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PROJECT RISK MANAGEMENT PRACTICES

HOW CAN THE CURRENT PROJECT RISK MANAGEMENT PRACTICES SURROUNDING MEDIUM CONSTRUCTION PROJECTS BE OPTIMIZED?

PUBLIC VERSION

LOUIS SOFFRONTE (4041801)
PUBLIC VERSION

Due to confidentiality issues, a public version of the research has been published. In the public version the organization in which the research was performed is referred to as Organization O. The research was led within the section referred to as PCM.
# Project Risk Management Practices

## Master Thesis Project

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EXECUTIVE SUMMARY

Multiple instruments and procedures are used within the different project management areas in order to execute projects in an efficient and controllable way. Project Risk Management (PRM) has become over the past years a crucial part of the project management practices and is seen by many practitioners as a key factor to go towards successful projects. More and more organizations are adopting this practice in an effort to achieve a better strategic alignment, increase the project success, and optimize the utilization of their resources.

The research aims at generating new insights to optimize the management of project risks within Organization O. This is done by investigating how Organization O’s PCM section carries out PRM and by comparing the empirical data with the main tenets of the risk management theory and more generally with the extant literature from the project management field.

The study departs from the main research question - How can the current Project Risk Management practices surrounding medium construction projects be optimized? This question is further divided into three sub-questions along three dimensions - the current strategic position of PRM, the involvement of the risk players, and the interaction between the risk players. This research is built around four phases, the Introduction, the Investigation, the Synthesis, and the General Conclusion. The three dimensions of the research are all three explored in the Investigation phase where the theory, what is ought to be in the guidelines of Organization O, and what really happens in practice are correlated. The empirics were collected from six different projects.

The methodology employed to collect the data is a single case study with multiple sources. This qualitative approach helped the researcher to gather a certain amount of empirics from the six sub-units of analysis (projects). In each project some risk players were interviewed following a specific set of questions. Observation was also used as well as desk research in order to be able to triangulate the information and minimize biases in the research conclusions.

The research outcomes depict the availability of a broad theoretical knowledge within the PCM section linked to a quite homogenised understanding of the beneficial influence on projects’ success surrounding the implementation of PRM in practice. However, we found an inhomogeneous implementation aligned with low standardized processes, low formality in the way project risks are managed, and an outlined divergence in risk players’ perception. We also found that the theory is lacking in some areas like need for scalability of the PRM processes, the recognition of the importance of the back-end of projects related to the lessons learned, how formal projects should be managed, and the general influence of some of the “human aspects”, which according to many scholars has an important stake for effective and efficient risk management.

In order to structure the short-, medium-, and long-term recommendations presented in Chapter 6, a Risk Maturity framework was used. The Risk Maturity Model was experienced as an explicit framework that helps to understand better where an organization stands, what want to be
achieved by the organization eager to shift its risk culture towards a more mature one, and how to go there.

Besides contributing to the extant body of knowledge by providing a certain amount of empirical evidence, the study is rich in practical implications for Organization O’s PCM section. The empirics could thus be used for further research and the final recommendations could be either adapted or used as additional findings to be considered by other organizations interested in optimizing their project risk management processes.
FOREWORD

The research that was performed from February to July 2011 was a joint project between Delft University of Technology and Organization O. This Master Thesis corresponds to my last achievement before graduating from my Master of Science in Management of Technology. The research was done at the PCM section.

This study lies within the field of project management and aims at designing recommendations that could help PCM to reach the next level for managing project risks and therefore benefit from a more logic and optimized approach. From the investigation of six projects led by PCM project managers, specific knowledge was gathered on the effectiveness of the project risk management process used in practice. This objective of the research was reached based on a correlation between an extensive analysis of the extant literature and the empirics.

This would not have been possible without good supervision and support from several people whom I need to truly thank.

Firstly, many thanks go to my supervisor from Organization O who made it possible for me to graduate in such an interesting company. Further, my supervisor actively took part in my research and really made it an interesting and challenging project.

During these six months, I referred to many people within Organization O who contributed to my research results and I am really grateful for their input.

Many thanks as well go to my first supervisor Sergey Fillipov for spending so much time and effort to guide me in the right direction every time I needed it and for assisting me in developing the research strategy.

Finally, I also want to thank Herman Mooi and Wijnand Veeneman, for their critical, scientific and valuable feedback.

Louis Souffront
Amsterdam, August 2011
ABBREVIATIONS

APM: Association for Project Management
ATOM: Active Threat & Opportunity Management
CM: Construction Management
CTY: Consultancy
ICE: Institution of Civil Engineers
MCE: Mechanical & Civil Engineering
M_o_R: Management of risk (OGC)
MT: Management Team
OGC: Office of Government Commerce
PID: Project Initiation Documentation
PLC: Project Life Cycle
PM: Project Management
PMI: Project Management Institute
POLG: Policy, Organization, Law, and Gaming
PPC: Planning and Project Control
PRAM: Project risk analysis & management (APM)
PRM: Project Risk Management
PRINCE2: Project IN Controlled Environment
RAMP: Risk Analysis Management for Project (ICE)
RBS: Risk Breakdown Structure
RM: Risk Management / Risk Maturity
RMM: Risk Maturity Model
SPS: Purchasing department
TM: Team Manager
TSE: Technology, Strategy & Entrepreneurship
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Chapter 1 describes the research problem, which helps to frame the scope of the study and elucidate the underlying incentives. Following the research problem, a Risk Maturity Model is presented. A Risk Maturity framework is used in the research in order to [1] benchmark the current PRM practices of the PCM section and is further employed as a base to [2] design recommendations (Chapter 6). Additionally, the conceptual and technical designs of the research are addressed. The conceptual design pictures the motivational aspects of the research whereas the technical design depicts what needs to be done to effectively find a sound answer to the set of research questions. This chapter also describes in specific terms the structure of the research.

It is relevant to consider that the research was performed at Organization O’s PCM; thus when reading “Organization O” we refer, depending on the context, to the PCM section.
1.1 RESEARCH PROBLEM

Project management is the discipline of planning, organizing, and managing resources in order to successfully complete the project objectives (Meredith & Mantel, 2008) and is specifically concerned with risk management, control, performance, and effectiveness (Crawford, 2009). Project management that was started without robust classical methods has evolved to offer a variety of models that fit growing areas of application and has expanded into a strategic model leading to a “vehicle” to implement organizational strategy (Tanaka, 2011) (PMI, 2004). It provides managers with powerful practices to control their projects (Meredith & Mantel, 2008) and is defined as the application of knowledge, skills, tools and techniques to project activities to meet project objectives (PMI, 2004).

In times of increased competition and globalization, project success becomes even more critical to business performance (Kerzner, 2000) (Cooper, 2001) (Raz, Shenhar, & Dvir, 2002). For instance, in the case of Organization O, a key project that would not be performed in alignment with the predefined objectives could have a severe consequence for the performance of the company. Yet, it is difficult to assess if a project is successful or not. In project management literature, a project is successful when performed on time, within budget and when it meets quality and performance specifications (De Wit, 1998) (Baccarini & Archer, 2001). However, for projects differing in size, complexity, and number of stakeholders involved, it is not always true that a project’s success can be measured only by fulfilling these three objectives (Atkinson, 1999). Looking at what determines a project’s overall success, there are a lot of factors that have their own influence, like a detailed conception and definition of the project, an efficient project execution, a good knowledge of the project environment, and the project’s stakeholders (Hayfield, 1979).

Much academic research has already been performed on what the important success criteria are for projects or what the reasons are for failure. However, there is a need for further investigation regarding the evaluation of the underlying project management practices, although they have a large share in efficiently managing the project in a controllable way (De Wit, 1998). In this sense, it is already suggested in the literature that by using management practices, project managers will be better able to plan and execute their projects to maximize the project’s chances of success (Jaselski & Ashley, 1991).

There exists a large amount of practices, tools and procedures proven to be efficient while performing a project in order to execute them in a proficient and controllable way. This research is directed to focus on Project Risk Management (PRM). PRM is more and more characterised as a major feature and indispensable integrated tool of project management (Kutsch & Hall, 2010) (Olsson, 2007) (Van Wyk, Bowen, & Akintoye, 2008) (Lyons & Skitmore, 2004). It helps project managers to address uncertainties in a proactive manner in order to minimise threats, maximise opportunities, and optimise success of the project’s objectives (Hillson & Murray-Webster, 2006). PRM is seen as one of the key elements to carry out project successfully (Cooke-Davies, 2002) and is recognized as an essential contributor to business and project success (Hillson & Murray-Webster, 2006). As a result, PRM is at the centre of attention and is methodically studied and
spread around by research institutes and risk practitioners. For several years now, an international consensus on the essential elements for PRM has grown stronger (Hillson & Murray-Webster, 2006). This has been supported by the increasing amount of methodologies, standards, processes, capable tools and techniques, but it has also been nourished by the academic involvement and the experience of practical implementation across many industries. From this growing interest for PRM, a common awareness and approval about the necessity of efficiently managing project risks is unmistakable (Perminova, Gustafsson, & Wikström, 2008).

Despite the numerous academic publications and the ongoing development of PRM (Aritua, Smith, & Bower, 2011), the research is lacking a critical amount of empirical evidences in regards to the effective application of PRM (Lyons & Skitmore, 2004). The study is led at the PCM section in charge of most of the internal projects of Organization O. In a large extent, the projects carried out at Organization O are considered to be medium sized projects based on criteria like the strategic importance, the technical complexity, the project value, the duration, the project resources, and the external constraints (Appendix 1).

Besides the relevance of gathering empirical evidences, the motive to investigate the PRM practices at Organization O’s PCM section comes from the determination of this section to implement a more standardized and more formalized approach to manage project risks. The current risk management process has recently been implemented (2007) and the beneficial aspects of managing project risks appear to be acknowledged by many practitioners. Yet, it seems that there is no high concern about the implementation of PRM, implying a likely low implementation at a practical level, which might not allow the organization to take advantage of PRM practices’ beneficial aspects. This research aims thus at investigating the main tenets of the PRM literature and assess the current Risk Maturity level of PCM to finally design some recommendations on which the optimization process could be based.

### 1.2 The Risk Maturity Model

All organizations encounter risk and uncertainty at the project level (Hillson, 1997). Despite the growing consensus surrounding the added value of managing project risks efficiently, effective implementation of PRM into organizations is not widespread and fails to meet the attributed benefits. In order to help organizations to benchmark their current PRM practices and further improve them, Risk Maturity Models (RMM) have been developed (OGC, 2010) (PMI, 2008) (Hillson, 1997). Andersen and Jessen (2003) describe maturity as encompassing both behaviour and competences. It is argued that maturity can be explained as the sum of action (ability to act and decide), attitude (willingness to be involved) and knowledge (an understanding of the impact of willingness and actions) (Filippov, Mooli, & Van der Weg, 2010).

At the moment, practitioners can make use of several frameworks. For instance:

- The Risk Maturity Model developed by (Hillson, 1997);
Phase 1 – Definition
Chapter 1 - Introduction

- Portfolio, Programme and Project Management Maturity Model (P3M3), designed by the UK’s Office of Government Commerce (OGC, 2010);
- Organisational Project Management Maturity Model (OPM3), developed by The Project Management Institute (PMI, 2008);

Those frameworks have been designed in order to assist organizations in defining, understanding and measuring the effectiveness of their processes (Filippov, Mooi, & Van der Weg, 2010). The general idea behind the maturity model can be summarised in a few questions [1] Where are we now? [2] What do we want to achieve? [3] How do we get there?

In order to answer those questions, these models contain several successive levels. In this respect, it stipulates that organizations’ PRM practices can be categorized into groups which array from those with no formal practices to those where PRM is fully incorporated and optimized into the business and organizational culture. A RMM is built around several standard levels of maturity based on P3M3 framework developed by (OGC, 2010). Six Risk Maturity levels are identified in Appendix 6-a and schematically represented in Figure 1.1.

![Figure 1.1 - The six levels of Risk Maturity](source: OGC, 2010)

This framework allows organizations to benchmark their PRM practices upon which they can take further actions. In this research the Risk Maturity framework is used to benchmark the current practices of PCM and further design some short-, medium-, and long-term recommendations in order to support the PCM section while improving the way project risks are managed. More details about the conceptual and technical design of the study are portrayed in the following parts.
1.3 CONCEPTUAL DESIGN

The steering purpose of the conceptual design can be compared to the architectural design of a building. The conceptual design helps the researcher to infer correctly which specific research activities need to be carried out during the implementation phase.

1.3.1 RESEARCH OBJECTIVES

Based on the research problem and the RMM, the main objective is to:

- Perform in-depth examinations of the PRM practices within PCM in order to benchmark its current Risk Maturity level, and further confront those findings with the main tenets of the literature to finally generate some recommendations.

The main objective can be divided into both theoretical and practical objectives (Van der Velde, Jansen, & Anderson, 2008). On the one hand, the theoretical objective of the research is to define the value of PRM and define based on empirical evidence some key factors to be improved while implementing PRM. On the other hand, the practical objective is to propose Organization O some recommendations on how to possibly optimize their PRM practices. Those recommendations are linked to the Risk Maturity framework with which PCM is benchmarked.

1.3.2 RESEARCH QUESTION AND ANALYTICAL FRAMEWORK

1.3.2.1 MAIN RESEARCH QUESTION

Following the above description of the research problem and based on the research objective, the research project aims to critically examine the implementation and applications of PRM at Organization O from which conclusions and managerial implications are derived. The fundamental research question driving this study is formulated as:

- How can the current Project Risk Management practices surrounding medium construction projects be optimized?

1.3.2.2 SUB-QUESTIONS

In order for this research to answer the main research question, a set of sub-questions is defined. First, more and more organizations may adopt their own approach to PRM or rely on existing methodologies designed and popularised by professional project management associations and consultancy companies. While PRM is widely accepted as an essential practice for managing project successfully, it is interesting to investigate what makes it so essential for reaching project success but also to find out what is the essential for performing effective PRM during the entire life cycle of construction projects. Thus, the first sub-question is:

1. What is the current strategic position of Project Risk Management practices throughout the project life cycle?
Further, the involvement and motivation to implement PRM may impact the efficiency when applied into practice. The way risk players perceive and perform PRM has a high stake on the success of the projects, i.e. meeting the project objectives. In this respect, the role of the risk players is seen as crucial as they are the one bridging the gap between what is supposed to be theoretically right and the implementation of it. Hence, the second sub-question is:

2.a How do the risk players get involved with the management of project risks?

Finally, it is not to forget that human beings conduct the PRM processes. The success of PRM implementation does not only rely on the way risk players are involved with the practices but also on how these players interact with each other. Investigating a real-life situation on how the risk players communicate, exchange, and share about PRM, gives another attractive dimension to the research. This emphasis gives rise to the third sub-question:

2.b How do the risk players interact with each other during the dynamic process of managing project risks?

Each of the research sub-questions is answered in a separate chapter of the thesis (Chapters 3 to 5).

1.3.2.3 Analytical framework

The analytical framework of this study is based upon the main research question and the three research sub-questions. The interconnection between the main research question and the three sub-questions is visually represented in Figure 1.2 and shows the two main areas of investigation, which are the techniques & processes and the risk players.

![Figure 1.2 - Analytical framework of the research](image-url)
1.4 TECHNICAL DESIGN

Up until now, all that has been written was aimed at developing the conceptual design, i.e. a feasible and steering research objective and set of research questions. In this part the question of what needs to be done to effectively find a sound answer to the set of research questions is addressed. In other words, the technical design represents how the research is going to be carried out.

1.4.1 RESEARCH DESIGN

This research is of explorative nature. In order to answer the main research question, empirics of PRM are gathered and contrasted with the main tenets of the relevant literature. Yet, it is difficult to gather quantitative data on PRM (Olsson, 2007) as risk and the management thereof are both multidisciplinary and highly context-related concepts. Accordingly, the methodologies used for this study are literature review and qualitative approach to data collection in a form of single case study with multiple subunits of analysis (Van der Velde, Jansen, & Anderson, 2008, p.79) (Yin, 2003, p.42). Yin (2003) characterizes case study as a research method enabling to understand the complexity of an environment. Using a qualitative approach allows to gain in-depth understanding of the phenomenon under investigation and to comprehend the underlying motivations and factors; yet results of such research can be generalised to a very limited extent.

1.4.1.1 LITERATURE REVIEW

The role of the theory development, prior to the conduct of any data collection of a case study is essential (Yin, 2003, p.28). It helps gathering knowledge of the information that already exists, in one form or another. Although, literature review is time and cost effective and provides a lot of information that can be accessed quickly, this strategy has several disadvantages. The results may be out of date and incorrect and the information available may be very limited (Cielo, 2011). Consequently, a certain amount of time is allocated to collect and analyse carefully the literature in order to keep the most relevant information on which the case study is performed.

1.4.1.2 SINGLE CASE STUDY WITH MULTIPLE SOURCES OF ANALYSIS

The single case study with multiple subunits of analysis is a qualititative case study defined as an in-depth investigation of PCM. In this research, choosing for a case study appears to be self-evident when looking at the definitions of (Yin, 2003) and (Van der Velde, Jansen, & Anderson, 2008):

“A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident.” (Yin, 2003)

“If the aim of your research is to conduct intensive study of a phenomenon within the total, natural surroundings, then a case study is the appropriate method.” (Van der Velde, Jansen, & Anderson, 2008)
Moreover, McCutcheon and Meredith (1993) mention in their paper that using a case study is particularly appropriate for exploratory research with a focus on documenting phenomena within their organizational context, exploring the boundaries of the phenomena and integrating information from multiple subunits of analysis. However (Yin, 2003) explains that using case study for research purpose remains one of the most challenging of all social science endeavours which could be for this specific case a problem of generalizability and/or intersubjectivity (Yin, 2003). The data collection methods as well as the description of the different cases are defined in Chapter 2.

1.4.2 RESEARCH STRUCTURE

In this part, the structure of the research is presented and gives the reader an overview of the report’s content. The research is structured around four phases:

**Phase 1** - “Definition” - encompasses the general introduction of the research (objective, research questions) and the description of the theoretical background as well as the context setting and data of the research. The Risk Maturity Model is also described.

**Phase 2** - “Investigation” - consists of the core of this research. In this phase the theoretical part as well as the collection of empirics is made using respectively the literature review and the single case study with multiple sources as described in part 1.3.1. Based on the three sub-questions defined in part 1.3 three key topics, pillars of the research, related to PRM are investigated:

- The current strategic position of PRM;
- The involvement of the risk players regarding PRM;
- The interaction among the risk players.

**1.4.2.1 The TSI Framework**

Every sub-question is answered in a separated chapter by facing the related theory with the relevant empirics. What is meant here is that the report does not encompass one separated chapter for the theory and one separated chapter for the empirics, but three chapters where theory and empirics are faced in respect to the three key topics. This phase is built around the triangular TSI framework, representing the connection between the **Theory**, the “**Soll**”, and the “**Ist**”.

The **Theory** relates to PRM and represents what has been researched so far in the field of PRM and what has been accepted as common knowledge. For the empirics (i.e. data from the single case study), “**Soll**” represents the normative approach and “**Ist**” the positive approach. By normative is meant what the company tries to implement as PRM practices (i.e. guidelines) and by positive is meant what is currently happening in practice. This is summarised in Table 1.1.
Phase 1 – Definition

Chapter 1 - Introduction

<table>
<thead>
<tr>
<th></th>
<th>Normative (what ought to be)</th>
<th>Positive (what is)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theory</strong></td>
<td><em>Theory: Common knowledge on PRM</em></td>
<td><em>X</em></td>
</tr>
<tr>
<td><strong>Empirics</strong></td>
<td>&quot;Soll&quot;: Organization O’s guidelines</td>
<td>&quot;Ist&quot;: current practices</td>
</tr>
</tbody>
</table>

*Table 1.1 - Normative/positive explanation of the TSI framework*

In this research, we want to investigate how the theory of PRM, what is supposed to be done according to the company's guidelines ("Soll"), and what happens in practice ("Ist") relate to each other. Then, we want to give recommendations to Organization O on how to optimize their PRM practices. This research will therefore provide recommendations that might help, if implemented, to increase the overlap between the three areas of the TSI framework (Theory, the “Soll”, and the “Ist”), as schematically represented in Figure 1.3.

![Figure 1.3 – Ideal evolution of the TSI framework](image)

**Phase 3** - “Synthesis” - is the contribution / the added value of the empirics in correlation with the theory. In this phase we investigate how the three key topics interplay with one-another. This phase gives deeper motivation for the research as well as a holistic critical view of the work.

**Phase 4** - “Discussion and Conclusion” - is the phase the results are critically discussed to help formulate the conclusion of the research where an overall managerial implication is given. Additionally, the contribution of the research and what could be improved are mentioned.

In Figure 1.4 is represented the research structure which encompasses the four phases and the seven chapters.
Phase 1 – Definition
Chapter 1 - Introduction

Phase 2 – Investigation
Theory

- Chapter 3 Strategic position of PRM
- Chapter 4 Involvement or the risk players
- Chapter 5 Interaction between the risk players

Phase 3 – Synthesis

- Chapter 6 Synthesis

Phase 4 – Discussion & Conclusion

- Chapter 7 Conclusion

Figure 1.4 – Research structure
1.5 **SCIENTIFIC AND MANAGERIAL RELEVANCE**

1.5.1 **SCIENTIFIC RELEVANCE**

From a scientific point of view, the research attends to present empirical evidences about PRM based on a single case study with multiple sources for data collection. As mentioned earlier, despite the recognised importance of PRM and the large amount of academic and practice-oriented publications on the topic, the research is lacking a critical amount of empirical evidence. The proposed research aims at contributing to the field of project management by investigating in depth how PRM is executed into the small to medium sized project environment of Organization O. Some recommendations might repeat the existing literature but some others might shed light on new areas to investigate. The findings are empirically relevant to the body of knowledge and add new insight that could be used for further research.

1.5.2 **MANAGERIAL RELEVANCE**

The performance of companies is increasingly conditioned by the success of their projects (Kerzner, 2000) (Cooper, 2001) (Raz, Shenhar, & Dvir, 2002). Additionally, unmanaged or unmitigated risks are one of the primary causes of project failure. By considering the increasing complexity of projects, the continuous and methodical management of project risks has become ever more significant. Therefore, a greater understanding on how projects could better be performed by effectively using the PRM practices seems to be relevant. From a managerial perspective, PRM can be improved. Based on the case study a Risk Maturity Model is used to benchmark the current PRM practices of PCM section, which gives some relevant insights about what could be improved. By facing the empirical data with the extant literature some recommendations are made which might help to implement more effective PRM processes.

The optimization of Organization O’s PRM practices will support project managers in performing their projects in a more successful way. It will also help managers and/or clients in trusting the result of the assessment as well as the ease of use when performing projects. This research is beneficial for Organization O, as it might enhance the business practices of the PCM section.
In Chapter 1, the research problem was described. The Risk Maturity framework portrayed in part 1.2 is further used in the research as a framework to benchmark the current maturity level of the PCM section. The benchmark is further used in this research to orientate the argumentation of the recommendations. The conceptual and technical designs of the research were also described followed by the presentation of the research structure.

In Chapter 2, a broad presentation of Project Risk Management is given. The notion of risk is introduced as well as its benefits for the organizations implementing it. Additionally, the context setting and data of the research is described, presenting the organization where the research was performed as well as the nature of the case study. This Chapter gives a general overview of what the essence of this research is and gives the relevant information to understand how the empirical data were collected. This Chapter ends with a description of the sub-units of analysis of the case study.
2.1 THE PROJECT RISK MANAGEMENT APPROACH

2.1.1 AREAS OF RISK MANAGEMENT

The concept of risk is not new and has existed for centuries; Herodotus (484 BC - 430 BC) believed that “Great deeds are usually wrought at great risks”. Risk is inherent to everyone’s life and this since the beginning of the recorded history. Risk management (RM) is therefore something done by everyone, and is characterized by Chapman and Ward (2003) as “Universal”. But for a long period of time it has not been done with any underlying approaches or logic. The origins of RM can be traced to the discipline of safety engineering, which is mostly focused on the physical harm that may occur resulting from a technical defect or human mistake (Raz & Hillson, 2005).

However, modern risk management is widely implemented through a large range of industries, driven by (Raz & Hillson, 2005):

- Growing importance of projects in organization;
- Central role of technology and its inherent uncertainty;
- Increasing turbulence in the business environment;
- Continuing trend towards globalisation;
- Increasing burden of regulation with which business must comply.

Resulting from the growing interest of many different sectors regarding RM, there are different types of RM and the characteristics and procedures of each type differ from one another. All these RM areas of application play a significant role behind the growth of an organization in the long term. Different areas of RM have appeared like Operational RM (focusing on quality, safety, health, etc.), Financial RM (market, currency, bank, etc.), Engineering RM (technical, supply chain, construction, software, etc.), and Business RM (project, portfolio, programme, etc.).

Project Risk Management (PRM) is currently, among the other sub-areas of application, a topic of major interest (Cooper, Grey, Raymond, & Walker, 2005, p.5). This is because PRM is extensively recognized in the literature as having a strong positive influence on projects’ success (Turner, 1999) (Chapman, 1997) (Elkington & Smallman, 2002). As a result, many reliable tools, methods, and standards have been developed over the past decades in order to help organizations to assess and manage their project risks. This research is interested in investigating in depth how the management of project risks could be optimized. However, how do we comprehend the notion of risk in the field of project management?
2.1.2 Are all Projects Risky?

Today’s projects include a high degree of uncertainty (Migilinskas & Ustinovicius, 2008) due to three principal sources as mentioned by Jaafari (2001):

- External factors to the projects;
- Use of the methods and processes for project realisation;
- Shifting business objectives.

The second source does not only refer to incomplete knowledge and a lack of skills, but also to the aspect of uniqueness inherent to every project (Jaafari, 2001). Indeed, projects are unique by nature (Cooper, Grey, Raymond, & Walker, 2005) (Jaafari, 2001) (Migilinskas & Ustinovicius, 2008) (Aritua, Smith, & Bower, 2009). The concept of uniqueness results from high level of uncertainty in projects, as there is only limited possibility to make use of past experience (Perminova, Gustafsson, & Wikström, 2007).

Further to the criteria of uniqueness, projects often take place over a certain time, which make them time-constrained. Therefore setting project goals is essential as it provides the project’s stakeholders with a clear vision of what needs to be achieved (Cooper, Grey, Raymond, & Walker, 2005). Projects are therefore goal-oriented with predefined project’s objectives that must be reached.

As a result, all projects encompass risks, because risks arise from the interaction of uncertainty and project objectives (Chapman & Ward, 2003). Hillson and Simon (2007) even write, “all projects involve risk, the zero risk projects are not worth pursuing”. In a nutshell, each project is specific and encompasses intrinsic risks (Fang, Zhu, & Wang, 2005).

A risk brings insecurity to projects, creating thus a continuous strain between the predefined actions and future uncertain events. The study carried out by (Raz, Shenhar, & Dvir, 2002) revealed that even if all the projects are risky, risk management techniques are mostly applied to highly uncertain and more risky projects. However, they also claimed that awareness to PRM should not be limited to high-risk projects, as less risky-projects also tend to fail and could thus benefit from the attention and routine application of PRM techniques and procedures (Raz, Shenhar, & Dvir, 2002). Project risk can hence be characterized as a crucial part for project success, making PRM a beneficial and essential practice of project management.

2.1.3 Benefits of Project Risk Management

Project risk is a very subjective notion as the perception of a risk’s consequences diverges depending on who looks at it (Hall & Hulet, 2002). The subjectivity of risk is also reflected in how scholars and practitioners define it. There is as much definition of project risk as there exist standards, methods, and books (Appendix 2). However, as mentioned by Hall & Hulett (2002), there are three characteristics commonly implicitly found in all of them:

- A project risk is considered to be a future event that may or may not occur;
The probability of the future event to occur must fit in the scope of project risk management and therefore be greater than 0% (total uncertainty) but less than 100% (total certainty) (Figure 2.1);

The consequence (positive or negative) of the future event on the project objectives must be unexpected or unplanned for.

The practice of managing these project risks also known as Project Risk Management (PRM) is extensively recognized as an indispensable practice of project management (Kutsch & Hall, 2010) (Olsson, 2007) (Lyons & Skitmore, 2004) (Raz & Michael, 2001) as it can assist the project manager to identify, analyse, treat, and monitor the project risks (Part 3.1.2). Various studies in the construction management literature pinpoint the importance of a “risk driven approach” as a critical success for construction projects (Dikmen, Birgonul, Anac, Tah, & Aouad, 2008). As seen in Part 2.1.2, projects always encompass uncertainty and uncertainty always implies risk. Therefore, one of the few certainties about projects is the implication of risks, which entails that risks need to be assessed and managed rationally and methodically. There are several reasons why doing effective PRM is both relevant and beneficial for an organization (Hall & Hulet, 2002):

− Formal methodology and procedure making the PRM better structured for day-to-day decision-making;
− Added value of reducing a possible threat and increasing a possible opportunity;
− Forward looking which helps to avoid for instance costly and delayed performance;
− More constrained project environment.

Furthermore, PRM assist in taking better decisions and having a less subjective judgment. It also improves distribution of the resources and makes more explicit the division of the responsibilities among the project’s stakeholders (APM, 2004). Table 2.1, adapted from (APM, 2004), provides more extensive data on what are possible “hard” benefits and “soft” benefits resulting from the use of PRM.

The benefits of using effective PRM processes are multiple and help to meet the ultimate objective that is to increase the probability and impact of positive events, and decrease the probability and impact of negative events throughout the life cycle of (PMI, 2004).
### Table 2.1 – Benefits of risk management (source: APM, 2004)

<table>
<thead>
<tr>
<th>“Hard Benefits”</th>
<th>“Soft Benefits”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generic benefit of risk management</strong></td>
<td></td>
</tr>
<tr>
<td>Enables better informed and more believable plans, schedules and budgets</td>
<td>Improves corporate experience and general communication</td>
</tr>
<tr>
<td>Allows more meaningfully assessment of contingencies</td>
<td>Helps to develop the ability of staff to assess risks</td>
</tr>
<tr>
<td>Discourages the acceptance of financially unsound projects</td>
<td>Focuses project management attention on the real and most important issues</td>
</tr>
<tr>
<td>Enables a more objective comparison of alternatives</td>
<td>Demonstrates a responsible approach to customers</td>
</tr>
<tr>
<td>Identifies, and allocates responsibility to, the best risk owners</td>
<td>Provides a fresh view of the personnel issues in the project</td>
</tr>
<tr>
<td><strong>Organizational benefits of risk management</strong></td>
<td></td>
</tr>
<tr>
<td>Compliance with corporate governance requirements</td>
<td>Better reputation as a result of fewer headline project failures</td>
</tr>
<tr>
<td>Greater potential for future business with existing customers, greater competitive advantage</td>
<td>Better customer relations due to improved performance on current projects</td>
</tr>
<tr>
<td>Reduced cost base</td>
<td>A less stressful working environment</td>
</tr>
</tbody>
</table>

### 2.1.4 Development of Risk Management

“It seems that project risk management is still at its infancy, and that there is still a long way to go” (Raz, Shenhar, & Dvir, 2002)

“Project risk management is relatively mature” (Aritua, Smith, & Bower, 2011)

Based on these two quotes, it can be assumed that during the past decade (from 2002 to 2011) some radical changes occurred in order to shift from “infancy” of PRM to “relatively mature” PRM. There has been a major surge of interest in improving the ability to deal with uncertainty and therefore risk (Raz & Hillson, 2005). Additionally, the strong interest for a more efficient management of project risks has led to the development and implementation of a large amount of methods, capable tools, and processes (Raz & Hillson, 2005). However, what does “relatively mature” means, and can we say, according to the definition of mature, that PRM has attained a “final or desired state”? According to Perminova et al (2007), although traditional project risk management is a well-established discipline within project management field, there is a clear need for further development.

