Application of risk management in Public Works organisations in Chile

Bachelor thesis, Michiel Wolbers

University of Twente
Enschede - The Netherlands

Documentation page

Title report	**Application of risk management in Public Works organisations in Chile**
Author	M.C. (Michiel) Wolbers m.c.wolbers@student.utwente.nl
Supervisors	Dr. S.H.S. (Saad) Al-Jibouri (University of Twente) Prof. dr. A. (Alfredo) Serpell (Pontificia Universidad Católica de Chile)
Research period	May 2009 till July 2009
Version	Final version
Date of publication	21 October 2009, Enschede
Cover	Plaza de Armas, Santiago, Chile – Ian Cowe (http://www.flickr.com/photos/iancowe)

Pontificia Universidad Católica de Chile
Santiago, Chile

University of Twente
Enschede, The Netherlands

Summary

This research focuses on the current state of the application of risk management in Chile. the Netherlands and the United States. Analysis of the current state is used for determining the necessary improvements to enhance the application of risk management in the Public Works in Chile while the theoretical state is used to underpin the recommended improvements. Risk management is seen as part of project management and the benefits of effective risk management in construction are widely recognized. It is however still not common whether risk management is applied in a proper way in the organizations.

The Risk Management Maturity Model (Risk Management R&D, 2002) and the Enterprise Risk Management Maturity-Level Assessment tool (Ciorciari & Blattner, 2008) are used to developed a new model. The model is basically the same as the Risk Management Maturity Model, but with additional segment. Hence it is called the augmented model. This augmented model is used during the research determine the maturity of the application of risk management. On the basis of this augmented model a questionnaire is designed which is used to measure the current state of risk management application in Chile and the Netherlands. The questionnaire is also used to determine the desired level of risk management application in the Public Works in Chile.

To determine the theoretical state of risk management application, a small literature study is done using five guidelines related to risk management application in the United States. The results of the current states in Chile and the Netherlands are analyzed and compared with each other and to identify the shortcomings of risk management application in the Public Works in Chile.

The research is based on a minimum amount of data and for this reason the conclusions and recommendations can not be used blindly.

In terns of risk management application Public Works in Chile have scored an average level that lies between the levels “Initial” and ”Repeatable” while in the Netherlands the score is between “Repeatable” and “Managed”. In benchmarking the current state of the application of risk management in Chile against the Netherlands 15 elements for improvement are identified. 8 elements are related to improvements from “Initial” to “Repeatable”. The other 7 elements have a level of “Repeatable” still there is possibility for improvement.

The elements with requirements for improvement are divided into three groups, based on their urgency and their importance in the application of risk management. The first group has the most urgency and includes taking the following steps:

- Risk awareness has to be part of the organization and risks have to managed mostly formal;
- Formal generic risk processes have to be applied to all projects;
- Personnel are trained in basic skills of risk management on a frequent basis;
- Key suppliers participate frequently in the projects and the projects have customer-oriented goals;
- Communication about the identified risks has to go trough formal and informal communications channels;
- In-house expertise has to be enhanced;.
- Risk management has to be applied routinely and consistently in all the projects and risk thinking has to be applied to all the activities;
- The resources in the process have to be dedicated to the projects;
- Risk management has to be linked to all standard procedures.

The second group includes elements which have a level of “Repeatable”, but are recognized by the interviewed employees of the Public Works in Chile for their importance in the application of risk management. The steps to bridge the shortcomings are as follows:

- Risk experts have to advice the project organizations and sometimes be part of the project organization;
- Risks profiles have to be used to make a distinction between the project types and to determine the measures to be taken;
- The responsibilities have to clearly defined and assigned and accepted by the personnel.
- Risk management has to be viewed as important and risk management has to be part of the holistic project management.

The urgency for the third group of elements is less than for the other two groups, however there is still need for improvement. The steps to be taken are as follows:

- “Bad news” risk information has to be accepted and also be shared and escalated in a limited way;
- The benefits of risk management has to be recognized and the upper management has to use risk information in their decision-making;

The benefits of risk management are not fully recognized in the Public Works organisations in Chile indicating a shortcoming for the application of risk management as a whole. To bridge this shortcoming a cultural shift in the organisations has to be made. This includes proactive commitment of the upper management, improvement of the communication in the risk management process. In addition the perspective on risk management has to be changed to improve the application of risk management in the Chilean Public Works.

Preface

This thesis is the last part of my Bachelor study at the Civil Engineering department, University of Twente. The internship has been conducted at the Department of Construction Engineering and Management in the Pontificia Universidad Católica de Chile.

The goal of a bachelor thesis, as prescribed by my university, is to demonstrate that the student has enough substantive knowledge and that he or she can work and report in a systematic way. Beside this prescribed goal, in going to Chile I had some personal goals I wanted to achieve during my stay in Santiago. One of them was to work and live in a different culture than the Netherlands.

During the realization of the thesis, the work was not much different compared with the Netherlands, except for the language barrier in some situations. The living part was a different story, but thanks to all the people I met during my stay in Santiago, I had an incredible time in Chile.

In particular I would like to thank all the people at the department who gave me the feeling of home. Not only during the time I was working at the university, but also by taking me with them to events, helping me with my Spanish and making me part of the group. I would like to thank them for making Santiago my second home.

This preface is also the place to thanking people in particular. First of all my supervisors, Prof. Dr. Alfredo Serpell and Dr. Saad Al-Jibouri, for their supervision, their comments on my work, but also for giving me the freedom to find my own way in the research process. Secondly I would like to thank Edith Garrido for helping me with contacting the Ministry of Public Works and having the patience of an angel while answering all my daily questions.

Thirdly I would like to thank Mario Rodriguez for accompanying me to the Ministry of Public Works and translating the conversations all there and also Patricio Oportus, my contact at the Ministry of Public Works, to be open for my research and helping with the distribution of the questionnaires.

Of course also my thanks to Maarten Cannegieter and Pieter Tiemessen for providing information about Chile and encourage me to do my bachelor research in Santiago.

The last person I would like to thank is Omar Zegarra. Of course for his help with my daily affairs and problems, but most of all for being a friend, with whom I could discuss all kind of subjects, talk about my research and laugh about all kind of jokes. High five!

July 2009, Santiago

Michiel Wolbers

Contents

1 Introduction

The introduction describes the necessity for the application of risk management in the Chilean Public Works. Paragraph 1.1 discusses the motive for this research and the benefits for the Public Works in Chile to use risk management. In paragraph 1.2 an outline of the report is given.

1.1 Research motive

Project management is necessary to deal with the construction projects of today. The Project Management Institute (2000) defines project management as "The application of knowledge, skills, tools, and techniques to project activities to meet project requirements." Mango (2008) however says that this definition puts too much focus on the science and less focus on the practical side of project management. According to him project management is "Leading projects to a successful conclusion by leading, planning, organizing, and controlling the project stakeholders, resources and the project environment." This definition is shared by the Association for Project Management (n.d.) that describes project management as "a process by which projects are defined, planned, monitored, controlled and delivered such that the agreed benefits are realized."

Both definitions describe however only the outlines of project management. According to PMI (2000) project management can be divided in nine knowledge areas. One of these areas is Project Risk Management and is defined as "the systematic process of identifying, analyzing and responding to project risks" (PMI, 2000). An equivalent of Project Risk Management is the component "Management of Risks" of PRINCE2 (Siegelaub (2004), Office of Government Commerence (n.d.)). The aim of this component is to understand the risks in a project and their likely impacts. Successful projects are the result of effective risk management by maximizing the benefits and minimizing the uncertainty of risks. The results of effective risk management are worldwide recognized and that is why many organizations are trying to introduce it in their organizational process.

Despite the recognition of the value of effective risk management, this function is not common in organizations. There are many cases that the use of risk management does not result in the expected benefits. In many cases this is because of the fact that the expectations were unrealistic, and that there were no clear vision for the application and how to implement its tools.

Risk Management R&D (2002) states that

> *"organizations attempting to implement a formal structured approach to risk management need to treat the implementation itself as a project, requiring clear objectives and success criteria, proper planning and resourcing, and effective monitoring and control."*

The application of risk management has to be treated therefore as a project to achieve effective benefits. Chapman (1997), PMI (2000), Keizer, Halman & Song (2001) and Del Cano & De la Cruz (2002) even declare that the application of risk management in a project can be considered as an extra phase that occur before starting the identification of risks. Ultimately the effectiveness of risk management determines the maturity level of risk management application in an organization.

The investments in the Chilean construction industry in 2008 were more than 8,6 billion Euros (Banco Central de Chile, 2008). This amount represents 7,6% of the Gross Domestic Product of Chile. In spite of the large amounts in the Chilean construction industry, effective risk management is not common in these projects. To improve the application of risk management in the construction industry, this research focuses on the maturity level of risk management application in Public Works in Chile. A comparison of this level to the maturity levels in the Netherlands and the United States of America serves as a basis for recommendations to improve and enhance the application of risk management in Chile.

1.2 Report outline

This research is structured as follows. In chapter 2 is the research framework presented. It describes the research objective, the questions regarding the objective and the approach of this research. The following chapters are related to the research itself.

Chapter 3 deals with the theoretical framework that has been used in this research. This framework creates the basis for answering the research questions.
Chapter 4 focuses on the maturity levels of risk management application in Chile, the Netherlands and the United States and the analysis of these levels.
In chapter 5 the desired level of risk management in Chile is presented.

Chapter 6 presents the areas for improvements in the application of risk management in the Public Works in Chile. The shortcomings are identified and selected for implementation in the Public Works in Chile

Finally, in chapter 7 the findings of the previous chapters are summarised and conclusions and recommendations are made. Also an outline is given of possibilities for further research on this topic.

2 Research framework

This chapter gives an insight in the research. First the research objective is reproduced in paragraph 2.1, followed by the research questions (paragraph 2.2). After that the research context is described in paragraph 2.3, followed by the approach for this research in paragraph 2.4 and finally in paragraph 2.5 the risks for this research are mentioned.

2.1 Research objective

The objective of this research is to make recommendations for the Public Works in Chile how to improve and enhance their application of risk management by determining and comparing the maturity levels of the application of risk management in the Public Works in the three countries Chile, the Netherlands and the United States.

The aim of the research is to improve and enhance the application of risk management in Public Works organisations in Chile.

2.2 Research questions

The main research question is related to the goal that is described in the previous paragraph. In addition there are several sub research questions that are defined to help and sustain answering the main research question.

2.2.1 Main research question

The main research question is:

- How can the application of risk management in Public Works organisations in Chile be improved and enhanced?

2.2.2 Sub research questions

The sub research questions are:

1. How is risk management been applied in Public Works organisations in Chile?
2. How is risk management been applied in similar situations in the Netherlands and in a theoretical situation?
3. What are the main differences between the maturity levels of risk management application in these situations?
4. What kind of changes need to be made in the application of risk management in the Public Works in Chile to improve and enhance the maturity level of the risk management application?

2.3 Research context

The study is undertaken at the Department of Construction Engineering and Management at the Pontificia Universidad Católica de Chile under supervision of Professor Alfredo Serpell.

The Pontificia Universidad Católica de Chile (PUC) is located in Santiago (Chile) and is one of Chili's oldest universities (Pontificia Universidad Católica de Chile, 2009). The university was founded on June 21, 1888 and taught in the beginning only law and mathematics. At the moment the PUC is a prominent university in America and offers a wide variety of disciplines. In 1930, Pope Pius XI declared the PUC a pontifical university.

The Ministry of Public Works (Spanish: Ministerio de Obras Públicas (MOP)) is the Chilean ministry responsible for planning, directing, controlling and building the public infrastructure, as well as the conservation and management of the infrastructure. (Ministerio de Obras Públicas - Gobierno de Chile, 2009). This is equivalent to "Rijkswaterstaat" in the Netherlands.

2.4 Research approach

This paragraph describes the research approach with the help of a flowchart (Figure 1). The flowchart outlines the most important steps in the research and for each step a small description is given.

The first step, formulate the research objective and also the corresponding research questions, was followed by an investigating of theories regarding the application of the Risk Management process (RM), which was done by a literature study (chapter 3).

The next step was a literature study to assess the application of risk management. Two important models were found in this literature study: the Risk Management Maturity Model designed by Risk Management R&D (2002) and the Enterprise Risk Management Maturity-Level assessment tool by Ciorciari & Blattner (2008).

