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RM3: An approach to lead projects to succeed

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Abstract
Risk is the measure of the impact that something undesir- able may happen. It is the perception that life is uncertain and that there are variables inside and outside the control of those involved in the project that directly influences daily events. In this paper, we present an approach that attempts to measure and compensate for known and un- known factors that affect our path to achieve goals. This work is a result of an ongoing study about the risk management and its impact on the success of the project, which counts with an international collaboration of several companies.
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I. INTRODUCTION

1.1 Overview about risks

Visintine [1] further states that risk is the measure of the impact that something undesirable may happen. It is the perception that life is uncertain and that there are variables inside and outside the control of those involved in the project that directly influence daily events. We attempt to measure and compensate for known and unknown factors that affect our path to achieve goals.

Andrade [2] claims that risk can be defined as an estimate of the degree of un- certainty to the achievement of desired future results, i.e., the uncertainty factor is present in the planning process as well as the risk factor. Most of the planning of a project is done from estimates, which already adds to it uncertainties.

PMBOK [3] defines risk as an uncertain event or condition that affects at least one project objective if it occurs. We can consider project objectives such as time, scope, cost, quality among others. PMBOK also states that a project risk is always a future event may have one or more causes, and when it occurs, it may have one or more impacts. The cause of a risk may be a requirement, a premise, a constraint, or a condition that creates the possibility of an impact in the project. We can cite as an example the inclusion of a requirement of an environmental permit for the start of a project. The risk event is that the agency responsible for authorization may take longer than expected to grant the authorization. If this event occurs, an impact on cost, schedule, or project performance may happen.

1.1 ANDRADE ET AL.

However, even with all the benefits, we can observe from the data illustrated in the previous chapter that more than 35% of companies do not have appropriate approaches to manage the risks or complexity of projects. Besides the literature found about RM, a lack of approaches to use as a guide in IT projects is evident and this gap between the theory and practice for RM is observed inside of the companies as demonstrated in [4]. This study demonstrates that managerial and administrative decisions have a significant impact on the projects since they create the enterprise culture, and consequently define how the PM area will be handled. It also illustrates information about the project itself (problems, results, approaches, success and failure rates).

1.2 Risk Management in IT

RM describes processes related to decreasing the likelihood and impacts of ad- verse events to the project objective. In addition to increasing the probability of occurrence of positive events for the project [5], RM involves security mea- sures (backup for example) to the planning of actions against unforeseen events or possible events that affect the excellent flow of the project; for example, the dismissal of an employee who was taking care of a critical part of the system.

Risks can be organized into categories, which, if well defined, should reflect common risk principles for a given area of application [6]:

– Organizational: they are linked to the company's policy and management. – Project management: they are linked to all the events that can cause the project manager to fail. – Technical, quality or performance: the use of unrealistic goals or very com- plex performance metrics that may affect project development, untested technologies, or even lack of knowledge. – External: any deviation from the ideal project environment, such as a request for resignation, labour issues, changes in priorities, among others.

According to [2], not every identified risk needs to be managed, but decid- ing which risk to manage and how to behave has a significant impact on the management process. Risk should be carefully analyzed to avoid misapplication of an adverse, unanticipated risk [7]. The activity of identifying risks and their action plan is dynamic, so it is fundamental to monitor the process continually, this will avoid unwanted surprises. In choosing which risks to manage, models are quite useful but their application must be meticulous. In organizations, the usual idea is for each person or department to try to cover up their shortcomings and to camouflage the real risks, which makes it difficult to apply the models. It is up to the management team to work in all the information received and available to eliminate the mistakes and obtain the desired results [8,?].

Although some managers say that they manage risks in their projects, there is evidence that they do not manage it systematically. In the same way, they evaluate technical risks to the detriment of the market and financial risks, vital to the success of the software development [9]. For [10], most techniques ap- plied to software development projects require clear and delimited objectives, time and resources defined before the beginning of the project, defined quality metrics, among others, which usually do not occur in large projects. Changes in requirements and scope are the main reasons for cancellation of projects [11].

