
Using Probability – Impact Matrix in Analysis and Risk Assessment Projects

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During the course of a project it may appear different threats being usually placed either in account of human resources or the funding account. However, they are not the only threat.

In achieving successful designs, its management must take into account sudden changes in the environment (natural disasters), of the political, the socio-economic (armed conflicts, strikes, new regulations, etc.). Completion of a project may also be threatened by labor incidental, movement and more.

Thus, difficult situations or risk management is of key importance in project management. Proper management of the threats of the type listed involves a more precise prediction of the effects that could be caused by events considered at risk. Of the reach of managers interested in determining the size of risk are qualitative, semi-quantitative and quantitative methods. The content of this study, in addition to highlighting a theoretical form of the key issues of risk and its management will be considered an example of how can be used probability-impact matrix as qualitative risk analysis method.

Keywords: *management; probability; analysis; risk*

Introduction

Performed by individuals any activity that is registered as risky involves incidents or accidents generating damages, especially economic. Sometimes the manifestation of these incidents can cause loss of human lives. Therefore, institutions, companies, and projects are permanent concern of the persons appointed mandatory to identify potential activities that could be characterized as threats or risks in achieving objectives. Avoiding the generation of hazardous events is possible if the projects are thoroughly analyzed and properly assessed, and, of course, corrected at time. Thus it is switched from a higher or high-risk on a acceptable lower level. If it is considered this period affected by the economic crisis, the approach of the policy makers of the potential risks of projects in a serious and pragmatic manner this shall mean a guarantee that the project has increased chances of completion.

The increasingly importance of risk management made possible its emergence and development, especially in the countries with functioning financial markets. In Romania this subject is just beginning to be taken into account, there are few "organizations with their own mechanisms for measuring and risk coverage, others do not know the advantages that you would get by applying the procedures already established" (ANCS, 2010). Adopting the principles of this branch of management by an ever increasing number of economic entities increased in our country is mainly related to the need for safety in all activities. It is no less important the trend in this direction registered at European Union level. Put pressure towards the analysis and risk assessment the preparation of draft requesting the EU funding can also be a good support in faster acceptance for risk management and its methods.

Specific to the assessment of event risk is a two-dimensional approach: on the one hand, from the point of view of the uncertainty occurrence (probability) and the other hand from the viewpoint of the outcome effect (impact). Quantification is possible using quantitative, qualitative and semi quantitative methods. When assessing major risks "is recommended quantitative evaluation methods that provide an accurate estimate of the possible consequences" (Iacob, 2013). The result based on a quantitative analysis may lead the decision makers to establish specific measures in order to ensure better protection for the potential receptors of risky events. For risk categories with lower impact quality assessment methods are preferred, which, even if they are slightly biased, give to interested parties a suggestive image of the size of the risk analysis. This material was conceived in order to present the main concepts related projects, risk and its management in projects and examples of risk assessment using qualitative methods: probability-impact matrix.

Risk within Projects

The project

The aim of human activity is to meet the various needs of getting a result, to complete a certain job, etc. Thus achieving a goal or set of goals could be recorded as a realization of a "project". Following this argument we can say that most of the things around us are the result of projects, the thinking of designers and effort of individuals or groups of individuals to put them into practice. If reference is made to the "the world wonders", taking into account their age could appreciate that the projects exist for millennia. However, in today's sense, the concept of design is relatively young.

In recent decades the term "project" has been defined by many experts (Rutman and Mowbray, 1983; Conrad and Hedin, 1987; Hayes, 1989; Valadez and Bamberger, 1991; Munns and Bjeirmi, 1996; Mățăuan, 1999). The last years of the millennium bring to the fore a new generation

of authors (Lewis, 2000; Ciobanu, 2002; Turner and Simister, 2004; Borgăoanu, 2005; Bulat, 2011; Opran, et al., 2012) retaining and enriched the definitions of their predecessors. In this way the project is a set of "specific elements: objective data specifically allocated resources, planned activities dedicated team fixed" (Pascu, 2005). Following the European Commission (1986), the project is defined as a "group of activities to be performed in a logical sequence to achieve a set of predetermined objectives formulated by the client" (Istrate, 2004). Subsequent appreciations designate the project as "an action that has a beginning and an end and is undertaken in order to achieve the objective, in compliance costs, calendar and plan quality criteria" (Hayes, 1989). In a recent definition with no significant differences, the project is "a set of actions performed over a period of time, with moments defined start and end with a clear purpose of the work performed by a own budget and a specified level of results achieved." (Lewis, 2000). Consequently, "the projects share a number of elements: a unique purpose, for a period of time for completion (with start and end time), consumption of material, financial, human" (Iacob 2013).