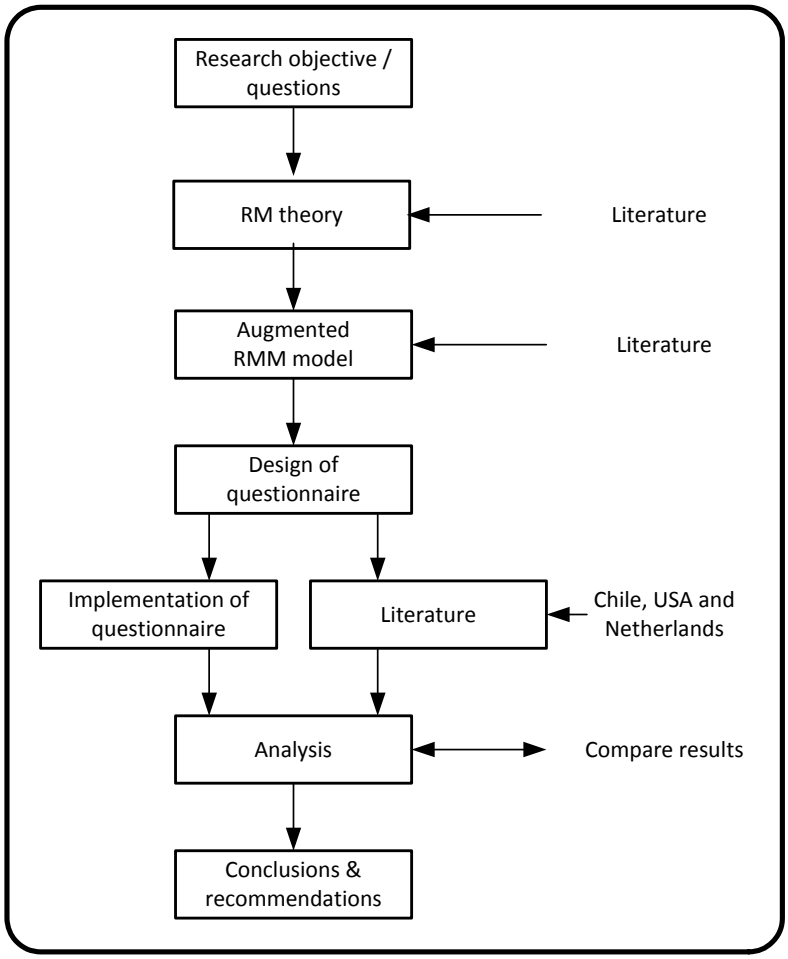

Figure 1: Flowchart research approach

These two models formed the basis for the assessment tool, the augmented RMM model, and the questionnaire that is used in this research. The questionnaires are translated to three languages: English, Spanish and Dutch. The Spanish questionnaire was conducted at the office of the Ministry of Public Works in Chile, and the Dutch and English questionnaire were conducted by using an online questionnaire (chapters 4 and 5). Also a literature study is carried out on the application of risk management in the United States in several organizations.

The data that was collected through the questionnaires was then analyzed and areas for improvements were identified (chapter 6). Finally, the results were compared to each other and conclusions were drawn and recommendations made (chapter 7).

2.5 Research risks

This paragraph describes some of the risks related to carrying out this research. These risks were important to manage in order to facilitate the study.

The most important risks were:

- The time limit of the research is 12 weeks. During this period the research had to be finished and the thesis had to be written;
- The language barrier during the research. The language that is used in Chile is Spanish and the researcher's knowledge of this language is limited;
- Collecting data about the application of risk management could be problematic, because of the fact that some of the information required is subjective and not enough concrete data can be collected to draw definitive conclusions.

3 Theoretical framework

This chapter contains a short introduction to risk management process (paragraph 3.1), followed by the description of two models to measure the maturity of application of risk management in paragraph 3.2 and finally in paragraph 3.3 a description of change management. This part of theory will be used for the recommendations regarding the improvements for the application of risk management.

3.1 Risk management

The widely accepted view of risk management is that it is an interactive process (see e.g. Al-Bahar & Crandall (1990), Project Management Institute (2000) and Schatteman, Herroelen, Van de Vonder & Boone (2006)). There are many researchers who proposed different risk management processes. Al-Bahar & Crandall (1990), Zhi (1995), Chapman (1997), Keizer et al. (2001) and Hallikas, Karvonen, Pulkkinen, Virolainen & Tuominen (2004) are among those who proposed the use of the process with four or five stages.

Despite the differences in the number of stages proposed, there are basically four phases that can be recognised. The first phase is the identification of the risk. In the second phase the identified risks are analyzed. The objectives of the third stage are to remove the impacts of the risks as much as possible and to increase the control of risk. The last phase is the interactive step of the process. In this phase the risks are controlled and monitored and finally, a report is made of the risk management process. The four stages of risk management process are shown in Figure 2.

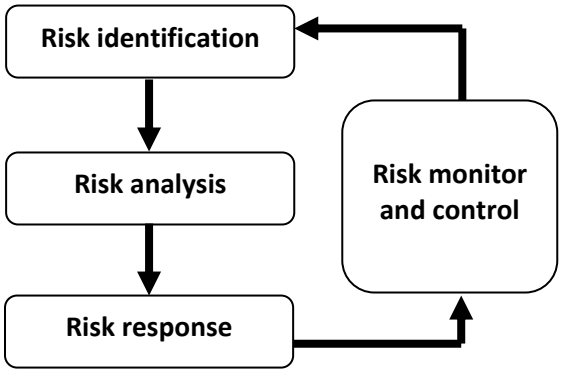

Figure 2: Process of risk management

Risk management is an approach for identifying, assessing, communicating and managing uncertainties to ensure that the objectives can be met. These uncertainties can be divided into two categories, based on their consequences to the objectives. A positive outcome of uncertainty is refereed to as an opportunity, whilst a negative outcome is referred to as a risk (Al-Jibouri, 2009).

3.1.1 Risk identification

The first phase of risk management is the risk identification phase. Risk identification is considered to be an important stage in the process (Al-Bahar & Crandall, 1990). Risk identification involves the identification of the uncertainties in a project combined with the project objectives. To determine the uncertainties the process must involve a study into the potential sources of risks and the consequences of these risks.

The identification process can be divided in two types: an informal and a formal system. In an informal system the identification process focuses only on the risks the management believes they can occur and have significant effects on the project. In a formal system a categorized system of

classification is being used to identify and categorize the potential sources of risks. A classification helps to focus the mind and to recognize sources that in an informal system are ignored. The Project Management Institute uses the classification that is shown in Table 1. Other types of classification can however be used in the identification process.

Table 1: Uncertainty classification table

Group	Risks
External Unpredictable	▪ Regulatory ▪ Natural Hazards ▪ Postulated events
External Predictable	▪ Market risks ▪ Operational ▪ Environmental impacts ▪ Social ▪ Inflation
Internal Nontechnical	▪ Management ▪ Schedule ▪ Cost ▪ Cash flow
Technical	▪ Changes in technology ▪ Performance ▪ Risk specific to technology ▪ Design
Legal	▪ Permits ▪ Contractual ▪ Third-party claims ▪ Force majeure

3.1.2 Risk analysis

The next phase of risk management is the analysis of the list of uncertainties that is identified in the identification phase. The objective of this phase is to determine the probability of a risk and the impact if the event occurs. A risk can be mathematical described as follows (Zhi, 1995):

$$R = P \times I$$

In this equation the R is the degree of risk, within [0;1], P is the probability that a risk occurs (within [0;1]) and I is the degree of impact of the risk, within [0;1].

After determining the risks, the overall uncertainty in the project and the significance of an individual event to the project can be calculated (Al-Jibouri, 2009). Several techniques can be used to determine the total uncertainty and the significance of an individual uncertainty, like PERT, a Monte Carlo Simulation, Sensitivity Analysis and Tolerance Analysis (Al-Jibouri, 2009). Al-Bahar (as cited in Al-Bahar & Crandall, 1989) suggests beside the named techniques by Al-Jibouri using influence diagrams. The advantage is that it provides a graphical representation of the interaction between events.

3.1.3 Risk response

After identifying the potential sources of risks and quantifying their impact, strategies for managing these risks can be made. Akintoye & MacLeod (1997) named four categories for risk response:

- Risk retention
- Risk transfer
- Risk reduction
- Risk avoidance

Risk retention involves accepting the loss when a risk occurs. It is however important to distinguish two types of risk retention: planned or unplanned (Al-Bahar & Crandall, 1990). Planned risk retention is to be used in case of small risks. Unplanned risk retention however is mostly the result of not recognizing or identifying the risks. Risk transfer can be in the form of insurance premium. The impact of risk is transferred by contracting out a part of the work.
Risk transfer reduces only the risk if the other party is more capable of taking steps to reduce the risk. Risk transfer can also be described as a post-event compensatory mechanism.
Risk reduction can work in two ways. Reducing the probability of a risk or reducing the impact of a risk. Activities that fit in this category are further investigation of the risk or outsourcing the activity. In case of the latter is an activity outsourced to a third party, because the third party is better in managing or controlling the risks.
Risk avoidance includes not performing an event, because it could carry risk. Not experiencing the potential losses is more important than the potential gains of this event (Ashley, Diekmann & Molenaar, 2006). To reach however the objectives and not have the impact of the risk, an alternative approach can be considered.

It is important in this stage to remember the connection between risks and opportunities. A strategy to treat a risk may cause that the opportunity disappears. Therefore the purpose of risk response and in general risk management is to find the balance between risks and opportunities instead of only minimizing the risks. Al-Bahar & Crandall (1990) describe that the goal of risk management is "to obtain the optimum or acceptable degree of risk elimination or control." The optimum or acceptable degree in case of risk management is achieving the project objectives.

3.1.4 Risk monitor and control

The last stage of risk management is monitoring and controlling the risks. This stage is considered as the interactive step of the risk management process. Ashley et al. (2006) stated that the tasks in this phase can vary, however three tasks are necessary to be integrated in the construction process:

- Develop consistent and comprehensive reporting procedures
- Monitor risk and contingency resolution
- Provide feedback of analysis and mitigation for future risk management projects

The objectives of these tasks are to track identified risks, identifying new risks, to manage effectively the contingency reserve and to capture lessons learned for future projects. Al-Bahar & Crandall (1990) suggest making a risk management policy, that includes the learned lessons and also provide guidelines for risk management in future projects.

3.2 Measuring the level of application of risk management

Every organization strives to achieve effective risk management process. Therefore it is important to know the current state of the application of risk management and which improvements have to be carried out to improve and enhance their risk management process.

This paragraph deals with two maturity models to assess the maturity level of risk management within the organization. Both models are especially designed to measure the application of risk management and have are also used to measure the application in organizations. The first model is the Risk Management Maturity Model (Risk Management R&D, 2002) and the second model, Enterprise Risk Management Maturity-Level Assessment Tool (Ciorciari & Blattner, 2008), which focuses more on the application of Enterprise Risk Management.

3.2.1 Risk Management Maturity Model

In 1997 Hillson introduced a model, called the Risk Management Maturity Model (RMM model), to assess the current level of maturity, identify realistic targets for improvement and produce action plans for developing and enhancing the organizations maturity level. In his work Van der Heijden (2006) built on the RMM model and made some adjustments to it. Van der Heijden (2006) stated that the Risk Management R&D's model was not clear enough and not easy to apply and hence was not easy to specify actions for improvement derived from the results. The adjusted RMM model of Van der Heijden will be used as a basis in this research.

3.2.1.1 Risk Management Maturity Model Framework

The RMM model provides four standard levels of risk maturity (Figure 3). Researchers have indicated that the use of more than four levels of maturity would increase ambiguity without giving any additional refinement to the model. The four proposed levels by (Risk Management R&D, 2002) that are:

1. Ad hoc
2. Initial
3. Repeatable
4. Managed

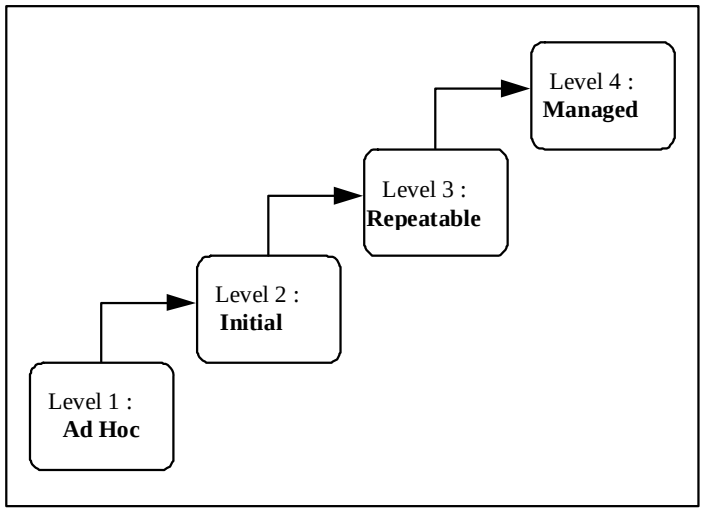

Figure 3: Four levels of the Risk Management Maturity Model

3.2.1.1.1 Level 1 – Ad Hoc

This level relates to the organization that is unaware of the value of effective risk management and has no structured approach to deal with uncertainty. The normal method for the organization for dealing with problems is to react after problems occur. Success in this level depends on the people in the organization and not on the organization itself. Those people are capable to identify and work with the risks, but when they leave the organization, their expertise leaves with them. The most difficult step in this model is the step from level 1 to level 2. This is because of the fact that management processes and activities for risk management have to be introduced in the organization.

3.2.1.1.2 Level 2 – Initial

An organization that has reached the initial level is experimenting with the application of risk management in the organization. There is no formal or structured process for risk management, but the organization is, at some level, aware of the potential benefits and learns from their mistakes. However, the knowledge is not formalized nor is there any structure to ensure application of effective risk management in the organization.