As previously mentioned, PRM is extensively recognized as an indispensable part of project management (Kutsch & Hall, 2010) (Olsson, 2007) (Lyons & Skitmore, 2004) (Raz & Michael, 2001). In order to reach a valid perception of the evolutionary trends of PRM, (Lehtiranta, Palojärvi, & Huovinen, 2011) carried out a qualitative comparison between data of a previous review involving PRM research between the years 1960 and 1997 and their data resulting from a
study led between the years 2000 and 2006. The purpose of this comparison was to identify the current developments in risk management showing thus the major transformations over the years. The results of the research demonstrate strong differences, revealing a continuous shift from a traditional approach to risk management (e.g. mechanistic, straightforward, and formal) towards a more modern concept (e.g. adapted, less formal, yet systematic) of managing risks. Some major remarks of the research are:

- The systematic approaches are now widely spread and address goal setting and other managerial tasks part of the day-to-day management practices;
- The definition of risk addresses nowadays threats and opportunities, not only negative implication;
- The latest decade has witnessed more considerations for health and social risks;
- Emergence and major improvements in the area of soft systems applications (i.e. tacit knowledge, collaboration, managerial competencies, complexity of human being as a decision maker, etc.).

A substantial gap has been crossed between “yesterday’s PRM” practices and today’s ones. There is nowadays an accepted core understanding of PRM, but new directions are constantly being explored to go towards a more elaborate way of managing project risks. Nevertheless, there are still numerous organizations across various industries that struggle to implement PRM practices to make use of the beneficial influence of PRM on project success.

### 2.2 CONTEXT SETTING

After briefly presenting what is PRM and what are its related benefits and current development, this part of the research intends to provide an overview of the industry in which Organization O evolves as well as a presentation of the PCM section in which the research was performed. Further, in part 2.3, the data and methodology are defined, which gives a clear overview on how the empirical data were collected. Finally, the part 2.4 presents the different cases used for the empirics.

_CONFIDENTIAL_
2.3 DATA & METHODOLOGY

2.3.1 NATURE OF THE CASE STUDY

The case study is done under a deductive approach, which proceeds from the general concept (theory) to the particular observations (case study) (De Neufville, 1998). This approach is also referred to as the Cartesian method, after Rene Descartes, a seventeenth century French mathematician or as the linear-analytical variant (Van der Velde, Jansen, & Anderson, 2008). Doing a case study is easier under the deductive than the inductive approach because the deductive approach begins with some extant theory that gives specific guidance on the type of data that are relevant for the study (De Neufville, 1998). In this respect the procedure of the case study is as follow:

- Define the theory;
- Identify the specific data relevant to its proof;
- Collect the information from the case;
- Analyse the data and face them with the theory;
- Draw the conclusions and make the recommendations.

2.3.1.1 UNIT OF ANALYSIS

A major step in designing and conducting a single case is defining the unit of analysis as well as the subunits of analysis in the case of an embedded case study design as described by (Yin, 2003). In this research the unit of analysis is the PCM section of Organization O.

2.3.1.2 SUBUNITS OF ANALYSIS

In this single case study, PCM, attention is given to several subunits. Therefore, in opposition to a holistic design of the organization where the global nature of the organization is used, this type of case study is qualified by (Yin, 2003) as an embedded case study design. Embedded design can serve as an important device for focusing a case study inquiry and the subunits often add significant opportunities for extensive analysis, enhancing the insights into the single case. However, such approach might have some pitfalls like when the case study focuses only on the subunit level and fails to return to the larger unit of analysis (Yin, 2003), in this case the PCM section.

The subunits of the case study are six selected projects led by the PCM section and are presented below in Part 2.4.
2.3.2 The data collection

2.3.2.1 Data collection methods

The gathering of evidence is an essential part of research. Evidence constitutes the link between theory and reality. The use of multiple sources of evidence can allow the researcher to make a triangulation of data; in other words, it allows searching for converging findings from the different sources (Yin, 2003). For the case study three different types of data collection are used:

- **Documentation** is characterized by Yin (2003) to be relevant as it plays an explicit role in any data collection while doing case studies, but one should carefully use the gathered documents. Gathering information from the risk management procedures of PCM as well as reports, risk registers, specific information of the subunits of analysis, gives some good insight to which extend PRM is integrated in the project management practices of PCM.

- **Interview** is one of the most important sources of case study information (Yin, 2003). The nature of the interviews is focused-interview. In other words, the respondents are interviewed for a short period of time with defined a set of questions. The interviews are also open-ended, which implied that the respondents are asked to give their opinions and own insights. These half-structured interviews help to get deeper insights (Van der Velde, Jansen, & Anderson, 2008). However, interviews should always be considered verbal reports only. As such, they are subject to problems of bias (Yin, 2003).

- **Direct observation** is used as an additional source to complement the interview results but also to provide additional information. As most of the subunits of analysis are ongoing projects some relevant behaviour or environmental conditions are available for observation. This mostly involves observation of meetings with the project teams with a focus on the risk players’ interactions and the procedures that are used.

2.3.2.2 Focused-interviews

The data were collected from February until June 2011 through the three types of data collection presented above. Most of the data were gathered through eight focused-interviews (semi-structured). The interviews were conducted on site and face to face. The interviews were conducted in English and were recorded.

The respondents encompassed six project managers (category 1) and two assigned risk champions1 (category 2). The interviews lasted on average one hour. Some other data were collected from another set of five shorter unstructured interviews with project team members (category 3). The purpose of these five interviews was to get some insight into how the team members besides the project managers and the risk champions were involved and interacted with the PRM practices. They were selected from three sub-units among the six. The choice of the sub-units was linked to the level of PRM in place. These interviews were shorter and lasted in

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1 In this paper we do not differentiate risk champion from facilitator or risk manager
average thirty minutes as they were focusing mostly on the involvement and interaction of the risk players. In Table 2.2, the respondents are listed in respect to the sub-units of analysis.

<table>
<thead>
<tr>
<th>Category 1</th>
<th>Category 2</th>
<th>Category 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project A</td>
<td>Project Manager</td>
<td></td>
</tr>
<tr>
<td>Project B</td>
<td>Project Manager</td>
<td></td>
</tr>
<tr>
<td>Project C</td>
<td>Project Manager</td>
<td>Risk Champion</td>
</tr>
<tr>
<td>Project D</td>
<td>Project Manager</td>
<td>Risk Champion</td>
</tr>
<tr>
<td>Project E</td>
<td>Project Manager</td>
<td>Project Buyer; Mechanical buyer</td>
</tr>
<tr>
<td>Project F</td>
<td>Project Manager</td>
<td></td>
</tr>
</tbody>
</table>

*Table 2.2 - Overview of the three categories of interview respondents per sub-unit of analysis*

The interviews were based on a questionnaire (Appendix 4) that was designed following the literature review and focused on the three key topics:

- The current strategic position of PRM;
- The involvement of the risk players regarding PRM;
- The interaction among the risk players.

In order to ensure authenticity of the case study by avoiding interview bias as much as possible, the intention of the study was clearly explained to each interviewee prior to the interview.

All the participants were experienced in their respective fields. Some of the participants were not from Organization O but have worked there for several years already. The results that will be presented in *Phase 2 – Investigation*, will keep the anonymity of everyone who participated in the case study.

### 2.4 CASE DESCRIPTION

Six sub-units of analysis are part of this research, each sub-unit representing a project. Their brief description is as follows:

- **Project A**: The project aims at *renovating* a part of the Organization O. This project was at the end of the front-end phase when this research started. The project closure phase was reached before the end of the research. The schedule of this project was critical for the organization.

- **Project B**: The project aims at *replacing* a part of a system. This project is seen as critical as the current system already reach its functioning life expectancy. After finalization of the front-end stage, the business case was challenged and needed review for further revalidation.
Project C: The project was part of the trial for PRM implementation back in 2007. This project is therefore completed but still with minor post execution phase activities. This project aimed at optimizing an existing process. This project was done following a pattern of different phases aligned with several maintenance stops. Each phase was time constrained due to the bottleneck character of the system being optimized. In this project there was, beside the project manager, a risk champion in charge on leading the management of the risk through the project.

Project D: The project emerged from a fire. And aims thus at rebuilding was has been damaged. At the time of the research the project was moving from the front-end phase towards the execution phase. This project is urgent and highly schedule driven.

Project E: The project is directly link to project D. It aims at debottlenecking the processes. The project was at the beginning of the study in the execution phase and was also highly schedule driven. It reached the closure phase before this research ended.

Project F: The project is a one of kind project for Organization O and aims at experimenting a process. For this project, Organization O is a member of consortium X. At the time of the research the project was in the commissioning phase (trials) but has now been hand-over back to the external owner, consortium X.

From these descriptions, it can be assessed that the six projects diverge from one another in purpose and in kind of application. Of course there are also many other differing factors like the budget, schedule, size and constitution of the project team, involvement of external parties, and requirement of technical skills and applicable knowledge. However, there should be many similarities in such a way that Organization O owns them all (except project F), they all are medium projects in the construction field (Appendix 1), the management procedure is based on PCM processes, and their organizational structure is based on PRINCE2. Further all six projects have a certain degree of riskiness for the performance of the Organization.

The second Phase of this research, including Chapters 3 to 5, focuses on three topics related to the management of risk during the project life cycle of projects (the current strategic position of PRM, the involvement of the risk players regarding PRM, and the interaction among the risk players). The six sub-units of analysis presented above were used to gather relevant data for the research from which some recommendations emerged. An overview of the sub-units is available in Table 2.3.

It is relevant to mention that some of the projects were not yet closed while performing the case study. Therefore, studying the PRM throughout the life cycle of projects might be seen as problematic. However, the selected projects are considered to be part of the riskiest projects currently carried out. It is believed that using current projects for the case study, even if not terminated, provides also relevant data for the case study than already closed projects; This for three reasons:

- It is possible to follow and observe the processes and therefore have the best material to carry out the study especially linked to the involvement and interaction of the risk players;
It is easier to involve risk players part of the project teams of on-going projects as their participation is based on fresh memories resulting in less biases;

Investigating projects that are not terminated might not give the best overview of the PRM processes carried out throughout the project life cycle. Yet, it pictures best what is currently happening in practice.

### Table 2.3 - Overview of the single case study’s sub-units

<table>
<thead>
<tr>
<th></th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
<th>Project D</th>
<th>Project E</th>
<th>Project F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Starting Date</strong></td>
<td>2008</td>
<td>2011</td>
<td>2007</td>
<td>2010</td>
<td>2010</td>
<td>2009</td>
</tr>
<tr>
<td><strong>Duration (months)</strong></td>
<td>2011</td>
<td>2013</td>
<td>2011</td>
<td>2012</td>
<td>2011</td>
<td>2011</td>
</tr>
<tr>
<td><strong>Expected end date</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current Phase</strong></td>
<td>Project closure</td>
<td>Waiting for approval</td>
<td>Project closure</td>
<td>Execution phase</td>
<td>Commissioning phase / project closure</td>
<td>Commissioning phase / project closure</td>
</tr>
<tr>
<td><strong>Size of Project team</strong></td>
<td>12</td>
<td>8</td>
<td>12</td>
<td>30</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>(Number of people)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Budget (M€)</strong></td>
<td>Confidential</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Level of PRINCE2 practice for PRM (1 to 5)</strong></td>
<td>2</td>
<td>2</td>
<td>3 to 4</td>
<td>3 to 4</td>
<td>1 to 2</td>
<td>2 to 3</td>
</tr>
</tbody>
</table>

*Project phase when the report was written*
Chapter 1 helps us to understand the research subject, the underlying reasons, and the objectives to be met. The structure is also described giving a schematic overview of what must be achieved. In Chapter 2, the brief description of the PRM practices demonstrate the ongoing changes of this area of project management seen as a key practice to be used by project managers.

As mentioned in the research problem, there is a need for further development related to the amount of empirical data. Three topics were investigated during this research. Based on the TSI framework (part 1.4.2.1), Chapter 3 aims at answering the first research sub-question: “What is the current strategic position of PRM practices throughout the project life cycle?” Therefore, we are going to explore the extant literature in order to see how PRM is characterized today and how it should be integrated in the project management practices. The results found in the theory are faced with the empirics and some pre-recommendations are made. The Risk Maturity Model is applied as a framework to benchmark the current practices of Organization O and used as a base to recommend PCM with further optimization of their PRM (Chapter 6).
3.1 THEORY

PRM has been considered for already some time as one of the most crucial project management practices to ensure a project to be successfully terminated (Turner, 1999) (Chapman, 1997) (Elkington & Smallman, 2002). Additionally, it has been stated by Royer (2000) that:

"Experience has shown that risk management must be of critical concern to project managers, as unmanaged or unmitigated risks are one of the primary causes of project failure."

PRM is therefore seen as a practise having a direct impact on projects’ outcomes, making it a strategic practice. This theoretical section discusses the relevant literature on the current strategic position of PRM and gives a critical look on what has been research so far. Several topics of interest, like the opportunity management, the PRM processes, and the level of integration into the project management practices are analysed shedding some light on a few current debates in the field of project management.

3.1.1 OPPORTUNITY AND THREAT MANAGEMENT

3.1.1.1 UNCERTAINTY AND RISK

According to (Perminova, Gustafsson, & Wikström, 2007), traditional PRM does not make a proper distinction between uncertainty and risk and there is no common understanding in project risk management literature as what is the difference between the two. Some scholars will prefer to use uncertainty and risk interchangeably because both terms describe uncertainties in project management (Migilinskas & Ustinovicius, 2008). However, some other scholars tend to consider distinguishing both as they have divergent influence on project performance (Perminova, Gustafsson, & Wikström, 2008).

Although risk results from uncertainty, risk and uncertainty are not theoretically synonymous (Olsson, 2007) (Hillson & Simon, 2007). Theoretically, uncertainty can be defined as a lack of certainty. Nevertheless, if we want to be more specific, uncertainty is defined as an event that cannot be quantified, which consequently cannot be reduced to probabilities and scenarios due to a lack of information (Meredith & Mantel, 2008, p.58) (Snyder, 2005). Whereas risk, reflects uncertain parameters that can be controlled by probability distributions known by the decision maker (Meredith & Mantel, 2008) (Snyder, 2005). In other words, a risk is a measurable uncertainty (Hillson & Murray-Webster, 2006) or an “uncertainty that matters”, because a risk can affect one or more project’s objectives (Hillson & Simon, 2007)

It is also noteworthy to differentiate risk from what is an issue and what is a problem (Hillson & Simon, 2007). Issue is characterized by being a negative outcome of an unmanaged risk while a problem is a potential issue; they are both situated in the past while risks are qualified as future threats or opportunities.
3.1.1.2 Opportunity Management

Traditionally, a risk is referred to as a combination of a probability and a negative outcome (Murtonen, 2010). Until the late 1990’s, project risks were qualified as exclusively negative, threats being defined as uncertain events which could have for consequence loss, damage, delay or cost – overrun (Lehtiranta, Palojärvi, & Huovinen, 2010) (Hillson, 2008). However, over a decade ago, a debate arose within the project management community regarding the nature of the risks to be managed within the scope of the PRM process. Professionals started to realized that there were not only the “down-side” risk that mattered but also the “up-side” risk. This resulted in an expansion of the concept of risk to include both “down-side” and “up-side” risks (Hillson & Simon, 2007) (Perminova, Gustafsson, & Wikström, 2008) (Olsson, 2007). This means that when managing project risks, we should enhance the possibility and impact of opportunities as much as we should reduce the probability of threats.

Lehtiranta et al. (2011) mention in their paper that this two-way approach has been adopted like the new standard; however, quite a few traditional concepts still focus on the negative aspect of risk. In addition, as pointed out by Hillson and Simon (2007), the debate still exists in regards to the definition of what should be a risk. According to the ATOM methodology, risk practitioners are divided into three divergent approaches (Hillson & Simon, 2007):

- The traditional approach undertaking the idea that the word risk should only reflect things that might occur having a negative impact for the project.
- The contemporary approach that stipulates the need to undertake the threats and opportunities together as benefits is seen in doing both at the same time.
- The last approach is only concerned with doing the job; the labels do not matter.

This debate might never reach an end, but as it can be seen in the extant literature, many standards and guidelines have already broadened their definition of project risk (Appendix 2). Olsson, (2007) concluded from an empirical study of eight companies that the absence of opportunity management is obvious. However, it could be expected that sooner or later, most of the organizations applying PRM will start managing opportunities, as they would recognize that integrating them into the general risk management activity is a proven way to achieve a cost-effective process and better project outcomes (Cooper, Grey, Raymond, & Walker, 2005) (Olsson, 2007).

Summarizing, risk has been defined as a measurable uncertainty and it has been argued that risk should be defined, assessed, treated and monitored as being either a threat or an opportunity to the project’s objectives. Therefore, opportunities as well as threats should be managed and both should be inherent to the PRM practices. According to several studies, the traditional PRM that focuses only on threats applies equally well to opportunities with only minor adjustments (Cooper, Grey, Raymond, & Walker, 2005) (Hillson, 2002).
3.1.2 PROJECT RISK MANAGEMENT PROCESS

The scope for risk in any project is considerable, and PRM practices are concerned with managing risks from the earliest stages of the Project Life Cycle (PLC) (Chapman & Ward, 2003). In other words, one not only needs to develop a list of relevant risks and responses, but will also have to actually manage the development of these risks and implement the risk responses. Nevertheless, PRM applied in construction projects is a difficult task as the project risks constantly develop as the objectives tend to change during the PLC, there are many changes in the macro-environment, new information is assimilated, existence of many parties involved in the project value-chain, and activities are going forward. Many data in the construction management literature identify the significance of a “risk-driven approach” (Dikmen, Birgonul, Anac, Tah, & Aouad, 2008).

Based on existing studies comparing the most widely used standards, it can be concluded that they have a really similar approach to PRM. Each one of them is meant to be iterative and recognizes the need to [1] define source of uncertainty (risk identification), [2] estimate the probability and consequence of uncertain events (risk assessment), [3] generate response strategies in view of expected outcomes (risk treatment), and based on the feedback received on actual outcomes and risks, [4] perform identification, assessment, and treatment generation steps continually throughout the PLC to guarantee that the project objectives are met (risk monitoring) (Dikmen, Birgonul, Anac, Tah, & Aouad, 2008) (Hillson & Simon, 2007) (Thevendran & Mawdesley, 2004). However, although there is a consensus among the most used methods on how to carry out PRM, there are major divergences regarding the actual required effort needed to really manage the risks in a proactive and continuous manner throughout the PLC (Hillson & Simon, 2007).

What we believe to be relevant is to find out in the extant literature information about the importance of managing the risks throughout the PLC. The processes are described in 3.1.2.1 and the extant literature regarding the need for a continuous process is analysed in 3.1.2.2.

3.1.2.1 THE “PLAN-DRIVEN” APPROACH OF THE ATOM METHODOLOGY

The growing diversity of projects is being reflected in a growing variety of ways to manage them. The dominant approach yet to be used is the “plan-driven approach” (Howell, Windahl, & Seidel, 2010), as exemplified by the methods, bodies of knowledge, standards that have been recently developed. The PRM process described in this part is based on the Active Threat & Opportunity Management (ATOM) methodology developed by Hillson and Simon (2007).

The ATOM methodology critically assesses some existing standards and methods to perform PRM and further develops a new approach focusing on managing risk and opportunities. This approach was designed following four critical factors for effective risk management, which are [1] the implementation of a simple and scalable process, [2] the use of appropriate methods, tools, and techniques, [3] the need for a supportive organization, and [4] the availability of competent people. In other words, the ATOM methodology was designed to manage both threats and opportunities and meet the need for a simple PRM process that can be applied to all projects by focusing on the involvement and interaction of the risk players. Additionally, the ATOM
process is the most recently published practical handbook and was developed based on several known best practices and tested methods and techniques used in the field of PRM for over forty years. As written by Hillson and Simon (2007), the ATOM process combines current "best practice guidelines and standards into a comprehensive, proven, practical methodology for managing project risk, presented as a simple stepwise process".

Therefore, the ATOM methodology is used to develop the theory and further to analyse the current PRM practices implemented at PCM. For a typical project PRM starts before the project is approved or rejected, by undertaking the initiation phase leading to a Risk Management Strategy\(^2\). Then a first risk assessment encompassing the identification, the assessment, and the response planning steps is carried out. After the project approval or rejection, reviews are performed throughout the PLC. The ATOM risk process is composed of the following eight different steps that cover the entire PLC:

**Initiation** - Before identifying the risks it is important to scale the PRM practices to the type of project. While the ATOM process offers a standardized risk management process, the depth at which it is implemented can vary depending on the project size (notion of scalability). A fundamental part of this stage is to determine the key risk players of the project and hold an initiation meeting in order to confirm the project size and the project objectives to ensure that they are clearly understood and documented. Furthermore, the risk players need to set the scope and objectives of the risk process, and define the parameters of the PRM processes to confirm the appropriate level of risk process (e.g. tools and techniques). It is also relevant in this stage of the PRM process to already look at the potential sources of risks to the project. The outcome of this stage is a Risk Management Strategy.

**Identification** - This is the first occasion for the risk players to explore the risk exposure of the project in a logic and structured way. The purpose of this phase is to identify all the knowable risks (threats and opportunities); i.e. risks that are practically and realistically identifiable qualified as *known unknowns* (Figure 2.1). According to the ATOM process, it should be done during a structured risk-workshop where the formerly selected key risk players should participate. Many tools can be used for risk identification. However, the ATOM process makes us of a structured brainstorming. In case of a medium project, the risk champion facilitates the brainstorming session. To aid brainstorming, the ATOM process recommends developing and using a Risk Breakdown Structure (RBS) drafted in the initiation phase (Appendix 5-a). The RBS can also be used a Risk Checklist (Appendix 5-b). Some further techniques are used in the ATOM in order to discard irrelevant risks or non-risks.

Once all duplicates, non-risks, and escalated risks are removed each risk is given a unique risk identifier and is further unambiguously described using risk metalanguage. In order to properly define risks, the risk event, causes, and effects need to be explicitly addressed. A risk should therefore be formulated as follow:

```
Because of <cause(s)>, <risk event> might happen, when it happens it will have <consequence 1>
```

\(^2\) Strategy describing the goals of applying PRM, as well as the procedure that will be adopted, roles and responsibilities, tools and techniques that will be used, the reporting requirements, and the timing.
A risk can also be mentioned in a table encompassing the four columns “causes”, “event”, “consequences”, and “project objectives”; see example below in Table 3.1.

<table>
<thead>
<tr>
<th>#</th>
<th>Causes</th>
<th>Event</th>
<th>Consequences</th>
<th>Project Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>On average 3 rainy days a week in the Netherlands in spring season</td>
<td>More than 6 mm of rain falls in the first 48 hours after pouring the concrete for the foundation that damages and weakens the concrete</td>
<td>Delay for the project due to extra hardening time</td>
<td>Schedule</td>
</tr>
<tr>
<td></td>
<td>The concrete used is cheap but not waterproof</td>
<td></td>
<td>Extra cost for repair measures of the concrete foundation</td>
<td>Cost</td>
</tr>
</tbody>
</table>

**Table 3.1 – Example of risk definition**

When all the risks are properly identified, a risk register is generated. A template of a risk register is given in Appendix 5-d; on this template one can see which elements should be mentioned. The risk register is used as a formal method that enables the risks to be documented and maintained throughout the PLC (Patterson & Neailey, 2002). Sufficient supporting procedures like training are desired to ensure that risk players are using the risk register effectively (Ward, 1999). It is argued that the effectiveness of such tool is closely linked to the propensity of risk players to search for information about previous risks, their intuition to perceive possible risk events, and their activity in documenting their own risk remarks (Ward, 1999). The risk register should not only be used as a risk repository but also as a support to evaluate and develop the PRM processes for future project.

Finally, during the structured brainstorming session, the risk players might already give some risk response. These responses should be kept and used later in the response-planning phase.

**Assessment** - The output of the risk identification phase is a list with proper defined risks. The goal of the risk assessment is to pursue the PRM process and thus the risk workshop by prioritizing the identified risk and rank them by order of relevance. Consequently, the assessment of the risks’ probability of occurrence and risk’s potential impact on the project objectives is done by using a double risk matrix including both opportunities and threats (Appendix 5-c). For medium-size projects a five-point scale is recommended for both probability and impact (i.e. very high, high, medium, low, and very low). After the number of scale points is determined, the meaning of each must be agreed. Most of the time the probability will be expressed in terms of percentage ranges while impact terms are defined against each project objectives translating each term into ranges of effects on time, cost, quality, etc. As mentioned by Hillson and Simon (2007), organizations tend to use a common impact scale for their projects while it should be project specific. Each risk only possesses one probability but might have several impacts by influencing several objectives as mentioned in Table 3.1. In this phase it is important to categorize the risk based on the risk breakdown structure (RBS) as it helps to define common causes to several risks. RBS categorization is highly simplified if the RBS was used for the risk identification. The final activity of the workshop is to nominate a risk owner for each
risk. The results of this step are recorded in the project’s risk register.

**Response Planning** - Understanding and defining the risks does not modify them. Designing a risk response is seen as the most important phase, because if well done, it results in minimized threat and maximized opportunity. It is vital for the risk process to move on to action and select an appropriate strategy for each identified risk. There are several responses to be taken depending on treating a threat or an opportunity (Table 3.2). It also important to develop specific actions to be able to fully implement the response strategy and this also implies that each action is assigned to an action owner. In the ATOM, it is advised to carry out the response planning by performing interviews with the risk owners.

- Avoid: involves changing aspects of the project, i.e. the scope, sequence of activities, procurement route so that the threat can no longer influence the project or even occur;
- Exploit: Seizing an opportunity to make sure that it will happen;
- Reduce: Proactive action taken reduce the probability and/or the impact of an event;
- Transfer: A third party takes the responsibility (mostly related to the financial impact of the threat);
- Enhance: Proactive action taken to enhance the probability and impact of the event occurring;
- Accept: a conscious and deliberate decision is taken to retain the threat due to lower cost than taking action. However, the threat should continue to be monitored;
- Reject: a conscious and deliberate decision is taken not to exploit or enhance the opportunity. However, the opportunity should continue to be monitored;
- Share: risk sharing through the formulation of a pain/gain formula, where the parties involved share the gains and the pains.

<table>
<thead>
<tr>
<th>Threat Response</th>
<th>Opportunity responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid</td>
<td>Exploit</td>
</tr>
<tr>
<td>Reduce</td>
<td>Enhance</td>
</tr>
<tr>
<td>Transfer</td>
<td></td>
</tr>
<tr>
<td>Accept</td>
<td>Reject</td>
</tr>
<tr>
<td>Share</td>
<td></td>
</tr>
</tbody>
</table>

*Table 3.2 - Risk response possibilities (OGC, 2009)*

**Reporting** - In order to manage the risk in the best way, it is important to communicate the people who need to have a holistic view the project’s current risk status and give them the information they need to take effective action. Reporting simply combines the outputs from the previous phases into a single risk report. Communicating the right information in the right way guarantees the good functioning of the dynamic nature of PRM.

**Implementation** - The implementation of the actions is done in parallel to the risk response and the reporting phases insuring the process continuity. The goal of the implementation phase is to perform agreed actions and report on their progress but also identify new risk and additional secondary risks that might arise after implementation. The risk register is of course kept up to date.
Review - To make the process efficient and reliable review meetings should regularly be done. The goal of the reviewing phase is to look at the development of the current risks identified during the definition of the project and identify new ones. This phase is also used to update the risk-register and more generally check the effectiveness of the PRM process itself.

Post project Review - This phase aims at capturing and recording risk related knowledge and experience from the completed projects in a form that can be use in a proficient manner for future projects.

In Figure 3.1 is represented the PRM process developed in the ATOM handbook. It shows that risk process is done throughout the PLC and based on the above descriptions that every step is crucial in order to manage efficiently future risky events.

3.1.2.2 PRM, FAILING TO BE A CONTINUOUS PROCESS

PRM would be best applied throughout the PLC as it is a "cyclic process and various risks arise unconsciously during the course of the project" (Thevendran & Mawdesley, 2004) and “more successful projects undertake more RM, and this the earlier in the project” (Elkington & Smallman, 2002). It is essential to recognize that PRM is not static but a dynamic and an on-going process. Therefore, there is a need to constantly try to grasp potential threats and opportunities (Perminova, Gustafsson, & Wikström, 2008). However, although PRM is frequently characterised as a life cycle process (Jaafari, 2001) (PMI, 2004), its implementation shows that risk management "procedures related to forecasting the future are not repeated at each and every stage of the project” (Perminova, Gustafsson, & Wikström, 2008).

Risk identification has been qualified over the years as being a phase of the PRM process having major influence on risk assessment and risk response; but there is too little existing empirical evidence (Chapman, 1998) (Allan & Davis, 2006) (Aritua, Smith, & Bower, 2009). According to Aritua et al. (2011), even if it has been agreed several times that the risk identification phase it too poorly investigated, the bulk of RM research still focuses on investigating the risk assessment and risk response phases. Yet if risks are not properly identified they, by deduction, cannot be analysed and further managed.

For the Construction industry, it was concluded by Van Wyk et al. (2008) that risk identification is more employed than risk response. Lyons and Skitmore (2004) made a survey among senior managers from 200 organizations part of the engineering construction industry that reflected the same outcome. The results describe that risk identification and risk assessment are the most often used phases of the PRM process. Additionally, a study performed by Thevendran and Mawdesley (2004) also found through interviews with construction practitioners that risks are evaluated in the early stages of the project. An earlier study confirms the above results by findings that risk identification was the “best known component” of PRM. However, the researchers also found that its application was relatively low (Uher & Toalkley, 1999). We could therefore imagine that due to a possible lack of relevant theory, PRM process is only carried out in the early stages of the project and that according to Hillson (2002), many companies fail to do the risk monitoring and control. But what is the relevance to assess the risk and plan risk responses if nothing in put into actions?
Figure 3.1 - The PRM process (source: Hillson and Simon, 2007)
The construction industry’s project environment is characterized as being typically exposed to a higher degree of risk (Ping-Tserng, Yin, Dzeng, Wou, Tsai, & Chen, 2009). Under these conditions, those decisions made by the risk players are generally under uncertainty. Accordingly, project performance for the construction projects is subject to a certain amount of risk that make risk players fail to reach the projects’ objectives, especially during the execution phase (Ping-Tserng, Yin, Dzeng, Wou, Tsai, & Chen, 2009).

Summarizing, risk players should carry out the PRM process throughout the PLC in order to fully benefit from it. However, a common source of difficulty in projects is a failure to carry out PRM process thoroughly enough throughout the PLC (Atkinson, Crawford, & Ward, 2006). One of the reasons might be the low integration of the PRM process within the current project management standards.

### 3.1.3 Project Risk Management an Add-In of Project Management

As mentioned by Hillson and Simon (2007), to be fully effective, PRM must be integrated into the overall project management process. It should not be seen as optional practise, only applied to some projects. PRM must be “built-in” in order to assist the organizations to meet the project objectives (Olsson, 2007) (Lehtiranta, Palojärvi, & Huovinen, 2010).

Active research has investigated the methodologies of PRM in order to develop it as a systematic approach and integrated methodology (Del Cano & Pilar de la Cruz, 2002) (Raz & Michael, 2001). However, most of the standards, methods, and project management handbooks include a separate chapter for the topic of risk management as it is in most cases considered as “just another project management technique” (Hillson & Simon, 2007) (Chapman & Ward, 2003). Consequently, its application is in many cases not fully integrated with the overall project management process, but considered as optional and additional.

Some methods try to make PRM an integrated part of the PM practices. Chapman and Ward (2003) describe PRM “as a process that is an add-in to the project management process as a whole rather than an add-on”. However, this approach is not so different from the ones of the other standards and handbooks and does not give the practitioners the correct vision to make PRM an integrated part of their PM practices (Murray-Webster & Pelleginelli, 2010).

Summarizing, for the overall organisation to gain the full benefits from implementing the PRM process, it is significant that PRM should become fully integrated at both operational and strategic levels (Hillson, 2003). In order to achieve this, it is necessary to develop risk-based thinking within the organisational culture, first, by reducing the existing gap between the theory and the practice.