Identifying the risks associated with IT projects can be a significant chal- lenge for managers since there are numerous ways to describe and classify them. According to [12], risks may vary in nature, severity, and consequence. Because of this variation, it is vital that those considered high-level risks be identified, understood, and managed.

1.3 Why should Risk Management be an ongoing process?

Once the project team identifies all possible issues that may jeopardize the suc- cess of the project, it should choose those that are most likely to occur. The team bases its judgment on the experience regarding the probability of occur- rence, feeling, lessons learned, historical data and others. At the beginning of the project, there are more risks, hence, RM should be done early in the life cycle of the project and be monitored throughout its lifetime. The meaning is that opportunities and threats remain generally with high relatively level dur- ing the project planning (early in the project life-cycle) but because of the low relatively level of investment up to this point, the amount at stake remains low. In contrast, during the project execution, risks progressively drop to lower levels as the remaining unknowns factors become known.

The main point is that RM is an ongoing process and as such should not be done only at the beginning, but continuously throughout the life of the project. For example, if the total duration of a project is estimated to three months, a new risk analysis should be done at least at the end of the first and second months. At each stage of the project lifespan, new risks will be identified, quantified and managed.

II. RESEARCH RESULTS UNTIL NOW

Software projects are high-risk activities, generating variable performance results [13]. According to [14], project management allies began to appear in 1985, with risk management emerging in 1996 when “companies realize that risk manage- ment involves more than securing an estimate or the risk management schedule and plans are included in project planning” [14].

According to [8], changes affect people and organizations in a good or a bad way. Changes always carry risks, and dealing with them plays a significant part in the organization’s survival. Dealing with risks does not mean eliminating them or simply ignoring them. In fact, we must manage the risks by deciding the ones to avoid and how, and the ones to accept and under what conditions. This is when Risk Management (RM) takes a crucial role in the success of businesses. However, even with all the benefits, we can observe from the data illustrated in [4] that more than 35% of companies do not have appropriate approaches to manage the risks or complexity of projects. Besides the literature found about RM (illustrated in Figure 1, which was generated with data from Scopus Website), a lack of approaches to use as a guide in IT projects is evident and this gap between the theory and practice for RM is observed inside of the companies as demonstrated in [4]