3.2.1.1.3 Level 3 – Repeatable

In this case the organization implemented risk management into their routine business process and their projects. The benefits of effective risk management are recognized and policies and procedures with respect to risk management are formalized. However, not all the benefits are consistently achieved in all the cases. The planning and managing of new projects is based on the experience with similar projects. A Risk Manager is normally assigned on these projects, depending on the scale of the project the roles of Project Manager and Risk Manager can be combined, otherwise the role of Risk Manager is distinct from the role of Project Manager. In level 3 the risk management process is stable and earlier success can be repeated.

3.2.1.1.4 Level 4 – Managed

At this level the organization can be described as risk-aware with a pro-active approach to risk management. Risk management is successfully implemented in the business process and the organization gains competitive advantage of risk management. In the organization a group of people is responsible for risk management, which provides a standard and consistent process. Risk information is continually developed and actively used in projects to improve the processes and to increase the probability of success. The risk management processes are geared to the kind of project and a group of personnel are assigned responsibility for the risk management in the organization.

3.2.1.2 Determining risk management maturity level

With the above brief description of the levels in the RMMM it is possible to indicate where an organization stands in terms of risk management maturity. To determine the maturity level of an organization on a more objective and consistent way a detailed diagnostic tool is required.

The RMM model suggests a tool (Appendix 1) to assess the maturity level based on four main criteria: culture, process, experience and application in this work. Van der Heijden (2006) added a fifth criterion, namely: structure. Some important factors were not in the model of Risk Management R&D. These factors are related to the structure of risk management. The adjusted RMM model is shown in Appendix 2. This model enables an organization to compare itself against certain criteria. Some organizations may cross the boundaries between the four levels, but the differences between the levels are large enough to determine the organization to a single level.

Risk Management R&D (2002) states that the extent of implementation of a specific attribute can be evaluated by assessing:

- Commitment to perform (policies and leadership)
- Ability to perform (resources and training)
- Activities performed (plans and procedures)
- Measurement and analysis (measures and status)
- Verification of implementation (oversight and quality assurance)

3.2.2 Enterprise Risk Management Maturity-Level Assessment Tool

Ciorciari & Blattner (2008) developed an assessment tool, Enterprise Risk Management Maturity-Level Assessment Tool (ERM-tool) to measure the maturity level of risk management in an organization. This tool is a practical approach of the "Enterprise Risk Management—Integrated Framework", defined by The Committee of Sponsoring Organizations of the Treadway Commission, an organization established in the United States. The framework's aim is to identify all potential events that could have affected the achievement of the enterprise's objectives. In addition to events with negative impacts (risks) the tool also identifies events with positive impacts (opportunities)

3.2.2.1 Enterprise Risk Management Framework

The Enterprise Risk Management Framework (Committee of Sponsoring Organizations of the Treadway Commission, 2004) provides risk awareness through the whole organization. This framework is aimed to achieve the enterprise objectives (from strategic to compliance) through the whole organization, from the entity-level to a subsidiary level. The risk awareness is divided in 8 control components, which are internal environment, objective setting, event identification, risk assessment, risk response, control activities, information & communication and monitoring. The framework of Enterprise Risk Management is shown in Figure 4.

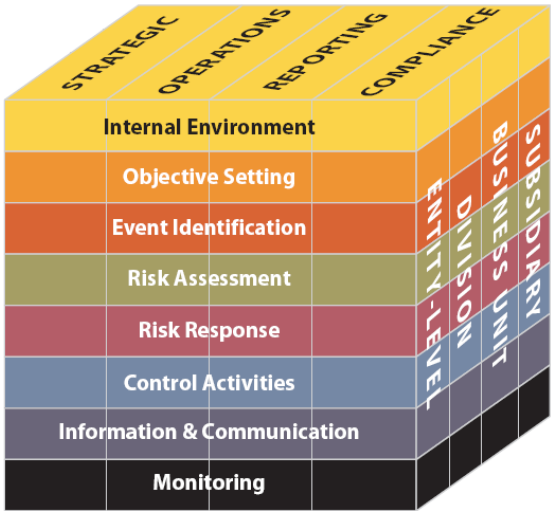

Figure 4: Enterprise Risk Management Framework

The eight components of the framework are translated into practical elements that are grouped in topics. These topics contain elements and criteria on which the evaluation of the application of risk management will be based. The topics are shown in Table 2.

Table 2: Evaluation topics based on the eight components

Components	Topics
Internal environment	▪ Risk Management Philosophy ▪ Corporate Governance ▪ Responsibility ▪ Competence ▪ Integrity and Ethical Values
Objective setting	▪ Strategy Formulation ▪ Strategy Implementation ▪ Strategy Effectiveness
Event identification	▪ External Factors Driving Events ▪ Internal Factors Driving Events ▪ Events Affecting Business and Strategies
Risk assessment	▪ Event Characteristics ▪ Assessment Metrics ▪ Assessment Mode
Risk response	▪ Risk Mitigation Strategies ▪ Residual Risk
Control activities	▪ Controls Basis ▪ Controls over Objectives ▪ Controls over Processes ▪ Controls over Information Processing
Information & communication	▪ Information over Objectives ▪ Information Quality ▪ Information Management ▪ Communication
Monitoring	▪ Monitoring Activities ▪ Monitoring Corrective Actions

3.2.2.2 Maturity level scale

The ERM-tool is using a five-point scale to measure the maturity level of each topic. In case of the lowest level there is no information available, no communication is given or the formalization is very low. The highest level implies that the topic is optimized and is integrated in the management process. A small description of the five levels is given in Table 3.

Table 3: maturity levels in ERM-tool

Maturity level	Description
Very weak	Very low formalization, no documentation available, no communication
Poor	Informally regulated, defined, still no training and communication
Mid	Standardized, principles defined and documented, basic training carried out
Good	Supervised, principles are carried out, observance is verified and regularly improved
Optimized	Optimized, risk management principles and processes are integrated in the management process

3.2.3 Augmented RMM model

For assessment of maturity level of risk management implementation in public institutions in Chile, a combination and continuation of the two previously mentioned models, the Risk Management Maturity Model and the Enterprise Risk Management Maturity-Level Assessment Tool is proposed. The RMM model and the ERM-Tool are used as a basis for the proposed framework used in this work to assess the maturity levels of risk management application.

3.2.3.1 Framework

The adjusted Risk Management Maturity Model (2006) contains 5 criteria and 24 elements. Van der Heijden added structure as an additional criterion to his model, because the original Risk Management Maturity Model (2002) did not contain a criterion regarding the structure of risk management in the organization. The assessment tool of ERM model proposed by Ciorciari & Blattner (2008) contains 8 criteria, or components named in their model, and 26 topics, which can be compared with the elements in the RMM model.

The elements of both models are compared to each other and the comparison is showed in the table in Appendix 3. Almost all of the elements of ERM model agree with the elements in the RMM model; only four elements did not match, these are:

- External Factors Driving Events
- Internal Factors Driving Events
- Events Affecting Business and Strategies
- Event Characteristics

However, the four elements are all four related to the sources of risks. Because of this, a 25th element is created for the RMM model, called 'risk sources'. The table with the adjusted elements is shown in Appendix 4.

3.2.3.2 Levels

The levels that are used in the proposed assessment model are the same four as in the augmented RMM model: ad hoc (level 1), initial (level 2), repeatable (level 3) and managed (level 4). These levels make a clear distinction in the maturity of the application of risk management in an organization.

For the purpose of assessment using the questionnaires, a seven-point Likert scale is used. The Likert scale is given in Figure 5.
A seven-point Likert scale has been used in many research in the past, see for example Schulman, Berlin, Harless, Kerner, Sistrunk, Gersh, et al. (1999) and Little, Everitt, Williamson, Warner, Moore, Gould, et al. (2001).

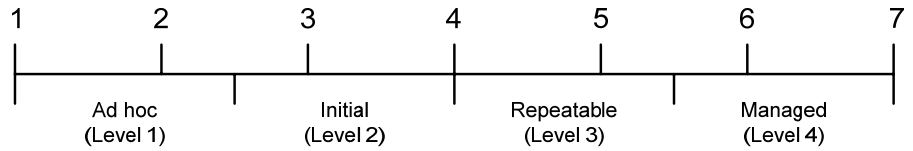

Figure 5: Seven-point Likert item

The format of the seven-point Likert scale used in the questionnaire is shown in Table 4.

Table 4: format seven point Likert scale

1	Strongly disagree
2	Disagree
3	Partly disagree
4	Neither agree nor disagree
5	Partly agree
6	Agree
7	Strongly agree

3.2.4 Questionnaire

To determine the level of application of risk management in Chile and the Netherlands a questionnaire is created. The questionnaire contains theses which are based on the descriptions of the levels used in the augmented RMM model. To estimate the maturity level, a seven point Likert scale is used, which is treated in the previous paragraph. An example of a thesis is given in Figure 6.

		Strongly disagree	Disagree	Partly disagree	Neither agree nor disagree	Partly agree	Agree	Strongly agree	Don't know
1	All employees and management are completely aware of the project risks.	○	○	○	○	○	○	○	○

Figure 6: Example of a thesis used in the questionnaire.

For each thesis the people, who are cooperating with the questionnaire, can indicate if the thesis applies to the organization. The seven point Likert scale is used to give the participants the option to indicate the degree of application of the thesis. The average scores of the theses are used to determine the level of application (ad hoc, initial, repeatable or managed) for each element in the augmented RMM model.

3.3 Change management

Implementation of a plan in an organization causes changes in the organization. These changes have to be managed properly. Several models exist that can be used to manage this process. In case of improvements in the Public Works in Chile two models will be suggested: the PDCA (Plan-Do-Check-Act) cycle, also known as the Deming Cycle and the EFQM Excellence Model. Both models and also the combination of the models are described in this paragraph.

3.3.1 Plan-Do-Check-Act cycle

The Plan-Do-Check-Act cycle (see Figure 7) is an iterative four-staged problem-solving process. This process is also known as the Deming cycle, named after W.E. Deming how made the cycle popular. He continued the work of W.A. Shewart, who developed the cycle in the 1930's. The cycle is a continuous process with the aim to improve quality (Soković & Pavletić, 2007).

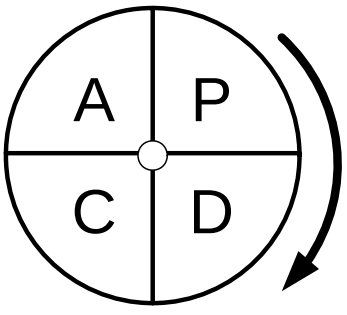

Figure 7: Plan-Do-Check-Act cycle

The four stages are:

- **Plan** – Determine the objectives and processes that are necessary to get the results in accordance with the expected output. The objectives are defined according to

SMART and the preconditions of the project are defined.

- **Do** – The new process is implemented and the results are measured. Sometimes this phase is also described as the 'implementation' phase. (Platje & Wadman, 1998).
- **Check** – The achieved results are compared to ascertain differences with the results according to the objectives.
- **Act** – The differences are analyzed to determine their causes. Actions in this stage can be described as a permanent corrective action since the causes are investigated and eliminated.

3.3.2 EFQM Excellence Model

The EFQM Excellence Model was introduced in 1991 as a framework for organizational management systems and designed to help organizations be more competitive by measuring their results, understanding the shortcomings and stimulating solutions. The model is extensively used throughout the world by several companies and therefore it can be used for international benchmarking.

The model exists out of nine criteria, divided into two groups: the "Enablers" and the "Results" (Rusjan, 2007). The Results criteria show what an organization has achieved and the Enablers are the preconditions for the Results. The five Enablers are leadership, policy and strategy, people, resources and processes and the four Results are people results, customer results, society results and key performance results. The last element is 'learning and innovation' and can be compared with the act stage in the PDCA cycle. The diagram of the EFQM Excellence Model is shown in Figure 8.

