

INSIGHT INTO PROJECT RISK MANAGEMENT

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ABSTRACT

The unprecedented development of project work within all types of organizations and activities, makes specific project issues be largely presented and analyzed in the literature. Project management, as a temporary management activity with precisely defined objectives and resources, has a number of features that require the managerial skills, knowledge and excellent competencies. Lately, increased complexity, duration and diversity of the issues addressed in projects have triggered hazards making room to risk situations which are more and more present. Under such circumstances, risk management is designed to anticipate, prevent, manage and establish the reaction of the project team to possible risk situations, thus becoming an important component of management. This article presents several risk management aspects and ways of taking action for achieving a successful project.

KEYWORDS: risk, uncertainty, risk management, risk assessment, risk scoring matrix, diagram risks, decision trees

JEL code: A2, C7, D1, D2

1. RISK IN ORGANIZATIONS AND PROJECTS

Our approach is based on the assumption that projects in which we are often involved in display various degrees of risk, specifically uncertainty, and the uncertainty degree varies greatly from one project to another, due to the diversity and variety of the environment in which they appear and evolve. Even projects similar to previous ones may be at high risk, as there are new specific requirements and new risk factors, which are further detailed in our current approach. If we generally define risk, as an uncertainty regarding the achieving of objectives, expected results, then it is a combination between the possibility of an event appearance and its impact. Its result can be measured/assessed by a certain level of risk, such as *high*, *medium* or *low*.

Specifically, any risk appears in every activity or organization, and is often called “the possibility of suffering a loss,”² or:

- “Probability of losing”
- “Possibility of losing”
- “Uncertainty about a result”
- ”Hazard or possibility of losing ”³

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² (<http://www.webster-dictionary.org/definition/risk>)

³ Constantin Opran (coord.), Sergiu Stan, Steluța Năstasă, Bogdan Abaza, *Managementul proiectelor*, comunicare.ro, București, 2002.

The Explanatory Dictionary of the Romanian Language defines risk as “the possibility of becoming a hazard, having to face a trouble or to bear a loss.”

Therefore, the concept of risk involves uncertainty notion and always has a cost associated which measures/assess the impact of the respective event and the sum of the suffered loss.

For a project, the suffered “loss” has various forms, such as:

- The end products have poor or lower quality than the quality originally planned;
- The costs to achieve the goals of making the end products are higher than originally foreseen;
- The resources have not been exploited effectively, they were either consumed or damaged;
- The term of “delivery” of the end product and project closure has been exceeded;
- The project is a total failure.

This means that *the risk* occurs either as a result of an unplanned event that appears, or as a result of a planned event which does not proceed according to plan. This means that, as it is impossible to predict with certainty the future, all projects include a dose of risk.

Since “*each project represents a set of unique activities aimed at an objective with a high degree of novelty and a complex workplan*”¹, it means that *risk management* is an internal element of coordination and control, with the help of which important risks are identified in the project activities in order to keep these risks at an acceptable level.

The Risk, as a probability for not reaching an objective of the project, has the following characteristics:

- It involves the notion of uncertainty and a cost is associated with it;
- It is an event that has *negative* effects in the organization or during a project;
- It is a possible occurrence of a situation, usually unfavorable, for which the generated effects are not known with certainty.
- For a given event, risk has two primary components:
- Probability or possibility of occurrence of that event;
- Impact or effect of the event appearance which is usually assessed in costs.

Under such circumstances, the risk is the uncertainty associated with any event. This may mean the probability of occurrence of an event or the effects of that event, if it occurs. One can therefore determine that risk occurs when:

- An event is certain, but its outcome is uncertain;
- The effect of an event is known, but the occurrence of the event is uncertain;
- Both event and its effect are uncertain.