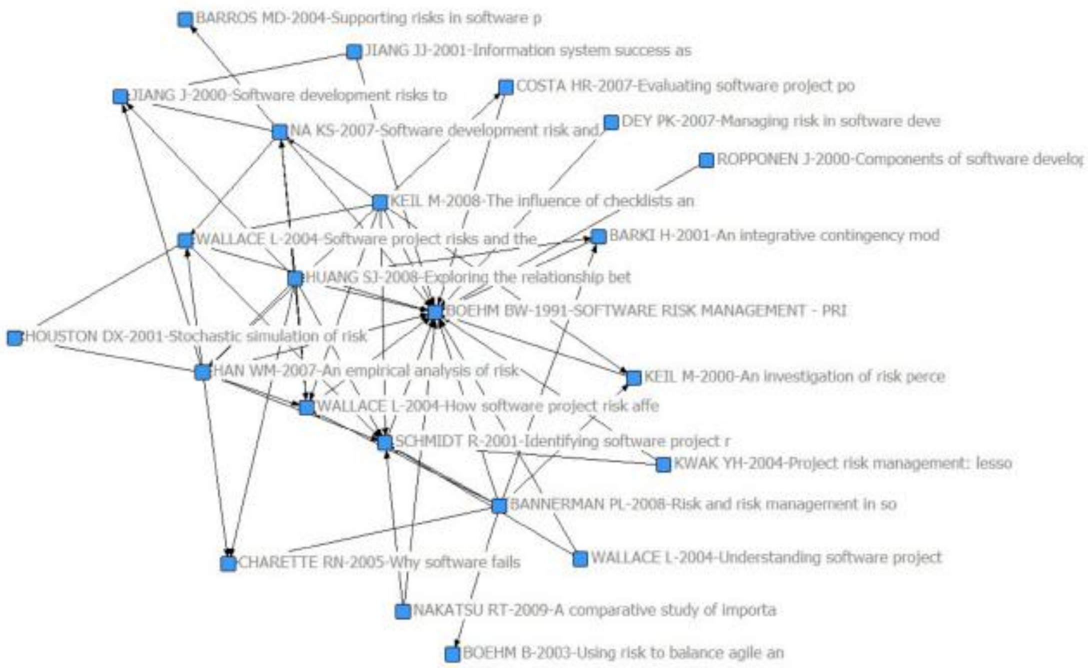

Fig. 1. Most cited authors for the RM field

Also in [4], the authors reviewed the PM field for the last 60 years and the current problems faced by companies. They compiled data from several reviews and created a table specific to IT Project Management (ITPM). From this data, it is possible to notice which areas need improvements in ITPM (being the Risk Management one of them). In their work, an online survey was created to analyze the actual PM and RM across the world, having a sample from different countries, mainly in North America, Brazil, Italy and Cote d'Ivoire (most rep- resentative in the sample). This survey had the support of several PMI chapters (local associations for the PMI Global, the most prominent organization for PM practices in the world).

Moreover, [4] discussed how project managers should put their efforts into managing the "triple constraint" (cost, time and scope). We can also include the project quality as a fourth piece, which can be affected by the balance of the triple constraint. These four "forces" maintain a natural balance between each other in a project, which we establish through the creation of baselines (snapshots of the project) for the scope, time, and cost. As one of the highlights from this work, we can compare the data from past researches illustrating that most of the people who work in IT projects possess an Agile certification CSM (Certified ScrumMaster). However, as illustrated by the survey data, we had 58.7% of participants holding the Project Management Professional Certification (PMP), and only 20.7% the CSM, updating the previous researches. We can also verify, from the results, how each country put the importance of each component of the PM processes, with Italy and Cote d'Ivoire having the best numbers (adherence) to theses process, even if the United States is the country more concerned in having a PM approach, Italy and Cote d'Ivoire has best numbers (around 70% of companies) when we talk about some main points of projects (having a portfolio approach; checking the project complexity; checking the project risks). Next, this work also discusses the Business Model for Project Management, and here we will have that there is still room for improvement in this field. In general, less than 70% of companies have the right tools to manage projects, and less than 40% can improve the success rate of projects using these tools.

Furthermore, we can link some others highlights, here: for companies with more than 80% of their successful projects, 29.4% created their approach, 41.2% used the Agile/Scrum; RM contributed to 41% of the success of large companies, 20% for medium-sized, and 37% for small-sized; Canada has 58.8% of their projects in the range of a good success rate, Cote d'Ivoire has 56.2%, Brazil has 52.5% and Italy has 41.7%.

III. RISK MANAGEMENT APPROACH

To avoid the problems described in the previous section, the alternative is to implement a risk management approach. The companies need to shield their projects against the uncertain and maintain a database with all the lessons learned to avoid doing the same mistakes or having the same problems in the project. RM also helps to take easily identify opportunities in new projects.

To this end, we created a new RM approach based in our survey result [4] and some ideas listed across the literature like the PMBOK [3] to make sure that the best practices are used. We first thought about this approach being a part of the PM5 process [2], but we decided to have an independent approach divided into three main processes (as we could identify in Figure 3). The approach was named as RM3 that means a Risk Management approach that has only 3 processes: Complexity Analysis; Risk Analysis; and Monitoring and Control of Risks.

The reason for this organization of processes is to have a RM that can easily fit in any existent process or can be used in any IT project, but simple enough to encourage the adoption the the team working in the project, and the manager itself as well. We going to call this approach as RM3 (or Risk Management 3, in reference of this approach only need three processes). These processes are discussed in the folowing sections.