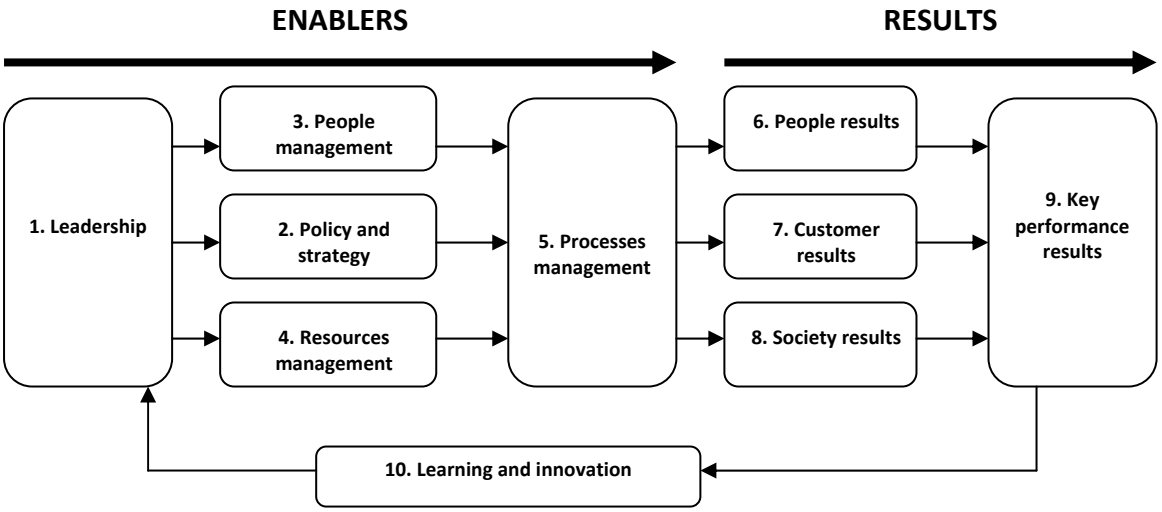

Figure 8: EFQM Excellence Model

Zink, Steimle & Schröder (2008) stated that to achieve the success of planned changes in a project or organization, a vertical and horizontal harmonization have to be realized. A vertical harmonization means a consistent transformation through the entire organization and the meaning of horizontal harmonization is that all the instruments and the resulting activities are related to each other. The vertical and horizontal harmonisations have to be achieved in the "Enabler" part of the EFQM Excellence Model. Zink et al. (2008) created an integrated framework, based on the "Enabler" part, with the criteria necessary for harmonization. This framework is shown in Figure 9.

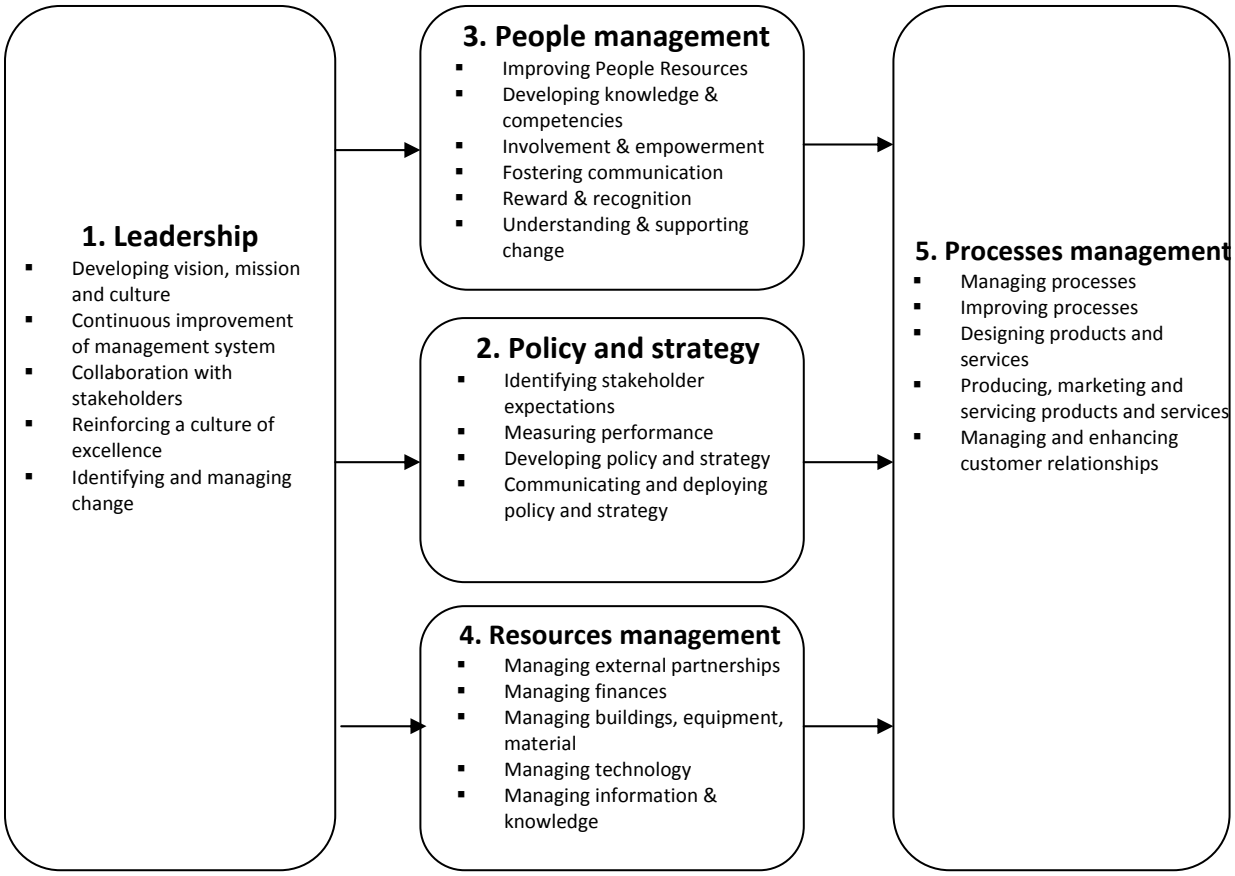

Figure 9: Integrated framework "Enabler" part

3.3.3 Combination of models

The EFQM Excellence Model is a perfect model to help organizations to improve. However, a continuous process can help to strive to an excellent result. To achieve this, both models can be combined. At the same time this is the most difficult part, since a dynamic model (the PDCA cycle) is combined with a static model (the EFQM Excellence Model). A visualization of the combination model is given in Figure 10.

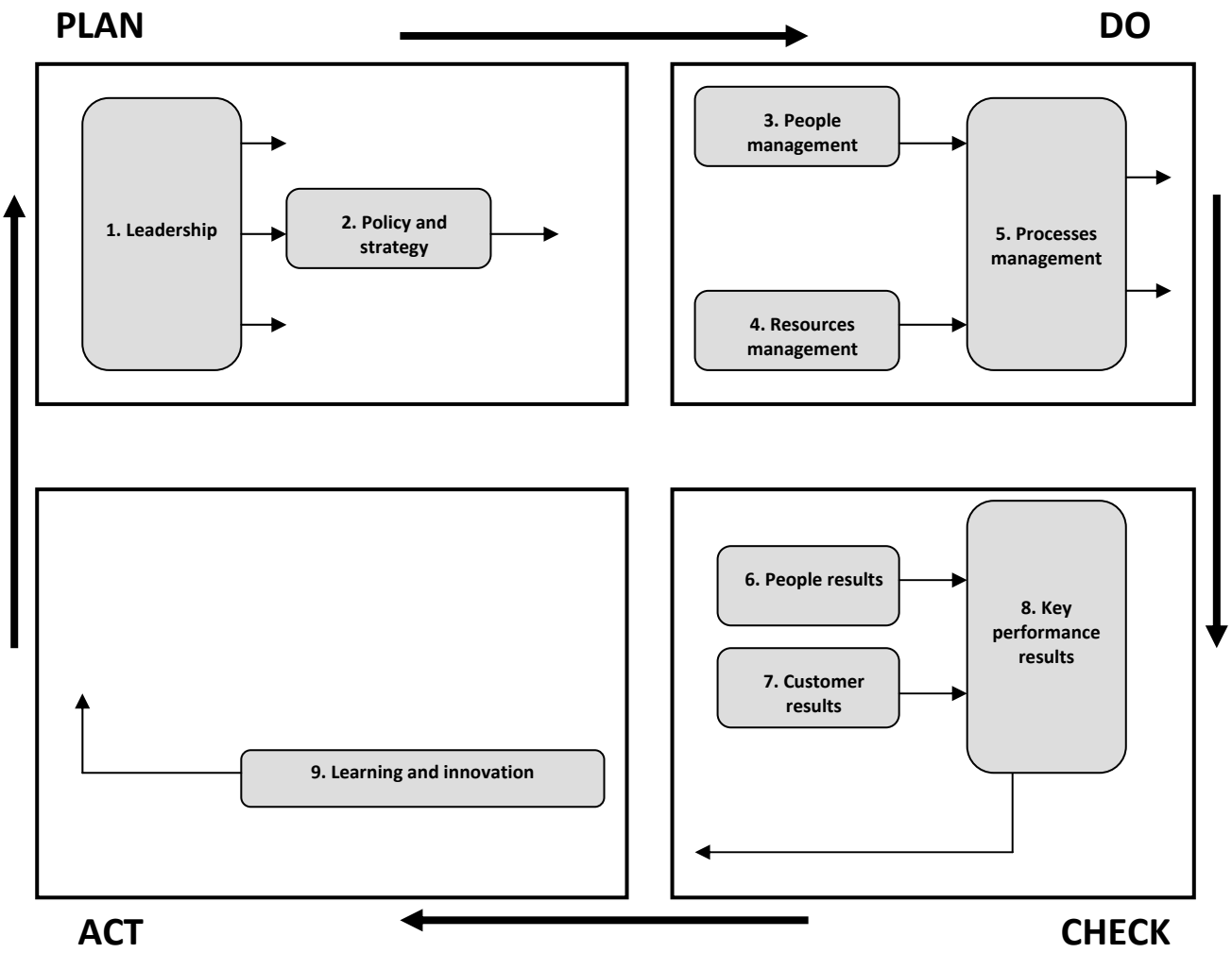

Figure 10: Combination of the PDCA cycle and the EFQM Excellence Model

The EFQM Excellence Model is divided into four parts, equal to the four stages in the PDCA cycle, and also the 'Society results' is taken out the model. This because the results are checked by using the RMM model which not focuses on the society results. In the first stage of the combined model the focus is on the aspect of planning. A mission and vision are created, leadership is important and a policy and strategy are developed. The next stage is about the implementation of the plan, managing the processes, people and resources and getting results. The third stage is the check stage, the phase where the RMM model is used to measure the results and compared to the objectives which were created in the plan phase. The last stage is to analyze the differences between the expected results and the obtained results and carry out corrective actions.

Since the two first stages are the preconditions for successful risk management which is checked by using the RMM model, the elements of the "Enabler" part have to fit with the elements of the RMM model. Therefore a comparison is made and shown in Appendix 5.

4 Current state of the application of risk management

This chapter describes the current state of application of risk management in the Public Works in Chile and three Dutch organizations. Also the theoretical states of the application of risk management in five organizations from the United States are described. In case of the first two countries, a questionnaire is used to measure their maturity level. The results of these questionnaires (the Dutch, English and Spanish version of the questionnaire can be found respectively in Appendixes 6, 7 and 8) are discussed in the paragraphs 4.1 and 4.2. For describing the application of risk management in the United States a literature study is done by using several guidelines for the application of risk management (paragraph 4.3). Finally, an analysis is made of the current states and the main differences and similarities are discussed.

4.1 Current state in Chile

To describe the current state of the application of risk management in Chile, questionnaires are distributed at the department of National Roads of the Ministry of Public Works in Chile (Dirección de Vialidad, Ministerio de Obras Públicas). Seven persons, who are involved with risk management and working at the Chilean Ministry of Public Works at the department of National Roads, filled in the questionnaire. The description of the current state of risk management in Chile is based on these questionnaires.

Based on the results of the questionnaires the current state of risk management in the Public Works in Chile can be described as between the levels “Initial” and “Repeatable”. For none of the criteria they achieve an “Ad hoc”, but they also do not achieve a “Managed”. The current states of the criteria are based on the average scores obtained by the questionnaires.

The scores on the five criteria are shown in Figure 11. The Chilean Public Works score the best on criterion “Culture” and achieve the lowest score on “Structure”. “Structure” is also the only criterion which is at the borderline between “Initial” and “Repeatable” levels.

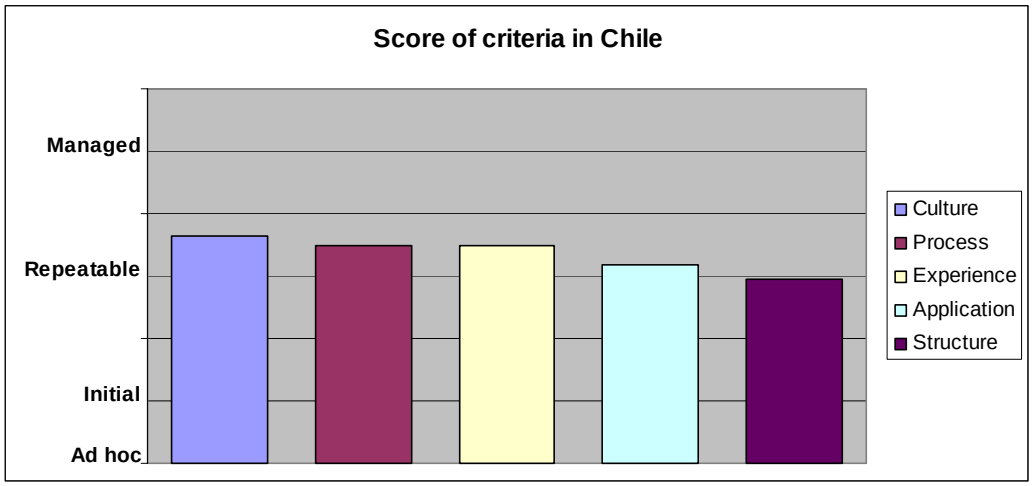

Figure 11: Score criteria Chile

The radar chart in Figure 12 shows an overview of the maturity levels for all the elements in the Chilean situation. The Chilean Public Works score the best on “Management” and “Data collection”, the lowest scores are for the elements “Project / business”, “Resources” and “Business processes”. None of the elements reach a score of 4,0 (Managed) so that it could be considered as optimized. In case of an optimized element, the element reaches the outer ring of the radar chart. A filled RMM model regarding the Chilean situation is shown in Appendix 9.