### 3.1.4 The Existing Gap

In construction, the enthusiasm of a new project often brings optimism with a belief that everything will go according to the plan; however construction rarely lives up to this in reality (Thevendran & Mawdesley, 2004) (Hillson, 2006). Often, the expectations of the risk players and
the project outcomes are not aligned because of an existing gap between the theory of how PRM should be applied and the practice (Cooke-Davies, 2005).

Based on detailed examinations, it is pictured that where PRM is implemented, more projects reach the established objectives in comparison to projects where PRM is poorly used (Cooke-Davies, 2005). Although there are many different standards and techniques about PRM available, the extant literature indicates that projects still fail to meet their objectives (Raz & Hillson, 2005). It is argued in the literature that these unsuccessful results are due to low and not effective deployment and implementation of PRM. A study led by the Project Management Institute (PMI) between 1998 and 2003 shows that PRM is the least applied PM practice independent from the industry and the project characteristics (Mullaly, 2006). Many other studies describe the same phenomenon across many different industries (Joustra, 2009). Additionally, in their research, (Ping-Tserng, et al. 2009) demonstrate that a typical problem of implementing PRM in practice consist of an existing dilemma characterized by the poor alignment between the employment of complicated risk analysis techniques and training insufficiency, leading to failed application of those techniques. Therefore, the extant literature confirms the existence of a gap between the theory and the effective application of PRM.

Summarizing, besides all the work achieved to improve PRM, there is still a gap between what is advised by the methods and standards and the implementation thereof. It is also found in the literature that this might be due to a lack of training in what should be achieved to effectively manage project risks. The following part discusses the empirical findings. In part 3.3, we will synthesize both literature findings and empirics and see if there is indeed a gap between the theory and the practice. We will also go further and examine, based on the TSI framework, what is the gap between the theory, the advocated procedures by Organization O, and the reality.

### 3.2 EMPIRICS

PRM is described in the literature as a relevant practice to reach higher project performance. In an organization like Organization O, one could expect the PRM processes to be standardized through the organization and be used to a certain extent by the practitioners. This research, which lies in the field of project management, investigates and analyses the risk maturity PRM level of one section in particular, the PCM section.

Before the analysis (part 3.3), we outline various visions on the essence of PRM related to the current strategic position of the PRM practices, as they appear from the case study. This is crucial because the way PRM is managed in each project by the respective risk players involves specific emphasis on particular features of PRM that influence how the project risks are managed. In other words, comparing the results from the different projects might lead us towards more pertinent recommendations in order to optimize the current strategic position of PRM within PCM. At Organization O the project management practices are based on the PRINCE2 method, as should the PRM processes. Put differently, the “Soll”, what is ought to be, is supposedly aligned
with the aspects of PRINCE2. The gathered empirical data are addressed by reflecting and facing the “Soll” and the “Ist” of the TSI framework in part 3.2.1, part 3.2.2, and part 3.2.3.

3.2.1 WHAT IS PROJECT RISK MANAGEMENT?

The respondents from categories 1 and 2 (Table 2.2) share a broad understanding in regards to what the PRM practices are and the probable value and benefits for the organization. In other words, most of the interviewees see PRM as a tool to meet the objectives of their projects and reach higher success. Yet, specific understanding of the ultimate goal of PRM and the awareness of the underlying incentive of PCM diverged significantly among the respondents. In the followings, the different views regarding the concept of PRM within PCM are described.

In project A, the notion of risk is defined as “threats of succeeding the project” while PRM is seen as a tool that can help “controlling those threats to prevent the project to fail”. It is also characterized as another means to manage the expectations of the project stakeholders. The PRM processes are believed to help the project manager to rely on a more structured approach to manage the projects.

In project B, the project manager defines PRM as a tool that can “structure the approach to risk reduction and help the risk players to be prepared to face all kind of uncertainties during the project”. The motivation from PCM to implement PRM is not clearly understood. However, it is believed that when PRM is properly executed and implemented in the working system, then it becomes beneficial; i.e. it helps the risk players to identify on time unforeseen issues and thus act upon them and be in control of the project.

In project E, PRM is considered as “unavoidable”. A project “cannot be run without PRM; the value is extremely high and important for a project”. The driver of PCM to enhance the PRM processes are described as not being clear but the drivers for the project itself is to focus on time, quality and cost issues.

In project F, the respondent mentioned that there exist no projects without risks. PRM is considered to be a tool “part of project management, which makes it a necessity to be performed”. In the specific case of project F, the fact that this project is a “first-of” it is supposed by the respondent that more risks are to be expected compared with other projects.

In projects C and D, both project manager and risk champion were appointed to the project and their respective views on what is PRM were collected.

In project C, the project manager defines the concept of risk as “a potential situation that might occur and damage the normal execution of the project”. PRM is seen as a tool used to “avoid that there will be surprises later on”. In other words, it forces one to look ahead for potential events that might occur during the execution phase of the project so that one can define counter measures to take action upon them, mainly to avoid over-budget and over time. The value of PRM lies in the enhanced control over the execution phase of the project and the possibility to give project stakeholders reliable insight on project related risks. According to the risk champion, risk is “anything that could happen that one would like to prevent for the success of the project”. PRM is described as a tool that “is necessary in order to realise a project based on its objectives”. The
requirement for PRM is explained through the uniqueness of the projects of Organization O and has to do with project control on all sorts of aspects of the project, e.g. best quality and according to the defined schedule and budget.

In project D, the project manager describes the risk as being the “severeness times the chance that things are going to happen”. PRM is further seen as a tool that helps one “in reaching the goals as agreed upon with the client, looking at quality, time, and budget”. It is also mentioned, "without PRM, you are not in control of your project". PRM is characterized as a dynamic process that needs to be done "every minute of the day". According to the risk champion of project D, risk is about “undesirable event of possible different nature originating from a cause which can happen and have an effect with a certain probability on the project objectives”. PRM is considered by the respondent to be in a way project management "because a project is a unique event with a start and an end and you do everything to maximize its success within the given constrains of time, budget, quality, organization and information"; in other words, PRM helps one to minimize the identified risks. The main motivation for PCM to implement PRM is depicted as being to reach a more standardized approach. In general the value of performing PRM is to maximize the success of the project by motivating choices for decision-making.

On the one hand, the broad picture taken from the categories of respondents 1 and 2 portrays PRM as a tool that helps to control and get prepared to face future threats in a structured way. PRM is qualified as an unavoidable tool to realize projects' objectives by minimizing the impact and probability of possible negative events. The gathered data reflect well the presence of a homogenised agreement around PRM as being a beneficial and essential tool to enhance project success.

On the other hand, the respondents from category 3 give a less cohesive view of PRM processes. From the respondent from project D, PRM is recognized as being very necessary to do and should become a common practice. From project C, one respondent did not experienced PRM as "a tool that help a great deal on the job itself" and further mentioned that “the processes in place were random and not aligned with what was happening”. The second interviewee of project C believed that the way he experienced PRM during the project had a really positive influence on its success. One respondent of project E sees PRM as becoming a more and more important aspect of project management while the other respondent of the same project did not have any knowledge about risk management. Thus we establish that even in the same project some risk players own different knowledge and share different views on what are the benefits of managing project risks.

Overall, a divergence among the respondents in regards to the definition of PRM is recognized. This divergence could mirror the current PRM practices within PCM where no explicit standardized approach is available for use, as we will see in part 3.2.2. Furthermore, there is a general lack of understanding about the motivation of PCM to implement PRM processes. Different definitions and therefore different views on what is PRM are observed among the three categories of respondents. This can be associated to some respondents having more knowledge than others (i.e. categories 1 and 2) about the PRM processes and their related benefits, probably due to more expertize and experience in practice.
3.2.1.1 **The Two Sided Nature of Risk**

As we have seen in the theory, risk should be characterized as either a threat to the project or an opportunity. From the data collected from the interviews it is clear that the existing procedure at Organization O does not relate to the standardized upside risk management. One respondent from project C said: "we have our hands already full of negatives risks" meaning that opportunity risk would be seen as an additional workload. Further, none of the respondents defined PRM as a practice used to minimize threats and maximize opportunities (part 3.2.1). But the respondent of project E characterized taking advantage of opportunities as common sense, because every project manager tends to automatically do it.

However, after asking a specific question regarding up-side risk, some of the respondents (project C, D, E, and F) knew the notion from the theory; the latest version of PRINCE2 uses this two-sided nature of risk as well. Besides the understandable idea that conscientious project managers are always looking for opportunities to improve their project, we believe that making this explicitly part of standardized PRM processes would enhance the capability of spotting more of them in a more effective way. However, nothing related to upside risk is currently referenced in PCM’s PRM procedures and therefore nothing is reflected in practice yet.

Overall, the respondents are divided in two groups:

- The risk players who have heard about it and do not implement it in the PRM processes;
- The risk players who did not hear about it before.

Besides the reduced knowledge measured from the interviews, one of the reasons why opportunity risk is not done in practice might be closely related to the fact that the documentation of PCM does not relate to the possibility of managing opportunities. This is believed to be self related to a low integration of the PRM processes within Organization O engendering a low scalability and continuity of the processes.

3.2.2 **Towards Scalable and Continuous PRM Processes**

As mentioned earlier, Organization O looked into the benefits of standardizing its PRM processes in the year 2007. Beforehand, Organization O had no processes in place to manage the project risks in a standardized manner. Although the current approach to PM and thus PRM are based on the PRINCE2 method and some efforts have been dedicated during the past four years to better integrate it into the PM practices, no significant results have been assessed. This statement is based on the analysis of the internal documentation of the PCM section, observations, and interviews that were performed during the case study.

It emerges from the six different projects that diverse processes are more or less followed in order to manage project risks. As mentioned by the respondent from project B, "the project management skills within PCM are very wide but every body does it in his/her own way; there is no one PCM way, there are approximately 40 project managers, therefore, there are approximately 40 ways to execute PRM". Another interviewee from project E stated that there are "too many loose individuals with their own views and personality, and thus PRM differs heavily from one project to
another”. Put differently, project managers from PCM have a different approach to perform PRM, reflecting thus unstandardized processes. Paradoxically, PRINCE2 was chosen a few years back as the method to become the unique standard within PCM to be used by all the project managers in order to manage their projects and by deduction their project risks.

3.2.2.1 Standardized Approach to Project Risk Management

The PRINCE2 standard for managing project risk is based on the M_o_R methodology and recognizes risk as a major component to be considered during the management of a project. M_o_R principles are intended to help organizations implement an effective framework for taking informed decisions about the risks that affect their performance objectives across all organizational activities. Moreover, M_o_R principles are not intended to be prescriptive but provide supportive guidance to enable organizations to develop their own polices, processes, and strategies to meet specific needs (OGC, 2007).

Within PCM, most of the project managers are PRINCE2 certified and thus understand the utility of such method and should be able to use it in practice. In regards to this method and the related proposed framework to perform project management, several respondents agreed that it is a “big improvement compared to what was done in the past” at Organization O. There is a general agreement among the respondents surrounding the positive influence of such method on the PM practices. The interviewees from the three categories (Table 2.2) see in PRINCE2 some concrete benefits and one respondent even describes it as “absolutely necessary for any engineering organizations”. Several aspects of PRINCE2 related to PRM mentioned by the respondents of the six projects are:

- The role played by the project board, as an essential support for the project manager (as perceived in project C, project D, project E, project F);
- The involvement of the client in the project, which make them part and responsible for some areas of the project (as perceived in project C, project D, project E, project F);
- Good overview of the status of the project and share it with the project stakeholders (as perceived in project C);
- The uniformity of language among the project stakeholders (as perceived in project C);
- It is not only about listing the risks, one takes action upon the risks in a proactive manner; PRINCE2 integrates the risk action (as perceived in project D).

However, the category 3 respondent of project D depicts PRINCE2 as being a really proficient method but that he does not have much experience with it yet. As perceived in projects B and D, PRINCE2 should be implemented at all the other levels of the organization in order to make it efficient at the PCM level in regards to PRM. Further, it was also mentioned by several interviewees that it is just another “management tool like many other existing methods” (as perceived in project A, project D) and project managers from PCM “tend to focus too much on the theoretical part rather than the idea of how project management should be done” (as perceived in project E). Additionally, for managing project risks that are considered to be new, Prince 2 has “insufficient documentation and it is not properly described” (as perceived in Project C). According to the respondent of project B, there is still some room for improvement at PCM, because “nothing is really done about PRM and there is a lack of tools and techniques available”.


Overall, there is a broad agreement about the utility of using a standardized approach to manage projects and the related risks (i.e. PRINCE2) but it seems that much still needs to be achieved at Organization O. It would be interesting to understand better what sort of benefits would a standardized method offer to the practitioners. In the followings paragraphs the notion of scalability (part 3.2.2.2) and the concept of continuous processes throughout the PLC (part 3.2.2.3) are discussed.

### 3.2.2.2 Scalability of PRM

No two projects are the same in regards to their schedule, budget, complexity, and size. Some projects are following a well-understood routine (e.g. project A) while others are totally innovative (e.g. Project F). Therefore a scalable method to implement PRM could be considered necessary and some of the respondents openly mentioned it during the interviews. The notion of scalability should be understood as the broadening of the beforehand-standardized tools and techniques in order to make them project-specific. In other words, scalability is qualified as something that can only originate from an existing proven approach, on which some developments are added, transformed, enhanced.

In March 2009, some more detailed work has been performed in regards to what should the PRM processes be within PCM. The management team of PCM asked the different work groups to find a possible and pragmatic way to implement PRM based on the PRINCE2 methodology. In regards to the notion of scalability a table was issued (Table 3.3).

<table>
<thead>
<tr>
<th>PRM processes</th>
<th>Implemented by</th>
<th>Accountable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business case</td>
<td>Project</td>
<td>Business case</td>
</tr>
<tr>
<td>Large Projects</td>
<td>&gt;20 M€</td>
<td>xx PRA's</td>
</tr>
<tr>
<td>Medium Projects</td>
<td>2 - 20 M€</td>
<td>&gt; 1 PRA</td>
</tr>
<tr>
<td>Small Projects</td>
<td>&lt; 2 M€</td>
<td>Not really necessary</td>
</tr>
</tbody>
</table>

*PRA – project risk sessions; / stands for “possible involvement of”*

**Table 3.3 – Scalable approach of PCM’s PRM processes** (source: Organization O documentation)

In Table 3.3 the PRM processes, responsibility for implementation, and accountability are differentiated in terms of business case and project. Three categories of project are defined only based on the project budget, large, medium, and small. Depending on the size of the project, the PRM method, the responsibility for implementing the PRM processes, and the accountability are different. For instance, for medium projects the implantation of PRM practices should be done by a risk champion (facilitator), while in large project some support from an external organization specialized in risk management could be required.

During the interviews, no specific questions were asked in regard to the notion of scalability. Yet, it was mentioned a few times by some respondents that for smaller projects it might not be necessary to go to deep in the details of PRM. According to one respondent of project C, *"if it is a..."*
simple project, perhaps one should not do too much about it, as it might be a waste of time". Another comment that was made by respondents of projects C and D was that PRM seems more integrated in bigger projects where more attention to risks is given. But as we have seen in the theory for each project, PRM should be performed. This could be possible in case some scalable tools and techniques would be available.

The concept of scalability refers to the type of tools and techniques used to manage the project risks. Even though PRINCE2 is a process-based approach that is quite flexible method for the management of all types of projects, the small amount of tools and techniques available within PCM do not show any signs of scalability. In this respect it was observed that the two different risk registers proposed within PCM were not adapted because, either too complex or too vague. For instance, projects B, C and D use the same risk register, but the impact scales of the risk matrix used to rank the risks are the same for all three projects. Hence, it is induce that the small amount of tools and techniques used within PCM are not defined as project-specific and are thus not scaled. Regarding the techniques, no meeting is carried out at the beginning of the PLC in order to size the projects and determine the appropriate level of risk process.

Although the notion of scalability is well recognized among the respondents, nothing such as scalable processes is developed in the guidelines and applied in practice at PCM. As it will be presented in Chapter 4, most of the project risks are managed following different and informal approaches. As mentioned in the introduction of part 3.2.2, all the projects follow different PRM approaches. However, this is not assessed as scalability but more as a random set of processes. Put differently, these approaches do not diverge due to a specific scalable set of tools and techniques but are just the reflection of an unstandardized set of PRM processes hardly carried out throughout the life cycle of the projects.

**3.2.2.3 Continuity of the PRM Processes**

According to some PCM documentation dating from 2007 and PCM chosen project management standard, PRINCE2, PRM should be carried out continuously throughout the PLC. The PRINCE2 method advises to design a Risk Management Strategy from the beginning of the front-end phase (Figure 3.1) as well as starting a risk register (Appendix 5-c) and include in the Project Initiation Documentation\(^3\) (PID). From what has been assessed from the case study, not much is said about a Risk Management Strategy. At most, a few lines about some identified risks are written down in the PID but nothing regarding the roles, tools, techniques, etc. is mentioned. The PRINCE2 method also advocates to continuously review the identified risks through the PLC and proposes much more information that could help PCM to design a standardized approach to manage project risks.

Based on the case study, although most of the respondents agree that PRM is a dynamic set of processes that should be performed continuously through the PLC, most of the PRM processes started late in the front-end phase or even at the beginning of the execution phase and kind of faded away during the project. In this respect, it is observed that in some of the projects nothing is concretely done to track the identified risks throughout the PLC; i.e. no risk register are used

\(^3\) Logical set of documents that brings together the key information needed to start the project on a sound basis and that conveys the information to all concerned with the project.
and/or a small amount of risk sessions or review meetings are organized. Furthermore, for all the projects no initiation meeting is organized in order to design a Risk Management Strategy and no post-project reviews are performed to capture and record risk-related knowledge and experience (Chapter 4).

In project A, the identification of the risks started late, just a few weeks before the execution phase. The project manager himself recognizes that in order to receive full benefits from the PRM processes, it should be done at the beginning of the project. After the first risk session, Similarly to project E, a self-made risk register was designed in order to keep track of the identified risks. Another risk session was carried out later on to discuss the evolution of the identified risks. However, during the execution phase of the project no risk sessions were organized. The top five risks were monitored through the PLC and many other risks were identified but no actions were specifically taken to mitigate them.

In project C, due to big budget and planning related problems that originated from unmitigated risks, an external consultant organization, DP, specialized in risk management, organized and led the PRM approach seconded by the project manager and the appointed risk champion. The DP method was introduced to be sure not to fail the project. The risk specialists entered the project during the execution phase, which was according to the risk player “a bit too late”. Therefore, the entire concept and front-end phases were skipped. DP has the experience on how to arrange the process for the risk sessions and which people should be available. In this project specific sessions were carried out with relevant members from the project team and the client to identify the risks. Further, a new risk register was designed (one of the two currently available on the quality system4 of PCM). The execution phase of the project was divided in three steps aligned with three maintenance stops. For each stop risk sessions were used to identify the risks that could occur. At the second stop, a deep investigation took place. Many risks were identified and many actions were drawn upon them. Yet, 60 to 70 % of the risks still occurred. This is the best example that PRM could be very fruitful if the risk players would not skip the step between response planning and implementation. According to the risk champion, “the last chain was missing”. Based on the experience gathered from the second step, the responses were well implemented and the last and third step was described as a success.

The project F started at a late stage at Organization O. Organization O, on this project is part of a consortium and another member of consortium X had already gone through the concept and big part of the front end phases. As mentioned by the project manager of project F, there is a significant lack of knowledge from the early stages of the project and much work had to be done again. No specific risk register was used for this project and no specific meetings to talk about risks were held. The project manager kept track of the risk on a personal document. Only when approaching the commissioning phase of the PLC some more attention was given to the PRM processes in order to ensure that the work that had been done met the requirements in order to be hand-over to the R&D department of Organization O, internal representative of the consortium X.

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4 Digital database where knowledge is shared
In project B, the situation is quite unique in comparison to the other projects. Besides that the project is still waiting for approval, a new project manager became in charge of the project during the front-end phase. The former project manager started a risk register based on the one available within PCM quality system developed by DP. However, the current project manager does not make use of it. Hence, the identified risks are not being updated and a general follow up on the action plan is missing. Since the new project manager took the lead of the project, no risk sessions have been organized.

Projects D, E are quite specific. Both business cases originate from a fire incident, one for renovation and the other one for optimization (debottlenecking). These projects are atypical, which implies that the risk management also started late, during the front-end phase. Due to a tight schedule the execution phase started quite fast.

In the case of the project D, similarly to project C, the risk register developed by DP was used. The risk register was developed in regards to the specificity of the project after the first risk session under the directive of a risk champion. The risk register is seen “as an integral part of the project initiation documents” as it helps to assess the gain and what are the chances of success. Risk responses have been designed and further implemented. The risk register was up-dated but too less times and tended to lag behind and no more risk sessions or review meetings were hold during the execution phase. A remark made by a category 3 respondent was that the periodicity of the PRM status up-date was too long (~2 months) and that it was difficult for the project team to follow the evolution of the processes. The main reason given by the risk champion was linked to “the kind of project and its hectic beginning”. Another reason might be linked to the conviction of the project manager that “from the moment you have the contract signed, scope and organization is in place, the budget is defined and assigned, then there are risks but they become minor risks, day to day risk management”. In other words, the main purpose of the risk analyses is characterized as making sure that all possible issues and probable risks are taken into the consideration before the project execution. After the project contract is sealed, risk analyses have only a subsidiary role.

The project E already started before that the project manager was assigned. According to the project manager of project E, “management of risk starts from day one”. Similarly to project A, a tailor-made risk register is available. Further no specific risk sessions were organized; the risks were monitored in a more or less informal way. Due to the time constrain of the project, the front-end phase and the execution phase were carried out in parallel.

Overall, the respondents agree that starting the PRM processes as early as possible in the project would be more beneficial as well as performing PRM continuously through the different stages of the PLC:

- “PRM is important at the initiation phase because in this phase of the project some alternatives can be explored” (project C)
- “The biggest influence you have in the project is at the beginning where you can have the most influence for the lowest cost. The choices made in the beginning impact the future of the project” (project D)
“In the beginning it is the most important to communicate about risks because then you are in a phase where the risks might start to develop” (project F)

However, the broad understanding of implementing PRM early is not well reflected in practice. In Figure 3.2 is schematized the start of the PRM processes during the PLC for every project.

![Figure 3.2 – Start of the PRM processes during the project life cycle](image)

Furthermore, it is reflected in the empirics that besides starting the processes late, the importance of using the proven tools is not so well reflected in all the projects. It is first assessed that not all the respondents seem to consider the risk register as an efficient tool to dynamically manage the project risks. Project A and E make use of a tailor-made risk register while only projects B, C and D make use of the risk register developed by DP and proposed by Organization O. Using this specific risk register seems to help the risk players to [1] identify and categorize properly the risks and in some cases appoint risk owners, to [2] categorize and rank the risks based on a four-point risk matrix, to [3] design risk responses but does not allow to formally appoint action owners, and to a reduced extent [4] track the risks through the project. Second, based on the risk registers that were provided when available by the project managers of each project, the observations of some risk sessions (projects A and D), and the interviews, we recognize that the way of identifying the risks could be improved. This is acknowledged as a lack of knowledge about PRM and as mentioned by the risk champion of project D, “risk players tend to mix up cause and effect, the definition of risk is not understood by everyone and originates from a semantic problem”.

Although it is difficult to judge all the projects on the same level due to their uniqueness and also due to the different origins of the business case, it is concluded, after analysis of the data and based on some conclusive observations, that the majority of the projects do not carry the PRM processes effectively throughout the PLC. Some common reasons that were found are:

- No standardized processes in the organization ready for use through the PLC;
- No project-specific tools and techniques and risk players show difficulties using them;
- Poor implementation of the tools and techniques to manage PRM;
- The interest of the project managers
- Good theoretical knowledge of the risk players but present insufficient experience in practice;
- Difficult project environment leading to tight schedule;
- Urgency linked to unexpected events that influencing the project life cycle of projects.
Finally, according to the above descriptions of the PRM processes of the six different projects, it is supposed that due to a lack of standardization and structure in the approach to manage project risks and a possible lack of practice or training and interest from the risk players, most of the projects do not experience continuous PRM processes throughout the project life cycle. Though, it is believed that if the PRM processes would be better integrated into the PM practices of the PCM section, the scalability as well as the continuity of the processes could be enhanced.

3.2.3 Level of integration of the PRM processes

From what can be observed on the quality system of and the amount of data available at the PCM section, we cannot qualify the PRM processes to be an add-in of the general project management processes in place. If we look at the total picture of what has been said during the interviews regarding the integration level of PRM, all the respondents without any exceptions agreed that PRM is not yet an integral component of the PCM’s project management practices. As mentioned by the project manager of project B, for now the PRM processes are only effort, cost and time. Additionally, he also said, "PRM should be implemented in the working practices and should not be a stand-alone issue". For instance if we look at the Project Initiation Documentation we see that PRM is not integrated as one of the important issues but just briefly mentioned.

From what has been said so far, it is assumed that in order to obtain continuous PRM processes throughout the life cycle of all the projects (i.e. scalable due to projects’ uniqueness) the PRM processes need to be integrated within the project management practices of the PCM section. Further, it is assumed that the first action to be taken in order to integrate the PRM processes within the PM practices would be to implement flexible enough standardized processes, which by definition encompass flexible standardized tools and techniques (Figure 3.3). Finally, it is supposed that implementing standardized processes would help the organization to optimize its PRM practices on the short-term and to scale them in order to maintain the momentum of the optimization process on the long-term as it will be clearly stated in Chapter 6.

![Diagram](source: author)
### 3.2.4 Summary

In Table 3.4, the empirics described in part 3.2 are summarized respectively for the six different projects:

<table>
<thead>
<tr>
<th>What is PRM? ... A tool that...</th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
<th>Project D</th>
<th>Project E</th>
<th>Project F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helps controlling the threats to prevent the project to fail</td>
<td>“Structures the approach to risk reduction and help the risk players to be prepared to face all kind of uncertainties during the project”</td>
<td>“Is used to avoid that there will be surprises later on; It is necessary in order to realise a project based on its objectives”.</td>
<td>“Helps one in reaching the goals as agreed upon with the client, looking at quality, time, and budget”.</td>
<td>“Is unavoidable! A project cannot be run without PRM; the value is extremely high and important for a project”</td>
<td>“Is part of project management, which makes it a necessity to be performed”</td>
<td></td>
</tr>
</tbody>
</table>

None of the respondents define PRM as a set of processes that could equally help to manage threat and opportunities.

<table>
<thead>
<tr>
<th>Standardized approach</th>
<th>Tailor-made risk register</th>
<th>DP risk register</th>
<th>DP risk register</th>
<th>DP risk register</th>
<th>Tailor-made risk register</th>
<th>Personal register</th>
</tr>
</thead>
</table>

No standardized approach to manage project risks is in place within PCM. But a broad agreement on the effectiveness of PRINCE2 is shared among the respondents of the six projects.

In all the projects a highlight report\(^5\) is used as the only formal tool to exchange about the project progress. Only few lines are dedicated to PRM.

<table>
<thead>
<tr>
<th>Continuous (Start of the PMR)</th>
<th>Late in the front-end phase</th>
<th>Stopped during the front-end phase</th>
<th>Late in the execution phase</th>
<th>Late front-end phase beginning execution phase</th>
<th>Late front-end phase beginning execution phase</th>
<th>During front end</th>
</tr>
</thead>
</table>

No initiation meeting and no post-project review are carried out in any of the six projects. In general the processes are not carried out throughout the project life cycle.

<table>
<thead>
<tr>
<th>Scalable</th>
<th>Some concerns, but in general nothing is either thoroughly proposed in the guidelines of Organization O or implemented in practice.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Integrated</th>
<th>The PRM processes diverge from every project and there is a broad agreement among the respondents that PRM in not integrated in the PM practices of PCM</th>
</tr>
</thead>
</table>

\(^5\) In PRINCE2 language it is a time driven report from the project manager to the project board on stage progress
3.3 **Analysis**

While in part 3.2 the gathered data from the six different projects that relate to the current position of the PRM were confronted, the intention of this part is to analyse all the results, and provide critical reflection and comparison to the literature.

As for the starting point, what is observed is a broad agreement among the interviewed practitioners regarding the utility and the likely benefits that PRM could deliver to a project. Nevertheless, the different views on PRM diverge to a certain degree from one respondent to another. These findings are broadly consistent with the body of literature as outlined in part 2.1.3, where it is mentioned that project risk is a very subjective notion (Hall & Hullet, 2002) and the perception of a risk’s consequences diverges depending on who looks at it. Furthermore, there is a lack of knowledge in regards to the new way of defining project risk as mentioned in part 3.1.1. Respondents only refer to project risk as being a threat to the project objectives. Moreover, this is not aligned with the PRINCE2 method and the extant theory, which clearly define project risk as being either a threat or an opportunity. The benefits of encompassing both sides of risks in the PRM processes are recognized by most of the scholars and practitioners and is mentioned in part 3.1.1.

Based on the empirical data, it is judged that the diversity of PRM processes attributed to projects is high. Although in the extant literature it is advised to align the tools and techniques and standardized the processes through the organization to reach higher project performance (part 3.1.2), it is pictured that there are as many PRM approaches in practice as project managers within PCM. Projects A, B, C, D, E and F, all follow a different pattern with dissimilar tools and techniques to manage their project risks (e.g. different risk register). Therefore, there exists no standardized PRM approach in place within Organization O and the appraised difference of PRM approaches is not due to the presence of scalable processes. The PRINCE2 method is proposed but nothing has really been developed yet in relation to PRM. If we look at what the PRM processes proposed by the ATOM methodology is, what PCM proposed and what happens in practice, there is a well pronounced divergence among the three.

Further to a poor standardization of the PRM processes within PCM, it is assessed that the level of project risk management in practice is in general insufficient. In the theory, it is mentioned that there exist a gap between the theoretical knowledge of what PRM is and the practical knowledge of how to implement PRM (part 3.1.4). In the case of the PCM section this gap is identified. Put differently, if we look at all the respondents, there is a certain quantity of theoretical knowledge on risk management available within the PCM section, surely due to the PRINCE2 certification owned by most of the project managers and a common knowledge on PM. Yet not much of it is identified in practice. Nevertheless, it is important to differentiate the size of the gap among the different projects. According to the best practices, some projects undertake more formal PRM (projects C and D) than other (projects A, B); while some do not implement any formal approach (projects E and F) as it will be more elaborated in Chapter 4. This is assumed to be related to the presence of a risk champion who facilitates the PRM processes. In addition, it is relevant to differentiate projects like projects D and E that originated from an unexpected event.
(fire) from the others. In the case of the other projects (i.e. with a proper concept phase), PRM should be implemented as soon as possible with writing the Risk Management Strategy at beginning of the front- end phase.

In order to manage risk correctly during the entire project, several steps should be followed as mentioned in the theory part 3.1.2. It is noticed in practice that none of the projects follow all the advocated steps. For instance, at the beginning of the project no initiation meeting is organized in order to develop the Risk Management Strategy. Yet, the related influence of starting early can help to influence more aspects of a project at lower cost as recognised by a respondent of project D. This is explained in Figure 3.4, where the influence over the cost is represented in function of the time. Acting as early as possible could help to define the budget better as well as foreseeing more project risks and have more time to design proper action plans.

\[ \text{Figure 3.4 - Influence of the cost and schedule in function of the project life cycle} \]

In addition, some projects do not organize risk sessions or review meetings (projects E and F), or did but stopped to do it before or during the execution phase (projects A, B, and D). Some projects organize review meetings but in small amount limiting thus the awareness among the risk players (project C, D). This could be qualified as scalable processes. Yet, it is important to make the difference between skipping what is recognized in the literature as being a necessary part of the PRM processes (i.e. essential applicability) and the scalability, which is to adapt the steps to make them project-specific. In project C, the risk sessions were planned based on an atypical execution phase (based on three maintenance stops); the risk session were planned and monitored by risk specialists, thus it is supposed that the processes were sound. However, identifying the risks and designing risk responses were seemingly not sufficient and risk players should be aware that the implementation of the risk response should not be underestimated as mentioned in part 3.1.2.2. Hence, one should not skip any of the recognized steps if one wants to perform effective PRM throughout the PLC and make effective use of the lessons learned, as we
will see in Chapter 4. However, depending on the project, the applicability of each step should be more or less developed to meet the intrinsic characteristics of the considered project. This notion is called scalability.