IV. COMPLEXITY ANALYSIS PROCESS

Complexity in projects is something that everyone intuitively understands, being a term often used by people involved in the project. However, an exact definition is not a consensus and defining a project with low or high complexity is commonly

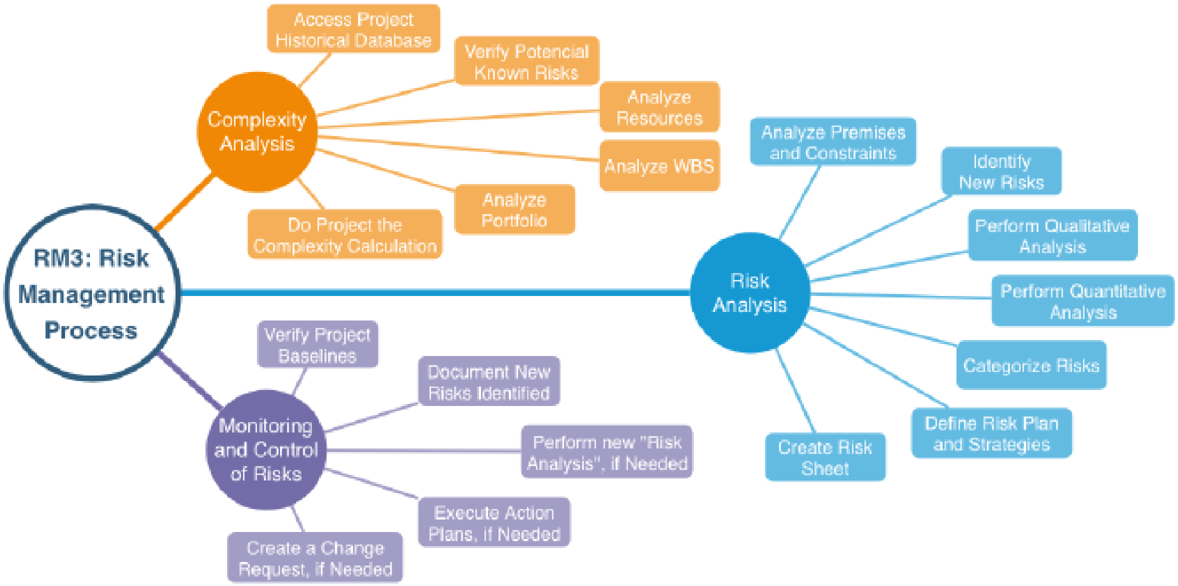

Fig. 2. RM3 - Approach Process

ambiguous. Although there are standards established by entities such as PMI and authors of books in the area, the term is nevertheless used according to the company's history, the experience of those involved, the interrelationships, among other factors.

The authors in [15] argue that there is no single concept of complexity that can adequately aggregate the intuitive notion of what the word should mean. Projects have been described as complex systems that require management, not only because they involve technological issues, but because they involve large organizational factors, which are beyond the control of the project manager [16]. According to [17], complexity is a problem, and it is a challenge and not a response. Complexity corresponds to diversity, to intertwining, and to the continuous interplay of an infinity of systems and phenomena that make up the natural world. It occurs not only by the existence of the factors that compose it but, mainly, by the lack of knowledge or inexperience about how to deal with it. A composition of factors thus classifies projects' complexity and demand a management focused on the interfaces of the products generated, without losing the attention of the conduction of each product. Complex projects require: spe- cialized technical and managerial knowledge; attention focused on the interfaces and objectives; awareness of the complexity of the project by the management team and, above all; the management of communications and relationships with stakeholders.

At the beginning of a project, when there is a higher level of uncertainties and changes, the complexity is high. As the scope is defined and certainties become more evident, the complexity decreases. Also, as risks are addressed, and changes occur, complexity can be controlled as long as new changes and uncertainties do not arise. Identifying the factors that make the project complex, as well as defining methodologies to manage the complexity of the project, is therefore of enormous importance to guarantee the success of the project.

The uncertainties represent critical points in the management of complexity and can be minimized the higher the degree of knowledge of the needs of the project. In addition, information on available resources and historical data on project management (such as lessons learned) are critical to success in managing complexity.

The most commonly considered projects of greater complexity are generally those of larger size or that require a high degree of advancement in technologies and innovations. However, smaller projects can become complex when it re- quires some care with stakeholder management, a critical factor for the impact of changes and risks related to projects.

