

SELECTED ASPECTS OF RISK MANAGEMENT IN THE CONTEXT OF PRINCE2®¹ METHODOLOGY – AS BASED UPON A PROJECT IMPLEMENTED BY AN ENTERPRISE IN THE SECTOR OF INDUSTRIAL AUTOMATION

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Abstract: As changes do occur during project implementation, and each change is accompanied by uncertainty and the risk factor associated with it, undertaking risks in projects is inevitable. The aim of the study is to identify and analyze risk management products according to PRINCE2® methodology, determining effective risk management in projects. In the research, the following hypothesis has been adopted: achievement of the set project objectives depends on the effectiveness of risk management in the project as a factor determining the success of the investment implementation. The main hypothesis is verified in accordance with the research procedure, including literature research and case study. The results of the conducted research show that a correctly conducted process of risk management based on risk management products, is the sole foundation of effective project management.

Keywords: risk, risk management, project management, PRINCE2® methodology.

1. Introduction

Recent concepts in the field of management emphasize the importance of risk in implemented projects, because uncontrolled levels of risk means that the costs generated by the risk often reach an extremely high level (Kasiewicz, 2011). The aim of the study is to identify and analyze risk management products in accordance with PRINCE2® methodology, determining effective risk management in projects.

¹ PRINCE2® is a Registered Trade Mark of the Office of Government Commerce in the United Kingdom and other countries.

The study assumes the following research hypothesis: the achievement of the set project goals depends on the effectiveness of risk management in the project as a factor determining the success of the investment. Hence, the following partial hypotheses are an extension of the above main hypothesis:

H1: Turbulent changes in the environment lead to an increase in the importance of risk management.

H2: Enterprises that ignore the risk management process in project management incur additional costs in subsequent stages of the project implementation.

H3: The risk management process increasing the effectiveness of project management is becoming a decisive factor in the success of the project implementation.

The above hypotheses are verified in accordance with the research procedure, including literature research on the PRINCE2® methodology and case study.

The results of the conducted research show that correctly conducted risk management process based on risk management products is the foundation of project management and becomes a key factor for the success of the project implementation.

2. Risk and risk management in projects according to the PRINCE2® methodology

According to PRINCE2® methodology, the project is defined as ‘a temporary organization set up to provide one or more business products according to an agreed Business Case’ (OCG, 2009a). The subjective scope of the project consistent with PRINCE2® includes three groups of stakeholders (Figure 1). Representatives of these groups form the so-called Steering Committee. The members of this body include:

- Executive – a business representative who makes sure that the project's product meets the need of business and provides a benefit, taking into account the expenditures incurred,
- Senior User – a representative of the user who defines the required products of the project and ensures that the project will provide them,
- Senior Supplier – a representative of the supplier, who supplies the necessary resources to enable the creation of project products.

In order to successfully complete the project, the interests of these three parties must be met (ibid: 34).

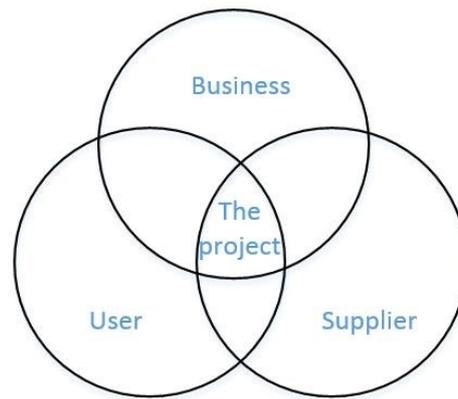


Figure 1. The subjective scope of the project by PRINCE2®. Source: own study on the basis of OGC, *PRINCE2®™ – Effective project management*, Office of Government Commerce, London 2009.

The negative risk concept presented in the literature identifies the risk with threat, loss, damage or failure to achieve the goal. The risk considered in these categories means that the expected effect cannot be achieved. In turn, the neutral risk concept shows risk as a venture whose result is not known, therefore, on one hand, it can mean a threat, and on the other hand – a chance. The achieved effect may therefore differ from the expected one and be better or worse than originally assumed (Jajuga, 2007).

