

# Organizational and Methodological Influence of Risk Management in Projects

## 1. Introduction

It is currently unthinkable to carry out a project without considering the risks that it may contain if it is actually developed. In this sense, project managers must integrate into their management the risks and consequences that may arise from them because even if the causes of risk are at a lower hierarchical level, they can have a major impact on the project [1]. In the background of risk management lies the management of uncertainty because it is in this management that risk assumes the probability of gain or loss [2].

The benefits of this integration are the early detection of project problems, possible losses or delays, and also project requirements associated with project quality [3]. There may also be strategic or business market benefits due to the success of the project. Thus the risk management system can create value at the intra-organizational and inter-organizational levels [4].

Risk management in project allows, through corrective actions, to direct the manager to the intended objective, without the risk spread being of great relevance [5]. So, identifying and assessing risk factors in a project is the most important risk management step [6]. For this there are risk matrices, analytical models, management software that indicate the KPIs to be analysed so that risk management is monitored, controlled and successful [4].

Project risks can be classified by: organizational risks, product risks, or risks related to project changes [5].

The constituent elements of risk management, whether quantitative, qualitative, models or matrices, managerial ethical practices or other relevant elements for project success, are elements that promote the risk management review cycle and thus progress towards continuous improvement [7].

## 2. Risk Management Assessment and Methods

### 2.1. Project Risk Management Assessment

For the success of a project it is necessary that the systems that are part of it be carefully defined and evaluated. One of the present systems is the risk management system and, through the existing literature, it is possible to present some of the evaluation parameters used. [4] Sets out a set of key parameters for assessing risk management in a project, namely:

- Risks avoided
- Mitigated Risks
- Total cost of risk response
- Total loss avoided through risk mitigation
- Relative risk exposure index

The cost associated with risk management should not be seen as a barrier but as an investment to prevent future and more serious damage to the project [8].

According to the Project Management Body of Knowledge (PMI) [9], there are six main categories of risk management, one of which is risk response planning that is composed of several action strategies (Table 1).

Table 1 - Risk Management Categories.  
Source: [9]

Categories		Risk Response Planning
Planning	<b>Risk Management (Project Management Body of Knowledge- PMBOK)</b>	Avoid the risk
Risk Identification		Risk probability reduction
Quantitative Risk Analysis		Risk Impact Reduction
Qualitative Risk Analysis		Risk Outsourcing
Risk Response Planning		Insure against risk
Risk monitoring and control		Extend project schedule

Risk identification and assessment is often performed using so-called risk matrices. These matrices assess the likelihood of risk occurring with its impact and thus allow for risk screening for prioritization [5].

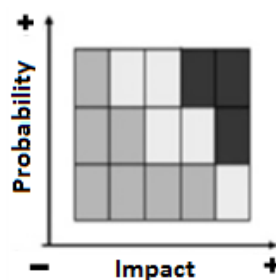


Figure 1 - Risk Matrix.  
Source: [10]

According to [9], risk monitoring and control is the process of “*identified risk tracking, residual risk monitoring, identification of new risks, execution of risk response plans and assessment of their effectiveness over time of the project life cycle*”.

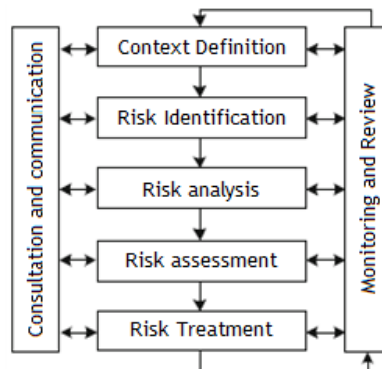


Figure 2 - Risk Management Processes.  
Source: [7]

## 2.2 Enterprise Risk Management Assessment and Customer Relationship Management

According to [5], there is clearly a need to differentiate between business risk management and silo-based risk management. They are translated, respectively, by an attempt to systematize the risk management process at all levels of the organization and for each silo to deal with its own risks and there is no sharing for the rest of the organization.

In the case of applying risk management to the end customer relationship, [6] present a new hierarchical structure to assist decision making when assessing risk factors. This new

hierarchical structure is made up of five groups, shown in Table 2, which aim to highlight the focal points that managers should focus on to assess risk factors in Customer Relationship Management (CRM).

Table 2 - Assessment of risk factors in CRM.  
 Source: [6]

Risk factor assessment in CRM	Organization and its purpose
	Stakeholders and top management
	Project organization
	Final client
	Monitoring and review dynamics

On the other hand, there are practices to be taken into account for better risk control and planning as illustrated for example in Figure 3.