4.1 General Process View
We illustrated in Table 1 the general idea of this process with its inputs (what is necessary to start) and outputs (what is generated in the end).

Table 1. General Process View - Complexity Analysis

Process: Complexity Analysis	
Inputs:	**Outputs:**
- Work breakdown structure (WBS) - Enterprise environmental factors - Organizational processes assets - Project assumptions and constrains - Historical Projects Database	- Initial list of potential risks - Update of project documents - Decision to continue or archive the project - Categorization of the project complexity in the portfolio
Steps:	
1. Check project assumptions and constrains 2. Check technologies to be used with the project 3. Analyze the impact of these technologies in the actual IT environment 4. Analyze the available resources 5. Analyze project WBS against the historical database, if any 6. Verify the necessary time to complete the project utilizing the top-down technique 7. Verify potential risks (could increase or reduce complexity) 8. Calculate the complexity and decide about the project continuation 9. Update project documentation	

4.2 Skills to Manage Complexity

Faced with a scenario where definitions are still varied and there is still no consensus on approaches to project complexity, the manager may be in doubt about how to minimize the impacts of a complex project. Figure 3 shows the relationship between uncertainty and complexity. It suggests that the greater the complexity and uncertainty of the project, the greater the risk of failure.

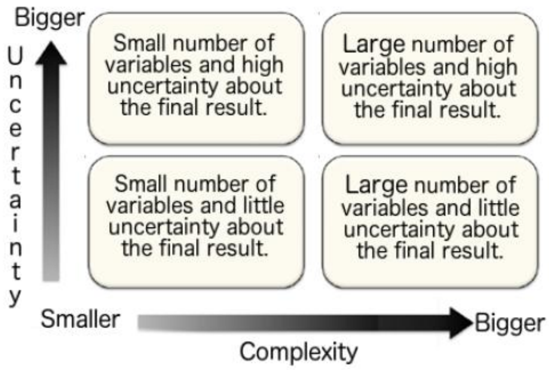

Fig. 3. Relationship between uncertainty and complexity

The results of a PMI survey in [18], the section of project complexity point out that companies should develop three strategic competencies to cope with in- creasing complexity in projects: create a project and program management cul- ture with engaged sponsors; advise and develop talent with a focus on promoting leadership skills; communicate effectively with all stakeholders. The authors in [19] state that 5 skills are required to manage complex projects: adaptability, collaboration, communication, expertise and leadership.

Based on the information so far, we can define some complex classification to be used in the complex analysis (it can also used for a quantitative analysis).

– Organizational complexity: Complexity increases as more and more when we have a bigger diversity in organizations. The definition of relationships re- garding communication and information should be considered, the allocation of responsibilities, the authority for decision making, and the assignment of tasks.

– Technological Complexity: It refers to the variety or diversity of some aspect of a task, such as the number and diversity of inputs and outputs, the number of different actions or tasks to produce the final product of a project, the number of specialties involved in a project, and novelty.

– Structural Complexity: It refers to the nonlinear potential of the project, which can occur from interactions between many interconnected tasks.

– Technical Complexity: It occurs in projects where technical aspects and design are unknown or untested.

– Directional Complexity: It occurs in projects where there are goals and objectives to be achieved and are not understood or agreed at all hierarchical levels of the project.

– Temporal complexity: It refers to volatility throughout the project, where the duration of the project is extended and where the environment is in flux and can affect the direction of the project.

4.3 Complexity Matrix

To help in the task of addressing the project complexity, we can use a tool called Complexity Matrix. This matrix is a qualitative tool to evaluate objectively the complexity factors and how they impact the project. After this analysis, this document will help in the decision to continue or to close the project. Depending on the result of each row in the matrix, some items could already be flagged as potential risks (positives or negatives). As an example of an opportunity would be a "Low complexity" of the factor "Number of executors" where we can have more free resources to use in other projects. On the other hand, an example of an identified treat would be generated by a "Medium complexity" of the factor "Sectors involved" since some decisions can take to long when depending on other sectors, what could potentially delay the project.