From the perspective of the PRINCE2® methodology, risk is considered as a future uncertain event or a set of events that, if they happen, affect the project's goals. The risk according to the PRINCE2® methodology, consistent with the neutral risk concept, is identified with a chance or a threat. At the same time, a chance, or an opportunity, means such uncertain events that may have a beneficial effect on the project's goals. In turn, the threat is an uncertain event having a negative impact on the project's goals (OCG, 2010). The project objectives are at the risk of:

- time,
- costs,
- quality,
- the scope,
- benefits,
- and risk.

The measure of risk is the product of probability of an opportunity or threat and the size of their impact on the project's objectives. Risk management in projects, according to the methodology of PRINCE2®, means not accidental, but systematic and proactive identification, assessment and control of risks, and also planning and implementing reactions to these risks.

3. Risk management products according to the PRINCE2® methodology

The PRINCE2® methodology defines risk management products within project management. They are (OCG, 2010):

- Risk Management Strategy,
- Risk Register,
- and Risk Management Procedure.

The aim of the Risk Management Strategy is to prepare a description of risk management techniques and standards, the duties of project team members, risk tolerance levels for the project, and how risk management is conducted in the managed project. The Risk Management Strategy also specifies the responsibility for creating an effective risk management procedure. Based on being adopted by the Steering Committee and recorded in the Risk Management Strategy, the level of undertaken risk can determine the degree of risk that is possible to accept in the implemented project. Threshold values of the risk acceptable in the managed project are registered in the form of risk tolerance. Exceeding the set values results each time in preparing an Extraordinary Report addressed to the Steering Committee.

The content of the Risk Management Strategy includes the Introduction, informing about objectives of the strategy, its scope and people responsible for it, as well as the Risk Management Procedure, which describes the procedure adopted for the putting together of the project, taking into account the deviations and their justifications. Activities embraced under the Procedure include:

- Identifying.
- Assessing.
- Planning.
- Implementation.
- Communication.

These activities are the subject of the analysis included in the further part of the article.

In addition to Introduction and to Risk Management Procedures, the Risk Management Strategy also includes the preferred and applied Risk management tools and techniques, as well as required provisions defining, among others, the Risk Register format used in the managed project. Moreover, the strategy documentation embodies a section on Reporting, which details the list of preferred forms of reporting, along with defining their goals, dates and recipients. It also incorporates set Deadlines for activities related to risk management. In addition, Roles and Responsibilities for risk management activities are an integral part of the strategy. Furthermore, the scale of grades is created in the strategy. The scale can be presented in the form of a two-criteria matrix, where the first criterion is the probability of occurrence of a given

event, and the second criterion is the impact of this event on project objectives considered from the perspective:

- time,
- costs,
- quality,
- the scope,
- benefits,
- and risk.

The time horizon is also included in the Risk Management Strategy. The Proximity Criterion assesses at what time risky events may occur. Depending on the moment of occurrence of a given event, the impact and range of impact vary. The categories of proximity can be, for example, 'soon', 'during the stage', 'during the project', 'after the completion of the project'. On the basis of a risk division structure diagram or a list of risks, the Risk categories are likewise defined in the Strategy. In addition, risk response categories are presented. The adopted categories depend on how the risk can be considered as a chance or as a threat. The risk management strategy includes as well, Early Warning Indicators that allow for monitoring critical project points. Exceeding the threshold values of these indicators means exposing the project's objectives to risk and, consequently, should result in taking corrective actions. Early warning signals may include, for example:

- the percentage of groups of tasks completed according to the schedule and the percentage of incomplete tasks groups according to the schedule,
- the percentage of approvals obtained according to the schedule and the percentage of approvals not obtained in accordance with the schedule,
- the number of issues to be resolved during project management,
- number of unresolved issues,
- the average number of days necessary to solve problems,
- the average number of errors detected during quality control,
- the level of expenditure remaining above or below the planned level,
- compliance with the work schedule,
- level of customer satisfaction,
- level of absence,
- the level of depletion of human resources, if they are relevant to the project,
- direction of changes in early warning indicators.