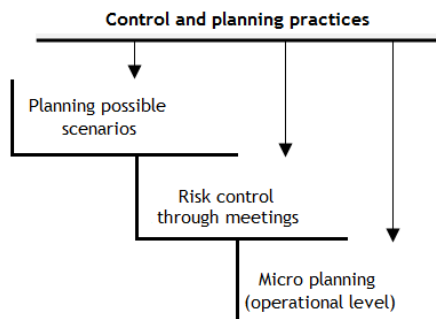


Figure 3 - Control and planning practices.  
 Source: [8]

Not all practices used for risk management assessment are based on the same perspective. Some practices consist of overlapping the various perspectives of different managers.

According to [8] a barrier such as lack of support from top management can trigger the emergence of others, such as employee awareness of the importance of risk management. It follows that the interaction that risks present in a project is an important factor for the manager to be able to prevent, plan or mitigate them.

### 2.3. Risk management analytical methods and software

Organized and effective risk management needs to be developed through the implementation of model-based methodologies that can interpret, process and evaluate data inherent to project risks. These methodologies intervene directly and/or indirectly in project parameters such as budget, progress, requirements or task assignment [10].

With regard to risk identification, [10] report that methods such as questionnaires, Work-Breakdown Structure (WBS), Critical Path Analysis (CPA) or Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis are generally used. Table 3 compares three methods: Event Tree Analysis (ETA), Failure Mode and Effect Analysis (FMEA) and Human Resource Analysis (HRA).

Table 3 - Project Phase and Project Type.  
Source: [10]

Method	Project Phase	Project Type
<u>ETA</u>	Pre-project phase: risk identification, risk analysis	All kinds of projects: new product introduction, service, innovation, software development
<u>FMEA</u>	Pre-project phase: risk identification, risk analysis	Industrial area: Introduction of new products and systems, innovation
<u>HRA</u>	Pre-project phase: risk identification.	No limitations

It can be seen that a disadvantage of the presented methods is that they only fit into the risk identification. When applying models to aid risk management it is appropriate to consider choices for countermeasures and not just risk identification [10]. For a more complete risk analysis, methods such as Monte Carlo simulation, risk histograms, six sigma functions, among others can be used [10]. It should also be noted that there are risk management aid software, very useful for managers such as: Risk Wizard, Active Risk Manager, Risk + or OCTAVE-S [10].

### 3. New Product Development

According to [11], with regard of New Product Development (NPD), the focus of risk management will focus on risks related to:

- Product Performance Expectations
- NPD Costs
- Established product development time intervals
- Match market requirements
- Portfolio management of new projects/products

In this context, risks can be defined as potential obstacles that will increase the total costs and time spent on developing new products, and also negatively influence their quality [11].

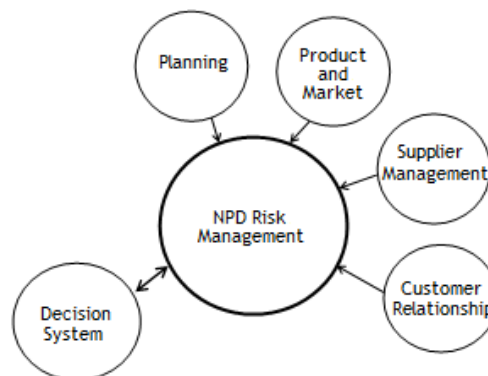


Figure 4 - Influential Factors in Risk Management.

Thus, in order for the risks associated with NPD to be controlled and minimized, it is necessary to carry out an analysis of the risk factors that may arise. Table 4 presents the stages to consider when analyzing risk factors in the NPD.

Table 4 - Phases of risk factor analysis in NPD.  
 Source: [11]

<u>1<sup>st</sup> Phase</u>
<ul style="list-style-type: none"> <li>▪ Project Information Management</li> <li>▪ Potential Risk Types Associated</li> <li>▪ Existing Response Activities</li> </ul>
<u>2<sup>nd</sup> Phase</u>
<ul style="list-style-type: none"> <li>▪ Individual risk level for different phases of NPD</li> <li>▪ NPD Total Risk Calculation and Integration</li> </ul>
<u>3<sup>rd</sup> Phase</u>
<ul style="list-style-type: none"> <li>▪ Optimization of response activities to the various risk factors identified</li> <li>▪ NPD Total Risk Minimization</li> </ul>

## 4. Managers and Stakeholders

### 4.1. Management environment

The type of environment present in the realization of a project is a crisis environment or an “ideal” environment, will influence the different phases of risk management [12]. These authors proposed the model represented in Figure 5 to relate the effect of the management environment to the magnitude of the existing risk.

