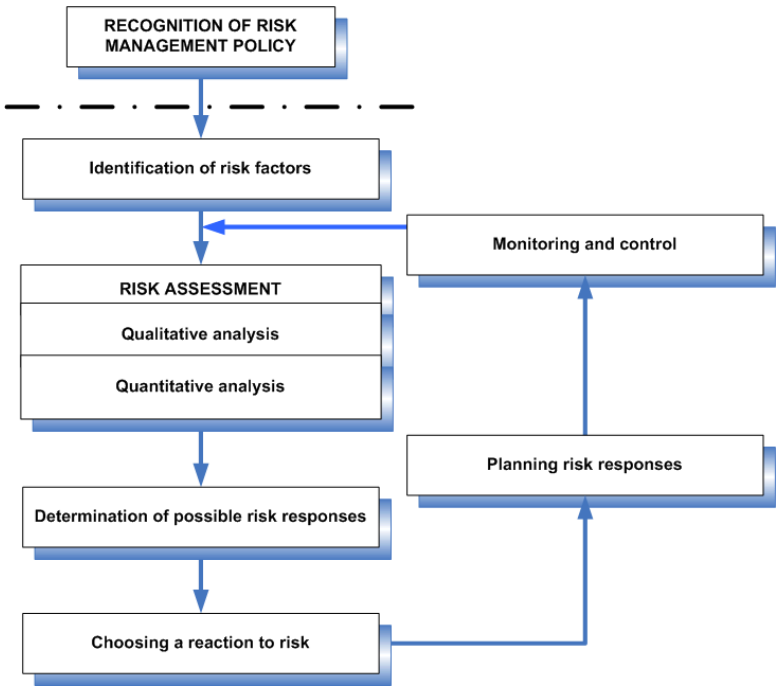

Fig. 1. Risk management cycle in projects – own elaboration based on Korczowski's paper (Korczowski, 2016)

In addition to the methodology, there are also standards supporting project risk management and describing work and machine safety. These are standards for risk management in the project, such as:
– ISO 31000:2018 (Risk management – Guidelines),
– ISO/IEC 27001:2017 (Information technologies – security techniques – information security management systems – requirements),

as well as safety standards regarding the entire safety environment and machine standards such as e.g. (Cierniak-Emerych et al., 2017):
– EN ISO 12100 (Basic safety standards – Machine safety),
– PN-EN 61508-1:2010 (Functional safety of control systems),
– PN-EN 349+A1:2010 (Safety of machinery – Minimum distances to prevent crushing of parts of the human body),
– PN-EN ISO 14119:2014-03 (Safety of machinery – Blocked devices coupled with shields – Design and selection rules),
– PN-EN 692+A1:2010 (Machine tools – Mechanical presses – Safety).

3. RESULTS

The main objective of risk management in projects is to increase the likelihood and the impact of beneficial risks and reduce the likelihood and effect of unfavorable risks. According to the PMBoK methodology, it consists of a cyclical implementation of processes, i.e. Plan Risk Management, Identify Risk, Risk Assessment: Qualitative Risk Analysis, Quantitative Risk Analysis, Plan Risk Responses and Control Risks. The risk management cycle in projects is illustrated in Fig. 1, and the diagram of individual processes together with the description of input and output data is presented in Fig. 2.