Risk tolerance is another aspect discussed in the framework of the Risk Management Strategy, which defines the expectations of the Steering Committee and the company's organization regarding risk. Risk exposure levels are set, above which risk is directed at the higher levels of management. In addition to risk Tolerance, the risk Budget is determined, along with the methods of its use.

The Risk Management Strategy is created at the Project Initiation stage and is then updated at the end of each project phase. The following factors influence the Strategy (OCG, 2009a):

- quality expectations of the project recipient,
- the number of entities involved in the project and the nature of the relationship between these entities,
- the needs of stakeholders involved in the project,
- the value of the project, its complexity and scale,
- assumptions adopted in the project,
- organization's environment,
- the risk management method adopted in the project.

The Risk Register is the second risk management product in the PRINCE2® methodology, which is a list of information about existing chances and threats identified within the managed project. Subsequent risks are assigned a unique reference number written as a numeric or alphanumeric expression and are characterized in terms of (OCG, 2010):

- author who reports the risk,
- the date on which the risk was identified,
- risk categories, in relation to the categories specified in the project, such as: quality, schedule, etc.,
- description of the risk in terms of cause and effect, along with the description of events associated with the registered risk,
- probabilities of their occurrence, impact on the project goals and expected value,
- proximity of occurrence of risk, recorded in the scale adopted for the managed project, determined by the length of time that will elapse from the present moment till the expected occurrence of a given risk,
- the risk response category, whereby the reaction can be perceived as avoiding, reducing, adopting a contingency plan, transferring, accepting or sharing, in turn for chances – strengthening, using, rejecting or sharing,
- activities adapted to selected risk response categories and undertaken within the accepted response to risk,

- the risk status, specifying whether the risk still exists or has been withdrawn, i.e. it has already the closed status,
- the risk owner who is responsible for the risk and manages it,
- risk response contractors, often the same as risk owners, responsible for taking action as part of the risk response.

Usually on behalf of the Project Manager, the Risk Register is run by Project Support.

The Risk management procedure as the last risk management product in the PRINCE2® methodology comprises five stages (Figure 2) (OCG, 2009a). These are:

- Identification.
- Assessment.
- Planning.
- Implementation.
- Communication.

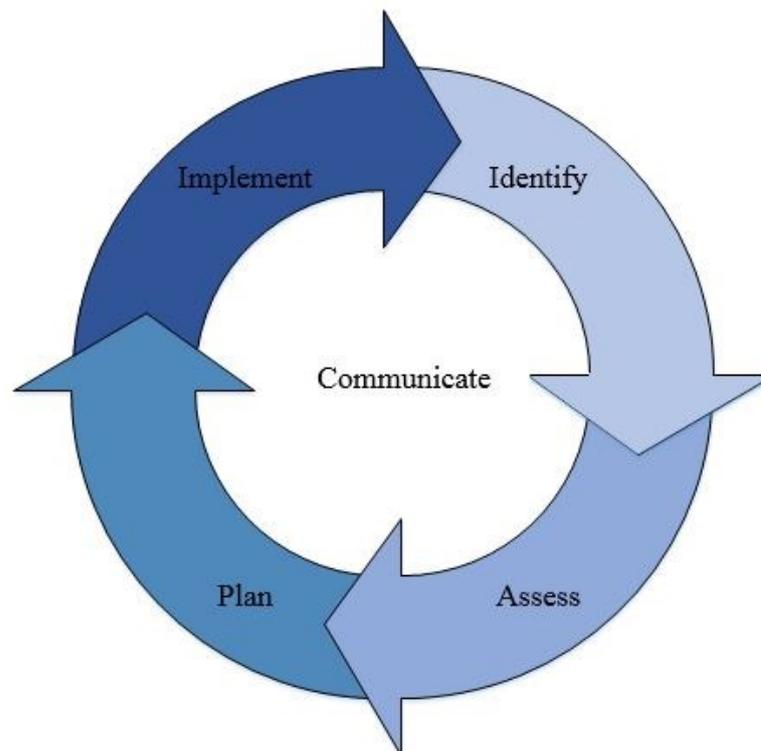


Figure 2. Risk management procedure according to PRINCE2®. Source: own study based on OGC, *PRINCE2®™ – Effective project management*. Office of Government Commerce, London 2009.