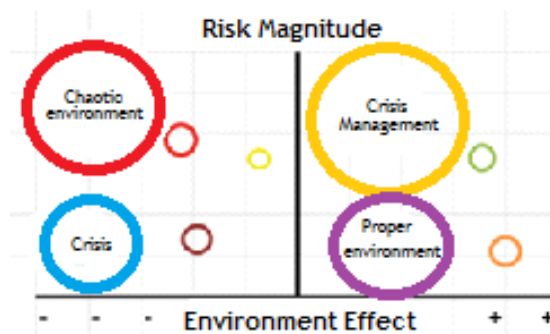


Figure 5 - Magnitude of the risk and the effect of the environment.  
 Source: [12]

Managers have to be positive about the risks that may arise in order to minimize their negative effects on the project [12]. It is therefore evident that the diagnosis of the causes of risk and the strategy to be adopted for their management are factors that managers should not overlook, especially in crisis or chaotic environments.

### 4.2. Overconfidence in risk management

According to [1], overconfidence in risk management is a negative factor because it indicates that the manager has a very low perception of risk and its impact compared to the reality of the project. This perception then translates into large deviations from risk occurrence and impact estimates, which in turn will lead to a deviation from expected results for project success. Based on this approach it can be concluded that overconfidence in risk management misrepresents and misleads companies with regard to their integration into new projects as they first appear to be good investments but eventually become unfavorable ventures. In addition, procrastination is another aspect of project managers and they tend to summarize their risk management intervention in an instantaneous manner rather than through detailed and well-structured planning [1].

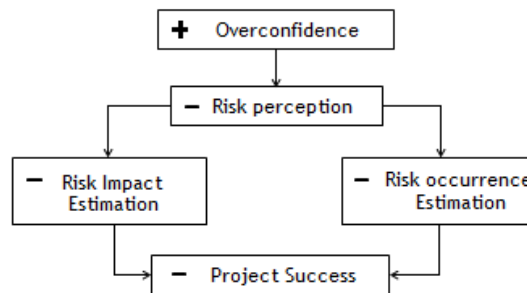


Figure 6 - Influence of overconfidence.  
Source: [1]

### 4.3. Role of managers in project risk and performance

Despite their position, many project managers need to internalize and implement flexible and efficient risk control guidelines for project performance to be beneficial.

To this end, [13] advises that managers negotiate with stakeholders justifying the fact that the project objectives are clarified and thus the stakeholders have a full understanding of the inherent expectations. Managers should try to anticipate delays at different project phases as well as resource allocation throughout project development [13]. A solution may include implementing, in the risk management system, practices verified and accepted by [9], for example.

Recognizing that to achieve high project performance is not a necessary condition to minimize risk, it is one of the most important assumptions in risk management and the role of a project manager [13].

According to [13], some common strategies used to respond to project risks include:

- Invest in risk understanding and impact
- Share risks with partners
- Exchange risks with third parties through contractual provisions

The role of stakeholders in a project's risk management system is directly intertwined with their professional culture [13].

## 5. Uncommitment, Crises and Opportunity

### 5.1. Disengagement of risk management practices

In most projects risk management processes are defined which, although identified and implemented, managers tend not to apply [14]. This decision is detrimental to the project as the risks are not properly allocated or analyzed.

Thus, [14] concludes with their study that the reasons why managers continue to be uncompromising with risk management are mostly:

- Lack of objective evidence of risk management
- Untrustworthy Risk Information
- Expects the risk to become real and commensurate
- Authority-level limitation to intervene in risk management

In order not to devalue risk management by project managers, they must be given the motivation, training and responsibility to be able to act on the risk management system and decide on the most appropriate response to the existing risk, considering all the information and focus needed to mitigate it [14].

## 5.2. Risk management vs crisis management

While risk management is associated with the leadership role and cannot be analyzed as a particular project group, crisis management requires more detailed analysis in order to be able to address it adequately and briefly [15].

These authors also characterize the motivation of the people involved in the project, as shown in Figure 7.

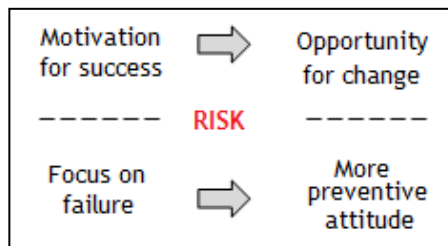


Figure 7 - Influence of motivation on Risk Management.  
 Source: [15]

Crises, when present in a project, are extremely harmful. They are unpredictable and are triggered by conditions outside the project that are not directly related to it [15]. So, it is important that managers take into account the environment, the psychological state and the acceptance of risk management by all involved as this is the only way to avoid or minimize risks and/or crises.