The many and diverse needs are found in the multitude and variety of projects. The new way to do something is the project. Projects fever swept across the world. There are projects on all continents in all economic and noneconomic sectors, for all sorts of ideas. In Romania the new fashion spread in all areas "mingling with the need to obtain project grants" (Negoiescu, 2003). The existence of different types of funds made available by the European Union for development seems to be "enlightened" guidelines for resolving diverse needs of businesses, institutions or other organizations. Romanian projects try to give a fresh face and impose a new pace in industry, agriculture, tourism, music, health, administration, etc. They are not a whim to be fashionable but also are a necessity. Without the project it cannot be capitalize any business idea cannot get money for the programs financed by the Union. Also, it should be noted that a draft drawn up improperly is ineligible to finance. The solution to a draft document, well written may be working

with people specialized in this direction. These specialists will be able to overcome the oppressive realities facing many projects: insufficient documentation, conflicts within teams, failure to comply with deadlines and budget, work unreasonable (in advance or additional) low after completion functionality poor, budget and time inconsistency, inadequate employment, insufficient documentation etc.

The project, as a whole assigned action in a particular temporal and spatial context in which allocations occur, should produce changes for the better. In any project allocation the decisions taken by the manager must take into account the purpose, time, and cost (Figure 1). These are the constraints of "the iron triangle" (Weaver, 2007; Lock, 2010)



Figure 1: The Project Management Triangle

Even if the project manager seems "trapped" in these constraints, he can maintain the quality of the project, if he has skill and sufficiently openness to manage a "a flexible triangle" (Ambysoft, 2012), in which at least one point varies.

Project management

Proper operation of the project processes is observed by the project manager. He does not do this by himself but helped by a team. The team

can be smaller or greater depending on size of the project. Within the team the decisions are taken for allocating available resources, identifying and analyzing potential risks, there are outlined possible measures, responsibilities and tasks to be assigned for each person. The success of the project depends on how the team assumes the project objectives. Project goals "provide a starting point for decision making and not a hard set of rules that the project team must work" (Coates, Koyl and Langford, 2008). When designing the project, it is preferable that these objectives to be chosen based on SMART criteria (Specific, Measurable, Achievable, Relevant, Time-based). A good management should pursue profitability of the project, to take into account the competition to lead to the "satisfaction of the beneficiaries and third parties" (Kerzner, 2003). As the "ingredients" of success should not be omitted: organizational resilience, executive commitment, ensuring planning and control, leadership of the project manager (Javed, 2009). In essence, project management is a methodical approach for the management and coordination of the processes within a project from start to finish or a "set of activities for achieving a successful group of objects. This includes planning, programming and support for the conduct of project activities "(WOD, 2010).

The notion of risk associated with projects

Complex structural relationships in the current social and economic system change with the development of science. Any progress is accompanied by tensions that could lead to risks. The theoretical and practical aspects of the concept are treated differently depending on the level where there is the possibility of the event risk:

- at the individual level - insurance, pensions, personal investments, health, etc.
- at the level of project - strategy, plans, management etc
- at the level of business - business strategy, corporate governance, etc..

- at the society level - food security, economic performance, terrorism etc.

Hillson and Webster (2004) argue that although the term risk is common to both areas, in theory and practice there is not yet a consensus interpretation. However various professional organizations and national and international standards (AS/NZS4360 1999 Project Management Institute 2000 British Standards Institute 2000 Institution of Civil Engineers 2002) addresses in a scientific manner, the risk getting closer to a comprehensive clarification of this concepts.