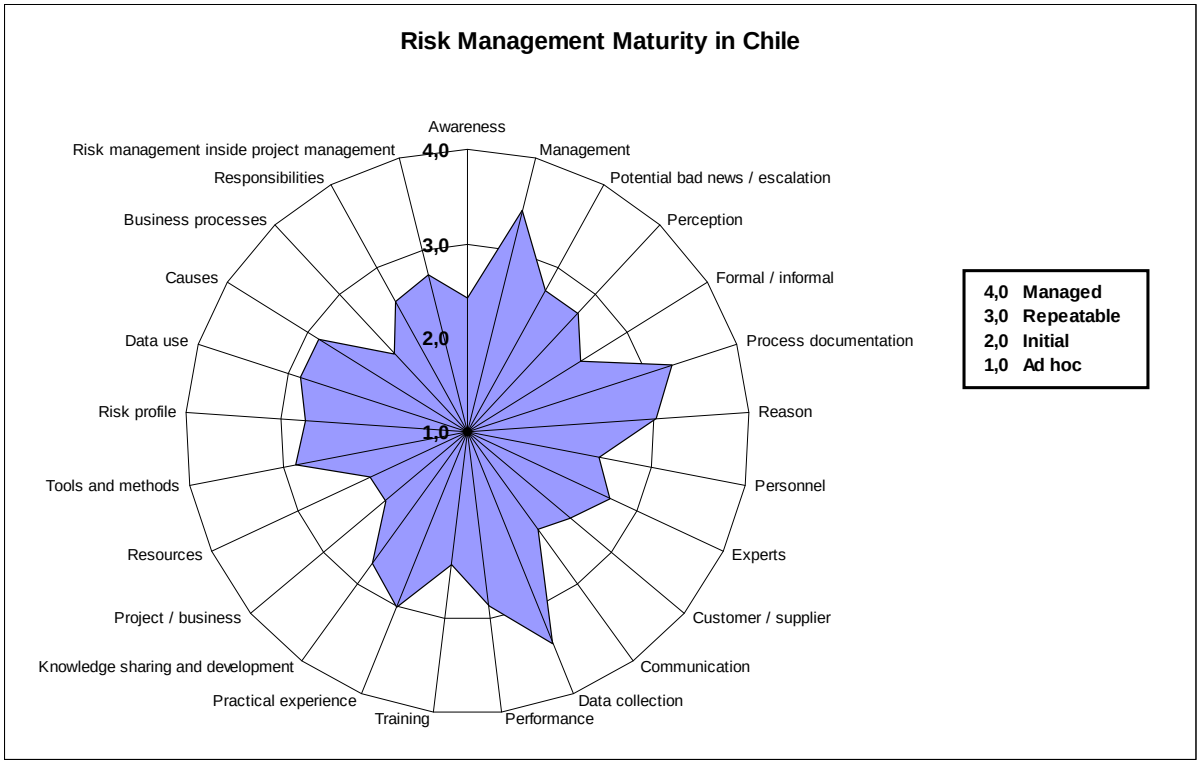

Figure 12: Radar chart Risk Management Maturity in Chile

In the following paragraphs the criteria and their corresponding elements of the Chilean Public Works are discussed.

4.1.1 Culture

Risk management is finding its place in the projects of the Public Works in Chile and the benefits of it is becoming more recognized, though there is still room for improvement. The upper management sets an example for their employees by requiring and encouraging proactive risk management, but rewarding efficient risk management is not yet part of the culture. This can be characterised as follows:

- Risk awareness is not yet a common part in the Chilean Public Works. The awareness of risks of the employees and management can be described as partial. Also the risks are mostly managed in an informal way. However, in some projects the risks are also managed in a formal way.
- Despite the lack of risk awareness in some projects, the upper management requires risk management in the organization and they also encourage the use of risk management. Rewarding proactive risk management by the upper management is however not common in the Public Works in Chile.
- Potential “bad news” is accepted in Chile, but the risk information is only in a limited way shared and escalated in the organization and the projects.
- The benefits of risk management are not in all the situations recognized with the result that risk management is not always viewed as an important part of the project or the organization.

4.1.2 Process

The Public Works in Chile are mostly recognized the need of risk management, but this is not the case for all the projects. The Chilean Public Works use risk metrics to improve the risk management process and also the formal risk processes are incorporated in the quality systems. Communication regarding the identified risks however is used in a limited way. This can be described as follows:

- The use of generic formal risk processes in projects is not yet common within the Public Works in Chile. For some projects some formal methods may be used, but in most projects this is not the case.
- Despite the infrequent use of generic formal risk processes, when formal processes are used, the processes are incorporated in the quality systems. Evaluating and refining of the processes is however not yet part of the process documentation.
- The need of risk management is recognized in most of the situations, but the Chilean Public Works view risk management not as a necessity in their projects.
- Personnel at the Chilean Public Works are mostly located under projects and generally speaking they are not always trained in the basic skills of risk management. External support is necessary when risk management is performed.
- The risk experts in Chile are no part of the project organization, but are appointed to advice the organization.
- Regarding the participation of key suppliers and customers, the suppliers participate in some projects regarding risk management. The key customers however do not participate in the risk management process of projects.
- Communicating about the identified risks is not common practice in the Public Works in Chile. Formal communication as well informal communication is used in the projects, but both are not often used.
- The Chilean Public Works are collecting risk metrics with the intention of using this data for evaluate some projects. It is however not frequent or systematic.

4.1.3 Experience

The experience in to risk management in Chile is still novice. Performance is measured, but not used for benchmarking. Also the personnel are not always trained to use basic risk skills, and beside that, the knowledge and skills that is available in the organization is not always shared. The specifications of the elements are as follows:

- The performances of risk management are measured, but the results of the measurements are not benchmarked with historical data.
- Limited personnel in the Public Works in Chile are capable of using the basic skills of risk management. Training for the personnel to enhance their risk skills is not considered common, but it is more so in the organization.
- Employees have little experience in risk procedures, but the risk experts in the organization are aware of the factors which influence risk behaviour. These factors are not always taking into account while risk management is applied.
- Risk knowledge and skills are not always documented and shared within the organization. The documented knowledge and skills are used to develop specific tools and processes.

4.1.4 Application

The application of risk management process into the organization is carried out inconsistently and the same applies for the resources for the process. The Chilean Public Works use integrated sets of tools and methods for risk management, but the use of risk database is not common and causes of risks are normally not taking into account. The characteristics of this criterion are as follows:

- The application of the risk management process in Chile is not always carried out frequently. Except for some projects, most of the projects have no structured application of risk management.
- The above is also applied in the case for the resources used in the projects. None of the resources are dedicated to the projects or even to the organization. There is talk of an inconsistent application of resources.
- The projects of the Chilean Public Works use integrated sets of tools, in some cases also adapted to the organizational culture. Quantitative and qualitative methods are used in the risk analysis,

although qualitative methods are more often used for risk analyses. These analyses handle as well the risks as the opportunities, but not in a systematic way.

- In the Chilean Public Works there is mostly a clear distinction regarding the types of projects by using a risk profile. Beside that, to determine the size of measures risk tolerance is used.
- The storage and use of data is not common in the Chilean Public Works. Sometimes the data that is available is used in reports, but the data is already less used in decision making. Also the data is not always available for new users in the Chilean Public Works.
- The causes of risks and also the effects are understood, but there is little action regarding these causes. They are normally not identified and measured and not at all managed.

4.1.5 Structure

Risk management belongs not to the organizational structure of the Chilean Public Works. Sometimes risk management is seen as important, but most of the time risk management is an unknown part of project management for the employees in the organization. The elements of this criterion are described below:

- Risk management in case of the Chilean situation is more linked to the corporate governance than the standard procedures in the organizations. This support the view that upper management requires risk management, but that the employees are not yet that familiar with risk management.
- The responsibilities regarding risk management are not always clearly defined and assigned. With the result that the definition of the responsibilities is not accepted and the personnel is not acted to it.
- In some cases the application of risk management is viewed as a project on its own and hence means that the importance of risk management is recognized, but this is not always the case.

4.2 Current state in Netherlands

The current state of risk management in the Netherlands is analyzed on the basis of questionnaires. The three persons that filled in the questionnaires, working respectively for three major organizations, namely Rijkswaterstaat, Strukton Engineering and ARCADIS, are partly responsible for risk management in their organizations and have experience with projects regarding public works.

The Dutch organizations reach an average level of “Repeatable”. Particularly on the criterion “Application”, the Dutch organizations score high. A score of the five criteria for the Dutch organizations is shown in Figure 13. Never a criterion reaches the level of “Managed”; although “Application” is close to reach this level.

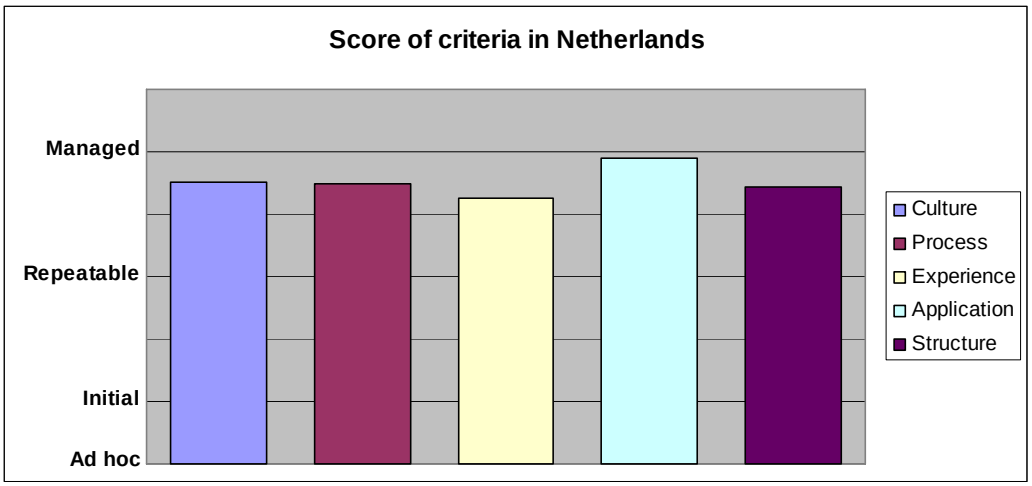

Figure 13: Score criteria Netherlands

The levels of all the elements according to the Dutch situation are shown in Figure 14. In case of an optimized element, the element reaches the outer ring of the radar chart (score of 4,0). The levels of “Ad hoc” or “Initial” do not exist; however for some elements the organizations reach a level of “Managed”. Most of the elements score “Repeatable”. Only the elements “Reason” and “Data use” are optimized in the Dutch organizations. A filled RMM model for the Dutch situation is shown in Appendix 10.

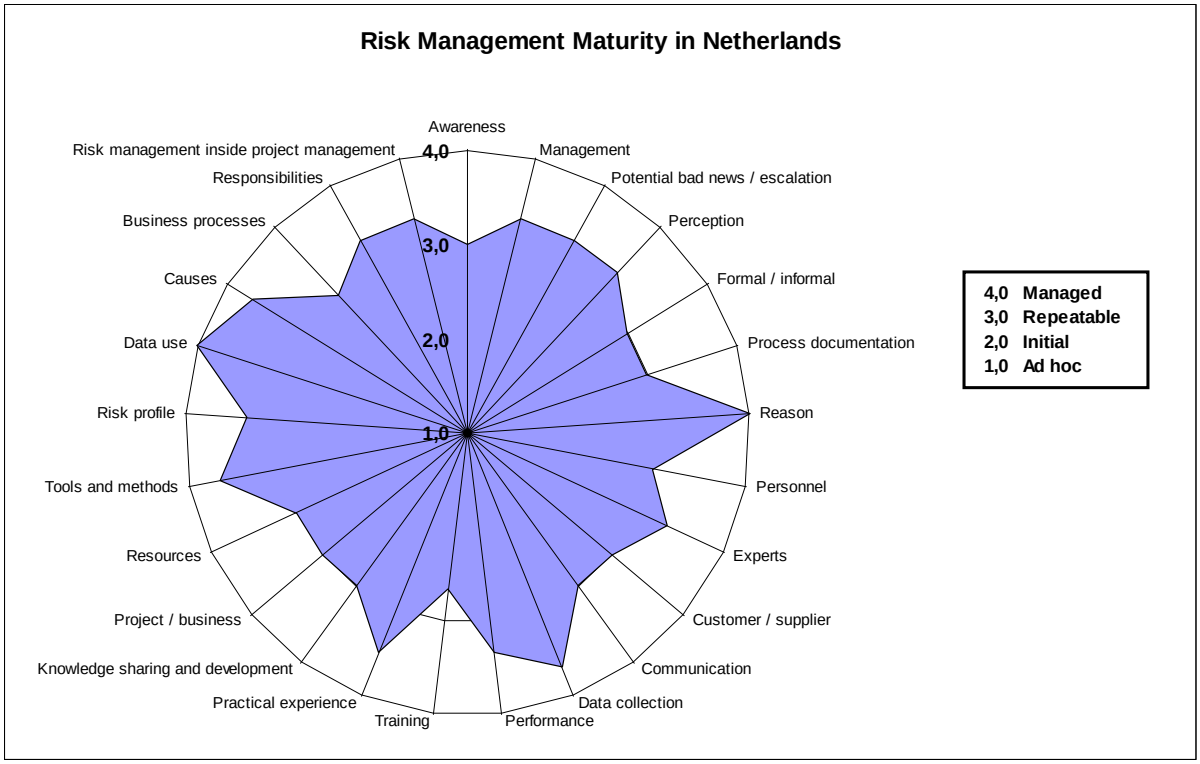

Figure 14: Radar chart Risk Management Maturity in Netherlands

The following paragraphs the criteria and their corresponding elements in case of the Dutch situation.