The first four steps are serial. This means that the Identification step always precedes the Assessment step. In turn, the Planning stage follows the Assessment stage. Only the last stage of Communication runs parallel to the subsequent stages.

The first stage of Identification is divided into Identifying the context and Identifying risks. Identifying the context aims towards understanding project goals that can be at risk. Additionally, as part of this stage, a Risk Management Strategy is established presenting the risk management method in the project. This strategy reflects the risk appetite adopted in the organization and determined individually, presenting an acceptable level of risk adopted in a given organization. In turn, the level of risk accepted by the Steering Committee is determined by the Risk tolerance. Violation of this tolerance results in the preparation of an Extraordinary Report each time. Within the phase of risk identification in the Risk Register, there are specified and written chances and threats that may affect the project's goals. These risks, which have an impact on key aspects of the project should have early warning signals designated and potential sources of these risks identified.

Identification of risks can be conducted by diagnosing the causes of risk, containing a list of factors triggering the risk, i.e. potential internal or external events, that initiate the risk. Such sources of risk may result in an uncertain event presented in terms of chance or threat. Such a risky event, in turn, may affect the project's goals.

The next stage of the Risk Management Procedure is Assessment. It is an estimation of risk parameters, such as:

- probability that determines the possibility of risk,
- impact on project goals, assessing the scope of the consequences of risk occurrence,
- proximity defining the time horizon in which a risk can be expected.

The essence of this stage is to determine the net effect of all identified and registered risks and verify whether this effect falls within the risk tolerance and whether the project still finds a business case. The results of the assessment are held in the Risk Register.

The next stage of the Risk Management Procedure is planning – understood as preparation of reaction to risks identified in the first stage and evaluated in the second stage. These risks can materialize in the form of chances or threats. The essence of this stage is striving to minimize or completely exclude threats and maximize chances. Balancing the costs of implementing a risk response in order to increase the chances or reduce the risks allows for choosing the right combination of reaction options.

Among the proposed responses to threats, there are:

- avoidance – manifested in the change of a certain aspect of the project, e.g. the supplier, the scope of the implemented project, the procurement mode,
- reduction – aimed at reducing the probability of occurrence of a given event, and in the event of its occurrence limiting its impact,

- contingency plan – developed to reduce the effects of hazards, not affecting the probability of a threat,
- transfer – as a form of ‘reduction’ reaction only applies to the financial consequences of the threat, for which the third party is responsible,
- sharing – often included in contracts with third parties, consists in the distribution of profits in the case when the costs turn out to be lower than in the plan of costs or coverage of losses, if the cost plan is exceeded,
- accepting – a conscious decision about the lack of reaction resulting from the assessment that total abstention becomes more economical than the option of undertaking any kind of reaction.

In turn, the recommended responses to chances are:

- use – aimed at using the potential of a chance,
- strengthening – increasing the probabilities of an event occurrences and its impact, and thus developing an opportunity,
- sharing – often included in contracts with third parties, consists in the distribution of profits in the case when the costs turn out to be lower than in the forecast plan or cover losses, if the cost plan is exceeded,
- rejection – a conscious decision about the lack of reaction and, as a consequence, failure to exploit the opportunity, resulting from the assessment that total abstention is more economical than the option of undertaking any kind of reaction.

The chosen option of the reaction does not always completely eliminate the primary, otherwise inherent risk that was identified before taking action. After applying the reaction to risk, the so-called residual risk remains. This happens often when the primary risk is significant and only partial removal has occurred as a result of the reaction. In this situation, the choice of further reaction options is considered.