The existence of different views does not preclude acceptance of risk as a result of its two dimensions: the likelihood and impact (Hillson and Hulett 2004; Mitruț, 2005). Likelihood is derived from uncertainty of risk occurrence. The impact is the effect of the contingency. Potential event of loss designating risk (R) is translated in mathematical terms as a result of the product of the size of the impact (I) and likelihood of (P).

$$R = I \times P \quad (1)$$

Risk costs. It may affect the integrity of the environment, property and individual being perceived as "potential harm" (Mitruț, 2005). For this reason, stakeholders want to know "risk event effects (results), their chances of occurrence (probability) and the severity or impact on the affected perimeter" (Druică, 2011). Any risk manager knows that the risk-within the projects can be caused by tolerating deviations from the planned initiative. An eventual materialization of the risk requires taking responsibility. Avoiding the development of pressures within the project and to third parties relating to the various effects of risk is possible by designing, developing and presenting a risk plan by the project manager. This document will allow the identification, formulation, calculation, preparation of response measures, monitoring and control of project risks.

Risk Management within the Projects

Through appropriation of being unique in its own way, any project can face specific risks previously inexperienced. If one of uncertain events occurs, the project objectives may be affected. The first step in risk management is the recognition of a potential risk. Project management task is to seek solutions to avoid risky situations. Hillson and Hulett (2004) points out that "there is no collection of lessons" learned from the various projects that provide the solution to overcome certain types of risks. Otherwise, to resolve difficult situations, each project manager, based on experience and by virtue of the similarity of the situations previously faced must challenge the project he leads. Going through all the stages and phases of its life cycle it is essential to complete the project. The project team will consider the objectives (to budget, achievement of milestones, compliance deadlines, insurance and resource consumption, etc.) and avoiding risks. Inadequate coordination of team, undocumented and hasty actions, failure planning can make difficult situations even stated objectives at risk. An effective way to manage critical situations and adopt the best measures of positive consequences, thus minimizing the risk materializes, is to give importance to proper risk management. From the literature (AS / NZS 4360:2001, Fraser and Cooper, 2005; Mironescu, 2005) it is drawn the conclusion that the application of risk management in projects involves the following steps: establishing the context in which risk occurs, it's correct identification, risk analysis, risk assessment, risk control, Figure 2.

In the risk management process each stage has its importance.

First stage. Determine the context of management, organizational and strategic establishing the composition and risk assessment procedures. Also here will be given precise ways of consultation and communication with stakeholders or affected.

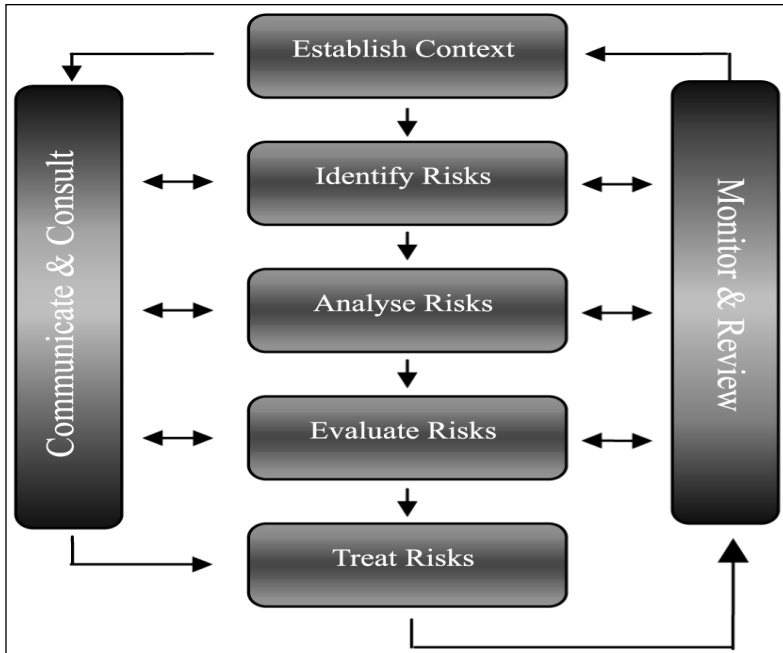


Figure 2: Risk management stages

The second stage. It is by far one of the most important steps in project risk management. Here risks configuration occurs associated with the identification of hazards and consequences. It's where risk management occurs. One cannot think anything related to a particular risk and is not useful to make action plans if that risk status does not belong to the context. Risk identification begins where the problem comes. It is necessary to study the basic organizational goals, the similar risk scenarios if any. As a result of these analyzes may create a risk map. Road to the success of the project is provided through the permanent risk of this map.