4.2.1 Culture

Risk management is an important part in the organizational cultures in the Netherlands. The benefits of proactive risk management are recognized and the upper management uses risk management in making their decisions. Nevertheless, proactive risk management should be more encouraged and be rewarded in the Dutch organizations. The elements are characterised below:

- Risk awareness is in general an important part of the organizational cultures in the Netherlands and employees and management manage the risks mostly in a formal way. Still there are some differences in the risk awareness between the organizations which were represented by the respondents; however none of the represented organizations has a optimized score regarding risk awareness.
- Upper management requires in all cases risk management and mostly they encourage the application of risk management in projects also. Rewarding by the upper management for proactive risk management leaves room for improvements.
- "Bad news" risk information is in the Dutch organizations accepted and also shared. The organizations understand that risks occur, but risk information is not commonly escalated in the organization or the project.
- Risk management is consider as important and most of the times the benefits for projects are recognized. Beside that, the upper management uses often risk information in their decision-making. Still, this is not the case in all Dutch projects.

4.2.2 Process

Risk management process in the Netherlands is in an advanced stage. Communication about risks and data collection is an important aspect in the process and the Dutch organizations view risk management as a necessity. More improvement can be done regarding the personnel and the

participation of suppliers and customers in the risk management process. This can be described as follows:

- Generic formal risk processes are applied to most of the Dutch projects. Improvement to generic formal risk processes is to apply them to all the projects and also the business processes.
- The formal risk processes are also incorporated in the quality systems of the Dutch organizations, evaluating and refining them is a less common fact in the Dutch organizations. In some projects it happens, but mostly not.
- All the Dutch organizations view risk management as a necessity in their organizations.
- Dutch personnel are normally trained in the basic skills of risk management still this is not the case for all the organizations. External support is necessary in projects, in some projects more than in others. On average this support is limited.
- Dutch organizations use risk experts in their projects. In some projects the experts are only advising the projects organization, in other projects the experts are part of the organizations. The interpretation of risk expert depends on the project.
- Key suppliers are participants in the risk management process of Dutch projects. It is less common that also the key customers participate in the risk management. This varies from case to case.
- Communication in risk management processes in the Netherlands is viewed as an important aspect in the process. As well direct formal communication as informal communication is used to communicate about the identified risk in the projects.
- The Dutch organizations are collecting risk data with the intention to use it. Beside that, the risk data is also consistently evaluated to improve the risk management process.

4.2.3 Experience

The performances of the risk management process are not commonly measured, and certainly not benchmarked with historical data. Yet, the Dutch organizations try to enhance the risk management process and the basic risks skills by knowledge sharing and regular training. The elements are described as follows:

- The benefits of risk management are recognized in the Netherlands and the process is used in most of the projects, yet, the performances of risk management are not always managed. In case the performances are managed, these performances are not benchmarked with historical performance data.
- Not all of the Dutch personnel are trained to using basic risk skills; however there is enough in-house risk expertise for the projects. The Dutch organizations also organize regular training to enhance the basic risk skills of their personnel.
- The risk experts state that the three Dutch organizations they represent are very experienced and aware of the factors that influence risk behaviour. Nevertheless, these factors are not always taking into account while risk management is applied.
- Just like the regular training for the personnel, knowledge sharing and development of tools and methods are important aspects to enhance the basic risk skills. This however can be improved regarding these aspects since learning from experience is still not a common part of the risk management process.

4.2.4 Application

The application of risk management in the Netherlands is on a high level. The tools and methods that are used in the risk management process are advanced and risk data is used in decision-making and to enhance the process. The process is routinely and consistently applied, but not always to all activities in the organizations. This also relates to the resources, which are mostly dedicated to the projects and not to the organizations. The elements regarding application are characterised as follows:

- Risk management is routine and consistent applied to all the projects of the Dutch organizations, from start to ending. Risk thinking is however not yet applied to all the activities.
- There is a consistent application of resources for the risk management processes. These resources are dedicated to the projects, but are not yet dedicated to the organization.
- The risk tools and methods that are used in the process are adapted to the organizational cultures. As well quantitative as qualitative analysis is used to evaluate the risks, although quantitative methods are more often used for risk analysis. In such analyses risks are more recognized and managed that opportunities.
- Mostly there is a clear distinction between the project types by using a project risk profile, but sometimes a gut feeling is used to determine the risk profile. The use of risk tolerance to determine the measures to be taken is however not common in the Netherlands.
- Risk data is always stored in the Dutch organizations with the intention to use it. The risk data is used in reports and also in making decisions. For new users it is not always common to have access to the stored data.
- Causes of risks are almost always identified by the organizations in the Netherlands. Measuring and managing the causes however is less common than the identifying process, but still it is part of the Dutch application of risk management.

4.2.5 Structure

Risk management becomes in the Netherlands more and more as part of the project management. Responsibilities are clearly assigned and mostly personnel acted also to it. The process is also linked to the standard procedures of the organization and sometimes also to the corporate governance. This can be described as follows:

- Risk management in the Netherlands is linked to most of the standard procedures. Beside that, the process of risk management becomes more and more linked to the corporate governance of the organization.
- The responsibilities for the application of risk management are normally clearly defined and assigned in the Dutch projects. The definition is usually accepted and personnel acted accordingly. This is not always the case, however.
- Risk management is not always seen as a part of holistic project management. In one organization risk management is sometimes seen as a project on its own, in the other organizations risk management is equally important to time or cost management or even part of holistic project management.

4.3 Theoretical state

To measure the theoretical state of the application of risk management as described by the theory five guidelines for risk management application are used. The guidelines that are used are all from the United States, namely NASA (Stamatelatos, Apostolakis, Dezfuli, Everline, Guarro, Moieni, et al., 2002), Federal Highway Administration [FHWA] (Ashley, Diekmann & Molenaar, 2006), California Department of Transportation [CALTRANS] (2007), U.S. Department of Defense [DOD] (2006) and U.S. Department of Energy [DOE] (2008).

The intention was to conduct questionnaires or to use papers about experiences about risk management. Unfortunately this was not possible; therefore guidelines are used to describe the state of risk management application in the United States. It was not possible to quantify the state of application instead a description of each element regarding the theoretical state of the application of risk management is given. The descriptions are then used to indicate roughly the level of application.

The general view on the state of the application of risk management is that the organizations strive to “Repeatable”. Only in case the criterion ‘Application’ the organizations strive to the level of “Managed”.

In the following paragraphs the criteria and their corresponding elements are discussed.

4.3.1 Culture

The investigated organizations recognize the benefits of risk management and require proactive risk management to use received information in their decision-making. Guidelines still have to help the organizations to develop their risk awareness and also their application of risk management. Most of the time only the technical part of risk management is described in the guidelines and not success factors like rewarding proactive risk management and an open, honest and realistic culture regarding risk management, the more human part of risk management. This is characterised as follows:

- Risk management is in the organizations seen as an important part of project management and the benefits of risk management are recognized by the organizations. Some of the investigated organizations are further than other organizations, like NASA and the California Department of Transportation (CALTRANS). On the other hand, the guidelines show that all of these five organizations recognize the benefits of risk management and use the risk information in decision-making.
- As result of recognizing the benefits of risk management, the upper management requires the use of proactive risk management and in case of CALTRANS and U.S. Department of Energy (DOE) proactive risk management is also encouraged. However, none of the organizations reward the use of proactive risk management.
- There is risk awareness in the organizations, but the necessity of guidelines shows that improvement in risk awareness in these organizations is possible. The Federal Highway Administration (FHWA) states that risk awareness in England and the Netherland is at an advanced level, while risk awareness is developing in U.S. highway agencies. Nevertheless, all the organizations declare that it is significance to have a formal plan for risk management.
- The guidelines describe ways to document risk information, still the way how to share this information and on which way this information has to be shared is not described in all the guidelines. Only the Department of Energy and CALTRANS state that an open and realistic culture is one of the key success factors for risk management and that “bad news” information is accepted, shared and escalated.

4.3.2 Process

The aspects of risk management that are described in the RMM model are also recognized by the five organizations. They all describe the surplus value of a formal risk management process in a project. However, there is space for improvement of basic skills in risk management of the personnel and risk experts should be part of the project organization. The communication and collecting of risk data is of a high level, still some improvement is possible. The elements are described as follows:

- The organisations are aware of the value of formal risk processes in their organizations and in most of the projects these processes are applied. Nevertheless, the processes are not applied to all the projects and business processes. The organizations see the application of risk management not as an entity in their organizations.
- Process documentation regarding risk management is common in the organizations in general. In all of the cases the process documentation is incorporated in the organizations, however, only the Department of Energy evaluates their way of documentation. The other organizations keep it to only gathering the information.
- The importance and benefits of risk management are recognized in almost every situation. NASA states that risk management only is necessary in cases that decisions have to be made that involve high stakes in a complex situation. The Department of Energy on the other hand declares that risk management is needed at all levels since they strive to an integrated risk management framework in their organization. A summarize of the theoretical situation is that the need for risk management is recognized in most of the situations.
- A majority of the personnel in the organizations are trained in the basic skills of risk management. Still, external support is necessary in some cases. The Department of Defense states that Defense personnel have to become familiar with the basis skills of risk management. However, in none of the organizations the regular training is followed by special trainings for personnel regarding risk management, which depends on the target group.
- Risk expertise is recognized and in most of the organizations risk experts are appointed to advice the organization. In case of the Department of Energy risks experts are even part of the project organization. NASA declares that a small but robust group of in-house technical experts is necessary to understand the risk management process and advice the organization.
- FHWA takes the Highways Agency in England as example for the participation of customers in the process. The Highways Agency in England uses performance indicators for client satisfaction with the product and the service. Beside that, FHWA seeks to allocate risks with customer-oriented performance goals. CALTRANS declares that the participators vary from case to case. Participators, outside the project team, can be customers, end users and stakeholders.
- FHWA and NASA are the only organizations that state in their guidelines that communication is an important aspect in the risk management and the key to any sharing of risk allocation. Also the other organizations declare that a risk management communication plan must be developed to improve the application of risk management. Nevertheless, in case of FHWA the communication in the risk management process is less standardized in other dimensions of transport project management.
- Another key factor in successful risk management is collecting realistic and high-quality data about risks (CALTRANS). The risk data is used for monitoring and continuous improvement of the risk management process at periodic intervals. The Department of Energy even acknowledges the surplus value of updating and monitoring the data itself.

4.3.3 Experience

The organizations acknowledge the surplus value of experience of risk management, but not all the manners to improve get the same attention. Training and knowledge sharing are getting more attention by comparison with performance measurement and practical experience. This can be described as follows:

- The organizations understand the risk management process, but only FHWA, CALTRANS and Department of Defense treat performance measurement of the risk management process. DOD only names it, FHWA and CALTRANS describe beside it also which aspects have to be measured to improve the performance of risk management. The other organizations, NASA and Department of Energy, do not describe ways to measure the performance.
- Training is an important aspect to improve the skills and knowledge of risk management. In most cases this results in-house expertise and personnel that is familiar with basic risk skills. DOD even trains their teams in an integrated manner with the help of a risk assessment training package for the full team.
- Except for NASA, all the organizations have a strong base of employees with experience in according to risk procedures. NASA acknowledges their limited in-house experience in risk procedures and use therefore external support in some cases.
- NASA and DOE use knowledge and skills sharing to improve their application of risk management. For this the use a database with 'lessons learned'. The other organizations document also their knowledge and skills, but not yet on an advanced way.