As we have seen in the literature, in order to optimize the PRM processes throughout the project life cycle, the notion of scalability needs to be understood and further applied to use the right tools and processes aligned with the right project. In fact the study carried out by (Raz, Shenhar, & Dvir, 2002) revealed that even if all the projects are risky, risk management techniques are mostly applied to highly uncertain and more risky projects. However, they also claimed in their findings that awareness to PRM should not be limited to high-risk projects, as less risky-projects also tend to fail and could thus benefit from the attention and routine application of PRM techniques and procedures. In this regard, PRINCE2 is quite flexible but does not offer any support to perform scalable PRM, whilst the ATOM proposes a clear approach and nicely differentiate small, medium, and large projects. ATOM is not considered to be a standard, but it is a practical methodology describing how to do risk management for a real project, and propose enough details to support practical implementation including scalability of the processes. The Table 3.3, developed by the management team of PCM presents a scalable approach, but only relies on the budget to size a project. However, the table presented in Appendix 1 is more relevant because it integrates more aspects that really characterize a project. Accordingly with the ATOM, it is also mentioned in this table that for medium projects a risk manager should be appointed. Yet, in practice only one third of the medium projects part of the case study made use of such individual. Furthermore, it was noted from the interviews that the respondents believe in more effective implementation of the PRM processes if scalable. In fact, the concept of scalable PRM processes is relevant for PCM because not only medium projects are carried out. In this case study, only medium cases were selected, but there are hundreds of smaller projects currently running and sometimes, large projects are also undertaken. If scalable processes could become an inherent part of the standardized processes, it is assumed that PRM could be effectively applied in all the projects. Yet at the moment nothing is observed in practice in regards to scalability.

Whilst the ATOM presents PRM as a set of well-documented processes, we found out that the number of documents to support PRM processes is quite poor within the PCM section. The PRINCE2 method is implemented for managing projects but nothing really relevant is shared on the quality system to manage project risks. Two different risk registers can be found. The fact that two risk registers are available already shows an issue of standardization. Additionally, both are hardly used within the section. The only formal document that is used to communicate about risk between the project board and the project manager is a highlight report where a few lines are dedicated to the project related risks. However, it is clearly mentioned in the literature (part 3.1.3) that PRM should be an add-in of the PM practices and not an add-on. Yet, regarding the agreement from the respondents and based on the general knowledge gathered during the case study, the PCM’s PRM practices are not integrated into the project management framework in place.
3.4 CONCLUSIONS

Although each project is by definition unique, some general conclusions about the current strategic position of the PRM processes at the PCM section can be derived to design some pre-recommendations.

If we characterize the strategic position of PRM processes as being integrated into the PM practices of an organization with both continuous and scalable capabilities then we can conclude that the position of PCM’s PRM processes is far from being strategic and much work needs to be carried out. This section will reflect the partial position of PCM on the RMM framework and develop the pre-recommendation.

Base on the analysis of the empirical data part 3.3, we are now going to benchmark PCM’s current strategic PRM practices position with the Risk Maturity framework (part 1.2 and Appendix 6). The relevancy of doing such benchmark is to situate based on a professional framework where Organization O’s PRM practices are situated. Further, it is of great assistance to define some appropriate recommendations that could help PCM going further with the PRM processes. More concretely it could help the PCM section to reach the next level of the RM framework.

3.4.1 BENCHMARK WITH THE RISK MATURITY FRAMEWORK

Summarizing the data analysed in part 3.3, general aspects related to the current strategic position of the PRM processes are defined:

I. **Broad understanding** among the interviewed practitioners regarding the utility and the likely benefits that PRM could deliver to a project but lack of knowledge in regards to the new way of defining project risk (i.e. threat and opportunity);

II. No **standardized** approach to deal with project risks is defined within PCM (i.e. the PRINCE2 method is implemented for managing projects but no relevant documentation is shared on the quality system);

III. Unstandardized and poorly used **PRM tools and techniques**;

IV. In practice some PRM is performed but none of the projects follow all the steps advocated in the ATOM (i.e. no **continuous processes**);

V. Nothing is observed in practice in regards to **scalability**. The difference of PRM approaches assessed among the different cases only reflects a random application of some tools and techniques;

VI. The PCM’s PRM practices are **not integrated** into the PM framework in place.

The Risk Maturity framework described briefly in part 1.2 and extensively in Appendix 6 is used. In the RM framework, some specific and generic attributes from the level 2 and level 3 can be correlated with the strategic position of the PRM processes in order to reflect the current maturity level of the PCM section. Focusing on higher levels (4 to 6) of the framework to benchmark the maturity level is not necessary based on the broad picture given by the case study. In Table 3.5 the findings from the cases are faced with the attributes.
<table>
<thead>
<tr>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Foreseeable threats likely to impact on projects</td>
<td>Different projects manage risk in different ways</td>
</tr>
<tr>
<td></td>
<td>Plans exist but are not underpinned by consistent development methodology, yet may still be effective locally</td>
</tr>
<tr>
<td></td>
<td>Estimation is more “guesstimation” and does not use standard techniques</td>
</tr>
<tr>
<td>II. Some information available but is outdated, unstructured and dispersed</td>
<td>Risk register based on an organizational template may be used</td>
</tr>
<tr>
<td>III. Some risks may be identified and associated with particular projects, but are not described or registered consistently, and there will be little, if anything, in terms of an effective risk management process</td>
<td>Risk management not aligned with other project life cycle activities</td>
</tr>
<tr>
<td></td>
<td>Local reviews, with some corrective actions undertaken within the group</td>
</tr>
<tr>
<td>IV. Risks unlikely to be tracked or re-assessed during project life cycle</td>
<td>Risk identification likely to be a one-off activity</td>
</tr>
<tr>
<td>Planning, if any, likely to be an initial activity</td>
<td>Risk response strategies and plans are likely to have been ineffective in the past</td>
</tr>
<tr>
<td>V.</td>
<td>Some projects recognize different categories of risk (e.g. distinguishing between project and operational risks)</td>
</tr>
<tr>
<td></td>
<td>Inconsistency of approach to the assessment of risks</td>
</tr>
<tr>
<td>VI. Risk identification likely to be a one-off activity</td>
<td>Risk management not aligned with other project life cycle activities</td>
</tr>
</tbody>
</table>

Table 3.5 – Level 2 and level 3 of the Risk Maturity framework for the current position of PRM

Based on Table 3.5, it can be confirmed that looking at the level 4 is neither necessary nor relevant because the general aspects found in the case study are reflected with the attributes of level 2 and level 3 of the framework. It is therefore assessed that the risk maturity level lies between the level 2 and level 3 but shifting towards level 3.

### 3.4.2 Pre-recommendations

In part 3.4.1, it has been evaluated that the risk maturity model of the PCM section is evolving between the level 2 and the level 3. Some pre-recommendations are described below. These pre-recommendations will further be correlated in the Synthesis Chapter with the ones of Chapter 4 and Chapter 5.

As it has been evaluated, there is a broad knowledge within PCM but dispersed over the entire section. Consequently some knowledge is there but should be centralized and should hence be brought together. However the knowledge is not entirely reflecting the current broad definition
of PRM where risk is defined as threat and opportunity (Appendix 2). Integrating the two-sided nature of risk could enhance the PRM processes and thus increase projects’ success. But before speaking about the two-sided nature of risk much must be done.

It assessed that among the six projects the PRM processes are too disconnected from the other PM practices. This creates according to the literature an artificial and ineffective activity, which rather than being a support for decision becomes a sort of audit activity. Consequently, the PCM section must integrate the PRM processes into the PM practices as part of the day-to-day job. In order to make PRM an integrated part of the PM practices, it is supposed that the organization should begin on the short-term with standardizing the processes (i.e. tools and techniques). At the moment the PRINCE2 method is used for managing project. This method also proposes a standardized approach for managing project risks. Some of the factors advocated by the method are to some extent used in practice but not in all the projects (e.g. risk register, review meetings, etc.). Therefore, the method should be looked into in more details in order to fully grasp its essence and understand how, when, which proven tools and techniques must be used and by whom. For instance the need to use a complete risk register in order to identify, categorize, rank, mitigate, and track the project risks throughout the PLC is crucial and should be used in every project. However, it is essential to grasp that the supposed beneficial influence of using standardized processes on won’t be sufficient on the medium and long terms and that the applicability of the processes should be understood through the notion scalability.

Further, to be able to choose “how much” PRM should be done for a specific project the notion of scalability must be considered. As previously mentioned, the notion of scalability is understood as the broadening of the beforehand-standardized tools and techniques in order to make them project-specific. In other words, scalability can only originate from an existing proven approach on which some developments are added, transformed, enhanced. Coupling standardized processes with a flexible and standardized method based on PRINCE2 would help to design scalable processes. Having a scalable standardized approach is necessary to use the right proven tools and techniques for the right project. The ATOM methodology provides the practitioners with great insights into the scalability of the PRM processes. Therefore, considering looking further than PRINCE2 could be beneficial.

With the growing size and complexity of today’s projects, the continuous and systematic management of project risks has become increasingly important. The PRINCE2 method is recognized as being quite flexible, which means that besides looking at what is advocated within, some complementary relevant actions mentioned in other handbooks or standards could be added. For instance, in order to manage project risks more effectively throughout the entire life cycle, the ATOM methodology advocates more explicit actions like planning post-project review or appointing a risk champion for medium and large projects. Once more, looking further than PRINCE2 could help enhancing the PRM processes.

In order to make the PRM processes continuous, they should first start at the beginning of the front-end phase with a Risk Management Strategy part of the Project Initiation Documentation. This strategy would allow the project stakeholders to clearly describe for instance the goals of applying PRM, define the roles and responsibilities, chose the tools and techniques that will be sued. Making it clear for all the risk players what is going to happen, how it going to be achieved,
and by whom should also make them more involved. When the strategy is known, a structured risk workshop should take place to start the identification process, followed by the assessment, the response planning, and the implementation. It is essential to continuously report and review the processes. At the end of the project a post-project review is also important in order to analyse what could be done better next time and thereof continuously improve the processes.

It is assumed that the project manager should be the owner of the processes (with some support from a risk champion when projects are medium or bigger). Therefore they should have some specific knowledge in order to formally manage the project risks. Specific training could be provided in order to train key players. As mentioned in the literature doing effective PRM is both relevant and beneficial for an organization because of the formal methodology and procedure making the PRM better structured for day-to-day decision-making, the added value of reducing a possible threat and increasing a possible opportunity, the forward looking which helps to avoid for instance costly and delayed performance, and the more constrained project environment.

If it is considered that implementing standardized processes will help on the short-term to optimize PRM in practice; it is further supposed that implementing them alone will not be enough. Embedding the PRM processes within the current PM practices in order to reach effective PRM processes requires the involvement of the likely risk players as well as possible guidance of internal and / or external experience in the field of PRM. Put differently, in order to use the tools and techniques in a scalable manner, effectively and continuously through the project, the involvement of the risk players must be considered. Effective PRM is not only about using the right tools and techniques, but also about involving the right people within the process and dividing clear roles and responsibilities for the efficient organization of PRM. Improving PRM effectiveness therefore requires the development of a comprehensive framework to fit specific roles and responsibilities for managing project risks to the project's organizational context. This is pictured in Figure 3.5. In the following Chapter we are going to look at several aspects linked to the involvement of the risk players and see that there is a close relation between the processes used and the roles and responsibilities, formal and informal behaviour, proactive and reactive approach, and ignorance of the risk players.

Figure 3.5 – Requirement of the risk players’ involvement for integrated processes (source: author)
Involvement of the Risk Players

In the previous Chapter the current strategic position of PRM has been discussed and a consensus around the efficiency of PRM practices is evident. The extant literature was faced with the empirical data collected at Organization O and some pre-recommendation have been made. Although Organization O is becoming more and more involved with PRM, the results reflect a poor and inhomogeneous integration of the PRM processes within the PM practices. Further, it was understood that relying only on standardized processes, tools, and techniques does not allow to effectively performing PRM.

This Chapter aims thus at answering the second sub-question: “How do the risk players get involved with the management of project risk?” We want to investigate base on the TSI framework how the risk players should perform PRM in order to benefit from it, focusing therefore on some of the “human aspects”. The extant literature is faced with the gathered empirical data resulting in additional pre-recommendations. The Risk Maturity Model is once again applied as a framework to benchmark the current practice of Organization O and used as a base to recommend PCM with further optimization of the PRM processes.
4.1 THEORY

Despite well-established PRM processes available through many different standards and handbooks, PRM is still seen by many project managers as ineffective and not helpful in reaching higher project success (Kutsch & Hall, 2010). The tensions between the growing importance of projects for organizations’ success and the complexity of translating the best PRM processes in practice obviously demonstrates the existing potential for investigating and further enhancing the method to manage project risks.

As we have seen in the previous chapter, one needs for effective PRM a set of continuous and scalable processes, which can be reached by using proven tools and techniques. Nevertheless, proven tools are not believed to be enough to resonate practitioners’ intuitive approaches to effectively manage PRM; in other words, risk cannot be managed successfully merely by relying on standardized processes, tools, and techniques (Kutsch & Hall, 2010) (Murray-Webster & Pelleginelli, 2010) (Loosemore, Raftery, Reilly, & Higgon, 2006) (Hillson, 2009).

The extant literature and most previous studies in construction project management seem to prescribe in a more extensive way how to perform proper PRM processes but little attention was given to factors significantly affecting the effectiveness of risk players' decision making (Kutsch & Hall, 2010) (Wang & Yuan, 2011). Only lately, the risk practitioners and researchers have increasingly considered the great influence of “human aspects” on the outcome of PRM in practice as an important topic (Wang & Yuan, 2011) (Thevendran & Mawdesley, 2004) (Kutsch & Hall, 2010) (Hillson & Murray-Webster, 2007). The influence of the “human aspects” is characterized by the influence of the risk players’ involvement over the PRM processes besides their roles and responsibilities, e.g. feelings, tacit knowledge, experience.

In comparison with Chapter 3 where we strictly looked at the PRM processes, in Chapter 4 we investigate how the risk players should be best involved with PRM practices. After all, the definition and assessment of risks and the management thereof depends entirely on people’s involvement (Hillson, 2009). In this theoretical part, after briefly describing the roles and responsibilities of the risk players, the most relevant subjects linked to the involvement of the
risk players for this research are discussed; e.g. the level of formality needed to perform effective PRM, the benefits and shortcomings of using lessons learned, and the human resistance towards managing project risks.

4.1.1 RISK PLAYERS, THEIR ROLES AND RESPONSIBILITIES

Instead of using the term stakeholders, the term “risk players” was advised by (Simon, 2011). In this research we define the risk players of a project as being the stakeholders link to this project that play a role in managing the project risks. The risk players are really indispensable in order to carry out the PRM process; they are the ones providing the essential input on future (Hillson & Simon, 2007). It is important for the PRM process to involve players that will give some relevant input. Therefore, risk players that should contribute to decisions about the risk process should be identified (Hillson & Simon, 2007). In Appendices 7-a and 7-b, an approach is proposed.

The risk players of a medium project encompass [1] the project sponsor, responsible for the entire control and management of the project, including the setting of scope, time, budget and quality within which the project has to be completed. The sponsor represents the pivotal link between corporate and project governance; it articulates the link between the top management setting the strategic goals and the manager and team seeking to deliver the project with meeting the objectives (Crawford, 2009). Then [2] the projects manager (overall responsibility for delivering the project by meeting the objectives), and [3] (some of) the project team members (report to the project manager and actively participate in the PRM process). Some other project stakeholders, classified as key stakeholders, could be part of the PRM process and thus become risk players. Further, within the risk players, the project manager should appoint a risk champion at the concept phase of the PLC. The role of the risk champion is to facilitate the risk process by overseeing and managing the PRM on a day-to-day basis. Assigning explicit risk champions to each project provides the required support and control and is seen as an important aspect of effective PRM process (Joustra, 2009). The project manager in liaison with the risk champion should appoint during the front-end / definition phase of the PLC a risk owner as the best person to manage an identified risks. The risk owner is the person in charge for the management, monitoring, and control of all aspects of an identified risk (OGC, 2009). An action owner should be appointed by the risk owner in liaison to the project manager and the risk champion as the most capable person to carry out the action assigned to one identified risk (several action owners may contribute for the response to one risk). The action owner is assigned, before or during the execution phase of the PLC, to carry out a risk response for a specific identified risk and needs to report to the project manager and/or the risk champion. In many cases, the risk owner and the action owner are likely to be the same person (OGC, 2009). The risk owner as well as the action owner role is temporary because as soon as a risk has been closed or the action has been completed, their role ceases.

Further in the literature, different views on the role of the project manager and the need of experienced individual in PRM were found. On the one hand, it is recognized by researchers that many practitioners see risk management as the responsibility of a centralized risk manager, who is most of the time recognized as being the project manager. Olsson (2007) found in is research...
that "risk management adherence is dependent on the project manager". Likewise, Elkington and Smallman (2002) found that project managers are the key to the success of projects and accordingly need to receive a formal training and qualifications. Consequently, the effectiveness of the PRM processes is highly dependent on the knowledge, skills, experience and management style of one specific individual recognized in the project manager.

On the other hand, it is understood from the literature that the PRM processes should not only be managed by the project manager, but should make use in case of medium or large projects of a risk champion to support and facilitate the processes (Hillson & Simon, 2007). Moreover, the processes should be decentralized among the appointed risk players of the project. It is recognized by Joustra (2009) that it is important to decentralized PRM processes rather than centralizing them around the project manager. This can be explained by the fact that specified knowledge on potential risks required for effective PRM processes might lie at the lower level of an organization. For instance, Cooke-Davies (2005) specify in his study that formally assigning specific "risk owners" is considered one of the most influential factors in PRM success.

In Figure 4.1 the different roles that were described above are schematized.

**Figure 4.1** – Required roles to manage PRM processes in a medium project (source: author)
In order to do so, a formal approach should be used, which defined the roles and the responsibilities accordingly and therefore help the appointed risk players to be effectively involved in the PRM processes.

### 4.1.2 Traditional versus Modern Project Risk Management

Nowadays, project managers face a major dilemma while managing their projects (Figure 4.2) (Dietrich & Lehtonen, 2005). On the one hand, they can rely on formal project management practices that have been proven efficient. On the other hand, they can let projects be guided informally, relying thus on individual leadership, feelings, skills. However, due to higher uncertainty coming from the need for more innovative project, managers need to be aware that today projects cannot be approached with too simplistic practices and tools in order to reach successful projects outcomes. It might be relevant for project managers to use a formal approach for effective project management.

![Figure 4.2 - Level of formality in function of the approach used to manage risks](image)

The need for a formal structured approach to deal with project risk at all stages in the PLC by the risk players has been widely recognized and many organizations are seeking to introduce PRM in order to gain the promised benefits (Chapman & Ward, 2003) (Chapman, 1997) (Hillson, 2003). Moreover, many enterprises are becoming conscious of the significance of project risk management for the success of both the project and of course the organization. Many methods have recently been developed or enhanced by research institutes and risk practitioners in order to meet the new challenges and help organizations formalizing their project risk management approach. But a debate remains regarding the formal versus the less formal approach to managing project risks.

In the field of risk management, formal processes are perceived as a day-to-day practice that helps reduce uncertainty in decision-making (Langley, 1989). Additionally, according to Murtonen (2010):

“The formal risk management procedures are predefined behaviour models for project managers: what they are expected to do in project risk management, with which tools and methods”

While,
“Informal risk management refers to all informal and intuitive actions that are taken to mitigate risks in order to reduce the uncertainties in a project, intentionally or not”.

In other words,

“Formality refers to an objective, cognitive, task-oriented and instrumental process, whereas informality refers to more subjective affective, people-oriented and sentimental processes” (Li, 2007).

Nowadays, project managers are expected to use both informal risk management by using their managerial skills and competencies and the formal risk management practices to respond in a structure manner to the project's risks and unexpected events (Murtonen, 2010). However, it appears that the formal PRM processes are not so well implemented in practice. In her study, Murtonen (2010) found that if the formal procedures are non-existent or inadequate, then project managers will faster adopt an informal approach to perform PRM rather than developing more formal procedures.

In the literature, the formal PRM processes are described by many scholars as being more dominant during the early stages of projects, but become less dominant throughout the PLC (part 3.1.2.2) (Susilo, Heales, & Rohde, 1991) (Van Wyk, Bowen, & Akintoye, 2008) (Lyons & Skitmore, 2004) (Thevendran & Mawdesley, 2004). Put differently, instead of using the formal approach, project managers are more likely to rely on more informal control elements (personal feelings / values, common sense). This concurs perfectly with the research of Murtonen (2010) where a close follow-up of the cases revealed that the interest towards the formal risk management process decreases as the project progresses. This was analysed through the use of risk registers, which is considered to be the most observable part of the formal PRM processes. Two factors have been defined as possible sources of ineffective application of formal risk management (Murray-Webster & Simon, 2005):

- A belief that a formal approach is not needed for competent people, only to support people who are less experienced and/or skilled.

- The ability to convince stakeholders that using a formal approach has a beneficial influence on the project outcomes.

Further, as mentioned in part 2.1.4 some divergent points of view regarding the formal approach to PRM are growing. The PRM concept is said to be going from being traditional (e.g. mechanistic, straightforward) towards being modern (adapted/scalable, less formal, yet systematic) (Lehtiranta, Palojärvi, & Huovinen, 2011). In her study Lehtiranta et al. (2011) compare a more formal/traditional approach similar to the one described in part 3.1.2, with a more modern one developed by Loosemore et al. (2006) stemming from human aspects (see Figure 4.3). The correlation between both traditional and modern approach reflects well the conclusion established by Murtonen (2010) in her research on formal and informal risk management:

“The efficiency in project risk management arises from developing both a formal PRM process and the informal activities in parallel to creating new flexible and more interactive PRM tools and techniques”.

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Consequently, the aptitude to decide how project risks should be managed quickly and
instinctively is considered important, disregarding that deviating too far from standardized
approach can sometimes be fatal to meet a project’s objectives (Murtonen, 2010). In other words,
informally performing PRM (e.g. rescheduling, arranging a crisis meeting or replacing a critical
technical component) might be really valuable in a hectic project and might help to avoid drastic
consequences that would make the project fail. Yet, if the actions that are taken to manage the
risky events are not documented and analysed, it will become really difficult to use the lessons
learned for future projects (Murtonen, 2010). Finally, informal actions are more personalized
and less codified by definition, which increases the risks involved (Murtonen, 2010).

<table>
<thead>
<tr>
<th>Traditional PRM process</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Process launch (context and objective definition)</td>
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<tr>
<td>2. Risk review (identification, evaluation, and response planning)</td>
</tr>
<tr>
<td>3. RM (including response implementation and control)</td>
</tr>
<tr>
<td>4. Process close-down (assessment and review)</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Modern PRM process</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Make stakeholders feel involved</td>
</tr>
<tr>
<td>2. Maximize information for decision making</td>
</tr>
<tr>
<td>3. Equalize perceptions of risks among the risk players</td>
</tr>
<tr>
<td>4. Make everyone understand the basis upon which a decision is made</td>
</tr>
<tr>
<td>5. Make people feel involved and valued in the process</td>
</tr>
<tr>
<td>6. Make people feel that their interests are being considered</td>
</tr>
<tr>
<td>7. Make people understand their responsibilities and role in a RM process</td>
</tr>
</tbody>
</table>

Figure 4.3 – Comparison of a traditional and a modern PRM framework (Source: Murtonen, 2010)

Summarizing, although it might be possible to adopt a proactive risk management approach intuitively and without the aid of a formal approach, managing project risk is considered difficult to do without some degree of formality (Murray-Webster & Simon, 2005). Therefore, using informal PRM cannot replace the formal approach and “should never be used as an excuse not to use the formal procedures available” (Murtonen, 2010). However, informal actions are always needed to give the project more adaptable actions available (Murtonen, 2010). Consequently, both formal and informal approaches should thus support each other. For instance, informal actions should support the formal approach by strengthening the project managers’ behaviours aligned with formally planned objectives. Additionally, several scholars agree that the formal PRM process could be complemented by more informal and flexible ways, such as continuous interaction, co-operation, and communication between the risk players (see Chapter 5) (Perminova, Gustafsson, & Wikström, 2008)(Murtonen, 2010). It is thus important to develop
some awareness in regards to the informal side of PRM and find a way to make the formal and less formal PRM approaches interact with each other.

### 4.1.3 LESSONS LEARNED

A significant concern regarding the performance of PRM is how to reuse the knowledge effectively as taking advantage of knowledge has become a crucial factor for organizational competitiveness (Ping-Tserng, Yin, Dzeng, Wou, Tsai, & Chen, 2009). It is assumed that exploiting knowledge gained from past or simultaneous projects may help risk players to debottleneck the successful risk management applications in practice (Dikmen, Birgonul, Anac, Tah, & Aouad, 2008). This knowledge, in the form of lessons learned can be used to derive important information about successful practices or procedures (Fitzek, 2002). In their research, Dikmen et al. (2008) define the term “learning from risk” as a driven risk management process focus on lessons learned for better PRM.

Focusing on learning as part of managing the project risks might help to overcome some of the challenges of PRM. Atkinson et al. (2006) mention in their study that having the possibility to access repositories of past data can be a fundamental aspect of doing effective risk estimates. Further, learning from past events might help to reach a more realistic and holistic vision of the projects risks implying more informed guesses about the future (Dikmen, Birgonul, Anac, Tah, & Aouad, 2008). As another benefit, learning from risk can help organizations to faster spread the project-based risk practice into the corporate level. It may also help the organizations to conceive PRM as an integrated part of their business strategy, contributor to their performance. However, the identification of the critical knowledge and its exploitation is a very challenging part for most of the organizations.

In order to profit from the above-mentioned benefits of learning from past risk events, organizations may construct a corporate “risk-memory” or database. In this database the risk information would be stored as well as the effectiveness of the response strategies and factors that affect the risk consequences. Risk players may therefore, make more reliable decisions about forthcoming projects if they can use risk information from former projects (Dikmen, Birgonul, Anac, Tah, & Aouad, 2008).

However, every project is unique, meaning that the actions to be undertaken to reach the objectives are also unique and cannot be compared to other projects. Therefore, there is a concern regarding the RM performance that is how to reuse the gathered knowledge effectively (Ping-Tserng, Yin, Dzeng, Wou, Tsai, & Chen, 2009) (Taleb, Goldstein, & Spitznagel, 2009) considers that "past events do not bare any relations to future shocks". Taleb et al. (2009) go further by saying that when risk players are convinced that studying the past will help them managing their project risks, they mistakenly use hindsight as foresight. In other words, focusing on the risk history of past projects could induce a lack of creativity as well as a narrow vision for managing project risks.

Summarizing, learning from past risk events is really significant in helping risk players manage the project risks. It is acknowledge that focusing on lessons learned would improve the working performance. Developing a “risk-memory” in which risk-related information could be stored and
updated throughout the PLC could facilitate this. However, there is no clear and generalised consensus on the beneficial aspect of tracking risks’ history due mainly to a possible constrained vision.

4.1.4 HUMAN CONFRONTATION TO EFFECTIVE PROJECT RISK MANAGEMENT

When important projects fail, the investigation is often focused on the engineering and technical reasons for the failure. Yet, in many cases the failures are not only from technical or engineering reasons but are characterized as being managerial and related to human aspects. Often, problems are rooted in the way PRM approach is carried out by risk players independently from the project characteristics (Sauser, Reilly, & Shenhar, 2009). The human confrontation to effective PRM is described through the risk culture that shows the existence of several tendencies to face the management of project risks. Then we look in more specifics into the differences between the proactive and the reactive approach to finally describe what is meant by deliberate ignorance of risk.

4.1.4.1 THE RISK CULTURE

Individuals, as well as groups and organizations are expected to have what is named in the extant literature as a risk culture (Hillson & Simon, 2007) (Hillson & Murray-Webster, 2007) (Hillson, 2009). Additionally, according to Hubbard (2009), for PRM processes to be effective, organizations should be aware of their “risk culture” to create a common awareness on PRM. The risk culture reflects the preferred approach to deal with uncertainty. It is also define in the literature as risk appetite (OGC, 2009) (Hubbard, 2009). There exist a continuous range of risk cultures that have been schematically represented in Figure 4.4:

- Risk averse is characterized by the individuals, groups or organizations with a negative attitude towards risk;
- Risk tolerant correspond to the individuals, groups or organizations with no strong involvement with risk;
- Risk seeking is characterized by the individuals, groups or organizations, which have a positive attitude towards risk.
These cultures can have a significant influence on the project’s outcome; for instance, if one is too much “risk averse”, it might lead to some denial resulting in important risks being ignored. On the other hand, being too much “risk seeking could lead to some risk addiction overwhelming the organization with risks turning into problems and implying that projects would tend to fail at a higher rate (Hillson & Simon, 2007). The preferred risk culture for an organization is neither risk-averse or risk seeking. Hillson and Simon (2007) characterize it as “risk mature”, which produces a supportive culture in the organization. It is acknowledge that uncertain events can occur during the project that will influence the project’s progress and outcome. The risk mature organization is thus committed to provide the necessary resources and support to manage the project risks proactively.

4.1.4.2 **Proactive versus Reactive**

According to Kerzner (2010), one of the biggest behavioural challenges that project manager face is learning how to manage risks in a proactive manner rather than in a reactive manner. Kerzner (2010) mentions in his book that proactive management is one of the most effective tools that can be used to ensure the projects success. Therefore, if applied, proactive attitude should make PRM an effective practice. While some risk players’ would prefer to identify, assess risks and act upon them in advance, other risk players seem to prefer waiting until risk resolves itself and to react to actual emerging risks (Yang, Burns, & Backhouse, 2004). Individuals tend to be unwilling to manage risks (White, Buehner, & Haye, 2003). Frequently, risk players only become active managing risks when risks have already turned into problems that have by definition already materialized (Joustra, 2009). It is found in the literature that there is a propensity in the construction industries for project managers to follow a more reactive
approach for managing project risks rather than preventing them from happening (Loosemore, Raftery, Reilly, & Higgon, 2006). In other words, they often do not consider the project risks until they occur. One of the explanations behind the tendency of the project managers to behave in a more reactive than proactive manner, is conceptualized in the “the hero concept” (Murray-Webster & Simon, 2007). This concept stipulates that project managers following a reactive approach, letting thus risks occur, spend most of their efforts and time on solving resulting problems and are seen as organization’s heroes. While those who proactively managed their project risks and consequently meet the project’s objectives are just seen as doing an easier job (Murray-Webster & Simon, 2007). In addition, the more project managers have work, the less capacity to be proactive they have and they become by definition more reactive (Kerzner, 2010). However, without acting proactively the impacts of the unknowns will be greater as the risk would be treated once it has snowballed (Kerzner, 2010).

By acting in advance a project manager helped by his/her project team would have more influence over the control of the unknowns (Kerzner, 2010). Consequently, proactively managing the risks makes it possible for the risk players to have a more holistic view of the future and give him/her more time to design adequate risk actions. Additionally, being aware of upcoming events makes it possible to plan the necessary resources in case they occur. Making the risk players ready in advance makes it almost sure that they will be ready when needed.

Summarizing, proactive management of risks has a considerable influence over the successful completion of a project because it simply helps to have the risk players ready to face uncertain events and assists the project managers to plan all the resources needed. Although proactive management of risks positively influences project performance there is a tendency for project managers to follow a more reactive approach.