Identification of risk in projects or organizations with a holistic approach is not suitable. Such treatment is counterproductive and does not stimulate creative thinking team. Moreover, in order to correctly identify

potential risks, decision makers should pay equal attention to every significant aspect of the project. Thus, about the technical side of the project, possible risks such as misunderstanding of drawings, degree of difficulty in assembling two components, improper use of new technologies, etc. Regarding project management can identify risks of misallocation of human resources, indiscipline etc., It can also be identified organizational risks, eg conflicts on access to, resources, funding interruptions, non-succession of works, project no longer wanted etc. Besides these, there might be external risks, other than those forming part of the force majeure, eg adverse weather conditions, as country risk, changes in legislation, changes in market outlets etc..

Third stage. Risk analyse. The third step involves qualitative and quantitative risk analysis, establishing opportunities for control and effect of control measures regarding the consequences and estimating the probability of risk. There will also be assessed frequency and severity of risk.

In the evaluation of the risks, costs and benefits are estimated activity being communicated to stakeholders. Evaluation criteria should be concise and for the efficiency of the measurements must be small. In the assessment must be captured all sides of activity.

- risk probability (almost certain / likely / likely / likely / rare)
- the level of risk (extreme / high / moderate / low / negligible)
- consequent (catastrophic / high / moderate / low / insignificant).

If the risk occurs, its treatment is to identify the measures that should be taken. Development of mitigation measures is to respond to threats and to introduce corrections. Applicable solutions should be obtained by methods known to be well founded. They should give confidence that there are no other risks after application. Risk treatment involves drawing up a plan that targeted risk mitigation procedures predefine This plan is part of the risk management plan.

The last stage of the risk management process is risk monitoring entails:

- check the validity of the assumptions on the risks identified

- is intended that the measures at risk are implemented as planned
- there is response measures to correct the effects of implementation risks
- identify possible new risks either seek symptoms of known risks
- development seeks exposure

Probability Impact Matrix, Qualitative Method for Assessing the Risk

Generalities regarding risk assessment methods

Effective management of a project is not only to identify what types of risk can influence completion. In today's economic climate, more than the increasingly, decision makers need calculations and results that give a level of magnitude of risk analyzed, based on which to assess the consequences that may result from its influence. As they made clarifications in text, risk assessment methods are quantitative, semi-quantitative and qualitative.

Quantitative and semi-quantitative analyses are performed using statistical methods (Monte Carlo, PERT, MCA, etc.) and include the use of quantitative or numerical data. Their result is quantitative. This approach is more objective and accurate. For the results to be more relevant it is necessary to use the correct input parameters from valid sources. In the case of the quantitative results of risk analyzes "should not be regarded as an exact numbers, but estimates of a variable that depends on the quality scale data" (Török, 2010).

The qualitative assessments have usually descriptive results and do not imply an accurate determination of risk. They provide support for further quantitative investigation. Successful achievement of a qualitative assessment starts from the module documentation and data collection intended for processing. Although they are considered formal,

quantitative assessments of quality are preferred for several reasons as follows:

- appears to be more easily understood by policy makers and others;
- gives the perception of ease and rapidity in achievement;
- No quantitative assessment is required or insufficient data for such evaluation;
- No qualified staff for the use of quantitative evaluation methods.

Even though sometimes such an assessment is not done quickly or simply numeric data would be preferable to formal ones, the decision makers satisfy their need for information on the results of qualitative assessments. In order to ensure continuity in the determination of an evaluation result to the methods apply the same principles as the unit of data collection. Depending on how the suggestion is appreciated risk profile assessed by qualitative methods, improving information can be decided by a quantitative assessment. That does not mean that the results of qualitative investigations do not provide enough information. Conversely, qualitative risk assessment can capture previously unidentified prospects.

It is recommended that the conduct of quantitative assessments to be followed and qualitative assessments because it can be identified the likely magnitude of associated risks, uncertainties on the data currently available, etc.. The conclusion is that much of the work for a quantitative assessment is made when it was made a qualitative risk assessment.