4.3.4 Application

The organizations are advanced in the application of the risk management process in their organizational structure and projects. Elements for attention are the application of resources and the distinction of project types. However, regarding the use of risk data in the process and the tools and methods that are used in the projects, the organizations achieve a high level of application. The elements are characterised as follows:

- The benefits of risk management are recognized and for this reason the organizations apply risk management and risk thinking to their entire organizations, from start to ending. Department of Energy declares that an integrated systematic risk management process approach has to support decision-making in the organization and FHWA states that risk management should be built into the organization structure.
- The application of resources is not as consistent as the process itself. In case of FHWA and the Department of Energy resources are dedicated to projects, in the other cases there is an inconsistent application of resources. None of the guidelines give a clear description of the application of resources.
- All of the organizations use an integrated set of tools and methods to manage the risks in their project. For this they use as well qualitative as quantitative risk analysis methodologies and historical data source are used in these analyses. Regarding managing risks and opportunities, NASA is the only organization that makes not a distinction between risks and opportunities.
- There is a clear distinction between the project types by a project risk profile. However, none of the organizations use risk tolerance, or describe the use of risk tolerance in their guideline, to determine the size of measures to be taken.
- All the organizations use data for risk-based reporting and decision-making in their projects. FHWA states that the use of risk data will lead to a more transport allocation of project risks and CALTRANS uses risk data to increase the likelihood of success.
- Each organization evaluates the root causes of risks. Besides the evaluating, they also measure and manage the risks in a project.

4.3.5 Structure

Risk management is part of the organizational structure, in all of the cases. FHWA is the most advanced in integrating risk management in their organization, but also both U.S. Departments, Defense and Energy integrate risk management in an advanced way. This can be characterized as follows:

- Risk management is in all the organizations embedded in the organization's structure and linked to the standard procedures in the organizations. In the cases of FHWA and the Department of

Energy risk management is also linked to the corporate governance. These organizations consider risk management as an integrated part of the organization.

- All the organizations work with responsibilities that are clearly defined and assigned. The responsibilities with the corresponding roles are represented in matrices, processes and procedures.
- FHWA states that risk management should be one of the critical project management practices applied to every project and the Department of Defense declares that risk management is most effective if it is fully integrated in the organizations. The other organizations describe risk management not as a part of holistic project management, but as an important part of a project.

4.4 Analysis of the current states of Chile and the Netherlands

The graph (Figure 15) shows the average scores of Chile and the Netherlands on the five criteria. The theoretical situation is not included in the analysis since the situation is only based on guidelines. Although both the countries score on all the five criteria "Repeatable", this can give a distorted view on the application of risk management since Chile just rose up the level of "Initial", while the scores of the Netherlands are close to "Managed".

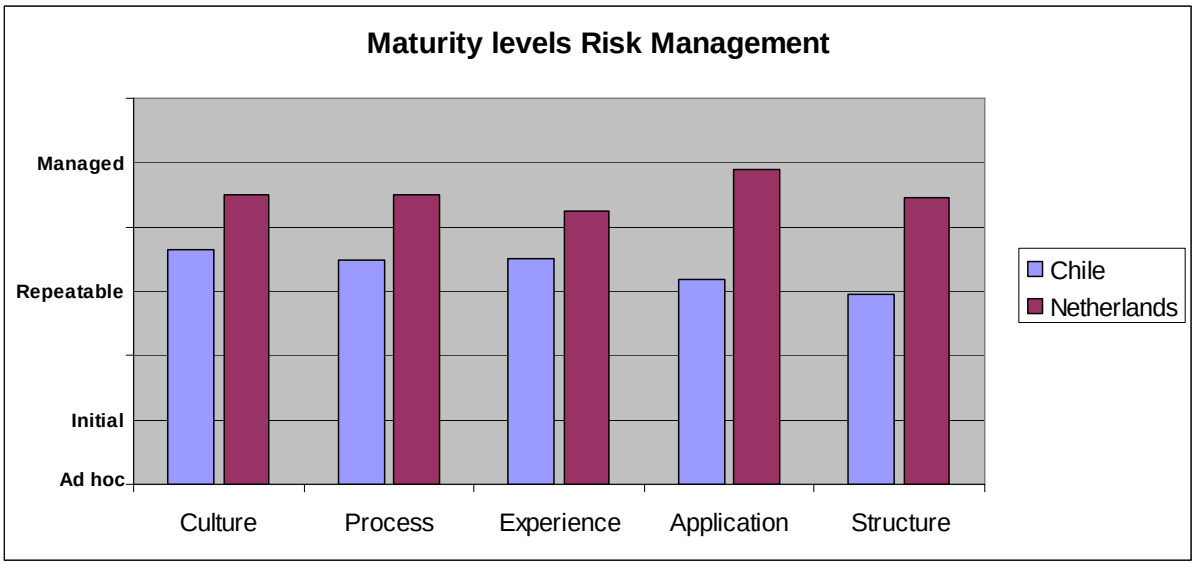

Figure 15: Maturity levels of the criteria

4.4.1 Culture

Chile scores on three of the four elements "Repeatable". However, only in case of the element "Management", Chile scores better than the Netherlands. A graph of the scores is shown in Figure 16.

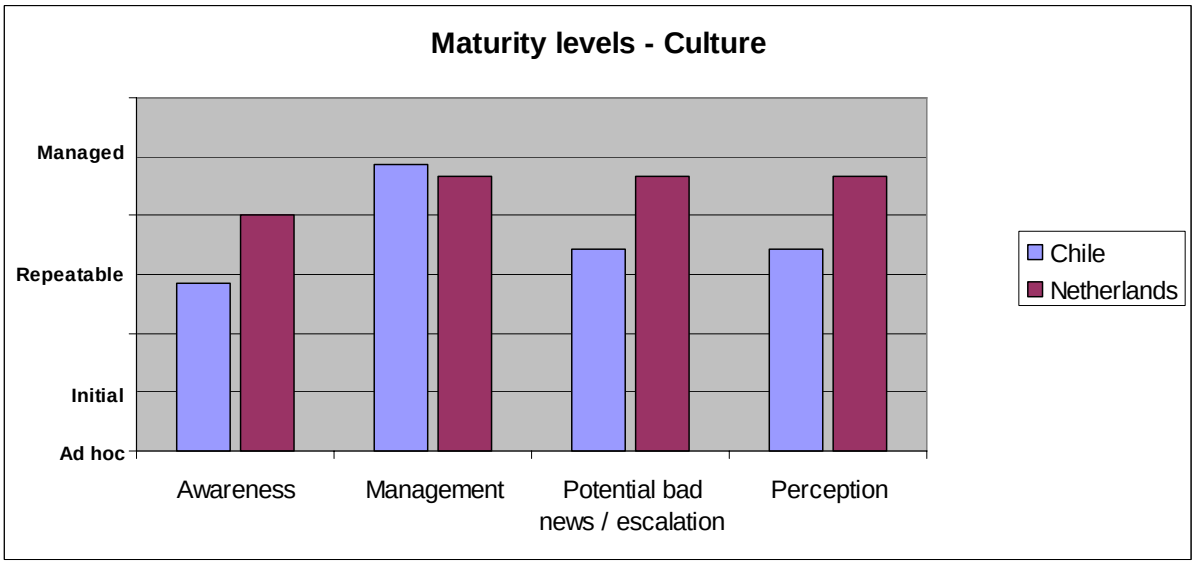

Figure 16: Maturity levels of elements related to "Culture"

A clarification of the scores is given below:

- The risk awareness in Chile is described as partial awareness and the risks are managed in an informal way. This is a big difference with the Dutch situation, where the risks are managed in a formal way and the employees and management are aware of the risks.
- Chile has the highest score of the two countries on the element "Managed", although there is a small difference with the situation in the Netherlands. In both countries risk management is required, but risk management is not always encouraged or rewarded.
- Although Chile scores just like the Netherlands a "Repeatable", there is quite a difference between the two countries. In the Dutch organizations bad news is in some situations also escalated which results almost in a score of "Managed". In Chile bad news is accepted, but it is not common to escalate the news.
- Both the countries score "Repeatable" on the element "Perception". The organizations in the Netherlands are aware of the benefits, but not in all the projects risk information is used in decision-making. Chile scores just "Repeatable" because the benefits of risk management are not always recognized.

4.4.2 Process

Chile scores four times "Initial" and just as often "Repeatable". For the element "Process documentation" Chile scores better than the Netherlands, but on the other seven elements the Netherlands score better. The Netherlands even reach the optimized score for the element "Reason". The scores of the two countries regarding the criterion "Process" are shown in Figure 17.

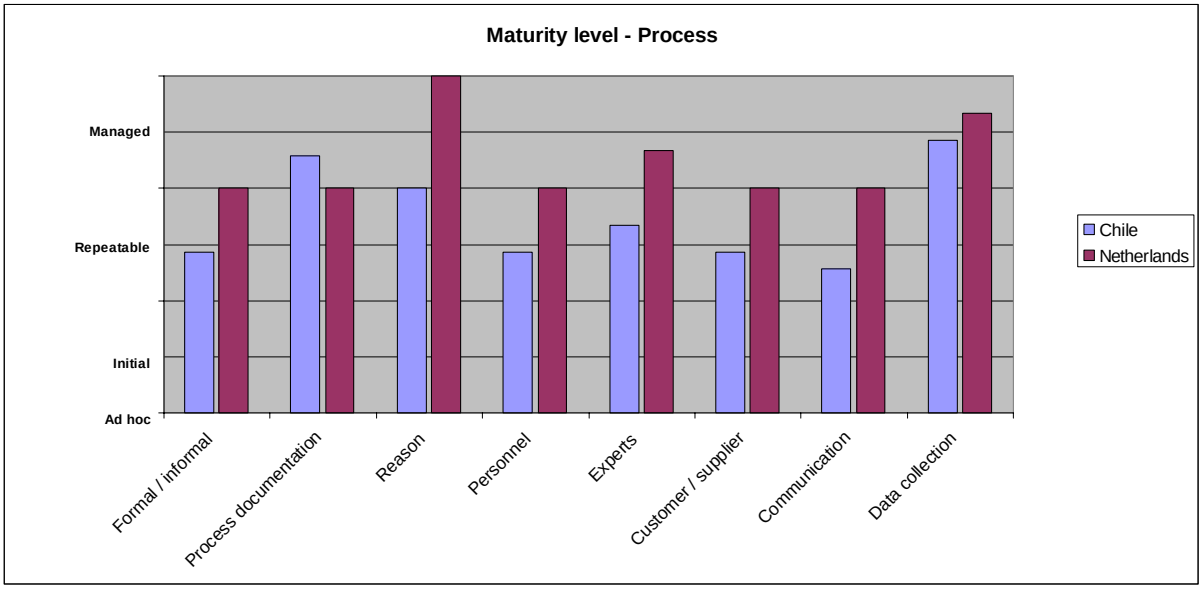

Figure 17: Maturity levels of elements related to "Process"

The elements are described as follows:

- Chile does not use generic formal risk processes in their project, although in some project the Chilean Public Works use specific formal methods. The Dutch organizations however have applied generic formal risk process in most of their projects.
- Regarding the element "Process documentation" the two countries score almost the same score, although Chile scores slightly better on this element. Both the countries have incorporated their formal processes that are in use in their quality systems still they do not evaluate and refine the processes.
- The Netherlands have an optimized score on the element "Reason" which means that the organizations consider risk management as a necessity. Chile scores "Repeatable" on this

element. Chile recognized the importance and need of risk management in most of their projects.

- Chile scores an “Initial” on the element “Personnel”. This because limited personnel in the Public Works in Chile are trained in the basic risk skills. Therefore external support is necessary in their projects. In the Netherlands the personnel is trained in the basic risks skills and regular training is a fact, but still external support is in some projects necessary.
- In all both the countries the risk experts are appointed to advice the project organization. The reason why the Netherlands score better than Chile is because in the Netherlands the risk experts are sometimes also part of the project organization.
- In some Chilean projects suppliers participate in the project, customers participate not at all in the project of the Public Works. This is different with the Netherlands. In the Netherlands key suppliers are part of the participation process and the organizations in the Netherlands that the participants vary from case to case.
- Communication in the Netherlands is more efficient than in Chile. In the Netherlands the organizations attach value to the use of communication. In the Chilean Public Works there is little communication about the identified risks.
- The collecting of risk metrics is in all the three countries used. Beside that, the three countries also evaluating the risk metrics for improvement, the Netherlands on a more frequent base than Chile. That is why the Netherlands score better on this element.

4.4.3 Experience

The Public Works in Chile score on one element (Training) “Initial” and on the other three elements “Repeatable”. The Netherlands score on three elements “Repeatable”, only for the element “Practical Experience” the Dutch organizations score “Managed”. The scores are shown in a graph (Figure 18).