Although complexity is often subjectively and abstractly handled, it can be potentialized by several factors, as described below.

– Number of executors: Identifies the number of people who execute the tasks and processes. It assumes that the larger the number of people the more complex the process.

– Sectors involved: Total sectors through which the project passes from beginning to end. The higher the number of sectors, the higher is the com- plexity.

– Interfaces with other processes: Total of interactivities between the project processes and the company processes (for example hiring and ac- quisition process). The higher the number of interfaces with other processes, the higher is the complexity of the process.

– Dispersion in product quality generated: More complicated processes are more likely to generate scattered products/services. Note that to use this factor, the products generated must be monitored in the company processes. – Geographic localization: Assumes that processes running in a single lo- cation are less complex than those running in different locations.

– Deadline: The process is part of the project's critical path. It has no gaps in the time set for its execution. Fewer gaps, more complexity.

– Quantity of control activities: The higher the number of activities nec- essary to control the project, the more complex it is. It is a common factor to increase the complexity in multi- companies projects.

– Number of activities: The higher the number of activities involved in the project, the higher is its complexity.

– External interference/sensitivity: Processes with higher sensitivity to external variations tend to be more complex (climatic variations, economy, regulations, and others).

– Familiarity with the project: How familiar is the team with the project requirements and scope if compared with previous (and documented) projects. More familiar (or available data) means less complexity.

It is important to point out that the presented method can be adjusted ac- cording to the reality of each organization and the market segment in which it operates (for each sector, each factor can have a different weight). The factors quantification (FQ) scales should be adjusted and calibrated according to the existing maximum, average and minimum limits. As a suggestion, we can use a three levels scale (high, medium and low) with values 3, 2 and 1 correspondingly. For each quantification, we also need to add a weight W (from 1 to 5) that will vary according to the team experience, company industry sector, project manager 's expertise, enterprise environmental factors, and organizational processes assets. We suggest not to use the same weight value more than three times to guarantee that the matrix is addressing the complexity of the project correctly and not underestimating or overestimating it. Equation 1 illustrates the formula used to calculate the final project complexity.

PC =
$\sum_{ni=1}(FQ_{n \times Wn)}$
n (1) Where:

– PC = Project Complexity – FQ = Factors Quantification – W = Weight of each factor – n = Number of FQs used in the matrix

V. RISK ANALYSIS PROCESS

This process was defined based on the IT best practices found in the Cobit Framework and the PMBOK. This step seeks to identify all project risks, ei- ther negative or positive. We can say that "anticipating" is the most important word in project management, and when managing risks, the concept of the word "anticipate" is intensely applied. A project manager needs to prepare for the risks, to anticipate the risks, and ultimately, to keep the risks under control. Unplanned risks are one of the causes of delays and failures in several projects. A project manager can not conduct a project, whatever it is, without managing the risks.

In this process, we will identify the risks of the project (taking risks identi- fied in the previous session as an initial basis) by classifying them as positive (opportunities) or negative (threats). Project assumptions and constraints are the basis for the preliminary identification of risks. We can use others ways to identify the risks such as interview techniques (talk with specialized profession- als, brainstorming, and stakeholder analysis); get information from the region such as weather, suppliers and labour; and look at the timeline and see where are the critical activities and timelines. This step is necessary in order to achieve a broader analysis of risks, minimizing threats and maximizing opportunities.

We can say that the difference between qualitative and quantitative analysis is that the qualitative does not attempt to assign cost of controls, expected losses, or fixed financial values to assets [20]. Instead, we try to calculate relative values. In [1], the authors sate that the critical elements of qualitative risk are: Value of Resource, Vulnerability, and Threats. These values make it possible to establish which risks are more significant than others.

In this model, [1] considers the value of resource being the money involved, vulnerability as the probability of occurrence of a loss and threat being some fact that can occur, and use of the vulnerability to generate a loss. If all risk factors are considered high, the relative risk is therefore high. However, when one of the factors is considered low, the risk already decreases and can be compared with other assessments, thus proceeding in the process of identifying the lowest possible risk.