In the implementation of selected risk response options, there may be changes in certain areas of the project in which new risks may arise as a result of applying risk responses. This is a secondary risk. The risk budget determines the financial amount for financing the risk response, and all mechanisms of access to the budget and its control are determined in the Risk Management Strategy.

The implementation of the planned activities as a reaction to risks is the next, fourth stage of the Risk Management Procedure. Constant monitoring of the risk response and, if necessary, the introduction of corrective actions to the applied risk responses determines the effectiveness of risk management. At this stage, roles and duties are assigned to people supporting the Project Manager through activities such as monitoring and risk management. The risk owner is the first supporting role of the Project Manager. It is a resource that is assigned to a specific risk, which it manages, and also monitors and controls all aspects related to this risk. In addition, one can

designate a person who is solely responsible for implementing the risk response. In practice, however, this risk response Provider is also the owner of the risk.

The last stage of the risk management Procedure is Communication. This stage is a key stage in the Risk Management Procedure and is conducted parallel through all other stages. It is, therefore, a continuous activity. The quality of communication determined by the value of information obtained and the time of access to them determines the level of risk management efficiency. Communication is carried out in the form of reports prepared in a project team. These are:

- Checkpoint Report.
- Highlight Report.
- End Stage Report
- End Project Report.
- Lessons Report.

4. Selected techniques and tools of the risk management on the example of the project of expanding the process of packaging food products

The project, based on which the analysis was carried out, concerns the delivery of an automation system for a production plant in the food industry. This investment is located in Poland. The development project of the production plant was started in 2018. The examined enterprise is responsible for providing technological solutions, as well as defining the standard of delivered products from the industrial automation sector.

The project was divided into three stages. The scope of commissioned works includes the implementation for each area of electrical documentation, the construction of power and control cabinets, the preparation of software for the process control system, the delivery of cabling, supervision of electrical installation and starting software on the site.

The risk register, which is a key risk management tool, is used in the audited company to gather information on identified threats and opportunities and their impact on the project's objectives, such as costs, quality and punctuality.

Example register is shown in Table 1.

The Risk Register contains information on the probability of occurrence of diagnosed risks. The essence of risk is determined as the product of this probability and the impact of this risk on the implementation of the assumed project objectives. In addition, the register compares the effects of the risk described. The document also contains risk classification. The proximity criterion informs about the period that elapses from updating the file to the term in which the risk may arise. The table also details responses to individual risks. The chosen strategy is aimed

at minimizing the occurrence of unfavorable events, i.e. threats and maximizing the chances of positive events, i.e. opportunities. In addition, the table also contains information on:

- risk identifier,
- date of reporting the risk,
- people reporting the risk,
- owner of the risk,
- status,
- update dates.

The simple table format is a risk communication tool and its status. It can be made available to stakeholders in this form. As a risk management tool, it allows for setting up activities to be carried out and people responsible for the undertaking of these activities.

Risk management is often carried out using a risk matrix, which allows a holistic view of the risks identified in the project (Table 2, Table 3).

Table 1.
Risk Register regarding the implemented project in the surveyed enterprise