4.1.4.3 Deliberate ignorance in Project Risk Management

The topic related to deliberate ignorance in the field of PRM has recently been investigated by Kutch and Hall (2009). Their qualitative study aimed at investigating the reasons behind which the risk players tend to consider certain known risks to be irrelevant. The findings of the research show that in some projects, PRM practices are conditioned by what they call the “deliberate ignorance” of risk players.

Ignorance is characterized as an effective impulse and two aspects of ignorance are recognized. On the one hand, ignorance can be defined as an error implying distortion of the information and incomplete knowledge, which is the definition of “being ignorant”. Of course no one can predict the future state of a situation perfectly; consequently, ignorance resulting in error is inevitable. On the other hand, ignorance can be defined as deliberate ignorance or irrelevance that is driven by social factors and/or conditioning. Irrelevance does not mean that the information is wrong or missing as such, but that the piece of information is not believed to be relevant by the risk players in a specific situation (Kutch & Hall, 2009).

The study investigates the irrelevance rather than error for the simple reason that is: while risk players have restricted control over the error, they are said to have more influence on how they look at risk related information as being irrelevant. Based on eighteen in-depth interviews with
project managers from eighteen different organizations, Kutch and Hall (2009) define in their study four types of irrelevance, subset of ignorance, that have impacts on the PRM processes:

- **Untopicality** refers to the kind of information off-topic. The results show that the risk players have the tendency to focus on specific topics, e.g. technical risk. The explanations depicted by the research seem to indicate that risk players accept information that is easy to process and not necessarily the one that may be most critical and relevant for the project's success.

- **Undecidability** refers to the lack of agreement on risks due to a double or dubious piece of information. In other words, it is when the risk players cannot come to one common opinion and hence decide to leave the risk out. A reason lying behind such irrelevance can be explained by the conflict of interest between project stakeholders. Undecidability seems to be related to trust issues leading to a lack of cooperation, which is essential for reaching successful projects (part 5.1.2).

- **Taboo**, refers to the degree to which risk players identify new risks related to an information that is perceived as inconvenient. A risk might be avoided because a risk player does not want to be exposed by confronting the project’s stakeholders with certain risks. Therefore, some risks that might have an influence on the project’s success are left out of the PRM process; they are discarded to avoid discomfort.

- **Suspension of belief** refers to when a piece of information was regarded as being "useless" because it did not have an immediate effect on the project. Because of a lack of relevant information and therefore evidences the risk players take distance from the information. It is described in the paper as an “act of suspending belief in risk related information”. The information is put with the other irrelevant data.

Managing the irrelevance might help risk players to reach more successful projects’ outcomes. As current PRM process does not explicitly propose any prescriptive approach to guide risk players to be aware about irrelevance and then to overcome it (Kutch and Hall, 2009), a multi-stage process of relevance was developed and is presented in Figure 4.5. To overcome the Untopicality, a common scope of PRM is required. When reaching a common scope, in order to pass the barrier of Undecidability trust has to be built among the risk players. Finally, the usefulness of the information is checked. Both irrelevance Taboo and suspension of belief are associated with the evaluation of utility.

Summarizing, due the influence of irrelevance phenomenon at various stages of the PRM process, the capability of the risk players to properly prospect for risks seemed to be diminished. Four identified types of irrelevance have briefly been described. Based on the different types of irrelevance a multi-stage process was created to overcome these irrelevances. The overall aim is to limit the number of potential risk excluded and hence to decrease the tendency of risk players to misjudge what could become a severe event for the project in a near future.
4.2 EMPIRICS

In Chapter 3, which is about the current strategic position of the PRM practices, it is described that PRM processes encompassing consistent tools and techniques thoroughly standardized through the organization are essential. However, it was induced that only implementing proven tools and techniques is not enough to reach effective PRM. In this section light is shed on the “human organization” surrounding PRM processes as well as some factors linked to a likely modernisation of the current processes by looking at the soft side of PRM.

Before the analysis (part 4.3), we outline various visions on the essence of PRM related to the involvement of the risk players with the PRM processes, as they appear from the case study. This is crucial because the extent to which risk players are committed to implement the PRM processes influences how the project risks are managed and ultimately the success level of projects. Put differently, comparing the results from the different sub-units of analysis might lead us towards more pertinent recommendations that could help optimizing the current strategic position of PRM within PCM. As mentioned in part 3.2, within PCM the project management practices are based on the PRINCE2 method, as should the PRM processes and thus the roles and actions to be taken by the risk players. In other words, the “Soll”, what is ought to be, is
supposedly aligned with the aspects of PRINCE2. The gathered empirical data are addressed by reflecting and facing the "Soll" and the "Ist" of the TSI framework in both parts 4.2.1 and 4.2.2.

4.2.1 THE TWO LEVELS OF THE “HUMAN ORGANIZATION”

We define “human organization” as the organization of the required roles and related responsibilities given to the project stakeholders that are involved in the PRM processes. In this research, we recognize two types of “human organization” necessary in order to implement effective PRM:

- **Level 1** reflects in the case of Organization O, the standardized and general organization of a project inspired and adapted from the PRINCE2 method. Level 1 is represented in Figure 4.6 and the responsibilities related to the roles are presented in Appendix B;

- **Level 2** depicts the different roles that should be played by the risk players during the entire PRM processes. This organizational structure is not fixed and evolves through the project as for instance risk owners and action owners are temporary. Figure 4.1 pictures this level 2.

### Figure 4.6 – Defined roles of Organization O’s projects (source: Organization O documentation)

Within PCM the level 1 of the “human organization” is globally well understood among the respondents. The PM practices follow the PRINCE2 method to a certain extent and thus the roles and responsibilities as described in the method are used to a certain degree (Appendix B). Some work has been done within PCM to find a way to integrate a more structured organization to manage projects. In Figure 4.6 the current project organization used within PT is schematized C, which is inspired and adapted from PRINCE2. In PRINCE2 terms, the project support is the person that supports the project manager for the administrative tasks but can also contribute to
the PRM processes. However, this person cannot be considered by definition as a risk champion or risk manager.

What was observed during the case study is that the level 1 of the “human organization” where a project board is defined, a project manager is appointed with a project-specific team, is well respected in practice. For all six cases no project support was formally appointed and in four of the medium projects (A, B, E, and F) no risk champion was assigned. On the other hand, at the level 2 it was assessed that the roles and responsibilities were not well defined. In most projects (Project A, B, E, and F), the PRM processes are centralized at the project manager level making him the owner and the facilitator of the processes implying that the risk players are not formally involved. In the following paragraphs we present the different views and critics on the level 1 and level 2 of the “human organization”.

The respondent from project F mentioned that one of the biggest benefits of the PRINCE2 based on the organization aspect is the role played by the project board. Making it more part of the responsible people throughout the project seem to be experienced as a much more logical division between the project stakeholders.

Further, some of the respondents, from category 3 (projects D and C), did not have much experience with the method so far. As perceived in projects B and D by respondents from the categories 1 and 2, PRINCE2 should be implemented at all the other levels of the organization in order to make it efficient at the PCM level (part 3.2.2). This would help all the risk players to be effectively involved, which is by deduction also true for managing the project risks. Therefore, if the PRM processes must be standardized, all the persons that “play” with the PRM processes must have some prerequisites in order to understand their roles and stand behind their responsibilities.

In order to effectively manage the project risks, it is important that the involved risk players understand their roles and responsibilities. In the PRINCE2 method, too little is said in this regard. Moreover, within PCM, nothing is explicitly mentioned about the roles and responsibilities that should be taken by the risk players during the PLC. Therefore, PCM does not provide any ad hoc information to help the project stakeholders to play the right roles and align them with the right responsibilities in regards to PRM.

In practice it is assessed that the roles and responsibilities differ from one project to another at the level 2 of the “human organization”. First, this can be explained by the use of unstandardized tools and techniques through the PCM section implying that the project managers do not approach the PRM practices likewise. Indeed, as we have assessed in part 3.2, no standardized approach is yet implemented in the guidelines of PCM. This explains thus the On the other hand, it might be due to a lack of interest / involvement, specific knowledge and/or formal experience in practice.

In respect to roles and responsibilities, both projects C and D are different from the others. For both projects a risk champion was assigned while the four other do not make use of risk champion or any kind of facilitator to manage the project risks. Their role was to oversee and manage the PRM processes within the projects. From the position of the respondents from
category 1 (project managers) and 3 (team members) of both projects, the view on PRM of the risk champion "is important". It emerges that relying on a risk champion for the processing the PRM activities had a positive impact on the involvement of the risk players. In addition, based on his knowledge and expertise, a risk champion is able to make effective use of the tools and techniques and to divide the roles and the responsibilities among the risk players. However, one risk champion mentioned that in a team where you have a risk manager, his role is to help identify the risk but then it is the role of the project manager to take those risk forward and make sure that the risk players are involved. In other words, the risk champion is there to support the project manager and not to replace the project manager.

In project C, as it was the first time that PRM was introduced at Organization O; therefore, an external consultant led the processes seconded by the risk champion and the project manager. The complete project team was involved and everybody had a role to play within the PRM processes; to every identified risk a risk owner was appointed and some action owners were informally appointed to counter measures. The risk owner and action owner are thus used but the risk register used did not mention the risk owner aspect.

In project D, the risk champion, without the help of an external consultant, involved the project team members and explicitly stated, "PRM processes is a team effort" and believes that having a multidisciplinary team to assess risks is the best. Similarly to project C, the risk owners are identified. Most of the time the risk owner is the risk player that flags the risk during the session. When the measures to be taken are designed and planned, action owners are appointed to act upon them. Often the risk owner and the action owner were the same person. However, the risk owner is not formerly mentioned in the risk register. The project manager was slightly more pessimistic concerning the involvement of the risk players and said that mostly himself and the risk champion were involved with the PRM processes. Based on some observations made during a risk session it was witnessed that most of the risk players approached the processes in a passive way maybe due to a lack of training or possible lack of interest.

For project A, the project manager is the only one formally involved with the PRM processes. Deductively the risk players are all involved but not formally and therefore no risk owners and action owners were appointed. The project manager qualifies himself as being both the risk and action owners. In some cases some members of the project board acts upon some action.

Within the project E the risk players are involved informally. The respondent stated that there should not be a separate risk manager; the project manager should be the risk manager. Further, only the people recognized as having sufficient knowledge are invited to discuss risk related issues with the project manager. Put differently, depending on the skills and knowledge of the people accountable, they will be more or less involved in the PRM processes. Comparable to project A, risk owners and action owners are not used, the project manager does it himself.

In project F, a lot of people could be involved in the process, as the consortium X that owns the project encompasses many players from all over the world. Yet, no specific meetings to talk about risk were organized. But at some point, while approaching the commissioning (after erection) more attention was given to risk management and a risk champion was appointed. This was done to ensure that the work that has been done met the requirements in order to be handover to the
R&D department of Organization O, internal representative of the consortium X. There is no formal list about the different roles like risk owner and action owner but according to the respondent the roles were clearly mentioned.

The project B is quite specific because waiting for approval. However, the respondent mentioned, “If there should be one person involved it should be the project manager”. He never questioned other risk players about risk management and maintained that there is a general lack of interest and involvement of the PCM project stakeholders. In general he requests the team members to look first at quality, scope control, progress, budget and time and do not bother them with risk. The roles of risk owner and action owner are not allocated.

Overall, as mentioned earlier, the level 1 of the “human organization” as depicted in Figure 4.6 is implemented in every project. Further, risk champions are not involved in all the medium projects, only for projects C and D a risk manager was appointed. This correlates quite well with some existing views among the categories of respondents from categories 1 and 2 (projects A, B, E, and F) and category 3 (project C), which stipulates that the project manager should be the one leading the entire PRM processes. Furthermore, the involvement of the project board according to the PRINCE2 terminology is in general well appreciated among the risk players. However, some issues related to the project board were addressed. First, the project board of case B was qualified by the respondent as bad functioning as it did not really understand the role it had to play in PRINCE2 terms. Second, one respondent of case D, mentioned that some decisions made by the project board do not consider the PRINCE2 approach. Third, in project D, although the project board is making use of the fact that there is a certain clear insight in the risk work on the project, it does not use its maximum right to get more involved in the project and make sure to understand the kind of risks that are dealt with.

On the level 2 of the “human organization”, roles and responsibility are not well implemented in practice and especially in the PM guidelines of the PCM section where they are not referred. Some projects (projects C and D) understand the importance of formally appointing roles like risk and action owners while some other do not (formally) perform it (projects A, B, E, and F). In several projects the PRM processes (projects A, B, E, F) are centralized around the project manager while in some others (projects C and D) the activities are to some extents well decentralized among the appointed risk players. Additionally, one assumption that is derived from the empirical data is, when a risk champion is involved in a project, the roles and responsibilities of the risk players seem better-defined inducing concurrently a higher involvement in the PRM processes. As one of the category 3 respondents of project C mentioned it, the way it was explained by the experts was short and clear for everyone, which helped the risk player to feel involved in the right way.

4.2.2 The soft side of the Project Risk Management processes

In this section we report the empirical data gathered from the case study dealing with the “human aspect” of project risk management. The data from the case study related to the level of formal PRM as well as the lessons learned and the human confrontation with the PRM processes are interpreted in the following paragraphs.
4.2.2.1 Level of Formal Management of Project Risks

We advance in part 3.4 that in order to obtain an integrated process for managing project risks, not only standardized processes are needed, but also proper involvement of the risk players. In terms of formality related to managing project risks, we understand that project managers have two antipodal ways of doing it, formal or informal (Figure 4.1):

- Following a standardized approach and therefore apply proven set of tools and techniques (part 3.2);
- Following individual leadership, feelings, and skills.

Although we believed that there is a close correlation between the implementation of a standardized method within an organization and the level of formality with which project risks are managed in practice, it is relevant to differentiate both of them. Put differently, having standardized tools and techniques in the organization does not suggest that project risks cannot be managed informally, and vice versa. Nevertheless, formally managing project risks could help to make the standardized processes more efficient in practice and having standardized processes could strongly help project managers to perform formally the PRM processes in practice by relying on the available proven tools and techniques. This is supported by the risk champion of project D who states that “with the implementation of PRINCE2, [formal PRM] is coming naturally”.

Previously, in part 3.4, it was concluded that no standardized approach to manage the project risks was implemented within PCM. The only formal documentation used is recognized by all the respondents to be the highlight report, where only a few lines are dedicated to the project risks. Further, in most of the projects risk registers are used but not so thoroughly. Some respondents are convinced that it should become a part of the formal documentation to make it an effective tool to manage project risks (projects C and D). It is mentioned in the theory that:

“A risk register, that is used to tabulate information about identified risks, their likely impacts, and proposed and completed actions to be taken, is the most visible part of the formal risk management procedure in projects It lists known risks, follows the linear identify/analyse/mitigate process, and aims at collective information sharing and learning from previous experiences”. (Murtonen, 2010)

Therefore, if we consider that the level of formality could be directly linked to the risk register, then by looking at part 3.2, evidences about the risk registers are gathered fro each project:

- Project A: The PRM process started just before the execution phase with a tailor-made risk register. An informal involvement of the risk players was recognized and no real up-date of the risk register was made through the project.
- Project B: The risk register was used at the beginning of the project and stopped to be used during the front-end phase.
- Project C: Some risk specialist entered the project during the execution phase and led the PRM processes seconded by the project manager and the risk champion in a formal way.
- Project D: Due to the origin of the business case the PRM processes started at the end of the front-end phase / beginning of the execution. A risk champion was assigned and followed a quite formal approach to lead the PRM processes. However, during the execution phase the
register lagged behind and was not up to date. The risk champion was more specific and said that the process was following a formal approach by applying document control and keep the team members aware of the last up-date of the risk log. However, he himself said that in respect things could be improved. For instance in one other project the risk register is integrated within the official project documentation where the approval of the project board is required. “In [Project D] it is not taken that seriously”.

- Likewise, Project E started at the end of the front-end phase / beginning of the execution. A risk register was made but the PRM processes were mostly carried out informally due to the tight schedule of the project. The respondent said that within the project PRM is so much integrated in everything that is done that it is administrated on a high level. He also mentioned that a “formal approach as such is not really done by means of having formal incentives towards PRM”. The low formality to perform PRM was also recognized by one of the category respondents.

- Project F: From the beginning of the project, the PRM were performed in an informal manner; the respondent mentioned that a lot of risks are discussed informally directly with the client. Further, no risk register was made.

Based on the gathered data interpreted in part 3.2 and the information mentioned above, the Figure 4.7 was made. Based on Figure 4.7, it can be established that:

- Most of the PRM processes are not managed in a formal manner throughout the entire PLC
- Some projects are more formally managed than others (projects c and D).

![Figure 4.7 - Level of formality throughout the PLC](source: author)

A practical reason why some projects are less formally managed than other could be explained by the fact that project managers do not analytically separate and document all the different events or situations that they encounter, but simply tackle them all as a part of their work. Moreover, it might be linked to the fact that the project managers rely more on their individual leadership, feelings, and skills and do not believe that formal PRM is needed. However, both projects C and D, for which a risk champion was appointed, experienced a more formal way of
being approached. Project C had the help of an external organization and Project D is not closed. Thus it not possible to draw any concrete conclusions, but there might be a high probability that appointing a risk champion to medium projects will help the processes to be more formally handled and thus more effective.

Finally, the respondent from project B shared with us that it is not possible that all the project managers act the same while managing the same project. There should be a certain extent to which everyone should formally manage project risks (60%) but also something else that would allow people to rely on their tacit knowledge, attitude, character, and personality (40%). At the moment, within PCM, the respondent mentioned that there is about 95% left to the influence of the human aspects and only 5% to the formal approach. And he believes that the 5% are not really useful in projects because they represent the administrative procedures, which have no value in the reaching the project objectives.

4.2.2.2 Learning from Risky Experiences

The lessons learned about PRM gathered during projects are first poorly translated in the risk register but most of all it is not transfigured in any database or repository within PCM. The accumulated knowledge stays for the biggest part tacit and will probably get lost with time. At the end of any project, the project an evaluation form is used, but nothing is extensively mentioned about PRM lessons learned. In practice, all the projects part of the case study did not start with a proper initiation meeting where lessons learned could be addressed to scale the PRM processes. Additionally all the projects that reached the closure/handover phase of the project life cycle (projects A, C, E, and F) did not perform a formal project review where the lessons should be registered. This induces that most of the lessons learned related to PRM are somehow lost or transformed into tacit knowledge, which is far more difficult to reuse for future projects.

In project A, which was the renovation of the third and last crane, the two older projects have been checked in order to find useful information to enhance the general management of the project. However, from the poor amount of data related to the PRM not so many relevant data were found; only the risks related to schedule were relevant. The respondent of this project mentioned that the information was not well managed for the two former projects and therefore the communication difficult to exchange.

In project C, the situation was quite simple. Because this project was part of the first trial to implement PRM as a standardized set of processes, nothing about risk management had been formally done before. Therefore, no lessons learned were formally available. However, for the commission phase, separate risk assessments were performed based on lessons learned from other project by the risk champion. Once again the process was based on tacit knowledge, which is known to be difficult to share.

In project D, the project manager states that using lessons learned “never works” because of the unique character of projects. However, the risk champion often discusses and shares experiences with other colleagues and believes that in order to use lessons learned effectively one must be eager to learn but also to share. He mentioned that there are different phases in the project defined by the uniqueness of the project. But like it is recommended in the textbook every formal
phase gate should keep an up-date of the register with a final wrap-up of the project where the lessons learned should be mentioned.

In project F, the respondent mentioned that lessons learned are a “difficult subject because one learns from every project that he/she does but how can one make these lessons valuable when other people use them as well?”. A department or even an organization could grow stronger if lessons learned would be effectively used. Besides this personal view on lessons learned nothing was formally used and procured during the project.

In project B, it is said that lessons are not documented in a good way, if documented at all. The project manager explained that within PCM project managers are working in parallel from each other and that no relevant information is shared. In addition, a lot of project managers are hired from outside companies and come with a different expertise and knowledge but can go as well with relevant tacit knowledge for Organization O. It was also mentioned that looking too much at lessons learned could lead to a narrow view and be counterproductive for the PRM processes.

Likewise all the other projects, nothing is done in project F regarding the lessons learned. Further, no personal view was addressed.

Overall, the view on lessons learned for PRM is mixed and nothing is done whether related to the use (concept phase) or the inventory of lessons learned (project closure) in practice. Some respondents see in lessons learned beneficial outcomes in order to manage project risks more efficiently while some others do not consider it as valuable. Further, the risk champion and the project manager of project D acknowledge that tacit knowledge plays a really important role in objectively managing project risks. Therefore, it is believed that gathering this tacit knowledge in a usable database or repository could help the PRM processes to be better aligned with future projects. Put differently, if lessons learned are appropriately used as reference during the concept phase and front-end phase, as mentioned in PRINCE2, the PRM tools and techniques could be better scaled to the project (part 3.2.2.2)

As mentioned in part 3.2, in general, no extensive post project reviews are done for PRM for the projects led by PCM. Moreover, it appears that the risk documentation is hardly updated during the project. Consequently, the documentation does not contain the full risk knowledge and fails to notify all the risks that have occurred during the project. Therefore, if post-project review would be performed based only on risk documentation, the review would be biased and making use of the risk documentation from earlier projects as a benchmark and support fro carrying out PRM in future projects would be ambiguous. In other words, even if the post project reviews would be done for the every project, as no continuous attention is given the risk documentation during the project itself, the reviews would not properly reflect the lessons learned.

4.2.2.3 The Human Confrontation with the PRM Processes

In some projects (projects A, B, E, and F), the current processes applied in order to manage the project risks are highly centralized around the project manager as we have seen in part 4.2.1. Therefore, the effective PRM processes depend for a great deal on the project managers’
acquaintance, expertise, and interest in using PRM tools and techniques, i.e. their risk culture. In other words, the processes depend on the project managers’ ability to proactively promote the application of the proven tools and techniques throughout the PLC. This reflects the strong influence of a project manager’s personal behaviour towards the involvement of the appointed risk players as well as the implementation of the PRM processes in practice.

Within PCM no standardized PRM approach is identified (part 3.4). In addition, as mentioned by the respondent of project B, “within PCM, there is a lack of PRM culture”, meaning that there is no general strong formal involvement of the risk players. If we look at the risk culture at the individual level, it is quite difficult to judge from the case study if one risk player has a more risk appetite than another one.

From the case study findings, it is also quite complex to assess the proactivity or reactivity level of the risk players. It supposed that in most projects, risk players might be less prone to act proactively because of the correlation between their workload given by their normal tasks and the tight schedule respective to each project.

In the project F, according to the respondent, the engineering team was overloaded because of additional work due to a lack of people between the tender-phase phase and the construction phase. Further, in project D and E where the time constrain was really high, risk players might not have been able to act proactively upon all the risks, as much work had to be done in a short amount of time. One of the category 3 respondents acknowledged that “time is needed to identify risks and mitigate them, but in [project D] time is missing”. It could be added that there is a non-negligible probability that risk players think that they act proactively, while they actually react to risks that have already materialized into problems. This is linked to PRM awareness and knowledge and might be achieved by following formal PRM processes.

Although the category 3 respondent from project C did not experience the PRM processes as a tool that “help a great deal”, he saw from formally and proactively managing project risks a really interesting and positive spin-off “in respect of awareness” of the risk players. Put differently, formal and proactive PRM made sure that people were involved and felt committed. Further, the category 3 respondent of project D agrees that performing PRM proactively has a high value in matter of awareness regarding the possible impact of the risks on the project objectives.

The more proactive or reactive involvement of the risk players is highly dependent on the extent to which they have some knowledge about uncertain events and how they react to what they know. This notion is called in the theory deliberate ignorance. Several reactions from the respondents are addressed.

In project A, a concrete example of deliberate ignorance was mentioned. The scope of the project was threatened from the concept phase until the execution phase because of the will of the client to do more work than planned during the short maintenance stop. The project board did not listen to the warning of the project manager and turned into an issue in the end.

The respondent of the project B outlined that deliberate ignorance “will happen ” and avoiding it

---

6 Reflects the preferred approach to deal with uncertain events
is difficult. It could be avoided by considering the need of having a really open mind-set to avoid tunnel vision from former project.

From project C, the risk champion thinks that deliberate ignorance occurs when you don’t apply PRM processes throughout the project or if you don’t take enough time for it. If one does it properly there should not be ignorance. The respondent mentioned that ignorance is closely related to the atmosphere among the risk players (Chapter 5). An open atmosphere will help more easily the players to feel confident and give them the chance to come up with the right input for the PRM processes. It might also enhance the envy to share.

According to the category 2 respondents of project D "one cannot ignore risk [as] we work with professionals [...] who are people highly motivated to do their job as best as possible". The deliberate ignorance of risk is not an issue as far as this interviewee appreciates it.

In project E, "sometimes [deliberate ignorance] is done" and can be due to time pressure. It can also occur when there is no consensus among the project team. For instance if a risk players does not agree on one action because he believes that it is not beneficial for the project and if this is ignored by the rest of the team then we should speak about deliberate ignorance of risk. One of the category 3 respondents outlined that due to internal political reasons risk players might have more difficulties to explain themselves. He also mentioned that to tackle this an objective person from outside the project team could help not to interfere with the relations within the project team.

In project F, the respondent mentioned that deliberate ignorance could happen if the pressure is very high to get the result, when willing to meet the project objectives. However, if it is an event that one has time to respond to, then there is no / less reasons to ignore it. The project stakeholders were constantly aware of what is happening. First, the communication with the board was also open. Second, project F was delivered late but there were no hidden topics with the clients so the working atmosphere was "relaxed" and there was no incentives to deliberately ignore some project risks.

Overall, it is difficult to define the risk culture of the PCM section because there does not exist any explicit culture echoed by the low level of standardization of the PRM processes. In general the involvement of the risk players could be characterized as not strong. It is also presumed that due to some factors like time pressure and work overload, the risk players tend to act more reactively than proactively towards PRM. Although a respondent of project D does not believe that it can happen because Organization O is a professional organization, there is a large agreement on the possible occurrence of deliberate ignorance among the three categories of respondents. This is understood to possibly happen in practice linked to several criteria:

- Performance of the PRM processes throughout the PLC;
- Time and work pressure;
- Agreement between the risk players;
- Political reasons internal to the project team;
- Mind-set and atmosphere among the risk players;
- Communication between the risk players and project stakeholders.
4.2.3 SUMMARY

In Table 4.1, the empirics described in part 4.2 are summarized respectively for the six different projects:

<table>
<thead>
<tr>
<th>Human Organization Level 1</th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
<th>Project D</th>
<th>Project E</th>
<th>Project F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The general organization for managing projects based on PRINCE2 is well implemented in practice. However, some projects face interaction issues among the different risk player levels (Chapter 5).</td>
<td>Presence of an external specialist and a risk champion that support and lead the PRM processes. Risk and action owners are formally appointed</td>
<td>A risk champion is assigned to support and monitor the PRM processes. Risk and action owners are formally appointed</td>
<td>The processes are centralized around the project manager. No risk and action owners are formally appointed</td>
<td>The processes are centralized around the project manager. No risk and action owners are formally appointed</td>
<td>The processes are centralized around the project manager. No risk and action owners are formally appointed</td>
</tr>
</tbody>
</table>

There is not general agreement on the beneficial influence of having a risk champion to support the PRM processes for medium projects.

<table>
<thead>
<tr>
<th>Level of formality through the PLC</th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
<th>Project D</th>
<th>Project E</th>
<th>Project F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Really formal from the beginning of the PRM processes until the end.</td>
<td>Really formal from the beginning of the PRM processes until the end.</td>
<td>Presence of a risk register but the PRM processes are mostly informal.</td>
<td>PRM processes are not formally carried out.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knowledge sharing</th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
<th>Project D</th>
<th>Project E</th>
<th>Project F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Presence of a risk register but the PRM processes are mostly informal.</td>
<td>PRM processes are not formally carried out.</td>
<td>Presence of a risk register but the PRM processes are mostly informal.</td>
<td>PRM processes are not formally carried out.</td>
<td>PRM processes are not formally carried out.</td>
<td>PRM processes are not formally carried out.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Human confrontation</th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
<th>Project D</th>
<th>Project E</th>
<th>Project F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>It is in general difficult to assess the risk culture of the organization because not much is done related to PRM. On the individual level when looking at the PRM processes of each project, it can be inferred than some tend to have a more risk mature culture. In general risk players might be less prone to act proactively because of a combination of workload and tight schedule. There is a shared agreement that risk ignorance is a phenomenon that happens, which could severely impact a project’s success.</td>
<td>Presence of an external specialist and a risk champion that support and lead the PRM processes. Risk and action owners are formally appointed</td>
<td>A risk champion is assigned to support and monitor the PRM processes. Risk and action owners are formally appointed</td>
<td>The processes are centralized around the project manager. No risk and action owners are formally appointed</td>
<td>The processes are centralized around the project manager. No risk and action owners are formally appointed</td>
<td>The processes are centralized around the project manager. No risk and action owners are formally appointed</td>
</tr>
</tbody>
</table>

Table 4.1 – Summary of findings – related to the involvement of the risk players
4.3 ANALYSIS

While in part 4.2 the gathered data from the six different projects that relate to the involvement of the risk players were confronted, the intention of this part is to analyse all the results, and provide critical reflection and comparison to the literature.

The PRINCE2 method has greatly increased the success rate of project run within the Organization O since its implementation, which is recognized by the all respondents. This is well assessed at the organizational level where the general “human organization” (level 1) for managing a project is uniformly done across the six cases. Yet, PRINCE2 has little in the way of directing project managers in handling project risks. At the level 2 of the “human organization”, every project follows a different approach to assign the roles and responsibilities that should be played by the individuals involved in the PRM processes.

While in the literature it is not clear who should manage, facilitate, own, or support the PRM practices, the same trend is portrayed among the six projects part of the case study. Some of the projects recognize the use of a risk champion to support and facilitate the processes whereas some others do not find it necessary. However, it was considered in part 3.3 that when there is a risk champion appointed to a project (projects C and D) the standardized processes appear to be more effective in practice. When more experienced people lead the PRM processes, risk players seem to be more involved and interested as they understand better the purpose and the goal related to managing project risks actively. However, linked to the scalability aspect of PRM, a risk champion is not always necessary; it is advised in the ATOM methodology to assign a risk champion only for medium and large projects, which is linked to tools and techniques scalability as seen in Chapter 3.

Further, similarly in PRINCE2 and in the ATOM methodology, it is clearly mentioned that different roles and responsibilities should be formally defined among the risk players during the PLC (e.g. risk owners and action owners). In practice this does not appear to be the case in all the projects. This is directly linked to the fact that some project managers believe that the PRM processes should stay centralized around them, which means that other risk players should not be formally involved. However, it is clearly stated by Cooke-Davies (2005) that formally assigning specific risk owners is considered one of the most influential factors in PRM success.

The need for formal structured approach to deal with PRM at all stages in the PLC by the risk players has however been widely recognized by the scholars (part 4.1.2). A general observation is that formally involving the risk players during the entire PLC seems to be in broad terms a common issue to all six projects in practice. Similarly as mentioned in the theory, the PRM processes are considered to be more formal at the beginning than when they stop (Figure 4.7). Some practical reasons are somehow aligned with the theory, when mentioning a possible disbelief that formally managing project risks will positively influence the outcome of a project. Yet, for both projects C and D to which a risk champion is assigned, PRM processes appear to be more formally managed. As mentioned earlier (part 4.2.2.1), it is well established that there is a reciprocal influence between the implementation of a standardized method and the level of formality that is used to manage project risks. This is consistent with what was found in the
literature. Murtonen (2010) assessed in her research that when no clear standards are in place to manage project risks within the organization (i.e. in this case Organization O / PCM), project managers tend to rely on a more informal approach rather than developing a formal one. Based on the case study, the statement made above can be completed with the supposition that appointing a risk champion to medium projects would positively influence the level of formality while managing project risks and thus the implementation of the PRM processes (Figure 4.8).