¹ Mariana Mocanu, Carmen Schuster, *Managementul proiectelor*, Ed. AllBeck, București, 2001

This means that it can become an **element of risk** anything that is likely to produce a considerable deviation from the objectives, from the initial plan. On the other hand, experience shows us that the risk is even greater when:

- The project takes longer;
- The interval between the planning and execution phase is greater;
- The project manager, project team and the organization lack the needed experience;
- The methodology and technology used for the project is newer and less known¹;

We do emphasize, however, that there are specialists who unconditionally do not associate the risk with a loss, but they consider it “an event or an uncertain condition which, if appears, has a positive or negative effect on the set objective ... Risk includes both threats to objectives and opportunities to improve these objectives²”.

2. THE RISK MANAGEMENT - A TOPICAL ISSUE

Achieving the objectives of an entity, a project or an activity requires risk acknowledgement and risk-taking of multiple risks which are even more diversified and can occur at its level. The Risk management has become an essential part of the management of an organization or project. Considering the increased complexity of activities carried out in various types of projects, the quality requirements for products, while reducing the execution time or costs involved, the risk management has become a very important activity in the economy of a project. This activity includes those processes for the identification, approach and mitigation or avoidance of risks that may arise during a project, which actually defines the reaction to risk.

The **risk management** is, in this context, the activity of identification, assessment and prioritization of risks followed by coordinated and economic allocation of resources to minimize, monitor, and control the probability and /or impact of unfortunate events (hazards) or to maximize opportunities.³

In this context, the role of risk management is to provide and manage risk and uncertainty levels so that the project could be completed successfully by the organization. The project team should identify any possible risks, the ways in which they can be minimized and the costs for management strategies.

The main processes specific to project risk management are:

- The *risk identification* by examining each area of the program and each technical process important to identify and describe any associated risk. They have to be identified especially the activities which tend to be critical as they have the

¹ Stanley E. Portny, „*Project Management for Dummies*“, Wiley Publishing, Inc. 2001

² Project Management Institute, *Guide to Project Management Body of Knowledge*, 2000

³ Hubbard, Douglas (2009). *The Failure of Risk Management: Why It's Broken and How to Fix It*. John Wiley & Sons. p. 46.

greatest impact on the deadline of project completion. Therefore, these activities will be viewed most frequently, will be tracked during their progress status and the human resource allocated to them will be well-selected to include experienced specialists in the required field.

- The *risk assessment*, by identifying and analyzing the program areas and the described risks to increase the likelihood of achieving the cost, performance and execution objectives in due time.
- The *risk management*, by identifying, evaluating, choosing and implementing one or more strategies to mitigate risks or eliminate them, according to the conditions and objectives set out in the program.

The risk management plan is thus an annex of the project implementation plan. It can be detailed or very general, standardized or non-standardized, according to the needs and specificities of each project.

The risk treatment plan consists of pre-defining actions to be executed when an undesirable event occurs. Usually it is part of the risk management plan, but it can be integrated into other components of the implementation plan, such as, for example, the quality management plan.

The risk management program control is the process of quantifying the implemented measures for risk management which leads to possible corrections during project execution. This includes all the means and techniques of risk management, including procedures, guidelines, organization charts, administrative or technical policies.

3. THE STAGES OF RISK MANAGEMENT

The risk management process is presented as a continuous process, comprising several stages, such as risk identification, analysis, use, monitoring, planning and continuous documentation throughout the process. They are summarized as follows:

- Planning - is the process of drafting and searching for a strategy to identify and track risks, develop risk treatment measures, ongoing risk assessments, and identification of resources needed to detect and mitigate the risks.
- The identification of risk, danger, hazard - is a review process of critical activities for events which pose risks, by providing the necessary costs, and elaborating both programs for mitigating the risks and programs for performance objectives. The risk may not necessarily mean a loss but may occur as an opportunity to carry out some activities or processes in better conditions of time, cost or quality, provided they are identified and used as such.
- The manipulation or risk analysis, is the process of evaluating each risk individually, to determine their likelihood, their consequences and their association with other processes that pose risks, establishing the necessary measures. It is thus determined the probability for event occurrence, who and what will be affected by its appearance, which are the effects, etc. This analysis identifies how risks relate to one another and in the end it will result in a list or

database of risks, which can be ranked by their probability of occurrence and the impact corresponding to each type of risk.