ID	Date	Author of the reporting	Risk description	Effect	Risk category	Impact (I)	Probability of occurrence (P)	Risk level (IxP)	Proximity (in weeks)	Reaction to risk	Risk owner	update date	Status
1	12.08.18	K.K	Exchange rate change	Increase / decrease of the cost of material purchase	foreign currency exchange	average	low	low	4	acceptance/ use	T.O.	25.08.18	active
2	12.08.18	K.K	Material price increase	Increased purchase costs of materials	commodity prices	average	low	low	4	sharing/ transfer	T.O.	25.08.18	active
3	12.08.18	K.K	Withdrawal of capital by the Investor	Decision about premature closure of the project	withdrawal of capital	high	low	average	9	sharing/ reducing	T.O.	25.08.18	active
4	12.08.18	R.Ż.	Failure to complete work on time	Loss of reputation	loss of reputation	high	average	average	6	reduction/ contingency plan	T.O.	25.08.18	active
5	12.08.18	A.S	Change of management	No experience from previous stages of the project. Errors due to poor management. Erroneous actions or decisions about legal, financial and reputational effects	management, addiction to the senior staff	average	very high	average	4	reduction/ contingency plan	T.O.	25.08.18	active
6	12.08.18	A.S	Poor coordination of human resources	Errors due to poor management. Failure to meet the deadline and assumptions of the project. The increase of project costs. Erroneous actions or decisions about legal, financial or reputational effects	management, addiction to the senior staff	high	average	average	4	avoiding / reducing	T.O.	25.08.18	active

Cont. table 1.

7	12.08.18	A.S	No human reserves. Inability to complete tasks. Unexpected absences. Improper planning of tasks and resources	Errors due to poor management. Failure to meet the deadline and assumptions of the project. The increase of project costs. Erroneous actions or decisions about legal, financial or reputational effects	management, addiction to the senior staff, personal	average	average	average	4	avoiding/reducing	T.O.	25.08.18	active
8	12.08.18	A.S	Lack of employee expertise. Unwittingly incorrect or hasty employee action	Erroneous actions or decisions about legal, financial or reputational effects	management, addiction to the senior staff, personal	high	low	average	4	reducing	T.O.	25.08.18	active
9	12.08.18	A.S	Personnel fluctuation	Inability to ensure adequate quality, size and efficiency of the work.	management, addiction to the senior staff, personal	average	average	average	4	reducing	T.O.	25.08.18	active
10	12.08.18	A.S	Fatigue of employees	Employee errors. Delay	management, addiction to the senior staff, personal	high	average	average	5	reduction/contingency plan	T.O.	25.08.18	active
11	12.08.18	B.C.	Lack of material reserves. Unexpected lack of components	Inability to fulfill the task. Improper planning of tasks and resources	material	very high	low	average	4	reduction/sharing	T.O.	25.08.18	active
12	12.08.18	B.C.	Limited access to materials, late delivery. A strictly defined list of delivered materials	Risk of unavailability, risk of shortages. Inability to fulfill the task. Improper planning of tasks and resources	logistics management	very high	low	average	5	reduction/contingency plan	T.O.	25.08.18	active
13	12.08.18	B.C.	Technological changes	Inability to fulfill the task. Delay	technical	very high	low	average	4	reduction/transferring	T.O.	25.08.18	active
14	12.08.18	B.C.	Changes in quality requirements	Inability to fulfill the task. Delay	technical	very high	low	average	4	reduction/sharing	T.O.	25.08.18	active

Cont. table 1.

15	12.08.18	A.S.	Performance limits. Bottleneck in the process	Inability to fulfill the task. Delay	organization, harmonization of processes	very high	average	very high	6	reducing	T.O.	25.08.18	active
16	12.08.18	A.S.	Incorrect product implementation	Erroneous actions or decisions about legal, financial or reputational effects	technology	very high	low	average	8	reducing	T.O.	25.08.18	active
17	12.08.18	A.S.	The project is not technically feasible	Projecting phases and (or) coding last longer than expected	technology	very high	low	average	8	reducing	T.O.	25.08.18	active
18	12.08.18	A.S.	Failure in following the development	Erroneous actions or decisions about legal, financial or reputational effects	technology	average	low	low	6	reducing	T.O.	25.08.18	active
19	12.08.18	A.S.	The risk of lack of full content. Incomplete project documentation, lack of expertise or access to appropriate sources of information	Erroneous actions or decisions about legal, financial or reputational effects	lack of full content	very high	average	high	4	reduction/transferring	T.O.	25.08.18	active
20	12.08.18	B.C.	Failure	Delays in the project or inability to complete the project	incident	very high	high	high	4	reduction/sharing	T.O.	25.08.18	active
21	12.08.18	R.Ž.	Inflated spending level. Error in trade negotiations. This results from a lack of expertise,	Project budget exceeded	excessive expenses	very high	average	high	8	reducing	T.O.	25.08.18	active