Probability Impact Matrix

Probability impact matrix is one of the commonly used qualitative methods for risk assessment. The two components of risk (equation 1) are actually variable of such matrix. Risk calculation is very simple considering that likelihood and impact of an event is assigned a random basis to the total which can be a particular classification, Table 1.

Table 1: Simplified model of the probability and impact classification

Clasificare probabilitate	Score	Impact classification	Score
Low	1	Major	3
Medium	2	Medium	2
High	3	Easy	1

Source: own

After awarding of the total (scores) for likelihood and impact of risk categories identified by the risk manager or project team members will proceed to multiplying the two variables. The result of this operation will expunge degree of risk.

This method was used in the project "Seminar: Trends in the restructuring and modernization of agriculture in the area of the Local Action Group (LAG) Mountain Valley 2013" to form an image on the risk of not having the audience on scheduled courses.

The first step was to define the probability of risk occurrence:

Table 2: Likelihood score risk

Likelihood level	Score
Very low	0-20
Low	21-40
Medium	41-60
High	61-80
Very high	81-100

The the second step was to set the impact on a scale of 1 to 5:

Table 3: Impact Analysis

Magnitude of impact	Impact definition	Score	Rating
High impact/ High probability	Very high They are the biggest risks that entrepreneurs should pay attention.	5	A
High impact / Medium probability Medium impact / High probability	High These risks have either a high probability of occurrence, or a significant impact	4	B
Medium impact / Medium probability	Medium There is a medium chance that the risks appear noticeable impact.	3	C
Medium impact / Low probability Low impact / Medium probability	Low These risks can occur in some situations and have a low to medium impact.	2	D
Low impact / Low probability	Insignificant There are risks with low probability of occurrence and low impact. Can therefore be neglected.	1	E

The the third step was to determine the risk exposure resulting values in Table 3.

Table 4: Calculation of the exposure risk

Nr. crt.	Risk	Occurrence likelihood*		Impact*		Degree of risk exposure **	
		Probability	Score	Probability	Score	Rating	Score
1.	Without learners	Very low	20	Very high	5	E	12,5
2.	A small number	Low	40	High	4	D	22
3.	Reasonable number	Medium	60	Medium	3	C	31,5
4.	Full house	High	80	Low	2	B	41
5.	More than places	Very high	100	Very low	1	A	50,5

For the last step was built a risk matrix as shown in Figure 3.

		IMPACT		
		Low (insignificant, just note)	Medium (reasonable impact, to be monitored)	High (will have a significant impact)
LIKELIHOOD	Low (unlikely to occur)	E	D	C
	Medium (may occur at a time)	D	C	B
	High (likely to occur)	C	B	A

Figure 3: Probability impact Matrix

The analysis matrix shows that the risk of not having learners for maximum fear is a risk class C, so a medium risk.

Conclusions

Through this study we made a short presentation of the concepts of risk and risk management projects. The whole text brings the reader structured information, consistent, and well documented. Also, the contents of the study were identified and information on the project and how they are managed under the pressure of "the triple constraints" time - cost objectives, noted for as the "the iron triangle."

Risk management process is a cautious attitude related to the possibility of a risk materializing. Reducing or eliminating the damage that could be caused by the manifestation of that risk lies in constructive decision can be taken based on precisely this attitude. Risk management of a project is subjected can be done only in terms of understanding risk, which is in fact, the general purpose of risk management.

Risk identification and establishment of sizes for these additional actions may sometimes be known as risk assessment or risk analysis. In practice, the most common method is to identify risk checklist (checklist). It is based on the idea that performs a process according to a given standard. The differences from the actual implementation may or may not score in the normal range by the risk manager. This method is not sufficient in assessing complex risk which is why qualitative, semi-quantitative and quantitative methods may be used.

To obtain information relative safety in a descriptive way about risks, managers appeal to qualitative evaluation methods that are approved and that can be more easily explained to third parties. The study concludes with a practical example using the probability - impact Matrix whose purpose is to calculate and determine the exposure in case of an event considered to be at risk. The graphical presentation of probability - impact Matrix was pursued and highlight for the ease of position on a certain level of risk taken in the study.

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