- The risk control - is the process of identifying, evaluating, selecting and implementing risk mitigation measures to ensure an acceptable level of risk, closely with the existing constraints in the project;
- Risk monitoring is the process of tracking and evaluating constantly the results of the actions taken for risk assessment, by comparing the results with the limits set out in the project;
- Documentation about risk systems - is the process of registration, storage and reporting of the risk, the effects of the risk treatment measures, the results of risk analyses as well as the communication of the results to the members of the risk management team.
- Continuous improvement - is the process of review and improvement of risk management processes by improving the skills and defining future needs.
- A graph of the risk management process is shown in fig.1 below¹.

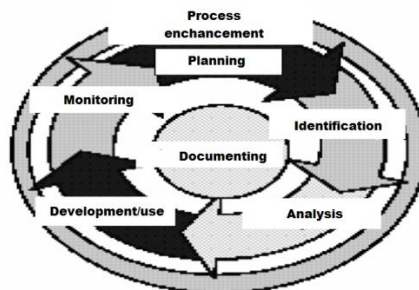


Figure 1. The Risk Management Diagram

4. MODERN METHODS OF RISK MANAGEMENT

Nowadays, risk management approaches have become very complex as there is the possibility of risks occurrence which have unpredictable effects on all activities and their stages at all times. Therefore, there are major concerns for solutions through which to identify potential risks in the various stages of an activity or project solutions to attenuate their potential effects or even to eliminate them completely.

Thus, a number of methods for project risk management are defined and described in the literature, such as: the process mapping, the classification of risks, the risk scoring matrix, the method for determining the risk profile, etc.

4.1. The determination of the risk profile

It is a modern method for assessing the risk profile of a company, enabling transparent and comparable assessment of the possible risks. This method involves making annual

¹ http://omicron.ch.tuiasi.ro/~mgav/pdf/EMR/Curs_11.pdf

reports on risk management activities, achieving constantly “the assessment and strategic, systematic and structured monitoring of existing risks”¹.

This method allows permanently, throughout the project, risk control without deviations from the targets and the established planning indicators. A renowned UK organization (Atomic Energy Authority (AEA) Technology, 2003), which provides risk management solutions, consider that this method is composed of five stages, namely:

1. Identification and definition of risk units;
2. Establishment of degrees and a chart of priorities;
3. Identification and assessment of threats;
4. Classification of risks and identification of controls;
5. Monitoring and action plans for risk control².

The identification and definition of risk units is a stage specific to all activities which is tightly connected to the production, finance and human resources departments. It involves identifying all possible events that may pose potential risks to the activities defined in the project. The identification of risks does not have to be a static process that takes place only once. Choosing a particular method of identification is achieved by the risk manager, in consultation with a large number of specialists outside the risk management department.

The identification of a risk may be performed in several ways, as follows:

- Lists of sources for potential risks, causes for their appearance, etc.
- Verification of documents which are associated with similar activities
- List of possible risks from the outside
- The specialist consultation, based on the experience that they have in the field.

The identification of a risk is followed by its proper registration. Basically, long before the beginning of the risk identification process it has to be developed and implemented a system for registering them, so that, and for any identified risk, all relevant data could be registered to be used in the analysis of the next period, as a benchmark.

Establishing degrees and a chart of priorities - is the stage which makes use of different techniques, a risk categorization, through which they get varying degrees, depending on the impact (severity) and likelihood (frequency) of their occurrence. The risk classification and grading needs to be simple, accurate and easy. *The matrix for risk scoring* is a tool proposed by the AEA to grade the risk and it establishes the severity of risks (none, minor, moderate, significant and impressive) and the frequency of risks (occasional, reduced, unlikely and unbelievable), as shown in Figure 2.