![Diagram](image)

*Figure 4.8 – Influence of a risk champion’s involvement on the formality level (source: author)*

However, Murtonen (2010) also mentions in her research that in case of a hectic project more informal management could be useful and might help to avoid drastic consequences that would make the project fail. Therefore, one could understand the lack of formality in projects D and E as being necessary to reach higher success. By looking at Figure 4.3, it becomes clear that a trade-off between formal and informal approach to manage risk should be considered. Yet, if the actions that are taken to manage the risky events are not documented and analysed, it will become really difficult to use the lessons learned for future projects.

Concerning the lessons learned related to PRM, if they remain undocumented and unanalysed as currently happening within PCM, most of the lessons will get lost (e.g. outsourced project managers as mentioned in project B), and transferring the knowledge to other projects will continue to be ineffective. However, it is clearly mentioned in the literature that effectively reusing and taking advantage of the knowledge has become a crucial factor for organizational competitiveness. In this research we identify two important aspects of the lessons learned. First, using them could help to improve the tools and techniques through time by using the feedback and critics from the practitioners. This could be done during the post project review as advocated in the ATOM. Then, it could help to decide at the beginning of the project the right proven tools and techniques to use for a project. This could be done during the initiation meeting as advocated in the ATOM methodology. Yet, one should keep in mind that lessons learned should not be taken for granted but considered as a support to trigger risk players creativity for identifying risks.

In order to understand better what risk culture is, we reason in such a way that if the PCM section would implement standardized PRM processes (e.g. proven tools and techniques), then it is supposed that the risk culture within PCM would tend to become more risk mature (part 4.1.4.1); i.e. supportive culture to manage the project risks. Consequently, it is assumed that a higher level of standardization could positively influence the risk culture within PCM. However, only by looking at standardized PRM processes, no statement can be made in regards to the
influence at the individual level (e.g. project manager).

Further, it is inferred in part 4.2.2.1 that there is a mutual positive influence between the implementation of standardized PRM processes and formally managing project risks. In addition, it is demonstrated that following a more formal approach could help one to manage project risks more effectively, i.e. in a more proactive manner. In other words, it is believed that applying formal PRM could positively influence the risk attitude at the individual level (e.g. project manager). In Figure 4.9 the vision about the relations between standardized PRM processes, formal management of project risks, and risk culture is schematized.

The general trend pictured from the case study is that at the PCM section level the risk culture inclines to be risk tolerant; i.e. no strong involvement with risk (part 4.1.4.1). According to the theory, every organization should strive towards being risk mature; i.e. supportive culture. Of course projects C and D could be considered heading toward a more risk mature culture, which might be due to the presence of experienced individuals (risk champion) as pictured in Figure 4.8, but more research should be performed in this area.

It was supposed in part 4.2 that there is a high propensity that actions to manage project risks can easily become more reactive than proactive. A simple practical explanation could be that risk players experience time constrains or work load or a summation of both. However, most of the projects at Organization O are time constrained. Therefore, shall the project risks be managed reactively rather than proactively? The answer is no as it is recognized in the literature that a proactive attitude is preferred to make PRM effective. Linked to the Chapter 3, scaling the tools and techniques could be an acceptable answer to help the risk players to act more proactively besides the work and time pressure and help them not to ignore risk for instance.

All the respondents agree that ignoring risks is a phenomenon that can indeed occur in practice. This is aligned with the research of Kutch and Hall (2009), which came to the conclusion that one of the obstacles to proactive action that might imply risk players not to perform effective PRM, is possible deliberate ignorance. From the data collected, the interviewees mentioned none of the four types of irrelevance identified in the theory. This topic should be further investigated and see if the multi-stage process presented in Figure 4.5 could be effectively aligned in practice with the standardized PRM processes.
4.4 CONCLUSIONS

Although each project is by definition unique, some general conclusions about the involvement of the risk players can be derived to design some pre-recommendations.

If the right involvement of the risk players should be recognized through having a standardized approach to define the roles and the responsibilities, appointing risk champion in medium or large projects, formally manage the processes, considering the lessons learned as essential, and bearing in mind the influence of the human aspects, then we can conclude that the risk players of Organization O are currently not involved in the manner that will make PRM an integrated part of the PM practices. This section will reflects the partial position of PCM on the Risk Maturity framework and develop the pre-recommendations.

Based on the analysis of the empirical data part 4.3, we are now going to benchmark the involvement of the risk players based on the different areas of research with the Risk Maturity framework (part 1.2 and Appendix 6). The relevancy of doing such benchmark is to situate based on a professional framework where Organization O’s PRM practices are situated. Further, it is of great assistance to define some appropriate recommendations that could help PCM going further with the PRM processes.

4.4.1 BENCHMARK WITH THE RISK MATURITY FRAMEWORK

Summarizing the data analysed in part 4.3, general aspects related to the involvement of the risk players are defined:

   I. **No standardized approach** to assign the roles and responsibilities in place
   II. The need of a risk champion to facilitate the PRM processes is not widely accepted, while some key players have some **lack of knowledge** to formally manage project risks;
   III. **Formally involving** the risk players during the entire PLC seems to be a common issue in practice;
   IV. **Lessons learned** are undocumented and unanalysed;
   V. The risk culture inclines to be risk tolerant, there is a high propensity that risks are **managed reactively**, and ignoring risks is a acknowledged phenomenon.

The Risk Maturity framework described briefly in part 1.2 and extensively in Appendix 6-b is used. In the RM framework, some specific and generic attributes from the level 2 and level 3 can be correlated with the strategic position of the PRM processes in order to reflect the current maturity level of the PCM section. Focusing on higher levels of the framework to benchmark the maturity level is not necessary based on the broad picture given by the case study. In Table 4.2 the findings from the cases are faced with the attributes.

Based on Table 4.2, it can be confirmed that looking at the level 4 is neither necessary nor relevant because the general aspects found in the case study are reflected with the attributes of level 2 and level 3 of the framework. It is therefore assessed that the risk maturity level lies between the level 2 and level 3.
### Table 4.2 - Level 2 and level 3 of the Risk Maturity framework involvement of the risk players

<table>
<thead>
<tr>
<th></th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>No standard roles, and responsibilities are not defined or are generic</td>
<td>Roles, responsibilities and competencies defined in some areas but not consistently across the organization</td>
</tr>
<tr>
<td></td>
<td>Little maintenance of ownership or tracking</td>
<td></td>
</tr>
<tr>
<td>II.</td>
<td>Key individuals lack experience</td>
<td>Key project managers understand and articulate the purpose and importance of risk management, but inconsistent levels of commitment and understanding across all projects or the organization</td>
</tr>
<tr>
<td>III.</td>
<td>Limited, if any, formal checking or review</td>
<td>Limited localized information controls, with no formal release management arrangements</td>
</tr>
<tr>
<td>IV.</td>
<td>Little or no knowledge sharing</td>
<td>Local sharing of knowledge may exist but mostly ad hoc</td>
</tr>
<tr>
<td>V.</td>
<td>Dealing with issues as they arise, with a reactive rather than proactive approach</td>
<td>Planning seen as activity tracking rather than proactive/forecasting</td>
</tr>
</tbody>
</table>

#### 4.4.2 Pre-recommendations

In part 4.4.1, it has been evaluated that the risk maturity model of the PCM section is evolving between the level 2 and the level 3. Some pre-recommendations are described below. These pre-recommendations will further be correlated in the Synthesis Chapter with the ones of Chapter 3 and Chapter 5.

At the moment the general organization of every project (level 1 of the “human organization”) based on PRINCE2 is well implemented in practice and seen as effective. However, aligned with what has been said in the pre-recommendations of Chapter 3, a standardized approach is needed for developing the tools and techniques as well as for structuring the involvement of the risk players; i.e. defining the roles and responsibilities. Therefore, there is a consistent need to develop applicable PRM approaches like a risk player analysis.

Furthermore, in order to appoint the right role and responsibilities to the right person a clear selection process should be developed as well as an involvement charter explaining explicitly the roles that must be played and the responsibilities that need to be taken.

For the improvement of PRM, one needs to ensure that the processes are implemented with enough exactitude and vigilance. Consequently, considering involving a risk champion for medium and large projects should also be taken into consideration. It has been demonstrated in this chapter that involving a risk champion has a positive influence on the implementation of the standardized processes as well as on the formality level used to manage project risk. However, the project manager should stay the owner of the process and the risk champion should only be the one supporting and facilitating the process.
Further, reaching a certain level of formality in managing project risks is recognized as essential for efficient information use, rational decision making, and willingness to act. Therefore, project managers should refer to more objective, task oriented, and standardized processes rather than more subjective, people-oriented, and sentimental processes. Aligned with the PRM processes, the formal management of the risk should be performed throughout the project. Moreover, it should be understood that only managing risk formally is not the right approach to follow in all the projects. Informally managing project risks also has some advantages like being more creative and flexible. Thus, a trade-off between formal and informal approaches should be found, the only requirement being that the action should be documented not to lose track of the lessons learned.

In regards to the lessons learned, much needs to be done. The use and gathering of the lessons learned should be done in parallel to the PRM process depicted in Chapter 3. In other words, at the end of the project the data relevant to the organization should be written down and analysed. The data could therefore be used for a future project during the concept phase in order to define objectives better but could also be used in order to scale the PRM process. Lessons learned are important because they represent the knowledge of PCM, and if this knowledge stays tacit then one day it will get lost.

Regarding the human aspects related to the PRM processes, one should just be aware that they exist. Regarding the risk culture, it will evolve at the organization level, PCM level, and individual level in parallel to the standardization of the PRM processes and the use of formal management. Likewise, by using a more formal and more structured approach (e.g. proven tools and techniques) the risk players should be more disposed to act proactively than reactively.

In this Chapter, the impact of the involvement of the risk players on the extent to which the PRM processes are integrated into the PM practices of PCM has been evaluated. However, the influence of the interaction between the risk players has so far been left outside of the picture. Yet, it is obvious to consider this side of PRM is necessary (Figure 4.10). In Chapter 5, the topic related to the interaction between the risk players is discussed.

![Figure 4.10 – Influence of the interaction between the risk players on their involvement](image-url)
In the two previous chapters, the issues related to the current position of the PRM processes (Chapter 3) and the issues linked to the interaction of the risk players with the management of project risks (Chapter 4) were described. Through these two chapters some cross-connections between the several described topics can already be perceived. For instance, how formal a process should be in order to have the full attention of the risk player but also to perform PRM throughout the PLC.

In this Chapter, we want to investigate further the area of “human aspects” by answering the third sub-question: “How do the risk players interact with each other during the dynamic process of managing project risks?” In Chapter 5 we look at how risk players communicate and cooperate with each other. The difference of perception between the different risk players is also investigated. The analysed theory will be faced against empirics to provide further pre-recommendations. The Risk Maturity Model is once again applied as a framework to benchmark the current practice of Organization O and used as a base to recommend PCM with further optimization of their PRM.
5.1 Theory

As we have distinguished based on the literature, current formal approach to PRM should be combined with a less formal approach. Murtonen (2010) found in her empirical study that projects that have adopted a more informal approach in order to manage the project risks emphasize the aspects of co-operation, communication, and personal relationships more than projects carried out with just a formal approach. It is believed that the growing area of PRM related to human aspects, thus informal aspects, is important in order to cope with a more complex project management environment.

In Chapter 4, we demonstrate the importance of certain areas of the PRM related to the human aspects. Investigating some topics connected to the involvement of the risk players in Chapter 4 (e.g. the need to decentralize the PRM activities among the appointed risk players) reveals that the interaction among the risk players is of importance. In this theoretical section some topics are explored. We first look into the difference of perception between the project sponsor and the project managers. Then, it is mentioned in the literature that successful project management can occur within any structure, if the culture within the organization promotes teamwork, cooperation, and effective communications (Kerzner, 2010); therefore, we also discuss in this part the beneficial aspects of co-operation as well as effective communication among the risk players.

5.1.1 Difference of Perception among Risk Players

As mentioned earlier, the role of projects for an organization is fundamental as they are the vectors to the implementation of the strategy (Crawford, 2009). However, the benefits they create are really variable from one project to another. This phenomenon might partly be explained by the difference of perception that risk players have on projects.

In the past and still today, many senior managers have had little interest in project management, considering it to be tactical rather than strategic (Crawford, 2009). This can be pictured by the existence of a gap between the strategy (why should we do this project?) and the tactics (what / how should we do?) (Hillson, 2006). The border between the strategic and tactical levels is represented by the project objectives since they are defined in relation to the strategic vision, and they in turn define the requirement for projects (Hillson, 2006). Many projects fail to meet their objectives because of a bad alignment between the strategy (sponsors) and the tactical project deliverables (project managers). In other words there is a gap between the probable benefits and the deliverables of a project due to the difference of perception between the risk players, which represents a high risk for the successful achievement of projects. As stated by (Wijngaard, Mooi, & Scholten, 2010):

"Different perceptions can lead to a gap between project managers and executives if both of them do not fully understand each other’s perception".
In their study, Crawford et al. (2009) found out that at the project management level, most organizations have to a greater or lesser extent sound project management capabilities in place, although this is not demonstrated at the sponsor level. In other words, they empirically found the “gap”.

The gap between the risk players originating from a difference in perception might get enlarged due to several reasons. According to (Shenhar, Dvir, & Levy, 2001), project managers and project sponsors have different stakes in the project that are closely linked to the difference of timescale of both parties. Project managers tend to see the benefits on short terms (reaching the project’s objectives) while the project sponsor is faced with the long-term results (positive and negative impact on the organization).

Further, project managers, by being involved in the execution of projects, directly contribute to the overall strategy of the organization (Wijngaard, Mooi, & Scholten, 2010). Therefore, both categories of risk players are involved with the development of the organization’s strategy. However, the project managers and the project sponsor have a different perspective of criteria of success. This is due to their different responsibilities and functional viewpoint. On the one hand, project managers want their projects to be successful with high Key Performance Indicators (KPI’s). On the other hand, the project sponsor, with its holistic view over the project, take decisions based on the project portfolio and consider projects as means to implement the global organization strategy (Hillson, 2006).

During the execution of a project asymmetry of information can occur between the project manager and the project sponsor (Wijngaard, Mooi, & Scholten, 2010). Unshared information can make executives become insecure about the project outcome leading to an increase of control over the project. More controls make projects managers see their decision power reduced and have the feeling of being less trusted, enlarging thus the gap between the risk players (Müller & Turner, 2005). Therefore, asymmetry of information can have a severe influence on projects and lead to an enlargement of the gap between the risk players.

Summarizing, there is a proven gap existing between different groups of risk players. This gap implying a difference of perception might have a great impact on the project objectives. Different stakes, different perspectives of criteria of success, and asymmetry of information are some of the different factors that can enlarge the gap. This gap may be reduce by increasing the interaction and co-operation between the risk players as well as establish an effective communication.

5.1.2 Why to co-operate in risk management?

Co-operation is described in the literature as the willingness of individuals to work with others for the benefit of all (Kerzner, 2010). It comprises the voluntary motivation of a group of people to strike for the same goal. In organizations where project risk management is implemented to a large extent with high results, co-operation is found to be a part of the day-to-day practices and does not require the involvement of any kind of formal processes (Kerzner, 2010). The risk players know the right things to do and act upon it. One needs to learn how to co-operate as it
goes, as co-operation is something that depends on the people with whom one interacts and there is no single way to do it (Kerzner, 2010).

Co-operation is particularly valuable for PRM, since the purpose in PRM should be for instance to diminish the global project cost, not just the cost of a single risk player (Klemetti, 2006). Additionally, at the beginning of the project, it is not possible to foresee all the risks but with a collective effort from all the risk players more risks might be identified. PRM is more flexible and effective when coalition between the risk players is used to bring innovative ways to deal with future events (Floricel & Miller, 2001). Co-operation is needed in order for risk managers to have a comprehensive and holistic view of the wide range of risks (Klemetti, 2006). It their research, (Pinto & Pinto, 1990) have found that cooperation is a strong predictor of certain project outcomes.

Summarizing, co-operation is an essential activity to be performed in order to increase the success of projects. A closer cooperation between the risk players is important as it is expected to reduce the gap mentioned in part 5.1.1. It is relevant to know that co-operative cultures are based upon trust and effective communication.

5.1.3 Effective Communication

Effective risk management has become a basic necessity for every organization, as has the ability to communicate effectively about project risks (Loosemore & Phua, 2011). Communication has long been documented as important for building and maintaining a productive interface between functional units (Pinto & Pinto, 1990). Communication is one of the most needed areas for improvement as the lack of communication has been specifically linked to problems in project failure (Pinto & Pinto, 1990). In the study of Thevendran et al. (2004), “better communication” is one of the recommendations that have been proposed to respond to the influence of human aspects on RPM.

Communication is an essential factor for project success. The size of the gap previously mentioned is proportionally linked to the level of communication existing between the risk players (Wijngaard, Mooi, & Scholten, 2010). Communication should be both formal (reports) and informal (day to day talks) as using only formal approach has a negative impact on the relation between the risk players (Shenhar, Dvir, & Levy, 2001). Balancing both less formal and more formal approaches should help to better align the different risk players’ perceptions.

According Kerzner (2010), the quality and frequency of information moving down the organizational chart are less consistent, especially in more formal companies leaving the employees, lower in the organizations, with less information. Additionally, Kerzner (2010) also states that in organizations that have a more formal approach for project management, employees usually claim that communication is poor. Senior managers, however, usually think that communication in their company is just fine. This reflects perfectly the topics investigated in part 5.1.1 about the risk players’ divergence of perception.

Summarizing, as it has been mentioned already in Table 2.1, improving the communication is a “soft” benefit of PRM. Therefore, using PRM processes helps the risk players to communicate
more effectively and effective communication helps risk players to manage projects risk in a more effective manner. However, it is mentioned in the literature that the communication process is not well implemented between the different organizations' levels, especially in the ones following a more traditional/formal management approach.

5.2 EMPIRICS

In Chapter 4, the influence of the involvement of the risk players on effective PRM processes was outlined. However, PRM practices should not be done by one individual but should involved several risk players. It is thus believed that the interaction among the risk players is crucial in order to manage effectively project risks. In this section we focus on the interactivity of the risk players.

Before the analysis (part 5.3), we outline various visions on the essence of PRM related to the interaction of the risk players, as they appear from the case study. This is crucial, because the extent to which risk players interact which each other is believed to influence the way they are involved with the PRM processes and therefore how the project risks are managed. Put differently, comparing the results from the different sub-units of analysis might lead us towards more pertinent recommendations that could help optimizing the current strategic position of PRM within PCM. As mentioned in part 3.2 and part 4.2, within PCM the project management practices are based on the PRINCE2 method, as should the PRM processes and thus the roles and actions to be taken by the risk players. However, the interaction between the risk players is something that is difficult to grasp from books, standards, and the literature in general. It is related to the human interaction and cannot be standardized in a process. Yet, a standard like PRINCE2 offers a framework to lead the interaction between the practitioners towards more effective PM practices but does not describe specific interaction patterns. The gathered empirical data are addressed by reflecting and facing the “Soll” and the “Ist” of the TSI framework in part 5.2.1 and part 5.2.2.

5.2.1 THE INTERACTIVITY OF THE RISK PLAYERS

In the previous Chapter two organization levels were defined within Organization O around PRM (part 4.2.1):

- Level 1, which reflects the standardized and general organization of a project inspired and adapted from the PRINCE2 method.
- Level 2, which reflects the different roles that should be played by the risk players during the entire PRM processes.

At both levels, interaction between the risk players is necessary in order to make PRM processes as transparent as possible through the organization. The general set of interactions between the
risk players is schematized in Figure 5.1 based on the data gathered from the six projects of the case study. According to PM guidelines within Organization O, the project board should have a general overview on the PRM processes and provide resources and budget to the project manager, which “in return” needs to report through a monthly highlight report. The project manager is in charge of involving the risk players and manages the PRM processes throughout the PLC by using a risk register. The risk players (e.g. risk owners and action owners) have to report to the project manager or to the risk champion when assigned to the project (project C and D). A continuous interaction within the team is of course also expected. The risk champion is there to support the project manager and has to report to him/her. In case of project C an external expert was appointed. The role played by the external expert is somehow to support and manage the entire process and involve the risk players that are part of the process.

Figure 5.1 – Interaction between the risk players pictured from the case study (source: author)

However, this general reconstitution of the risk players’ interaction is quite different from one project to another. For instance, as we have seen in part related to the involvement of the risk players, the project board is not always playing its role according to the PRINCE2 terms.

In project A, the risk players were sitting together and acknowledge the importance of doing risk management, yet the procedure stayed really informal and the risk players had trouble to interact with each other. This was due to a general lack of knowledge about risk management and lack of expertise from the project manager to lead the processes and effectively involve the risk players.

In project B, the respondent do not see that risk players properly interact in such way that many risks relevant to the projects were not identified and that informally appointed risk owners were not acting as such. Some of them wait for specific directive from the project manager instead of
taking the initiative. In general they do not have a risk approach implying that between the team members the interaction is poor. Additionally, the project board of the project is qualified as a bad functioning board because the players in it do not know what to do with PRINCE2 method and what their role is regarding PRM. At the project manager level there is not much interaction with the risk players.

For project C, PRM was new for most of the people involved (both PCM and client) and the external experts controlled the interaction between the risk players. Organization O and DP were in the same team working hand in hand; there was a good exchange between both parties. One knew the content of the PRM and the other one how to manage the content. DP was only requested to step in for support. Further, people part of the PRM processes, were in the biggest part from a technical background and were not trained and focused only on the technical execution, which lessened the interaction between the risk players. They only relied on previous experience, which developed a tunnel vision towards PRM. Risk management is characterized by the respondent as "a new thing" that is not kept in the minds of people at PCM. According to the risk champion, if the cooperation among the team is good then risk assessment is done in an "easy" way. However, if there is tension within the team and no proper atmosphere and if there are no good relations during the PRM sessions, it is a hard job to accomplish PRM. In order to create this atmosphere, the project manager needs to be convinced himself/herself in order to convince the other players. In fact, in project C, the risk players were not convinced fast about the beneficial aspects of PRM. But once the risk players had accepted the method and believed that doing it would be beneficial for the project, there were no major hesitations anymore and the players felt that they were needed engendering more interaction.

In project D, within the project team there was a good interaction. One interviewee from category 3 understands that the more people are involved and interact, the better. The concept of interaction is defined by the risk champion in a way that a risk can impact different aspects of the project and therefore involves more than one risk players, which thus have to support each other; it is always a team effort. However, outside of the PRM sessions there is a poor interaction between the project manager and the risk champion. Further, The knowledge of the risk players is seen by the risk champion as crucial to have a proper input in the risk management sessions because “when you look at the risk itself it relies on the awareness of people who can help to solve the risks”. However, the category 1 respondent believes that there are not so many people who can take part in the risk assessment and interact with the rest of the risk players because there is a consistent lack of knowledge of the risk players to have a proper input. For example the engineers are only focused on their areas and do not consider the complete overview. He considers that in this project only several project stakeholders (risk players) have the complete overview. According to the category 2 respondent, the project board is making use of the fact that there is a certain clear insight in the PRM processes. However, they do not use the maximum right as the project board to interact more with the players. Highlight reports is “THE” tool to flag risks at the project board, which is considered to be far too little.

In project E, the respondent defines it difficult to speak specifically about PRM related interaction as the PRM is deeply integrated in the PM process.
In project F, the interviewee outlines that making the executive more part of the responsible people throughout the project provides a much more logical division between the people involved and helps to stimulate the general interaction of the risk players. The respondent specifies that within the team, you had the good players and the less good players meaning that some players will faster interact than other. In addition, the interest of risk players to interact might be more or less high depending on the personality and the context of assessing the risks.

Overall, every project faces different difficulties related to the interaction of the risk players. Several of the factors are listed below:

- Informal approach to manage project risks
- Not adapted tools and techniques
- Lack of involvement at different level of the organization
- Funnel vision due to lack of general overview
- Lack of knowledge linked to the novelty of the processes
- Lack of initiative and interest
- General atmosphere among risk players

### 5.2.2 Communication

As previously mentioned in Chapter 3 and Chapter 4 and represented in Figure 5.1, the only formal and compulsory way to communicate about risk between the project manager and the project board within Organization O is through a report called highlight report where a few lines are dedicated to the follow-up of the project risks. In regard to what is available to support the processes in order to structure the communication between the project manager / risk champion and the risk players, two different risk registers (one simple and one more complex) can be downloaded from the quality system. Moreover, as mentioned by one of the category 3 respondents of project C, the meta-language used at Organization O is not yet aligned among the different units as the internal communication is in transition from former language towards the PRINCE2 terminology. It was also said that the PRINCE2 method helps a great deal to support the transition.

In practice, as the highlight report is compulsory, all the projects are using it. However as we have seen in part 3.2.2, risk register are not properly used in all the projects to support the communication between the risk players.

In project B, it is agreed by the respondent that when risks are not properly managed it is better to share, interact, and communicate, in order to know more about what might be the risk. It was mentioned that the communication with the client should also be transparent.

In project C, the project board was informed after every sessions supported by a summary made by the risk champion. According to one category 3 respondent, the communication with the project board was quite transparent. It was mentioned that if one needs to communicate with the project board, it is easier to use simple results or simple formal communication means. However, the communication about risk was more or less formal but it appeared that less formal communication also helps to perform better. The other respondent from category 3 thinks that
using formal PRM processes are of great help to make people interact and communicate about the issues. This interviewee also understands that interaction as well as communication depends on the knowledge of the people involved in the process.

In project D, the risk sessions are the only moments when the team is complete and where risk players have the opportunity to think and communicate about PRM as a team. One interviewee from category 3 mentioned that the project manager did not deliver enough information to the project team.

In project F, it was stated that there was a great communication between the risk players. The respondent further mentioned that increasing the formal communication enhances the trust and interest between the risk players. Additionally, transparent communication between the client and the project managers helps a lot to make the project a bigger success.

Overall, the respondents understand the necessity of transparent communication between the different players part of the PRM processes in order to share, understand, and find a way to act further upon uncertain events. However, not all the cases experience such transparent communication between the different levels of risk players. Furthermore, simple means of communication are mentioned as more efficient. Likewise, a combination of formal and informal communication seems to have better outcomes. Formal communication might help to keep track of the knowledge exchanged and create trust between the project stakeholders while informal one might help to exchange information faster.
5.2.3 **SUMMARY**

In Table 5.1, the empirics described in part 5.2 are summarized respectively for the six different projects:

<table>
<thead>
<tr>
<th>Co-operation</th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
<th>Project D</th>
<th>Project E</th>
<th>Project F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Risk players had trouble to interact with each other. The project manager lacked experience to lead the processes</td>
<td>Poor interaction among the project team and with the project board. The general behaviour is qualified as passive.</td>
<td>Novelty of the process related to ignorance of the participant. Players tends to focus too much on their area of expertise and need to be convinced about the benefits related to PRM processes</td>
<td>Good interaction during risk sessions. However, a lack of knowledge blocks a fluid interaction among the players. The project board could be more involved</td>
<td>High motivation within then team. But the processes are so informal that no interaction specific to PRM is perceived</td>
<td>Unstable interest of the risk players linked to “better” players and “less good” ones.</td>
</tr>
<tr>
<td>Communication</td>
<td>The project manager experienced a really good collaboration with all the members of the project</td>
<td>It is better to share, interact, and communicate, in order to know more about what might be the risk</td>
<td>Easier to use simple results or simple formal communication means. It appeared that less formal communication also helps to perform better</td>
<td>Place for improvement but the communication among the project stakeholders is good.</td>
<td>The project manager is satisfied.</td>
<td>Transparent communication between the risk players. Increasing the formal communication enhances the trust and interest between the risk players</td>
</tr>
</tbody>
</table>

A general remark about Organization 0 is that the meta language seem to be in the middle of a transition between the formally used terms and the PRINCE2 ones. Only formal way to communicate about the risk is through a few lines encompassed in the highlight report. Between the project managers / risk champion and the project team in most of the project a risk register is more or less used.

*Table 5.1 – Summary of findings – related to the interaction between the risk players*
5.3 **ANALYSIS**

While in part 5.2 the gathered data from the six different projects that relate to the interaction between the risk players were confronted, the intention of this part is to analyse all the results, and provide critical reflection and comparison to the literature.

In the theory (part 5.1.1), Hillson (2006) defines a gap between the strategy and tactics. This represents the difference of perception between the executives (project board) and the level of the project manager. What is assessed from several projects part of the case study is a lack of support from the project board in regards to PRM. The need of the project to require only the highlight report in order to formally follow what is happening at the deliverables level could definitely be seen as a difference of perception between the risk players. No practical reasons besides a possible misunderstanding connected to the implementation of the related roles and responsibilities in PRINCE2 terms were found in practice. Nonetheless, one should keep in mind that based on the literature [1] difference of stakes, the [2] difference of perspective of criteria of success, and [3] asymmetry of information could likely cause an increase of difference of perception, thus enlarging even more the gap.

The co-operation between the risk players is described in the literature (part 5.1.2) as part of the day-to-day business and does not require the involvement of any kind of formal processes. The co-operation is something that should come naturally between the risk players. What was found in the case study is that some players are more likely to co-operate than others. Practical reasons could be, the interest of the players linked to the level of formal processes and the definition of the roles and responsibilities, and personal expertise and knowledge. Overall, every project faces different difficulties related to the interaction of the risk players, due to several reasons going from tools and techniques that are not adjusted to an atmosphere among risk players that does not let them express themselves in an open way.

The ability of communicating effectively about project risks has become a basic necessity for every organization. Within PCM, the only formal way to communicate about the risks between the project manager and the project board is through a few lines encompassed in the highlight report every month, while this communication line is crucial. In most of the projects, a risk register is more or less used as a formal means to exchange around the topic of PRM between the project managers / risk champion and the project team. Further, still many terms are different through the organization, which makes it complicated to have a sound common understanding. A general agreement around the need to have transparent communication throughout the organization is observed. However, can it really happen in practice? We have seen in Chapter 4 the topic related to the deliberate ignorance of risk; additionally, in this Chapter we have mentioned a likely difference of perception between the different risk players. Consequently, reaching transparent communication appears difficult in relation the some human aspects and might need further attention. According to the literature (part 5.1.3), the communication as well as the managerial approach should be both informal and formal because only using formal communication has a negative impact on the relations between the stakeholders. This is well recognized in the case study. On the one hand, a respondent from category 3 of project C thinks
that using formal PRM processes are of great help to make people interact and communicate about the issues. Then, one respondent from project F also recognizes that formal communication enhances the trust and interest between the risk players, which is therefore a really important aspect of any teamwork and should therefore be improved. On the other hand, according to a respondent from project C, less formal communication also helps to perform better.

5.4 CONCLUSIONS

Although each project is by definition unique, some general conclusions about the interaction between the risk players can be derived to design some pre-recommendations. This section will reflect the partial position of PCM on the RMM framework and develop the pre-recommendation.

Base on the analysis of the empirical data part 5.3, we are now going to benchmark the interaction between the risk players based on the different areas of research with the Risk Maturity framework (part 1.2 and Appendix 6). The relevancy of doing such benchmark is to situate based on a professional framework where Organization O’s PRM practices are situated. Further, it is of great assistance to define some appropriate recommendations that could help PCM going further with the PRM processes. More concretely it could help the PCM section to reach the next level of the Risk Maturity framework.

5.4.1 BENCHMARK WITH THE RISK MATURITY FRAMEWORK

Summarizing the data analysed in part 5.3, general aspects related to the interaction between the risk players are defined:

I. Difference of perception between the risk players of what is PRM
II. Some players are more likely to co-operate due to more experience for instance
III. General agreement around the need to have transparent communication
IV. Communication is poor and is formally done only through the highlight report. Additionally, it should be both informal and formal

The Risk Maturity framework described briefly in part 1.2 and extensively in Appendix 6-b is used. In the RM framework, some specific and generic attributes from the level 2 and level 3 can be correlated with the strategic position of the PRM processes in order to reflect the current maturity level of the PCM section. Focusing on higher levels of the framework to benchmark the maturity level is not necessary based on the broad picture given by the case study. In Table 5.2 the findings from the cases are faced with the attributes.