For Ciborra [21], the quantitative risk analysis activity examines those iden- tified in the qualitative analysis and assign numerical probabilities for each of them. Both analysis examines each risk and its potential impact on the project. This technique may not be used since its depends on the project complexity and the organizational risk planning policy.

The PMBOK [3] indicates that the process of conducting quantitative risk analysis should also be repeated during the process of monitoring and controlling risks in order to evaluate if the global project risks have been reduced and may indicate whether there is a need for additional RM or not.

Once we have defined the risks, categories, impact, and priority, we need to plan how to deal with threats (through Elimination, Transfer, Mitigation, or Acceptance) and opportunities (Exploration, Sharing, Improvement, or Accep- tance).

5.1 General Process View

We illustrated in Table 2 the general idea of this process, with its inputs (what is necessary to start) and outputs (what is generated in the end).

5.2 Risk Exposure

The Risk Exposure (Risk Factor) is a quantitative measure widely known and used in risk assessment and prioritization [22]. Due to its simplicity and appli- cability, it remains unrivalled as a quantitative technique.

IEEE-SA [23] defines risk exposure as "The potential for loss presented to an individual, project or organization by a risk; a function of the probability that the risk will occur and the magnitude of the consequences of its occurrence". The classic example of its application involves the use of decision trees. Equation 2 illustrates the formula to calculate the Risk Exposure.

$RE = P(UO) \times L(UO)$ (2)

Table 2. General Process View - Risk Analysis

Process: Risk Analysis	
Inputs:	Outputs:
Project Management Plan Enterprise Environmental Factors Organizational Processes Assets Project Assumptions	Risk Matrix Risk Management Plan Update of Project Documents
Steps:	
1. Analyze the premises and constraints 2. Identify risks 3. Conduct qualitative and/or quantitative analysis 4. Categorize risks 5. Analyze priorities and impacts of identified risks 6. Define strategy for each risk 7. Create a risk response plan 8. Create risk sheet 9. Update project documentation	

Where:
– RE = Risk Exposure – P(UO) = Probability of Unsatisfactory Outcomes – L(UO) = Quantitative estimation of the loss caused by the occurrence of unsatisfactory results.

As an example, the situation where the occurrence of a given risk factor has a probability P (UO) of 15% (P (OU = 0.15)) is given. Under this threat factor, the estimated average loss is 1200 monetary units. The calculation of risk exposure (having the monetary units as result) is defined as follows:
$RE = P(UO) \times L(UO) = 0.15 \times 1200 = 180$ (3)

A great feature of the use of risk exposure, particularly among decision trees, is the ability to perform sensitivity analyzes, testing for possible fluctuations in the probability of occurrence of risks and predicted values as losses of their occurrence in situations with decision problems in multi-stage. The generation and analysis of alternative scenarios are also possible.

5.3 Risk Matrix

An ordinal risk matrix is a qualitative option that contrasts with some of the restrictions pointed out in the calculation of the risk exposure. One of the dif- ficulties in using this type of calculation is the need for retrospective data that is not always available. Osmundson et al. [24] point out a series of difficulties in estimating values in the area of software development: quantity of work required for development, time of execution of activities, etc., and the estimation of the losses caused by the risk and its possibility of occurrence is part of this problem. This instrument allows the subjective variables to be surveyed, their mea- surement, prioritization and visualization in a singular way. This method has been used in technological projects in general that involve mixtures of hardware and software in different proportions.

The risk matrix can usually have seven columns and as many rows as the project requirements are: Requirement (describing a characteristic to be imple- mented); Technology (which can help implement the corresponding application); Associated Risk (depending on the requirement, more than one risk variable can be identified); Impact (I) (can be Low [L], Medium [M], High [H]); Probability of Occurrence (P%) (can be Very Low (0-10%), Low (11-40%), Moderate (41-60%), High (61-90%) and Very High (91-100%)); Risk Level (result of the composition of the impact of the risk with the probability of its occurrence); Management Measures and Risk Mitigation.