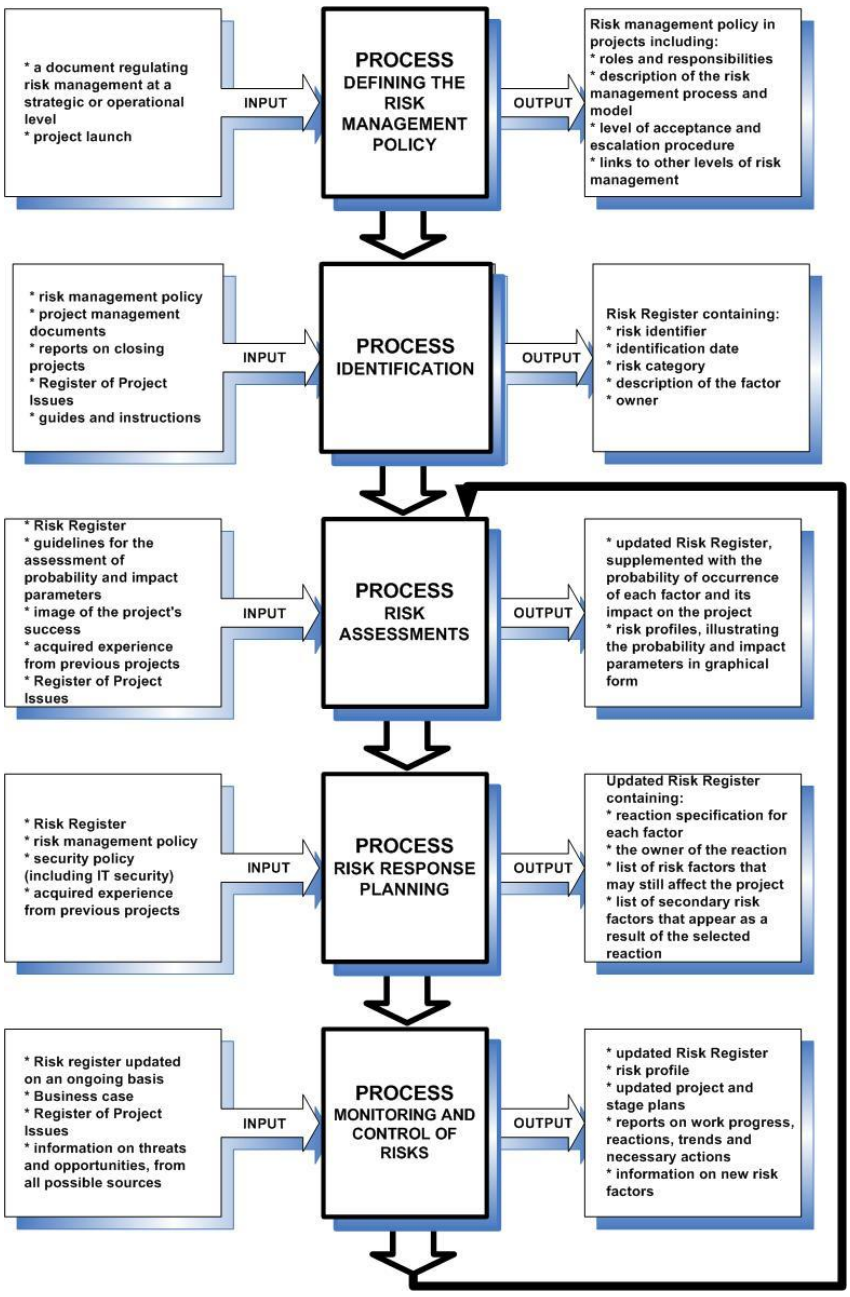

Fig. 2. Diagram of risk management processes

The proposed flow diagram was applied to risk management to ensure safety in the implementation of processes in the international project entitled 3DCentral –

Catalyzing Smart Engineering and Rapid Prototyping (Homepage of 3DCentral, 2018). The project was carried out at the Institute of Machine Technology and Production Automation at the Cracow University of Technology in years 2016…2018. The proposed solution made it possible to above all identify opportunities and threats dormant in the internal and external environment of the implemented project, develop a security policy and contingency plans, and achieve the intended objectives and results of the project, despite many adversities.

4. DISCUSSION

Adapting contemporary organizations to the extraordinary complexity and dynamics of their environment and the associated unpredictability of phenomena occurring in it requires a continuous and quick adaptation of applied management systems and business models by existing enterprises. This is a condition required to implement strategic goals and gain competitive advantage. Under these requirements, accomplishing a risk analysis only for the product/project would result in an incomplete scenario for assessing the situation. It should be remembered that risk management is undertaken at four levels: at the strategic level, at the operational level, at the program level, and at the project level. Due to the complexity of the subject matter, this article concentrated on risk management at the project level.

The analysis of risk management processes for the implemented project proposed in the article allowed, inter alia, at identifying chances and dangers in the internal and external environment of the project, development of security policy and emergency plans. Complexity and cultural diversity in the international environment of the project, innovative character and uncertainty associated with its unique character in the initial phase of the project implementation indicated the existence of many potential difficulties. However, reliable preparation of risk analysis and effective risk management made it possible to counteract the effects of threats, as well as take advantage of the opportunities occurred during the implementation of the 3DCentral – Catalyzing Smart Engineering and Rapid Prototyping project.

The case study shows that risk management is necessary in large and small projects, while the appropriate use of this tool and the management's awareness of the risk and related consequences greatly simplify the project process flow and increase the likelihood of project success.

It should be remembered that it is impossible to plan any project without any mistakes and it is not possible to carry out all aspects strictly according to the plan. Therefore, risk management includes activities such as identifying a potential threat, assessing its effects, establishing activities to minimize risk, and re-assessing events that may have an adverse effect on the project.

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