## 5.3. Risk and opportunity management

By analyzing risk management, it is possible to verify that the quantification of risk exposure is inherent. However, it is necessary to realize that there is, in fact, a possibility of transforming risk management into opportunity management to reduce project exposure to difficulties that may exist [16].

*“The risk focus needs to be balanced out with focusing on opportunities, even if it is difficult and requires extra effort.”* [17]

For a quantitative analysis of Risk Exposure (RE), [16] states that it is calculated by the probability of the risk occurring and its impact (1). With regard to Opportunity Exposure (OE) it is also possible to quantify it by calculating the probability of the gain occurring and its impact (2):

$$RE = \text{Probability (risk)} \times \text{Impact (risk)} \quad (1)$$

$$EO = \text{Probability (gain)} \times \text{Impact (gain)} \quad (2)$$

Thus, risk management can be translated into opportunity management to identify, assess and decide on opportunities to effectively reduce risk exposure [16].

An alternative approach to quantifying risk exposure is demonstrated by [3] introduces another factor allowing managers to anticipate the onset of risk and consequently intervention to mitigate it. Thus, the Estimation Factor for the Incidence of Risk (EFIR) events is introduced and its exposure will be given by expression (3):

$$EFIR = \text{Probability} \times \text{Impact} \times \text{Incidence} \quad (3)$$

## 6. Case studies of risk management - Company of medical gases

For the purpose of presenting case studies where risk management was crucial for the success or failure of business opportunities, it was consulted a company specialized in the production, installation and supply of medical gases in hospitals and clinics.

The company has had some projects/new products development in which the application of risk management turned out to be successful and other cases that had to be dropped out, since they would not benefit the company as it was first expected. These projects/new products development are exposed in detail in Table 5.

Table 5 - Case studies of risk management in a company of medical gases.

<u>Project/New products development</u>	<u>Implementation</u>	<u>Benefits</u>	<u>Success/Failure</u>	<u>Causes</u>
<u>Pacient tracking in the hospital</u>	Wifi connectable bracelet that transmits information to the hospital staff of the patient location and state of care.	Allows optimization of human resources (nurses, doctors, etc.) and hospitalar routes.	Success	HRA ETA CPA
<u>Hospital staff training in medical gases</u>	Online training with certification for the hospital staff.	Client would be less dependent of the medical gases company. Qualification of the hospital staff in a specialized medical area. Differentiation of the product (installation, supply and training).	Failure	Client would only accept the online training if it was a free complement of the product. Overconfidence of management and stakeholders led to the mistaken evaluation of the product acceptance.
<u>New product for dosed insuline administration</u>	New equipment that allows the dosed administration of insuline for patients with diabetes.	Removed the need for the patient to inject himself with insuline.	Failure in the first approach. Success after a period of time.	The equipment was not economically viable to the client (First approach). After a period of time, due to the comparticipations for the product purchase it became successful.
<u>Optimization of production and bottling of medical gases</u>	Six sigma and lean practices in the flow process of production and bottling.	Optimization of work distribution, times between stages of bottling and routes.	Success	WBS CPA HRA ETA FMEA Lean matrices for production prioritisations

As it can be verified through Table 5, risk management can bring benefits to a company, and all the parts involved in it, only if it is analyzed and applied correctly.

For example, it is shown that overconfidence, in accordance to the previous Figure 6, was translated in the failure of the hospital staff training program which made the company of medical gases loose a business opportunity.



On the other side, the application of lean practices allowed the optimization of production and bottling of medical gases through the minimization of risks associated with these processes.

## 7. Conclusions

Risk management is an increasingly essential issue to consider in project management. Its implementation depends on several not only qualitative but also quantitative factors. It is necessary to highlight and analyze all processes inherent to good risk management practices, in project, so that in the end, the manager can correspond with the idealized results.

These premises were verified through the different exposed cases where risk management was crucial for the success or failure of projects in a company of medical gases. Overconfidence was translated in the failure of the hospital staff training program which made the company of medical gases lose a business opportunity. But, the application of lean practices, namely DFSS, allowed the optimization of production and bottling of medical gases through the minimization of technical risks associated with these processes.

Although this paper does not cover the full range of risk management issues, it allows the reader to understand the integral factors and the essence of the subject in general.

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