Table 2.
The Risk Matrix based on the Prince2® methodology

Probability	very high	0,9	71%-90%	0,045	0,09	0,18	0,36	0,72
	high	0,7	51%-70%	0,035	0,07	0,14	0,28	0,56
	average	0,5	31%-50%	0,025	0,05	0,1	0,2	0,4
	low	0,3	11%-30%	0,015	0,03	0,06	0,12	0,24
	very low	0,1	less than 10%	0,005	0,01	0,02	0,04	0,08
				0,05	0,1	0,2	0,4	0,8
				very low	low	average	high	very high
Impact								

Table 3.
Risk matrix regarding the implemented project in the surveyed enterprise

very high			5		
high					20
average			7, 9	4, 6, 10	15, 19, 21
low			1, 2, 18	3, 8	11, 12, 13, 14, 16, 17
very low					
probability \ impact	very small	small	average	large	very large

Points in the matrix are described by identifiers from 1 to 21. The coordinates of the points determined in the matrix are the quantitative parameters of the probability of the occurrence of the event and the impact of this on the project's objectives. The highest probability of occurrence of an event represent points located in the upper part of the matrix. The points that occur in the lower part of the matrix are characterized by a low probability of materializing the risk.

In turn, the points shifted to the right have the greatest impact on the goals of the project, while that with the least impact are on the left side of the matrix. Such a map presented in the form of a matrix allows for intensifying activities around risks in the upper right corner. In order to manage the entire undertaking while taking into account the identified risks, it is important to sort the risks and then plan the responses in relation to the most important of the identified risks and then implement these reactions.

The risk tolerance line in the matrix shows the level of tolerance accepted by the Steering Committee in relation to the project being managed. The specificity of the implemented project in the examined case and the attitude to the risk of the examined enterprise allowed to set a tolerance level of 0.25. Above it, the risk is not tolerated by the Steering Committee. On the other hand, proactive actions must be taken in the case of risks ranging from 0.1 to 0.24. The hazards above the tolerance line are the risks:

- limiting performance and diagnosing bottlenecks in the process. In the case under consideration, the bottleneck is identified as the machine responsible for product sorting. Its efficiency does not allow for smooth flow of material within the production line. It generates delays in the process and, as a consequence, makes it impossible to obtain the required efficiency of the manufacturing process in the analyzed area. The risk response used is to reduce it. These activities involve the introduction of technological changes within the sorting machine. This allows for obtaining the required performance.
- lack of full content, incomplete project documentation, lack of expertise or access to appropriate sources of information. In the implemented project, the basis for full implementation of the project objectives is to receive complete technological documentation. The quality of the information received determines the quality and schedule of the next stages of the project. Incorrect data results in erroneous or unnecessary actions and decisions. This affects the finances and reputation of the company. The risk response used is its reduction and transfer. With regard to risk responses in the form of a transfer, for all delays and unplanned downtimes resulting from the lack of full documentation, the main project provider is financially liable. With respect to the risk response in the form of reduction, critical deadlines have been set in the schedule of project work, in which documentation for individual stages of the project is to be provided and submitted for approval.
- failure (incident). Failures of production machines and equipment on the existing production line result in failure to execute production plans at the scheduled time. As a result, as part of the implemented project, machines intended for relocation to new places cannot be planned in new locations due to an unfilled production plan. Unplanned downtimes result in delays in planned operational activities that adversely affect the schedule of project work. They may result in the inability to complete the project within the prescribed period, as well as failure to meet the project's objectives. The risk response used is its reduction and sharing. With regard to the risk response in the form of sharing, it was agreed that all delays and unplanned downtime caused by a failure result in the schedule being extended by the time of failure. In turn, the main contractor shows flexibility in relation to the investor and adjusts the schedule of operational

activities to the existing situation. With respect to the risk response in the form of reduction, appropriate people and methods have been designated to increase the efficiency of machines and devices that, as part of the implemented project, are to be ready for relocation without any delays. Productive maintenance of machines and devices, as well as planned maintenance are to reduce the risk of unplanned failures that prevent entry into the production department from design work.