Severity	None	Minor	Moderate	Significant	Impressive
Frequency					
Occasional	Medium	Medium	High	High	High
Rare	Low	Medium	Medium	High	High
Improbable	Low	Low	Medium	Medium	High
Not believable	Low	Low	Low	Low	Medium

Figure 2. Matrix for risk scoring in terms of severity and frequency³

¹ Dickson, C.G. (2003). *Risk analysis*, 3rd edition, Witherbys Publishing, New York

² Petre Brezeanu, Laura Elly Novac, Metode moderne de identificare a riscurilor în managementul riscului

³ Petre Brezeanu, Laura Elly Novac, Metode moderne de identificare a riscurilor în managementul riscului

The value of the risk degree is given by the intersection of the severity column with the line corresponding to the risk frequency. The classification of risks by degrees: *high, medium and low* is achieved according to AEA classifications through the color system: *red, yellow and green*.

The prioritization of threats makes possible the distribution of those resources that are limited to significant risks which could deviate the objectives of an organization. This method is considered abstract, and hence in larger companies risks may be ignored or wrong decision may be taken to assess risks, whereas in small companies low priority risks may be ignored.

Identification and evaluation of threats – is a stage which focuses on the risks identified for each activity, the main threats, and hazards that may occur. The assessment is being performed considering both risk characteristics: frequency and severity.

Risk classification and identification of controls – is a stage in which it is achieved the classification, a grouping of risks so as to identify both risks with a high degree of occurrence and those with a low degree of occurrence.

Making action plans and monitoring - is a stage focused on finishing to implement control solutions and on getting feedback periodically to identify any new risks.

4.2. The process mapping

The process mapping is a graphical representation of the processes in the form of a diagram; hence the risk manager is trying to improve the activity of the organization by identifying all elements that could adversely affect the project as a whole.

The processes are events which transform the inputs of the organization into outputs that meet the needs of the organization. The inputs of the processes are the elements required to achieve them (human, financial, logistics, technology, knowledge). The outputs of processes are the results of processes (products, services, information).

The process mapping is basically a diagram which shows the concrete activity of the organization and the processes by which it is achieved. Process mapping presents in an order of their necessity, the important elements within each process, the inputs (resources) of processes and the corresponding outputs. The objective of achieving a map is to identify the workflow so that risk management could bring an increase of efficiency, safety and could reduce hazards and costs involved.

It is used, in the process mapping method, the diagram for process definition which describes each process in detail and identifies four important components in the development of any process or activity (Fig 3) as follows:

- *Inputs of the processes* are the elements needed to continue the process, which are processed or consumed during the process, thus leading to its results.
- *Outputs of processes* are those goods or services resulting from the execution process.

- *Restrictions*, either internal (procedures, internal standards or budgets) or external (national legislation or international standards, limited resources) are particularly important as they design and influence the processes.
- *Resources* are needed in the process to achieve its outputs. Resources are different from inputs as they are neither transformed nor consumed during the process.

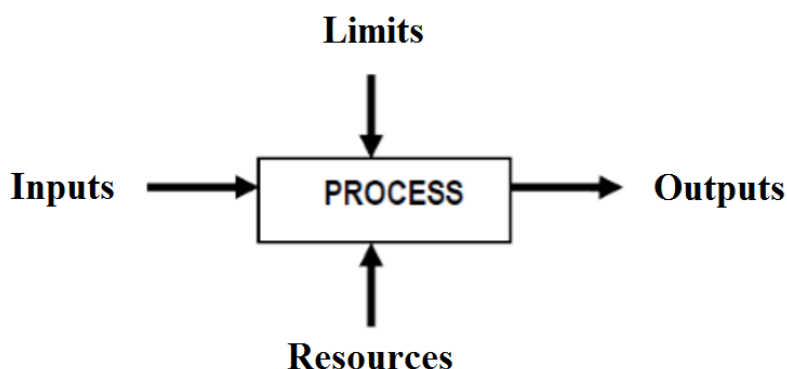


Figure 3. Diagram of the process definition.
Source: Audit Scotland. The Map to Success (2000).