The Risk Maturity framework does not say much more than the to attributes related to the communication between the risk players. Hitherto, based on Table 5.2, it can be confirmed that the risk maturity level lies at the level 3. Yet, this is true only for the communication aspect. The pre-recommendations reflect all the relevant topics that we have assessed during the case study.
Table 5.2 – Level 2 and level 3 of the Risk Maturity framework involvement of the risk players

<table>
<thead>
<tr>
<th>Level 2</th>
<th></th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV.</td>
<td>Little, if any, communication with other parts of the organization concerning project risk</td>
<td>Risk status reported to Project Board on ad hoc basis, if at all</td>
</tr>
</tbody>
</table>

5.4.2 Pre-recommendations

In part 5.4.1, it has been evaluated that the risk maturity model of the PCM section is level 3. Some pre-recommendations are described below. These pre-recommendations will further be correlated in the Synthesis Chapter with the ones of Chapter 3 and Chapter 4.

The difference of perception is closely related to a difference of interest but also awareness. As mentioned in Chapter 4, it is important that all the players taking part in the PRM processes understand and act upon their roles and responsibilities. In order to optimize it, it is first necessary to select the right players and then to involve them in the right way. It was earlier agreed that using a risk champion could make it easier. If every risk players would be aware of what should be done and how it should be done regarding the standardized PRM processes in PRINCE2 terms, then it can be expected that the different perceptions would be aligned in a better way. Consequently, in order to assist the alignment of perception, besides implementing a standardized approach, risk players could receive some training and some internal information meetings could be organized in order to generate a common awareness.

The level of co-operation might be linked to several factors like interest, expertise, stake in the project, and attitude of risk players. In order to maximize the level of co-operation one first need to select the right players as mentioned in Chapter 4. Further, the expertise could increase by providing some training. In order to trigger the players’ interest, it is important that the players feel involved, which can be done by involving proactive individuals (project manager / risk champion) to facilitate the project. The attitude is something difficult to judge but also to change. Yet, one should bear in mind that attitude of the risk players is something key for the success of PRM.

Communication is an essential aspect to be considered for effecting PRM and should be formally and informally improved. First, a common and “understood by everyone” (meta-) language to describe risks as well as to communicate around them should be used. As PRINCE2 is implemented as the PM best practice, the language of PRINCE2 should be used. Further, it is understood in the case study that using a highlight report is not sufficient to exchange the relevant information about risk management with the project board. Thus, more formal documentation should be developed to enhance the communication between the project manager and the project board, but also between the project manager and the project team and projects risks should become a part of the default project meeting agenda. Informal communication should also be used to create a necessary dynamic, creative, and flexible work atmosphere, which could also influence the players’ attitude. Further, the quality system should be used as a digital communication support to inform the entire organization about the PRM activities.
Chapters 3, 4, and 5 provide comprehensive answers to the set of research sub-questions. The sub-questions were answered based on the TSI framework involving a deep analysis between the theory, what is ought to be according to the company guidelines, and what is happening in reality. The intention of this Chapter is to answer the main research question: “How can the current Project Risk Management practices surrounding medium construction projects be optimized?”

On the one hand, answering the main research question is done by critically reflecting the findings and thoroughly assessing how the results obtained in the Second Phase (Investigation) interplay with each other. On the other hand, it is done by synthesizing all the results from Chapters 3 to 5 in order to properly benchmark PCM’s risk maturity level based on the Risk Maturity framework. Doing this will help to design short, medium, and long-term recommendations. The final recommendations are orientated towards the optimization of PCM’s PRM processes and are aligned with the Risk Maturity Model.
6.1 Interplay of the Findings

In Phase 2, a literature review and a case study were performed, which led to several pre-recommendations related to the PRM processes and the risk players. It was mentioned several times until now that there exists an obvious link between both. Moreover, in this research several other cross-connections could be established between the results and help to design stronger recommendations. Therefore, it could be interesting to critically reflect the findings from Chapter 3, 4, and 5 and see how they interplay with each other.

6.1.1 Standardizing the PRM Processes, Not a Goal in Itself

It is supposed in this research that standardizing the PRM processes would equally have on the short-term a beneficial influence for the continuous implementation of the PRM processes throughout the PLC and the human organization surrounding PRM. Put differently, by standardizing the processes, a set of tools and techniques would be made available to the risk players, which could make them more involved by understanding better their roles and responsibilities. Aside from being practical, these standardized processes could become the groundwork for human involvement and human interaction. They could materialize the support needed to facilitate the processes and provide a clearer vision.

The standardization of the processes is believed to be correlated to the formal management of project risks and to positively influence the risk culture at the section level; i.e. help the PCM section to support its ambition of becoming more risk-mature (part 4.1.4.1). Moreover, it could help project managers as well as the other risk players to align their risk culture with the one of the section through the use of concrete and proven processes.

Uniformed tools and techniques encompass by definition a common language and a common vector for communication. As it has been mentioned in Chapter 5, formal and informal communication should be made transparent. It is thus supposed that using standardized processes could really help in this matter. Additionally, it might help to enhance the interaction among the risk players, as everyone would have supposedly used the tools in another project (as the projects are internal to the organization) and would understand how the processes work and most of all what their purposes are.

The standardization of the processes is thus seen as beneficial for the PCM section. Yet, nothing can thoroughly be concluded in regards to the relation between the standardization of the processes and the PRM effectiveness on the long term and it could be retorted that implementing a unique approach to manage project risk is not the right solution. This is taken into consideration and it is why it is clearly stated that implementing standardized processes should be used as a means to optimize the practices on the short-term but not as a goal in itself on the long run.
6.1.2 Continuous use of lessons learned throughout the PLC

As stated earlier in Chapter 3, following the advocated steps of the PRM processes is essential to profit from the related benefits; identifying potential project risks is not enough, action plans should be designed and implemented. In parallel to continuously perform PRM, it is important to understand that the lessons learned, which can be lessons from the beginning or the end of the project, are really essential. First the importance of the lessons learned is reflected in the practical feedback that could be used to optimize further the processes in place. Lessons learned could be seen as experiments’ results used to refine the procedures, this is why practitioners should stay critical and personally involved.

On the other hand, the lessons learned could be relevant to be used at the beginning of the project where the project’s scope is defined. It is widely acknowledged that each project is unique, but using the lessons learned form former projects could trigger some creativity among the risk players and help them to see further than what is known and increase the known unknowns and thus decrease the unknowns unknowns (Figure 2.1). Somehow, using the lessons learned could enhance the involvement of the risk players.

Further, if a way to share the lessons learned could be designed and implemented, it would help by deduction to share some knowledge and increase the general PRM understanding within the section about the processes usage. But this should not be considered to be enough and some attention should be focused in the direction of PRM education and training.

6.1.3 Risk Champion, Not Just Another “Tool”

The project manager is and should stay the owner of the PRM processes. However, some internal or external “help” should be used while carrying out medium projects. As presented in part 4.3, the risk champion has a positive influence on the level of formality and thus on the implementation of the PRM processes.

In this research the “help” mentioned above is characterized by the support of a risk champion in charge of facilitating the PRM processes, which is also believed to facilitate its integration. Yet, the role played by the risk champions does not stop at facilitating the processes. They also represent an effective “tool” that create a certain dynamic among the risk players. They do not own the processes but lead them. It is also believed that the risk specialists can also canalize the difference of perception and interaction among the risk players by employing the right tools and techniques and by assigning the right players to the right tasks.

6.1.4 Scalability of the Risk Players’ Involvement and Interaction

In this research the notion of scalability appears to be something necessary to bring the PRM processes further than a simple standard available for use. The notion of scalability should be understood as the broadening of the beforehand-standardized tools and techniques in order to make them project-specific. In other words, scalability can only originate from an existing proven approach on which some developments are added, transformed, enhanced.
The scalability of the PRM processes goes further than adapting already existing tools and techniques. Scalable processes could help to scale the involvement of the risk players as well as their interaction. What is meant is that by having an explicit idea of the kind of tools and techniques that should be used for a specific project, the number of risk players and how their roles and responsibilities should be divided could become clearer and more effective. Therefore, the notion of scalability could make a remarkable difference not only on adapting the PRM processes and make them project-specific but also on making the human organization more effective.

6.2 THE “GLOBAL” BENCHMARK OF PCM

In this section of the report the benchmark of the PCM section is made based on the three partial benchmarks that were done focusing respectively on the current position of the PRM practices, the involvement of the risk players, and the interaction between them. The “global” benchmark will be used to design recommendations in order to possibly optimize the PRM practices of the PCM section.

In chapter 3, the current position of the PRM practices is studied. It is found that a lot of general knowledge about PRM is available within the PCM section; yet, no standardized approach to manage project risks is consistently implemented within PCM. This is supposed to be a major why the PRM processes are poorly carried out through the entire project and the existing tools and techniques are not uniformly used in every project and are also not well documented on the quality system of the PCM section. In general the PRM processes are an add-on rather than being an add-in of the PM practices. The benchmark with the framework reveals that the Risk Maturity level lies between the level 2 and the level 3 of the framework.

In chapter 4, in which the involvement of the risk players is investigated, two levels of “human organization” are identified: the general one related to the project and the one specific to the PRM processes. It is assessed that both are essential but that in the level 2, the roles and responsibilities to manage the project risks are not widely well defined which causes some poor commitment of the risk players in some of the projects. Further, it is also not well accepted that managing the processes formally could increase the implementation of the standardized method and help the section to shift towards a more mature risk culture. So far nothing is done in regards to risk related lessons learned, while the benefits of gathering and further using the lessons learned is well acknowledged in the literature. The benchmark with the framework revealed that the Risk Maturity level lies between the level 2 and the level 3 framework.

In chapter 5, it is stated that the interaction between the risk players is something that is linked with the level of formal management and the level of implementation of proven tools and techniques. It was found in the case study that every project faces different difficulties related to the interaction of the risk players, due for instance to a lack of support and possible lack of interest from the project board. Further, formal communication is something that seems to need to be enhanced. Yet, it is acknowledged that informal communication also helps to perform better
PRM. The benchmark with the framework revealed that the Risk Maturity level tends to be at the level 3, only in terms of communication.

Overall, based on a pre-assessment of the risk maturity level in Chapters 3 to 5, the Risk Maturity level of the PCM section lies between the level 2 (Awareness of process) and the level 3 (Repeatable process), as we have seen in part 3.4, part 4.4, and part 5.4 (Figure 6.1). Put differently and based on the description of the framework, PCM risk maturity lies between:

- Level 2 where there is minimal evidence of risk management being used to any beneficial effect on projects and where there may be evidence of risks being documented but little evidence of active management.
- Level 3, where the risk management is recognized and used on projects, but there are inconsistent approaches, which result in different levels of commitment and effectiveness. For more detailed information, it is possible to refer to Appendices 6-a and 6-b.

*Figure 6.1 – Benchmark of the PCM section*
6.3 Final Recommendations

In part 6.2, it is evaluated that the risk maturity model of the PCM section is evolving between the level 2 and the level 3. The final recommendations described are organized in three levels of importance:

- Short-term recommendations that might help PCM to shift entirely towards level 3;
- Medium-term recommendations that might support PCM to start going towards higher levels by developing further what will be in place after implementing the short term recommendations;
- Long-term recommendations that should contribute to maintain the momentum of the optimization process within PCM.

6.3.1 Short-Term

In order to shift entirely towards level 3 (repeatable process), it is considered that a common understanding within the PCM section should be reach on what PRM is and what the related benefits are. In order to that, some basic PRM practices have to be established and the players need to be involved. In order support the players some basic training could be delivered to them. However, only doing this will not be sufficient to reach high project success, as there is still a consistent lack of integrated risk management and inadequacies in communication strategy. In part 6.3.2 some other recommendations are given to reach higher success.

6.3.1.1 Mature a common understanding

A lot of theoretical and some practical knowledge about risk management is available within PCM. This knowledge should be used as the core of the development for the approach to manage project risks.

- Seek the local knowledge and the level of involvement within the entire PCM section in order to generalize the benchmark made in part 6.2;
- Undertake awareness briefings (perhaps using the in-house expertise or involving external one) in order to set the vision of project risk management and make everyone understand the clear benefits of carrying out PRM formally throughout the PLC. This could/should include all the potential risk players; i.e. members usually part of the project board, project manager, engineers, project buyers, etc.;
- Ensure the involvement of the project managers as well as the one of the project board (seniors and executives). They are the ones steering the processes;
- Consistently include risk communication in the tasks that are carried out. For instance make risks part of the default agenda and not the final item of the list;
- In order to make PRM effective during project by aligning the perception and enhance the commitment, in would relevant to find a way to expend the awareness further than PCM;
Acknowledge, advertise, and celebrate success in order to encourage the players and enhance the involvement.

6.3.1.2 Develop Standardized Processes

For the success of PRM, the processes should be truly embedded in the PM practices. Therefore, there is a consistent need to start developing a basic standardized approach. Having a standardized approach to manage project risk will help in the beginning to align the tools and techniques with the risk players’ involvement; yet it won’t be enough on the medium and long term and the notion of scalability should be looked into (part 6.3.2). Consequently, the PRINCE2 method already used to manage project should be carefully understood in regards to PRM and further implemented. The last version of PRINCE2 introduces several interesting concepts that should be integrated in order to possibly optimize the PRM practices:

- Use one unique and “understood by everyone” (meta-) language throughout the section and if possible the organization (e.g. PRINCE2). This should help to make the communication more transparent as well as for instance ease the identification process where event, cause, effect need to be soundly assessed;
- Use a clear approach to help define risks that includes carrying out a structure risk brainstorming session and using a checklist or a risk breakdown structure (RBS) to trigger risk identification and help players to think out of the box to identify additional risks; Further the identified risks should be classified based on the RBS and/or checklist;
- Assess the overall risk exposure and prioritize the risks by giving each risk a likelihood and an impact related to one or more of the project objectives;
- Consider the effect of time that helps focusing on risks that are of a more pressing concern;
- Consider the risk status that enables one to know the current status of a specific risk;
- Plan risk action and implement them and track them until the risk is considered closed;
- Clarify the ownership issues in order to make it clear who is responsible for what risk (risk owner) and to make it clear who is responsible to take action (action owner(s)). It is essential to explicitly allocate each risk to a single risk owner during the structured risk workshop, while it is important to know that several individuals can act upon one risk.

However, some other recommendations are not explicitly mentioned in PRINCE2 that could be achieved on a short term and related to the development of basic standardized processes could be:

- Establish a procedure that should be followed in order to get the maximum out of the risk workshop, the process should be formalized;
- Understand the PRM process as described in Figure 3.1. Every step is important and should be considered; practitioners should be aware of the benefits of starting with an initiation meeting and finish with a post-project review (part 6.3.1.3);
- Plan major review meetings at every stage boundary of the project and smaller review meetings during the project to keep everyone alert and aware, thus involved and committed.
Making use of the PRINCE2 method could therefore be a good start to reach basic management practices, but should be completed by other knowledge found in the extant literature (e.g. ATOM).

6.3.1.3 DEVELOP EFFECTIVE TOOLS AND TECHNIQUES

It is also crucial to develop effective tools that would be standardized through the entire PCM section and thus used by all the project managers.

In order to follow the identified risks, one needs to maintain a risk register. A risk register is a tool that enables to view progress and make sure that one will manage the risk players to act upon all the identified risk and their associated action plans. Tracking action plans should be a day-to-day job for each project manager. Tracking risks and tracking tasks should be differentiated (i.e. need for risk and action owners). The risk register is also a perfect communication tool that informs the risk players on what is going on, therefore:

- PCM should design a new risk register that everyone can use and develop it in parallel to the elaboration of the basic standardized processes. The version made by DP (Full risk log) could be used as many essential aspects are already mentioned (e.g. overview of participants contributing to the risk analysis). Yet, it could be improved by for instance introducing the notion of risk owner as well are redefining properly the risk categories and not limiting the project objectives to quality, budget, and schedule.
- A basic and generic Risk Breakdown Structure should be developed to help risk players to identify and further classify the risks.
- In order to effectively prioritize the risks, it is recommended to use project-specific risk matrix (i.e. adapted impact scale for every project). For medium-size projects a five-point scale is recommended for both probability and impact (very high, high, medium, low, and very low). The notion of scalability is more extensively described in part 6.3.2.
- The highlight report is the only current formal communication tool between the project manager and the project board. It should either be improved on the part dedicated to the risks or the risk register as well as a PRM reporting template should be considered as formal and official documentation. Sharing information more extensively with the project board is essential to involve it more in the PRM processes and therefore create a more interactive relationship and align the perception;
- The quality system of PCM should be developed in regards to PRM; the documentation related to PRM should available for use.

It is agreed in the theory that the risk register is used as a formal method that enables the risks to be documented and tracked throughout the PLC. Sufficient supporting procedures like training are desired to ensure that risk players are using the risk register effectively. However, the effectiveness of the risk register is dependent on the project manager’s interest to search for information about previous risks, their intuition to perceive possible risk events, and their activity in documenting their own risk remarks. Therefore, as mentioned above, a new risk register should be designed (adaptation of DP’s one) and some basic training should be delivered.
6.3.1.4 Basic Training

The project managers are characterized as the owners of the PRM processes in practice; i.e. he/she is the one in charge of implementing the tools and involving the risk players. Of course they can be assisted / supported by a risk champion, but they should still be the ones leading the process and involve as much as possible the key players. Therefore, some basic training should be delivered to them. Delivering basic training to key staff is necessary for several reasons:

- They are the one who should own the PRM processes, therefore, they need to be convinced themselves before convincing the project team;
- Proposing some proven tools and techniques is not sufficient; individuals need to know the meaning of such tools and techniques and how to use them;
- There is some inflow and outflow of individuals within the PCM section and therefore the knowledge should be continuously levelled to the one in-house;
- Improve the involvement and interaction of the risk players.

6.3.2 Medium-term

In order to reach higher Risk Maturity levels, the PRM processes need to be fully documented and integrated to the PM practices. Besides standardizing the processes, the involvement and interaction between the risk players are two critical factors. Accordingly, the top management should be engaged consistently in order to provide active and informed support. Further to the basic training recommended in part 6.3.1.4, an established training programme that would help to develop the skills and knowledge of the individuals should be in place. The level 4 is finally characterized by having standard processes that can be managed more proactively and which can be tailored to suit specific circumstances, in accordance with the developed guidelines.

6.3.2.1 Develop Further the Common Understanding

According to the extant literature, the definition of risk does not refer anymore to it as a threat, but as an event that can have a positive or negative impact on the project objectives. Prince 2 also allows focusing on threat as well as on opportunity. Therefore,

- The two-sided nature of risk should become part of the processes in order to minimise threats and maximise opportunities, and so increase the likelihood of achieving both strategic and tactical objectives. This requires an adaptation of the tools and techniques but can be well integrated within.

6.3.2.2 Develop Further the Basic Standardized Processes

There is a subsequent need to develop clear processes that must be applied through the entire life cycle of projects. It is clear that both the front- and back- ends of a project are fertile territories for improvement of the PRM processes.

- The front-end should be looked into in order to better identify the project and the needed PRM tools and technique. It is relevant to develop a Risk Management Strategy at the beginning of the project, which outlines the way in which the goals of applying PRM, as well as the procedure that will be adopted, roles and responsibilities, the timing of
PRM interventions, the tools and techniques that will be used, and the reporting requirements. This Risk Management Strategy as well as the opus of the risk register should become part of the Project Initiation Documentation;

- The project’s back-end activities should be developed in order to better communicate and share about PRM processes and their influence and benefits on projects (part 6.3.2.3). The processes should be carried out until the project closure in order to make use of the lessons learned. The post-project review step (Figure 3.1) should be expended to address PRM evolution through the project. Improving this part of the project life cycle could help to assess the use of the tools and techniques and use the lessons learned and feedback to optimize them further.

Scale the PRM processes is also essential in order to grasp the benefits of the tools and techniques. Every project is unique by definition and should therefore require project-specific attention.

- Redefine in terms of Organization O characteristics a scalable approach on which to decide which level of PRM to apply for which project. What is presented in Table 3.3 in order to size projects should be improved based on what is mentioned in the ATOM methodology (Appendix 1);

- In order to effectively prioritize the risks, it is recommended to use project-specific risk matrix; i.e. adapt the impact scale for every project (e.g. depending on the budget of the project the impact scale should defer). For medium-size projects a five-point scale is recommended for both probability and impact (very high, high, medium, low, and very low)

**6.3.2.3 Adapt the Processes**

Lessons learned represent for a big part the knowledge of the organization and should not be lost. In this research using the lessons learned related to PRM has been described as essential. Find a way to share lessons learned about past projects would help the risk players first to see the benefits of successful PRM but also shortcomings of a less successful implementation. Second, enforcing a system that allows the sharing of project risks related information could help the organization to become more risk-aware and make PRM an inherent part of the organizational culture. However, it is important that one does not constrain himself / herself to what happened but use the past events as a help not to omit possible future uncertain events for the considered project.

- Lessons learned should be thoroughly captured at the end of the project during the post-project review step of the PRM processes in order to reuse them later for future projects;

- Lessons learned should be used at the beginning of every project during the initiation step of the PRM processes, to [1] define better the scope and objectives of the PRM processes and to [2] scale the tools and processes. This is very useful to design the Risk Management Strategy better during the initiation;

- Use a clear approach during the initiation step to help define risks that includes reviewing lessons learned from previous project
- Use a clear approach during the post-project phase to thoroughly identify the lessons learned;
- The creation of a sort of repository where lessons learned could be stored and of course used should be investigated.

6.3.2.4 Involve the right players in the right way

Implementing new processes as well as optimizing the existing processes, requires the alignment of the commitment of the risk players. It is believed that only optimizing the processes will not help to reach the full potential of the PRM practices. In order to perform the processes in the right way, the involvement of the risk players is crucial. It should therefore become clear for everyone what are the different roles and techniques to use and which players should be involved.

- Develop a risk player analysis that will support the activity of determining the key players. This analysis should take part in the initiation step and be part of the Risk Management Strategy.

In the case of medium project and based on the PRINCE2 method, a project board should be assigned as well as a project manager. This is already done within PCM. However,

- A risk champion should be assigned in medium and large projects in order to support the project manager and facilitate the processes. This was recognized as essential to involve the risk players effectively during the PRM processes. Assigning a risk champion should also help to enhance the control over the process and ameliorate the communication between the players;
- The roles and responsibilities should be decentralized among the risk players. Thus, as already recommended in part 6.3.1, risk and action owners should be appointed. Both risk owners and action owners are essential for the continuity of the PRM processes.

It can be discussed as mentioned in Chapter 4, that both formally and informally managing PRM have their advantages and drawbacks. Yet, a formal approach should be preferred at this stage of the PRM processes optimization to help the project managers as well as the other players to get used to the processes and consequently be more involved. Therefore,

- A formal approach to manage project risks should be favoured. Yet depending on the type of project a stable balance between both approaches, formal and informal, could be used.

In Chapter 5 the gap between the executive (project board) and the rest of the risk players was depicted as really negative for managing project risks effectively. Thus,

- The backing up from the executives and top management should be reinforced;
- The successes should still be acknowledged, publicised and celebrated.
6.3.3 Maintaining the PRM Momentum (Long-term)

In order for the Organization O to focus on the optimization of its processes, strive towards a risk mature culture, and be aware of the possible changing business needs and the influence of possible external factors, the organization should maintain a PRM momentum.

6.3.3.1 Ensure...

Everything that should have been realized in order to shift entirely to level 3 (part 6.3.1) and to start going towards higher levels (part 6.3.2) should be continuously critically reassessed. Therefore it is necessary to:

- Ensure that the processes are well integrated in the PM practices of PCM;
- Ensure continued commitment of the senior management;
- Ensure that the PRM processes are well decentralized among the risk players (i.e. not focused on the project manager) as much as possible to make the involvement of the risk players really high;
- Challenge the risk players and make sure that they are involved. It is really important to involve the client;
- Ensure the co-operation throughout the entire organization, enhance the communication, make risk players more responsible, and keep on using a reward system.
- Ensure effective learning from experience / lessons learned;
- Implement fully the proactive management of threat and opportunities;
- Continually invest time and money in order to improve the PRM processes, tools, techniques, and staff skills and commitment.

6.3.3.2 Established Training Programme

Aligned with ensuring that what is in place should be continuously and critically assessed, it is important to appoint few people in the organization that will be the individuals representing the in-house experience and expertise. Consequently, Organization O should:

- Undertake formal risk training to develop existing in-house expertise;
- Design and train for formal risk management some future risk champions.

Organization O should not hesitate to make use of external expertise to support existing internal skills, which could also help to spread the existing knowledge in other parts of the organization; thus the organization could:

- Use audit and review techniques to keep application of risk techniques at the required quality and standards.
6.4 Plans for Improvements in the Eyes of the Practitioners

During the interviews we also asked the respondents to share with us some ideas that could help to enhance the PRM practices.

“In your opinion what is key to making project risk management a success or not and how can the current practices be improved?”

The respondent of project A mentioned that PRM should be part of the PM the whole time and done throughout the lifecycle.

The project manager of project B said that there “there is room for improvement as we do nothing for PRM”. Further, in order to be improved one needs to learn more about PRM. Everybody involved in the project from Organization O (PCM, clients, etc.) should put more effort into it by receiving training people in PRM.

In project C, the project manager declared that PRM is very useful only when all the steps part of the processes are applied. In addition, people from the different departments have to be convinced by the way of working and that it will support them in performing their job better.

In project D, the quality of the people working on the project is mentioned as well as the general understanding by the team about the impact of the risks on the project. Develop processes that allow having a better follow up on the action plan. Further, structuring the risk sessions was also mentioned.

In project E, improving the communication between the different levels of risk players could have a great influence. Additionally, PRM must be an integrated part of the whole project management practices.

In project F, the respondent believes that PRM can be improved by making a good standard and be sure that everybody uses it. Further, it is important to keep it simple and not to make it a goal in itself. Make sure that people who have to use it see the benefit of it.

As mentioned in the beginning of part 6.3, a lot of knowledge is spread within PCM and should be used. If we look at what has been said by the respondents during the interviews, it can be evaluated that many recommendations are aligned with the one made in this research. In other words, besides the existence of knowledge there is also awareness in regards to what should / could be improved. The only thing that needs to be done is starting the optimization process.
This chapter summarizes, synthesizes the overall managerial implications and the academics' contributions, and depict the limitations of the research. The accumulated new empirical evidence taken in a specific context faced with the literature as well as the established specific directions for further research are also addressed. The recommendations for further work will finalize this report.
7.1 CONCLUSION

The construction industry’s project environment is usually exposed to a higher degree of risk and faces a significant amount of uncertainties. With the growing size and complexity of today’s projects, the continuous and systematic management of project risks has become increasingly important. Consequently, risk management recently received a lot of attention from research institutes and risk practitioners. Over the years, this has resulted in the development of a large variety of PRM standards, processes, tools and techniques, demonstrating a common awareness and acceptance of the need for the explicit management of project risk.

The study is explorative; but its findings gave us confidence in answering the research sub-questions and the main research question, which is:

*How can the current Project Risk Management practices surrounding medium construction projects be optimized (at Organization O)?*

In this research three key notions evolving around PRM were investigated, the current position of PRM, the involvement of the risk players, and the interaction between the risk players. Each of them were reflected in terms of theory, what is ought to be in the guidelines of Organization O, and what is happening in practice.

The research highlights a common understanding among the respondents on the beneficial influence of implementing PRM in medium project of the construction field and a wide availability of theoretical knowledge within Organization O. Yet, the research features divergent practical implementations of PRM in practice. These divergences manifested themselves mostly in terms of inexistent standardization of the project risk management processes, no general formal management of the project risks involving less clear repartition of the roles and responsibilities, and a lack of optimal alignment of perception between the different risk players.

The nature of the methodology employed in this study, namely single case study with multiple sources of analysis, has by nature some intrinsic limitations. The empirical evidence gathered in the case study is broadly consistent with the literature and supports its main tenets particularly in regards to the difficulties to perform the PRM processes through the entire project, the existing gap between theory and practice, the poor formal approach to manage project risk linked to the low level of standardization, and the difference of perception between the risk players. Nevertheless, the extant body of literature on PRM insufficiently addresses several issues; for instance the need for scalability of the PRM processes, the recognition of the importance of the back-end of projects related to the lessons learned, how formal projects should be managed, and the general influence of some of the “human aspects”, which is though a growing topic. This research contributes hence to the body of literature by addressing these topics.

While Organization O implemented PRINCE2 and follows the advocated standardized approach for managing projects, it seems that, depending on the cases part of the case study, the organization faces difficulties in using PRM in a standardized way, which could be helpful in the beginning for implementing proven tools and techniques.
To help Organization O and more principally the PCM section to optimize the PRM processes, the empirical results from the case study were benchmarked with a six levels Risk Maturity Model in order to evaluate the current maturity level. The result of the benchmark is quite conclusive and places the PCM section between the awareness of process level (level 2) and the repeatable process one (level 3). In other words, there is some evidence of risk management being used with beneficial effect on projects but inconsistent and unstandardized approaches were found, which result in different levels of commitment and effectiveness among the risk players. In addition, there is evidence of risks being documented but little evidence of active management.

Further to the evaluation of the risk maturity level, this study is rich in managerial implications. They can be derived from the short-, medium-, and long-term recommendations presented in the Chapter 6. First, in order to stabilize the maturity model to the level 3, a common understanding should be established within the PCM section in order to make everyone understand the beneficial influence of PRM on the project’s objectives and explain the goals of going further with it. Then, it essential for Organization O to start with developing a set of standardized processes that will structure the approach to manage project risk and thus be a base for further improvements. The standardized processes should encompass effective tools and techniques. In order to facilitate, the above-mentioned managerial implications of the research basic training should be delivered to the right individuals. Then, in order to reach higher maturity levels, the common understanding and the basic standardized processes should be developed further in terms of scalability, continuity, and formality. Quite some attention and time should be spent on involving the right players in the right way and adapting the processes in terms of collecting and making use of the lessons learned. Finally, in order to maintain the momentum of the process, it is crucial to ensure that what has been implemented is still relevant. In a nutshell, what is needed besides standardizing the PRM processes is a shared understanding of the key concepts and principles of PRM, and their importance to successful project reflected in an adequate involvement of the risk players. This implies that continuous training on PRM principles should be delivered to develop one unique language and common understanding among the risk players.

Though, it should be kept in mind that no matter how effective PRM processes are, projects will always face uncertain events. However, the implementation of well-standardized PRM processes aligned with the right involvement of the risk players and the adequate interaction between them could create a simple and effective structure to deal with risks. Consequently, PRM is not something that will make the decisions always right but that will support risk players in making more structured and faster decisions to increase the probability of achieving the project’s objectives.

This research has produced interesting and insightful results for Organization O, yet it is bound to certain limitations related to its qualitative nature. As already mentioned above, a single case study with multiples sources for data collection was used. Since it is a single case study, it is a limitation by itself and a statistical generalization is not possible. The results can only be generalized to organizations being in the same situation as Organization O. However, it should be noted that different industries might need to approach PRM practices differently. Further, the data gathering processes that were used, including observations and interviews, are processes that are really difficult to keep purely objective for the researcher as well as for the respondents.
In order to overcome certain unreliable notions a procedures was followed during the interviews but is not sufficient to obtain fully reliable results. As a consequence, tendencies which have emerged and been explored should be carefully interpreted beyond Organization O’s PCM section.

Moreover, this research focuses on the optimization of the PRM practices throughout the project life cycle. As mentioned in part 2.4, the projects that were selected to be part of the case study were not all closed while performing the research, which might imply another limitation.

### 7.2 Thesis Reflections

The subject of risk assessment is complex in terms of the amount of ideas and approaches found in the literature. Regarding the research that was requested to be done for the PCM section, defining the main research question was not too difficult. However, as the topics of PRM is really broad, defining the key topics (i.e. sub-questions) was slightly more challenging. Thanks to the help of Peter Simon (Author of the ATOM methodology) who took the time to discuss with me some areas of project management, it was decided to focus on the one hand on the processes of PRM (Chapter 3) and on the other hand on the human aspects related to the management of project risks (Chapters 4 and 5). It is believed that it made the research more interesting in terms of diversity of topics as well as more challenging in terms of complexity related to the human dimension of PRM. Yet, the human aspects should be studied further due to the nature of this topic, which is a very evasive concept per se.