Based on the data of the risk matrix, probability and impact matrices are constructed. The data recorded on each observed risk allow its ranking and prioritization of management and control actions based on the result observed in this instrument. Such structures are basically cross-tabs in which one dimension is observed an occurrence frequency range of the risk factor and the other a degree of harmful consequences caused by the same scale.

VI. MONITORING AND CONTROL OF RISKS PROCESS

According to [25], the process of monitoring and control of risks involves re- sponding to risks as they occur. The Risk Management Plan (RMP) and the Risk Response Plan (or RRP, part of the RMP) are two of the inputs to this process. With them, it will be possible to identify how the risk is managed and how strategies will be implemented in case an actual risk event happens. It is essential to be alert because some of the risks identified in the planning could occur during any phase of the project, requiring a response to them.

PMBOK [3] complements stating that planned risk responses that are in- cluded in the project management plan are executed during the project life cycle, but project execution must be continuously monitored for new, modified, or outdated risks. The process of monitoring and controlling risks is also useful in determining whether:

– The project premises are still valid;

– The analysis shows an assessed risk that has been modified or can be deactivated;

– Risk management policies and procedures are being followed;

– The contingency reserves of cost or schedule should be modified according to the current risk assessment.

This process seeks to apply the actions of the risk response plan if necessary while we are monitoring and updating the risks already identified. We also need to: monitor, plan and treat residual risks; identity, plan and address new risks and assess risk response effectiveness throughout the project. Other indirect purposes of the risk monitoring process may include: analyzing whether the assumptions are valid; analyze whether risk management policies and procedures are being followed and review whether contingency, cost and time reserves are in order or should be adequate.

During monitoring and risk management, it may be necessary to choose al- ternative strategies, execute a contingency plan, take corrective action or modify the project management plan. It is the responsibility of the risk response owner to report periodically to the project manager on the effectiveness of the plan outlined above. It is during this process that also happens to update the assets of organizational processes, such as lessons learned databases and project risk management models, for the benefit of future projects. If changes are required in the project, which generates adjustments to some of the activities or plans, it will be necessary to put a new change request and go trough the Change Management Process.

6.1 General Process View

We illustrated in Table 3 the general idea of this process, with its inputs (what is necessary to start) and outputs (what is generated in the end).

Table 3. General Process View - Monitoring and Control of Risks

Process: Monitoring and Control of Risks	
Inputs:	Outputs:
Risk Matrix Risk Management Plan	Update of Project Documents Change requests
Steps:	
1. Verify the project baselines 2. Document new risks identified 3. Conduct a new quantitative analysis, if necessary 4. Re-analyze priorities and impacts of all identified risks 5. Execute the action plan for imminent risks, if necessary 6. Create a change request for the Change Management, if necessary 7. Update the risk response plan 8. Update risk sheet 9. Update project documentation	

VII. CONCLUSION

In the real world, an organization will not be able to eliminate or completely eradicate risks. Each engagement in our project will have its own set of risks to be addressed. A certain degree of risk will be involved when carrying out a new project.

We should not compromise the risk management process at any point; if ignored it can lead to harmful effects and compromise the delivery of the project as a whole. The entire project management team in the organization should be aware of project risk management methodologies as well as applied techniques. For these reasons, improving risk assessment and assessment is often the best way to minimize risk damage and increase opportunities.

Managing risks efficiently in this dynamic environment in which companies are inserted is a great challenge but above all a critical factor for the success and survival of companies.

Through the approach here presented, risk management should be the first step in project planning since it involves the complexity analysis of a project. We should not practice it arbitrarily, but according to efficient techniques and good practice recommendations. The purpose of this work is to serve as a reference of best pratices in risk management, leaving each responsible person or project manager to use the techniques here presented and other existing tools, making the necessary adjustments in accordance with their specific project, so that they can have control in the management of their projects and increase the chances of success of the project.

Moreover, as important as it was exposed, it is advised that all documentation generated from the risk management process be archived, to serve as a basis for future projects (lessons learned). In search of continuous improvement, it is vital to learn from the experiences that have been made, so that decision making becomes more confident and agile in the future.

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