In practice, the detailed maps of processes are the result of a standard methodology entitled the *integration definition for modelling functions*.¹ There are software products for this integration definition for modelling functions, in which the mapping process is a complex process that requires a great deal of effort, money and time.²

The process mapping is a method that encourages the „culture of employee motivation” within the organization, urging them to identify and investigate the causes of losses and to find ways to prevent them in the future.³

The technique is complex, as it uses numerous charts that causes confusion, the results may become limited or even be a waste of time, effort and resources. Therefore, the method requires an analysis and a rigorous planning of the resources necessary to the project.

4.3. Risk Scoring Matrix

Specialists use the method called risk scoring matrix to identify strategic risks; it is based on the idea that improving an organization's performance can be achieved mainly by quantifying key indicators of performance⁴.

¹ Petre Brezeanu, Laura Elly Novac, Metode moderne de identificare a riscurilor în managementul riscului

² Black, K., Life and Health Insurance, 13th edition Upper Saddle River, Prentice Hall, 2000

³ Institutul Managementului de Risc, Risk Analysis, Editura Witherby, London, 2003, p.34

⁴ Petre Brezeanu, Laura Elly Novac, Metode moderne de identificare a riscurilor în managementul riscului

Key indicators of performance indicators are mainly those that imply clients, internal operations and financial management. A variant of this method is the *risk scoring matrix-FIRM* (financial, infrastructure, reputation, medium).

The method focuses on the evolution of risks over time, their impact on the organization and correlation between the risk exposure and the organization's capacity to react to risks. In this way, the risk scoring matrix method demonstrates the complexity and the effects of risks on the entire organization.

The method divides risks into two categories, namely: internal risks (financial, infrastructure) and external risks (reputation and environment).

The financial risks are risks which impact the financial resources and the balance sheet, specifically the available funds available and the controlled incomes¹.

These risks can be quantified easily, because they quantify the losses or the missed opportunities due to mismanagement. People involved in financial risk assessment are the CFO, risk manager, accountants and internal auditors who are aware of the internal financial control systems.

In this case, control systems include authorization for acquisitions and internal financial control procedures.

The infrastructure risks are usually called "settled risks" and those risks are covered by insurance and similar mechanisms².

As examples, we include the equipment, buildings, employees and other parties affected by the activities of the organization. The risks in this category may influence the effectiveness of the organization through routineless events. Therefore, this type of risk can be measured relatively easily, being generally of a domestic nature. The staff involved in assessing these infrastructure risks consists of the production manager, the risk manager and the safety manager. The mechanisms of control involve procedures, maintenance and insurance mechanisms.

Reputation risks relate to the organization's image to customers, suppliers, shareholders and society. These risks, however, are varied and difficult to quantify. As an example, we include the company management, ethical issues, legal issues, and their outcome may be a negative image that damages the company's reputation³.

Therefore, the risks in this class may affect the organization's relationship with the customers and suppliers of the organization, the organization's image and its brand. The insurance procedures and procedures for crisis management and business continuity represent accepted the acceptable control mechanisms.

¹ Ciurel, V., Asigurări și reasigurări: abordări teoretice și practici internaționale, Editura All Beck, București, 2000

² Badea D.; Ionescu L., Asigurări de persoane și reflectarea lor în contabilitate, Editura Economică, București, 2001

³ Tănăsescu, P.; Dobrin, M., Teoria și practica asigurărilor, Editura Economică, București, 2002

The *medium risks* are risks related to the organization's position on the market, the commercial risks which affect customers, the organization's ability to maintain contracts with partners, the market profile and the organizational performance¹.

Quantifying medium risks can be achieved by indicators such as: low income, turnover and profit. Control methods include planning and carrying out proper risk assessment strategies and opportunities for new projects.