- excessive level of expenditure, error in trade negotiations resulting from lack of expertise. The dynamics of changes in the project work schedule generates increased costs of operational activities that must be performed by specialized staff. Delays in the work schedule exert an impact on other projects conducted by the surveyed enterprise, because in the assumed time in the area of resource planning, there is parallel implementation of work in several locations and, consequently, the need to subcontract works to external entities. Errors in trade negotiations, as well as incorrect quantities and selected types of materials result in overstated material costs. The risk response used is its reduction through transfer. This involves conducting a detailed analysis of the required materials necessary to carry out the design work. This allows precise specification, and for precise determination of the types and quantities of ordered material, taking into account prices and delivery times. Any deviations from the material specification, resulting in the ongoing execution of works, are approved and paid by the investor. The costs of subcontracting works to specialized external entities are reduced by negotiating flat rates, independent of the number of man-hours and the number of employees purchased from the sub-supplier. All works outside the scope set in the project work schedule are treated as additional works. An offer is prepared for works that go beyond the scope of the main contract. The implementation of additional works takes place only after acceptance of the offer.

All events described above represent a risk level greater than 0.25, i.e. a high level.

Below the risk tolerance line there is a set of risks, the level of which is in the range (0.1; 0.24). These are all other risks from the table excluding risks 1,2, 18, as well as those risks that are above the risk tolerance line and are discussed above. Risks within the range (0.1; 0.24) require a proactive policy aimed at blocking the possibility of individual risks getting into the area above the tolerance line.

5. Conclusion

In an environment marked by a high dynamics of change, risk management in projects becomes a strategic skill of the company and a way to gain a competitive advantage (Kasiewicz, 2011). The risk management process in increasing the effectiveness of project management, is becoming a decisive factor in the success of project implementation. The results of the conducted research show that a correctly carried out risk management process based on risk management products such as Risk Management Strategy, Risk Register and Risk Management Procedure is the foundation of effective project management and protects the company against incurring additional costs in subsequent stages of project implementation. Only effective project management allows achieving the set project goals considered from the perspective of time, costs, quality, scope, benefits and risks.

It can be stated that the risk register, being referred to as a main tool for risk management, is applied in the audited organization for such purposes as collecting data or determining perils and chances as well as exerting influence on the programme's goals in terms of ensuring quality, establishing costs and enhancing punctuality.

In the pursuit of venture management while regarding the identification of risks, it proves vital to denominate the threats and, subsequently, to design reactions addressing the greatest of the recognized hazards and then to put in practice these responses.

The indiosyncrasy of the introduced programme in the researched issue and the approach to the risk of the analysed company enabled establishing the line of tolerance at 0.25. There is no tolerance of risk above this stage by the Steering Committee.

Having conducted a through analysis, it turned out that the perils located over the tolerance level constitute risks which decrease efficiency and in identifying bottlenecks in the projects, they can be reduced by the risk response. Secondly, this category of risks tends to reveal deficits in content that are not documented sufficiently. Additionally, they can be characterised by gaps in expertise, because workers and supervisors, and even the project managers lack access to proper information sources. These risks can be diminished and transferred by the risk reaction as well. Furthermore, the hazards can be featured by the cases of incidental failure, which also may be depleted and shared by the appropriate risk reply. Finally, the threats can be caused by exorbitant expenses and mistakes committed on the level of negotiations which are derived from the deficiency of competencies. They can be prevented by the risk feedback including transfer.

The aforementioned strategy is implemented for the purposes of limiting the number of disadvantageous incidents taking place in the company referred to as threats, and multiplying favourable happenings defined as opportunities. This enables the organization to increase its performance to the expected and desired levels of outcomes.

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