The output of this research is a set of short, medium, long-term recommendations directed at medium projects in the construction field. There is a high propensity that some of them might be considered out of reach, unfeasible, or not adapted to the PCM’s way of working. Moreover, these recommendations might face rigidity from some risk players, making them difficult to implement and it is not to forget that they might be costly too. However, it should be noted that great care was taken in defining these recommendations. In other words, the various claims are supported by empirical results from other studies, literature, and the Risk Maturity framework. Furthermore, the outputs have been designed based on a structured approach. The structure of the research (three topics divided in three chapters in which the theory, the “Soll”, and the “Ist” were correlated) really helped to stay focused on the main research question. Yet, more interviews with team members could have helped to gather more relevant empirical regarding the involvement and interaction of the risk players in practice.

No evaluation and further practical implementation of the recommendations have been made. Therefore, this research should hence be seen as a starting point for optimizing the PRM processes within the PCM section by showing what is currently lacking and by proposing concrete action to implement. Yet, it is up to the manager of PCM to decide what will happen with the recommendations.

Despite the few difficulties related to the definition of the research and the gathering of theoretical data, it was an interesting project that increased my knowledge base in terms of PRM.
7.3 **Further Work**

In this research no attention was given to the quantitative aspects of PRM. One main reason is linked to the type of projects carried out at Organization O, which mostly considered being either small or medium. Moreover, the ATOM method does not advocate using a quantitative approach to manage risk in small and medium sized projects. The ATOM process, as typically applied to small and medium projects, does this in a purely qualitative manner, without using statistical analysis. Looking at the types of project carried out by Organization O, we consider that approaching PRM only from a qualitative side is efficient and effective enough (for now). Additionally, before implementing the quantitative approach in the PRM practices we deeply believe that PCM should focus on developing a sound, scalable, and continuous approach throughout the PLC. However, doing quantitative risk management could be part of further investigations.

In this research, it is supposed that implementing standardized processes would help the organization, at least on the short-term, to optimize the current PRM practices. However, a certain lack of empirical data exists in this regard. In other words, it is broadly understood that having standardized tools and techniques might have a positive influence on the way project risks are managed but not specific supportive data have been found. The literature pictures a quite idealistic image of the existing standards, handbooks, and bodies of knowledge and their benefits. But much has also been found on their limitations. In this research, it is further specified that the notion of scalability should be understood and is recommended as a medium-term action. Therefore, some further investigations could be performed to assess the connection between standardized processes and successful project outcomes.

Furthermore, the development of a risk-mature culture within the organisation is needed in order to recognise that risk exists in all levels of the enterprise, but that risk can and should be managed proactively in order to deliver benefits. Consequently, it might also be interesting to develop the recommendations to see if they could fit to other part of Organization O.

The part of the study related to the human aspects could be further developed. As it was mentioned several times, these aspects are essential to understand and recognize PRM as potential to either negatively or positively influence the project’s success. Therefore, some more investigation could be performed in order to help risk players to comprehend the importance of their involvement and their co-operation to enhance the project results.

Finally, this research is not aiming at judging the project performance but the PRM performance. Of course it is clear that both are related but this investigation does not intend to give a critical regard on how the project managers perform. In other words, we looked into how PRM is performed in several projects and draw some recommendations and conclusions, yet none of the results relate to the project success. Therefore, some further work within PCM should be carried out as an internal assessment to evaluate the real impact of PRM on projects and kinked it to the use of standardized processes and the notion of scalability.
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## APPENDICES

### APPENDIX 1 - PROJECT SIZING TOOL

The project-sizing tool from the ATOM methodology helped to categories the 6 research sub-units of analysis (projects A, B, C, D, E, and F). After applying the project-sizing tool, we see that all the project are characterized as medium projects.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Value 2</th>
<th>Value 4</th>
<th>Value 8</th>
<th>Value 16</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategic importance</strong></td>
<td>Minor contribution to the business objectives</td>
<td>Significant contribution to the business objectives</td>
<td>Major contribution to the business objectives</td>
<td>Critical to business success</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td><strong>Commercial complexity</strong></td>
<td>No usual commercial arrangements or conditions</td>
<td>Minor deviation from existing commercial practices</td>
<td>Novel commercial practices, new to at least one party</td>
<td>Ground-breaking commercial practices</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>External constrains</strong></td>
<td>None</td>
<td>Some external influence on elements of the project</td>
<td>Key project objectives depend on external factors</td>
<td>Overall project success depends on external factors</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td><strong>Requirement stability</strong></td>
<td>Clear, fully defined, agreed objectives</td>
<td>Some requirement uncertainty, minor changes during projects</td>
<td>Key project objectives depend on external factors</td>
<td>Requirements not finalized and subject to negotiation</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td><strong>Technical complexity</strong></td>
<td>Routine repeat business, no new technology</td>
<td>Enhancement of existing product/service</td>
<td>Novel product/project with some innovation</td>
<td>Ground-breaking project with high innovation</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td><strong>Market sector regulatory</strong></td>
<td>No regulatory requirements</td>
<td>Standard regulatory framework</td>
<td>Challenging regulatory requirements</td>
<td>Highly regulated or novel sector</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td><strong>Project value</strong></td>
<td>Small project values (&lt;€250K)</td>
<td>Significant project value (€250K - €1M)</td>
<td>Major project value (€1M - €3M)</td>
<td>Large project value (&gt;€3M)</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td><strong>Project duration</strong></td>
<td>Duration &lt;3months</td>
<td>Duration 3-12months</td>
<td>Duration 1-3 years</td>
<td>Duration &gt;3 years</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td><strong>Project resources</strong></td>
<td>Small in-house project team</td>
<td>Medium in-house project team</td>
<td>Large project team including external contractors</td>
<td>International project team or joint venture</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Post project liabilities</strong></td>
<td>None</td>
<td>Acceptable exposure</td>
<td>Significant exposure</td>
<td>Punitive exposure</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td><strong>Overall project score</strong></td>
<td>70</td>
<td>72</td>
<td>72</td>
<td>68</td>
<td>68</td>
<td>74</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

≥ 75  Large project  Extended PRM processes are required
35 – 74  Medium project  Standard PRM processes are required
< 35  Small project  Reduced PRM processes are required
### Appendix 2 - Definition of Project Risk

Different definition of risk from the literature:

<table>
<thead>
<tr>
<th>Negative definition</th>
<th>Neutral definition</th>
<th>Broad definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAN/CSA- Q850: 1997</strong></td>
<td>BS6079-3: 2000 ‘Uncertainty ... that can affect the prospects of achieving ... business or project goals’</td>
<td>ICE – RAMP: 2004 ‘A threat (or opportunity) that could affect adversely (or favourably) achievement of the objectives of an investment’</td>
</tr>
<tr>
<td><em>The chance of injury or loss</em></td>
<td></td>
<td>AMA PM: 2004 ‘An uncertain event or condition that, if it occurred, would have a positive or negative effect on a project’s objectives’</td>
</tr>
<tr>
<td><strong>IEEE 1540: 2001</strong></td>
<td>IEC 62198: 2001 ‘Combination of the probability of an event occurring and its consequences for project objectives’</td>
<td>PRAM Guide: 2004 ‘An uncertain event or condition that, if it occurs, has a positive or negative effect on a project objective ... includes both threats to the project objectives and opportunities to improve on those objectives’</td>
</tr>
<tr>
<td><em>The likelihood of an event, hazard, threat or situation occurring and its undesirable consequences; a potential problem</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BSI PD 6668</strong></td>
<td>JIS Q2001 (E): 2001 ‘A combination of the probability of an event and its consequence'</td>
<td>PRAM Guide: 2004 ‘An uncertain event or set of circumstances which, should it occur, will have an effect on achievement of ... objectives ... either positively or negatively</td>
</tr>
<tr>
<td><em>Risk ... hazard x consequence</em></td>
<td></td>
<td>ATOM: 2007 ‘Any uncertainty, that, if it occurred, would have a positive or negative effect on the achievement of one or more objectives’</td>
</tr>
<tr>
<td><strong>COSO – ERM: 2004</strong></td>
<td>ISO 31000: 2009 ‘Risk is the combination of the probability of an event and its consequences’</td>
<td>M_o_R (PRINCE2): 2007 ‘An uncertain event or set of events ... will have an effect on the achievement of objectives. A risk is measured by a combination of the probability of a perceived threat or opportunity occurring ... on objectives’</td>
</tr>
<tr>
<td>‘... Event with a negative impact, which can prevent value creation or erode existing value.‘</td>
<td></td>
<td>AS/NZS 4360: 2004 ‘The chance of something happening that will have an impact upon objectives. Combination of the probability of an event and its consequence ... which can range from positive to negative’</td>
</tr>
</tbody>
</table>

(Source: Hillson & Simon, 2007)
APPENDIX 3 - CONFIDENTIAL

APPENDIX 4 - INTERVIEW PROTOCOL

The prime aim of performing the semi-structured interviews is to gain an understanding of the state of project risk management practices at the PCM section of Organization O. A secondary aim is to gain knowledge on the way risk players are involved with these practices and how they interact with each other when performing risk management.

To be mentioned at the beginning of each interview: "Firstly please can you confirm that you are happy with this interview being recorded? This will then allow the interview to be transcribed, which will aid in my analysis. Are you OK with this?"

THE INTERVIEWEE & PROJECT PROFILE

1. What is your role in the project (in regards to risk management)?

2. Please can you tell me a little about the project you work on? Looking here for type/size of project, complexity, budget and timescales, PHASE. The information is already collected but this question might be useful to possibly get missing data.

PROJECT RISK MANAGEMENT PRACTICES

3. Can you describe what the project risk management procedure of PCM covers? Allow the interviewee to explain as much as they like here. If the interviewee does not provide evidence then specific questions regarding use, way of defining risks (cause, risk event, consequences, probability), frequency of revisiting the registers, presence of specialist risk experts, etc. (to be defined).

4. What is the main motivation to implement risk management process at PCM? We are looking for confirmation (or not) that the process is used to aid in decision making, making choices between options and preparation of realistic plans incorporating the setting of contingency.

5. Please can you tell me in your own words what Organization O’s working definition of a risk is? Does this include upside and downside risks (no comments will be made)?

6. Does your documented project risk management process include the things that might happen that if they did would have a beneficial impact on project outcomes (i.e. upside risks)?

If yes:
   6a. What term do you use to describe the things that might happen that if they did would have a beneficial impact on project outcomes?
   6b. Based on your experience within Organization O are there any difficulties with identifying, assessing and responding to upside risks / downside risks? If so, what are they?

If no:
   6d. Do you agree with the concept that there are things that might happen that if they did would have a beneficial impact on project outcomes?

7. Can you tell me what you understand about the differences between qualitative and quantitative risk management quantitative risk management?

8. Does the documented process proposed by PCM include both qualitative and quantitative risk analysis techniques?

PROJECT RISK PLAYERS

PRINCE 2 (2009) is being integrated as the project management process of PCM,
9. What do you think about such methodology for managing your project but specifically managing the project risks? *We want to introduce the next question dealing with formal risk management approach*

10. What is the level of formality of your project (risk) management processes?

10b. Would you characterise risk management to be integrated in the project management practice?

11. Could you explain how you manage risks throughout the lifecycle of the project (tools, protocols, etc.)? *The different stages of the PLC are defined beforehand. The answer of this question should help us to collect data about: How and when are the risks assessed and prioritized? Is Risk Breakdown Structure used? At what stage in the project’s lifecycle is the risk log/register prepared? What information is held against each risk and how is it maintained throughout the PLC? How are new risks, issues, or problems during the implementation phase dealt with? Etc.*

12. At which stage(s) of the project life cycle do you consider risk management to be the most important?

13. Does risk feature as an agenda item at project meetings? *Yes/no answer will suffice*

If yes:

13a. What is discussed under the topic?

14. Do you incorporate lessons learned from past projects into the management of risk? How?

15. Do you own the project risk management process within the project and who else is involved in managing risks *(who are the risk players)?*

16. How are the risk players involved in the management of risks and are they empowered with some tasks?

17. Does your process recognise the role of a risk owner and/or action owner?

If yes:

18a. Can you describe what does each role in relation to maintaining the risk register?

18. If I mention deliberate ignorance of risk, what can you tell me about it?

19. How would you qualify the interaction among the risk players?

20. How can you characterize the collaboration and communication among the project team members as well as with other people/organizations involved in the project?

**Benefits of Project Risk Management** *(closing up)*

21. What is, in your opinion, the value of doing risk management related to the delivery of projects?

22. What kind of difficulties do you face when implementing risk management? *(Procedures, people, knowledge, etc.)*

23. In your opinion what is key to making project risk management a success or not and how can the current practices be improved?
## APPENDIX 5-A – EXAMPLE OF A STANDARD RISK BREAKDOWN STRUCTURE

<table>
<thead>
<tr>
<th>RBS level 0</th>
<th>RBS level 1</th>
<th>RBS level 3</th>
</tr>
</thead>
</table>
| 0. Project risk | 1. Technical risk  
1.1 Scope definition  
1.2 Requirements definition  
1.3 Estimates, assumptions, & constrains  
1.4 Technical processes  
1.5 Technology  
1.6 Technical interfaces  
1.7 Design  
1.8 Performance  
1.9 Reliability & maintainability  
1.10 Safety  
1.11 Security  
1.12 Test & acceptance | 2. Management risk  
2.1 Project management  
2.2 Program/portfolio management  
2.3 Operation management  
2.4 Organization  
2.5 Resourcing  
2.6 Communication  
2.7 Information  
2.8 Quality  
2.9 Reputation | 3. Commercial risk  
3.1 Contractual terms & conditions  
3.2 Internal procurement  
3.3 Suppliers and vendors  
3.4 Subcontracts  
3.5 Client / customer stability  
3.6 Partnership and joint ventures |
| 4. External risk | 4.1 Legislation  
4.2 Exchange rates  
4.3 Site / facilities  
4.4 Environmental / weather  
4.5 Competition  
4.6 Regulatory  
4.7 Political  
4.8 Country  
4.9 Pressure groups  
4.10 Force majeure |

(Source: Hillson & Simon, 2007)
**APPENDIX 5-b – Example of risk checklist based on the RBS**

<table>
<thead>
<tr>
<th>RBS Level 0</th>
<th>RBS Level 1</th>
<th>RBS Level 2</th>
<th>Example risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0. Project Risk</td>
<td>1. Technical risk</td>
<td>1.1 Scope Definition</td>
<td>Scope changes may arise during project</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Redundant scope may be discovered</td>
</tr>
</tbody>
</table>

(Credit: Hillson & Simon, 2007)

**APPENDIX 5-c - Double risk matrix / Probability and Impact matrix**

<table>
<thead>
<tr>
<th>Probability</th>
<th>Threats</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.05</td>
<td>0.09</td>
</tr>
<tr>
<td>0.90</td>
<td>0.04</td>
<td>0.07</td>
</tr>
<tr>
<td>0.70</td>
<td>0.03</td>
<td>0.05</td>
</tr>
<tr>
<td>0.50</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>0.30</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>0.10</td>
<td>0.05</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Impact (numerical scale) on an objective (e.g., cost, time, scope or quality)

(Credit: PMI, 2004)

Each risk is rated on its possibility of occurring and impact on an objective if it does occur. The organization’s thresholds for low, moderate or high risks are shown in the matrix and determine whether the risk is scored as high, moderate or low for that objective.
### Appendix 5-d - Risk register and the essential information that it should contain

#### Risk Register

<table>
<thead>
<tr>
<th>Risk Identifier</th>
<th>Risk Description</th>
<th>Risk Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>A unique reference for every risk entered into the Risk Register</td>
<td>In terms of the cause, event and effect (description in words of the impact on project objectives). It is important to differentiate cause and effect. Cause → probability → Event → impact → Effect. One way to reduce the risk is to reduce the barrier between the cause and the event, thus to reduce the probability. The impact of a risk if not dealt with will be the same at the time T during the project.</td>
<td>Type of risk in terms of the project’s chosen categories. The categories depend on the project. A good way to do it is to make a Risk Breakdown Structure.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Probability</th>
<th>Impact</th>
<th>Expected Value</th>
<th>Proximity</th>
</tr>
</thead>
<tbody>
<tr>
<td>These should be recorded in accordance with the project’s chosen scales</td>
<td>These should be recorded in accordance with the project’s chosen scales</td>
<td>These should be recorded in accordance with the project’s chosen scales</td>
<td>How close to the present time the risk event is anticipated to happen</td>
</tr>
</tbody>
</table>

#### Pre-Mitigation Plan

<table>
<thead>
<tr>
<th>Risk Response Category</th>
<th>Risk Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>How the risks will be managed in terms of the project’s chosen categories</td>
<td>Actions to resolve the risk (should be aligned to the chosen response categories. Note that more than one risk response may apply to a risk.</td>
</tr>
</tbody>
</table>

#### Post-Mitigation Plan

<table>
<thead>
<tr>
<th>Probability</th>
<th>Impact</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>These should be recorded in accordance with the project’s chosen scales</td>
<td>These should be recorded in accordance with the project’s chosen scales</td>
<td>These should be recorded in accordance with the project’s chosen scales</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date Registered</th>
<th>Risk Author</th>
<th>Risk Owner</th>
<th>Action owner</th>
<th>Risk Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person who raised the risk</td>
<td>Action owner</td>
<td>Active or Closed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Source: OGC, 2009)
APPENDIX 6 - THE RISK MATURITY MODEL

APPENDIX 6-A RISK MATURITY MODEL’S LEVELS OVERVIEW

The six levels of the framework (Naivety of process, awareness of process, repeatable process, defined process, managed process, and optimized process) are briefly describes below (Source: OGC, 2010)

A more detailed description of each level can be found in Appendix 6-b.

Naivety of process
Organizations that are at this level are simply ignorant of the necessity of PRM.

Awareness of process
The awareness of process level refers to the organizations where there is a negligible evidence of PRM being used. There might be evidence of risks being documented but with little, if any, guidance. Additionally, there is no formal approach in place to deal with risks and usually the knowledge is spread over a few key nominated individuals rather than on the organization wide knowledge and competencies. Consequently, terminology may not be standardized across the organization, i.e. risk may not be interpreted in the same way by all the risk players.

Repeatable process
The organizations at the repeatable process level have some knowledge about PRM. Some basic management practices have been established and PRM is recognized and used on some projects. However, there are no formal or generic processes in place with any consistent approaches resulting in different levels of commitment and effectiveness. Basic training is likely to have been delivered to key staff. Although conscious of the potential benefits of PRM, this type of organization has not yet efficiently integrated PRM into practice in order to gain its full benefits.

Defined processes
The defined process level represents the organizations with their PRM practices based on a centrally defined process. The PRM processes are used consistently and are scalable to particular projects. PRM is documented, standardized, and integrated with some other business processes. It is formalised, widespread and its beneficial influence is understood through the entire organization. There is likely to be an established program to develop the skills and knowledge of individuals in order to enable the processes to be managed more proactively.

Managed process
The organizations that reach the managed process level have PRM practices that are working effectively, that are embedded, and the value of PRM can be verified. This level is characterized by mature behaviour and processes that are quantitatively managed, i.e. controlled using metrics and quantitatively techniques. Moreover, there is evidence of threat and opportunity management. Risk management is not only used for improving the processes but also to gain competitive advantage.

Optimized process
PRM when at the optimized process level is considered as embedded in the organizational culture and lies behind all the decision made within projects. There is an evident continual improvement.
APPENDIX 6 - DETAILED INFORMATION ABOUT THE RMM’S LEVEL

The different levels descriptions are taken from the Procurement | Programmes & Projects Portfolio, Programme and Project Management Maturity Model (OGC, 2010) Version 2.1

Naivety of process – Level 1

There is a general unawareness regarding the need for managing risks and no structured approach is in place to deal with uncertainty.

Awareness of process – Level 2

Description
There is minimal evidence of risk management being used to any beneficial effect on projects. There may be evidence of risks being documented but little evidence of active management.

Specific Attributes
1. Some risks may be identified and associated with particular projects, but are not described or registered consistently, and there will be little, if anything, in terms of an effective risk management process
2. Focus of management attention is on dealing with issues as they arise, with a reactive rather than proactive approach
3. Risks arbitrarily classified and rarely, if ever, quantified
4. Risk identification likely to be a one-off activity and risks unlikely to be tracked or re-assessed during project life cycle
5. Foreseeable threats likely to impact on projects
6. Little, if any, communication with other parts of the organization concerning project risk

Generic Attributes
1. Training provision is uncoordinated, with little or no knowledge sharing
2. Key individuals lack experience
3. No standard roles, and responsibilities are not defined or are generic
4. Some information available but is out-dated, unstructured and dispersed
5. Limited, if any, formal checking or review
6. Plans, if any, are conceptual or merely sequences of events with rough timescales
7. Planning, if any, likely to be an initial activity with little maintenance of ownership or tracking

Repeatable process - Level 3

Description
Risk management is recognized and used on projects, but there are inconsistent approaches, which result in different levels of commitment and effectiveness.

Specific Attributes
1. Different areas and projects manage risk in different ways
2. Some projects recognize different categories of risk (e.g. distinguishing between project and operational risks)
3. Risk response strategies and plans are likely to have been ineffective in the past
4. Inconsistency of approach to the assessment of risks
5. Risk register based on an organizational template may be used, but escalation and communication on risks outside the project may be ineffective
6. Local risk management processes in place and managed by Project Board and teams
7. Risk management not aligned with other project life cycle activities (e.g. project planning)
8. Risk status reported to Project Board on ad hoc basis, if at all
9. Key project managers understand and articulate the purpose and importance of risk management, but inconsistent levels of commitment and understanding across all projects or the organization

Generic Attributes
1. Localized information structures, with some information sharing between teams
2. Focus on documentation during start-up and definition, but not maintained over initiative’s life cycle
3. Limited localized information controls, with no formal release management arrangements
4. Local reviews, with some corrective actions undertaken within the group
5. Generic training may be provided in key concepts, and there may be individuals undertaking qualification training
6. Local sharing of knowledge may exist but mostly ad hoc
7. Key individuals may have practical delivery experience and track record
8. Roles, responsibilities and competencies defined in some areas but not consistently across the organization
9. Plans exist but are not underpinned by consistent development methodology, yet may still be effective locally
10. Planning seen as activity tracking rather than proactive/forecasting
11. Estimation is more “guesstimation” and does not use standard techniques

**Defined processes - Level 4**

**Description**
Project risk management is based on a centrally defined process that is cognizant of the organization's policy for the management of risks and is used consistently.

**Specific Attributes**
1. Standard risk management templates and tools used extensively and consistently
2. Risks identified, assessed and controlled in accordance with recognized procedures, across all projects
3. Regular reviews, addressing broader opportunities for improvement as well as compliance
4. Reviews seen as a positive opportunity to improve, not a threat
5. Risk management interventions embedded within project life cycle
6. Risks consistently categorized by type (e.g. commercial, operational or strategic)
7. Audits of risk within projects
8. Processes exist for escalation of project risks
9. Risks not limited to internal impact on project goals
10. Risk assessment techniques defined and deployed consistently

**Generic Attributes**
1. Information has a refresh cycle or is regularly accessed
2. Organization-wide information standards on confidentiality, availability and integrity
3. Formal information release management procedures
4. Independent reviews take place
5. Scrutiny largely for compliance reasons, identifying failures rather than opportunities for improvement
6. Plans developed to a central and consistent standard that is output- or goal-based
7. Plan development takes into account a range of relevant factors
8. Evidence of effective estimating techniques
9. Dependencies are identified, tracked and managed effectively
10. Training is focused on the organization’s approaches and raising competence of individuals in specific roles
11. Forums exist for sharing organizational experience to improve individual and organizational performance
12. Centrally managed role definitions and sets of competencies defined and used to support appointments

**Managed processes – Level 5**

**Description**
Project risk management is working effectively, is embedded, and the value of risk management can be demonstrated. There is evidence of opportunity management and management of risk aggregation.

**Specific Attributes**
1. Projects able to demonstrate resource and budgetary implications of risks throughout project life cycle
2. Cost effectiveness and feasibility of response measures demonstrable across all projects
3. Audits of risk management effectiveness
4. Aggregated risk levels across projects tracked and managed
5. Clear understanding of level of risk exposure from projects being undertaken
6. Evidence of lessons being learned from project reviews and assurance reviews
7. Risk management seen as organizational process, with clear ownership
8. May be a risk manager, providing guidance and controls
9. Evidence of decision-making based on risk assessment
10. The business and project stakeholders generally feel comfortable with the management of project risks, and are involved as appropriate

Generic Attributes
1. Information is current and extensively referenced for better decision-making
2. Trend analysis and measurement undertaken on performance information to identify improvement opportunities
3. Knowledge management is a central function and is used to help improve performance and planning
4. Reviews focus on opportunities to improve as well as compliance
5. Plans kept up to date, with the application of sophisticated planning techniques and recognition of interdependencies
6. Extensive training is provided, focusing on personal development and performance improvement
7. Evidence of interventions to avoid conflicts and take advantage of opportunities
8. Mentoring and individual development is used to improve organizational performance
9. Succession plans exist for key roles

Optimized process – Level 6

Description
Risk management is embedded in the organizational culture and underpins all decision-making within projects. There is evidence of continual improvement.

Specific Attributes
1. Accountability for management of risk at Executive Board level
2. Executive Board has clear visibility of risk exposure to the organization from projects
3. Risk assessment underpins all decision-making
4. Projects ensure adequate consideration of business continuity, especially on business handover
5. Evidence of opportunity risks being actively managed
6. Risk management policy and supporting governance arrangements periodically reviewed for effectiveness
7. Business intelligence informs risk management process and has clear cascade and escalation route
8. Strong links and integration with financial management, planning, estimating, project control and governance processes, and risks to project benefits are highlighted and examined

Generic Attributes
1. Information is valued, with continual maintenance and reference
2. Evidence of extensive intelligence-gathering processes, with information disseminated through a variety of channels
3. Review and improvement is continual and proactive, with lessons being shared openly
4. Planning inherent in decision-making process, with adjustments and implications managed and deployed
5. Active management of interdependencies between initiative plans and other business plans
6. Estimations are accurate and used effectively to ensure delivery
7. High levels of competence embedded in all roles and seen as part of career paths
8. Knowledge transfer is an inherent behaviour within the organization
9. Skills embedded into organizational leadership and management development programmes
APPENDIX 7 - SELECTION OF THE RISK PLAYERS

APPENDIX 7-A - PLAYERS ANALYSIS TEMPLATE

<table>
<thead>
<tr>
<th>Players</th>
<th>Area of interest</th>
<th>Attitude (+/-)</th>
<th>Power (+/-)</th>
<th>Interest (+/-)</th>
<th>Player type (Appendix 7-b)</th>
</tr>
</thead>
</table>

(Source: Hillson & Simon, 2007)

- List all the key players and their interest (or stake) in the project in the first two columns;
- For each of the stakeholder, identify whether their attitude toward the project is supportive or resistant, whether their power to influence the project is high or low, and whether their level of interest in the project is high or low.

The player type can be defined by looking at the Appendix 7-b.

APPENDIX 7-B - DESCRIPTION OF DIFFERENT RISK PLAYERS

<table>
<thead>
<tr>
<th>Player Type</th>
<th>Attitude</th>
<th>Power</th>
<th>Interest</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saviour</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>Powerful, with a high interest level and positive attitude toward the project. Important to pay attention to them</td>
</tr>
<tr>
<td>Friend</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>Low power but high interest and positive attitude. These players can be used as confidents or sounding board</td>
</tr>
<tr>
<td>Sleeping Giant</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>Powerful stakeholders who support the project but displaying low level of interest. They need to be awakened to raise their commitment to the project</td>
</tr>
<tr>
<td>Acquaintance</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Low power, low interest, backers that should be kept informed</td>
</tr>
<tr>
<td>Saboteur</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>Powerful with a high interest level in the project, but display a negative attitude; they must be actively engaged to prevent them to cause significant disruption to the project</td>
</tr>
<tr>
<td>Irritant</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>Very interested in the project but do not support it though they have too little power to influence things. Their negative attitude must be contained and countered where possible</td>
</tr>
<tr>
<td>Time bomb</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>Powerful but with low interest levels and a negative attitude toward the project. These players must be understood so that they can be “defused before the bomb goes off”</td>
</tr>
<tr>
<td>Tripwire</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Low power, low interest, negative attitude, players who are likely to hinder the project; their interaction with the project should be minimized as much as possible</td>
</tr>
</tbody>
</table>

(Source: Hillson & Simon, 2007)
### APPENDIX 8 - ROLES AND RESPONSIBILITIES AT LEVEL 1

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibility</th>
<th>Name / Department</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Board</strong></td>
<td>Responsible for the entire control and management of the project, including the setting of scope, time, budget and quality within which the project has to be completed.</td>
<td>Led by Business Executive</td>
</tr>
<tr>
<td><strong>Senior User</strong></td>
<td>Represents the users. Responsible for functional and user requirements (of the business). Responsible for availability and quality of the resources from the user’s organisation. Responsible for acceptance of the delivered product by users and maintainers. Focus: will this work.</td>
<td>/</td>
</tr>
<tr>
<td><strong>Senior Supplier</strong></td>
<td>Represents the executing party. Responsible for the technical quality and achievability of the products within the given time and money. Responsible for the quality of the project process and for the availability and quality of the resources (human and material) in the project. Focus: can this be realised.</td>
<td>/</td>
</tr>
<tr>
<td><strong>Senior Buyer</strong></td>
<td>Represents the purchasing department. Responsible for the quality of the commercial approach and the purchasing process of the entire investment project, for safeguarding of the purchasing relations with other projects and availability of resources from the purchasing department. Fulfilment of this role is responsible of value and complexity of the parts to be purchased. When not fulfilled by SPS (&lt;5 MEUR) this role will be handled by the Senior Supplier</td>
<td>/ SPS</td>
</tr>
<tr>
<td><strong>Business Executive</strong></td>
<td>Customer. Has ultimate responsibility for realisation of (the benefits) of the business case. Has ultimate responsibility in decision making in the Project Board. Focus: Will this be beneficial.</td>
<td>/</td>
</tr>
<tr>
<td><strong>Project Assurance</strong></td>
<td>Supervision of the project in representation of all steering committee members on all aspects of the project (business case, goals, time, budget, quality of products and scope, standards, etc.). Project monitoring can be done by the steering committee itself or can be delegated. Reports to the board, but is not part of the board. The responsibility and power of decision remains with the steering committee.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Project Manager</strong></td>
<td>Responsible for the daily management of the PID of the project and for delivery of the project results/products (including handover to maintenance) within the boundaries of time, budget, quality and scope as defined by the Project Board.</td>
<td>/</td>
</tr>
<tr>
<td><strong>User Requirements</strong></td>
<td>Responsible for definition of the User Requirements (on behalf of the Senior User)</td>
<td>/</td>
</tr>
<tr>
<td><strong>Quality Control BM</strong></td>
<td>Organises and monitors control and acceptance of the delivered products (incl. documents) on the basis of the set targets (user requirements, technical requirements, standards and laws), in line with the Project Quality Plan</td>
<td>/</td>
</tr>
<tr>
<td><strong>Project Support</strong></td>
<td>Supports the Project Manager in organisation and administration</td>
<td>/</td>
</tr>
<tr>
<td><strong>Project buyer</strong></td>
<td>In charge of the commercial and legal issues related to the project. Report to the senior buyer through a highlight report.</td>
<td>/ SPS</td>
</tr>
<tr>
<td><strong>Team Manager</strong></td>
<td>Responsible for delivery of the products as defined by Project Manager, within the boundaries of time, budget and quality as defined by the Project Manager</td>
<td>/</td>
</tr>
</tbody>
</table>