If we consider all such risks, we can determine *the risk capacity in an organization*, and, on that basis, the organization will be able to accept the four sections of the risk scoring matrix (FIRM).

The formula for calculating the risk capacity of an organization is:

Risk capacity = acceptance of control + tolerance for hazards + appetite for opportunities

4.4. Decision trees

Decision trees are graphical instruments with the help of which one can describe the interactions between decisions and the random events as they are perceived by decision makers.

The *tree branches* represent decisions and are represented by squares, whereas the *random results* or *uncertain results* are represented by circles.

The following figure shows an example of a decision tree².

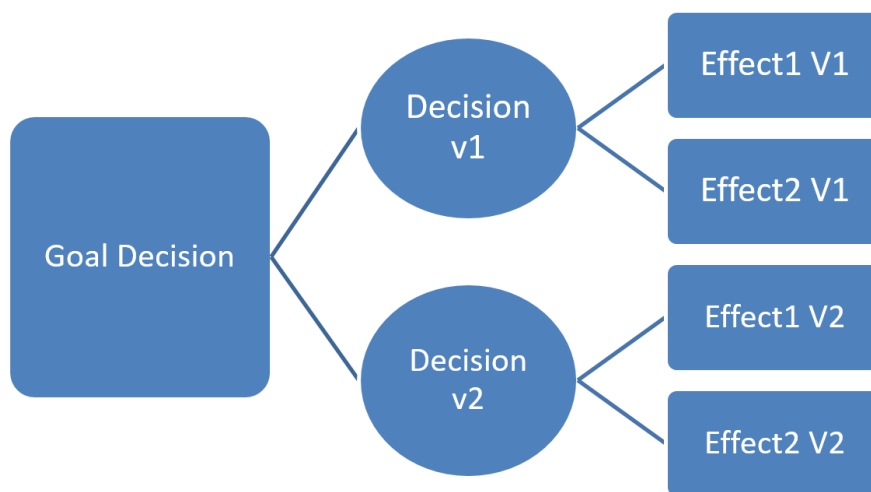


Figure 4. Decision Tree. Eexample

In a decision tree, it can be calculated the expected value indicator (EV), both for one effect, and for a decision. Thus:

¹ Tănăsescu, P.; Dobrin, M., *Teoria și practica asigurărilor*, Editura Economică, București, 2002

² <http://ebooks.unibuc.ro/StiinteADM/cornescu/cap5.htm>

The expected value of an effect = the effect x probability of effect appearance

and

The expected value of a decision = the sum of expected values of all effects resulting from that decision.

For complex projects, the process of building a decision tree is often very complicated. The decision trees contain decision nodes, represented by squares, in which the decision makers have to choose one of the possible options. The circles represent points of opportunity that will produce a random event.

Making a decision tree graph requires, as a rule, three steps:

- Building a logical tree, from left to right, which will have to identify and represent every decision point and every opportunity point;
- Establishing probabilities of states occurrences on each branch, achieving a probability tree;
- Adding the conditioned results, thereby achieving the decision tree.

Having calculated these values, we can say a project that has a high expected value becomes a program or an “aggressive” project and the one which has a lower expected value is “conservative”.

If decision makers have to choose one of the mentioned programs which comparatively have far different expected values, they can opt for the aggressive one to the conservative one or the vice versa, depending on the project peculiarities in terms of scope, specificity, defined constraints, terms and costs of implementation.

This method can be used to choose at the beginning one option or other for project completion, if it is a complex one, in which the uncertainties, the hazardous events can generally occur at any moment, and the decisions that can be taken are very varied, with different effects on the development of the project. Thus, one can choose at the beginning the most convenient option for the implementation of a complex project, in which the likelihood of hazards is minimized.

5. THE REACTION TO RISK

The reaction to risk is defined as the activity that establishes possible steps to exploit the opportunities and respond to threats which can appear throughout the project. The reaction is basically the concrete risk-stage action within risk management and it focuses on taking proper measures to eliminate, mitigate and distribute the arisen risks.

The reaction can occur for various threats in several ways, such as:

1. *Avoiding the risk*, which involves removing a possible threat by eliminating the cause that can determine it.
2. *Reducing the negative effects of risk*, which involves reducing the estimated cost of a potential risk, by reducing the probability of its occurrence.

3. *Acceptance*, which means accepting the consequences of the risk, with all the costs involved.

As a result, during the course of a project, one can be in one of the following situations:

1. Threats which are taken into account, specifically there will be reactions to these threats.
2. Threats are ignored, specifically their effects will be accepted.

The available tools and techniques to get a reaction to these threats could be:

1. The acquisitions, as appropriate actions to certain types of risk. They can, however, often determine the shift of a risk into a new risk.
2. Planning of possible future actions, which sets out the steps to be followed where there is a signal of possible threat.
3. Alternative strategies, defining methods or techniques to prevent or avoid risk signals.
4. Insurance which represents a special way of facing certain categories of risk.

The direct results of the reaction to risks may include the following:

1. The Risk Management Plan, which defines the methods to be used in risk management project. It encompasses the results of the processes of identification and quantification of risk, mentions the people who will deal with various types of risk, how to implement future action plans and how to allocate reserves as necessary resources.
2. The inputs for other processes
3. The possible future action plans
4. The reserves which are included in the project plan for attenuating cost-related risks or project schedule-related risks.
5. The agreements concluded for insurance, service and other aspects in order to avoid or to minimize the potential threats.

The control of reaction to risk is a mandatory activity within the project management and tracks all changes that imply possible risks during project. This means that if changes occur, the activities of identification, risk quantification and reaction to risk must be repeated. This cycle repeats throughout the execution of a project until its completion.

6. CONCLUSIONS

It is obvious that the considerable complexity and diversity of projects, their spread in more types of organizations and activities may trigger hazards, unpredictability, random events of the internal and external environment during the development of projects, effecting their execution. More and more organizations whose expertise span various fields, are currently working on projects funded by various sources; they have clear objectives, a well-defined budget, and financial, human, technical, communication

resources, limited periods of time which are well-defined and thoroughly monitored during the project implementation. Any unforeseen event will directly influence the results of project implementation, such as schedule, costs, quality constraints of achieved products, etc.

It is, therefore, highly important for risk management, as part of project management which identifies and deals with risks is an ongoing activity designed to note errors and correct them on time in order to minimize their effects as much as possible.

It is important that the identified risks be monitored and that new risks be identified in each moment.

Any identified risk has to be properly registered. Basically, before starting the identification of risk it has to be developed and implemented a registration system for the identified risks. All important data about the risks that have been identified will be registered in a database to be later used in the risk analysis for the next period.

In this way, the reaction to risk will not be random, but it will be based on the successful actions of previous periods of time or similar projects.

We identify, based on our experience in projects, a series of events, actions or processes that may be elements of risk in a project, including:

- A long period for implementing a project may attract numerous elements of risk
- Big acquisitions planned in the last stage of the project
- Key persons in the project lack experience in the field
- Many important activities take place in parallel
- Lack of progress reports during project execution; they must be available and be required at intervals that hinder the appearance of hazards, without having the possibility of intervention and correction thereof.

Therefore, the constant actions of the project management or an organization to identify and deal with the risks, are carried throughout the execution of ongoing projects and they require the use of modern IT tools for registering all risks. Thus, effective opportunities are possible such as: searching the database for registered risks, looking for new methods and developing solutions to monitor and profile them for a better and accurate reaction to any unforeseen event, achieving afterwards, based on this data, mathematical models, econometric or statistical analysis of the emerging risks profile, identifying ways to mitigate their effects and offering examples of best practices for facing different types of risks. All these measures can create the framework for an effective risk management in projects in order to implement and complete complex projects successfully.

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