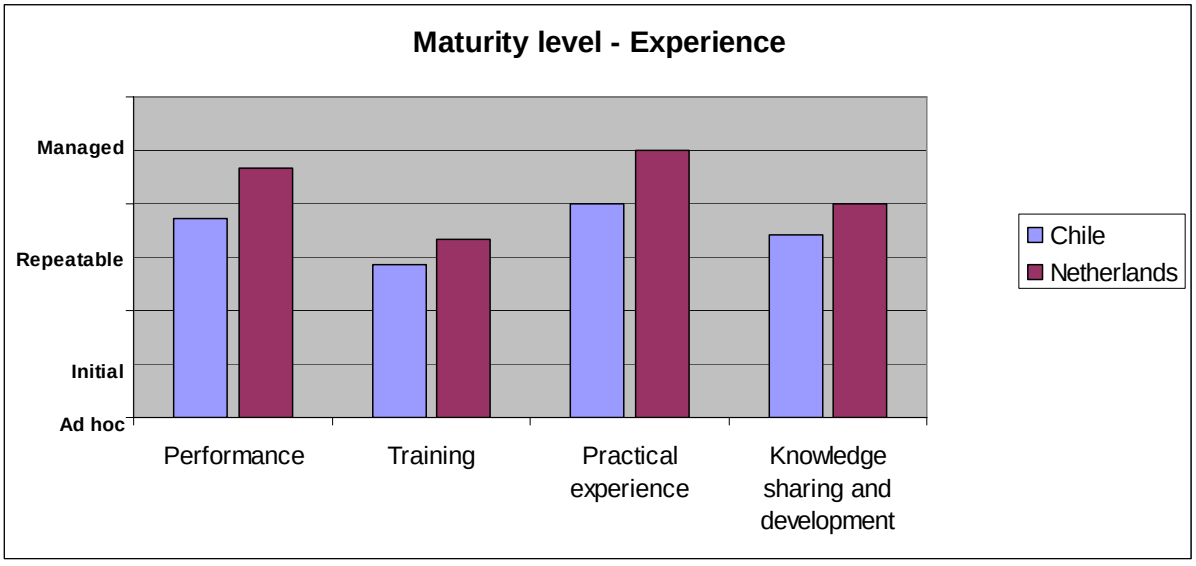

Figure 18: Maturity levels of elements related to “Experience”

The elements of the criterion “Experience” are described as follows:

- The Chilean Public Works measure the performance of risk management, but do not benchmarked these results. The same case is in the Netherlands, although the measuring of risk management performance is often carried out.
- Limited persons in Chile are capable of using basic risk skills and regular training for personnel to enhance their risks skills is not common. In the Netherlands is also not all the personnel capable of using risk skills, but trainings are a more frequent fact.

- The Dutch risk experts are the most experienced compared to the risk experts in Chile. In both the countries the experts are aware of the factors that influencing risk behaviour, only in case of the Netherlands the experts state that they take these factors sometimes in account.
- In the Chilean Public Works it is not common that knowledge and risks are documented and shared. However, when the knowledge and skills are documented, they are also used to improve processes and tools. In the Netherlands is it already more common to document and share the information and use it to develop tools and methods.

4.4.4 Application

Chile scores on the elements “Project / business” and “Resources” “Initial” and on the other four elements the Chilean Public Works score “Repeatable”. For all the elements the Netherlands score better than Chile. The Netherlands have on the element “Data use” an optimized score. A graph of the scores is shown in Figure 19.

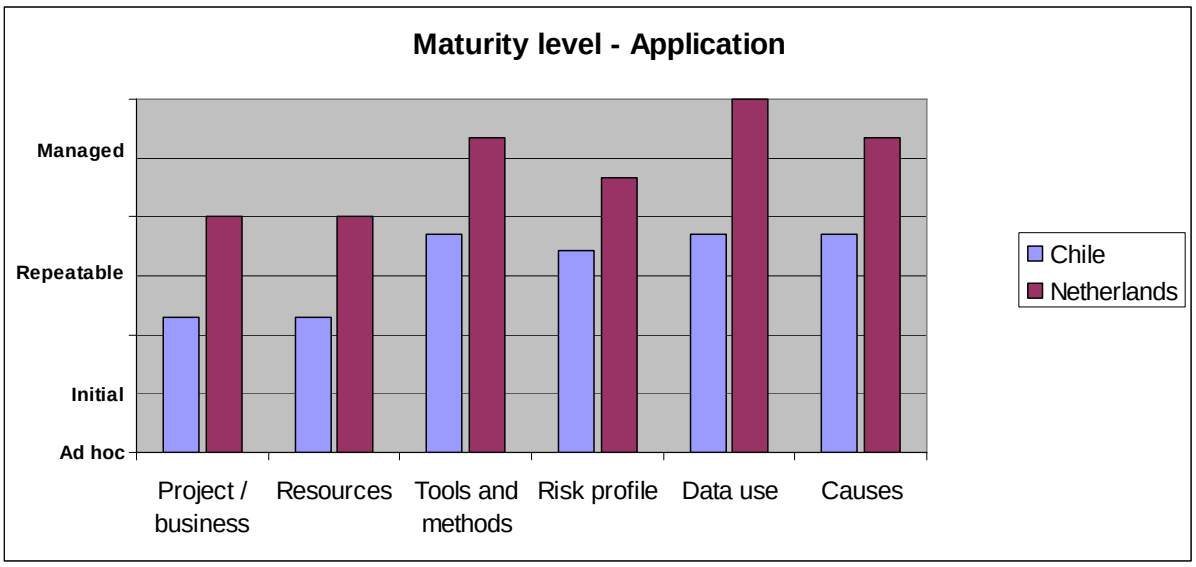

Figure 19: Maturity levels of elements related to “Application”

The analyzed elements are as follows characterized:

- Risk management is not frequently and consistently applied in the Public Works in Chile. This in contrast to the Netherlands where risk management consistently and routinely is applied.
- The resources that are necessary for risk management are in Chile inconsistently applied.. The Dutch organizations dedicate their resources to the projects, but not yet to the organization.
- An integrated set of tools and methods is in both the two countries common. The personnel at the Public Works in Chile stat that they use more qualitative methods than quantitative methods, while in the representatives of the Dutch organizations state that in the Netherlands it is the other way around. Still both the countries are more focused on the risks than on the opportunities.
- The organizations in the three countries are all using project risk profiles to make a clear distinction between project types. The organizations in the Netherlands are using sometimes risk tolerance to determine the size of measures to be taken, but not in a consistent way.
- The storage and use of risk data is not common in Chile. When data is stored it is sometimes used in reports, but almost never in decision-making. This stands in contrast to the United States and the Netherlands since both countries reach an optimized score on this element.
- The cause and effect chain is understood in Chile, but little action is undertaken. In the Netherlands the causes and effects of risks are identified and measured, but not always

managed. The United States are always identifying, measuring and managing the causes of risks, what means the reach an optimized score.

4.4.5 Structure

Regarding the criterion “Structure”, the Public Works in Chile score one “Initial” (Business processes) and twice a “Repeatable”. The Netherlands score on all the elements better than the Chilean Public Works. The graph with the scores is shown in Figure 20.

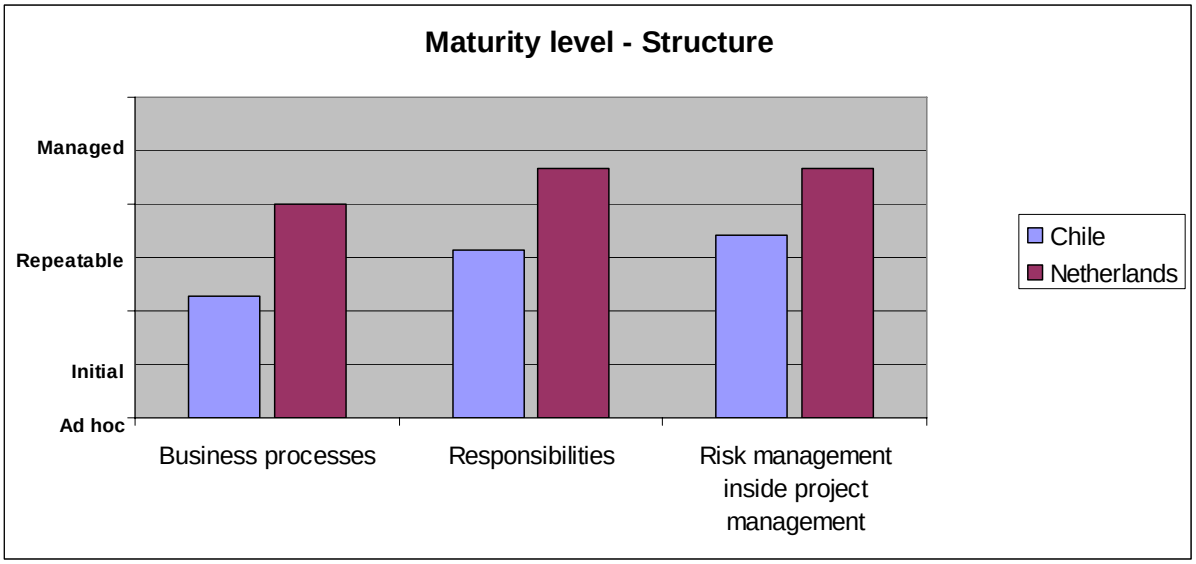

Figure 20: Maturity levels of elements related to “Structure”

The elements regarding the criterion “Structure” are characterized below:

- Risk management is in the Chilean Public Works more linked to the corporate governance than to the standard procedures. In the Netherlands on the other hand is risk management linked to all the standard procedures and becomes it more linked to the corporate governance.
- In case of the Chilean situation the responsibilities are not always clearly defined and assigned with the result that the definition usually not is accepted. This is different with the Dutch situations where the responsibilities are clearly defined, assigned and accepted.
- In the Chilean Public Works risk management is by some persons viewed as important, but this not always the case. In the Netherlands risk management is always recognized as important,, but not yet as a part of the holistic project management.

5 Desired level of the application of risk management

This chapter contains a description of the desired levels in the Chilean Public Works. First, a general description of the five criteria is given and after that the desired levels for the elements are described.

5.1 Desired level in Chile

In general the Chilean Public Works strive to a level of "Repeatable" for all the five criteria. A remark on this pursuit is that not all the personnel strive to this level. In case of some elements three or four persons strive to a level of "Initial". The average scores on the five criteria are shown in Figure 21 and a filled RMM model with the desired levels is shown in Appendix 9.

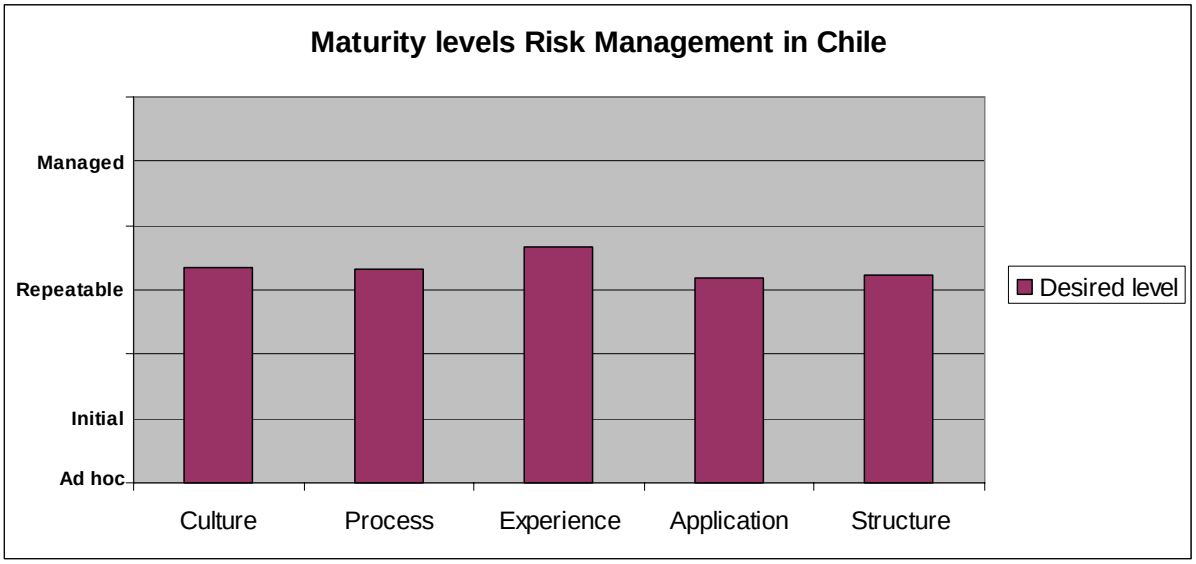

Figure 21: Desired levels in Chile for the 5 criteria

5.1.1 Culture

The Public Works in Chile strive in three of the four elements to a level of "Repeatable", only for the element "Awareness" they strive to "Initial". The desired levels for the four elements are described below:

- The employees and the management in the Chilean Public Works are partly aware of the risks and the risks can be managed informal to achieve the desired level.
- The upper management of the organization requires risk management of their personnel, but does not encourage or reward proactive risk management.
- "Bad news" risk information is accepted in the organization and in a limited way this information is also shared and escalated. This happens however not on a frequent way.
- Risk management may be viewed as important in the Chilean Public Works and the benefits of risk management are recognized.

5.1.2 Process

For seven elements the personnel of the Public Works in Chile desire a level of "Repeatable". In case of the element "Personnel" the people at the Public Works desire a level of "Initial". The elements with their desired level are characterized below:

- To handle the risks in projects, generic formal risk processes are applied in most of the projects of the Chilean Public Works.

- These generic formal risk processes are documented and incorporated into the quality system of the organization, however the processes are not refined or evaluated.
- Risk management is not only applied when it is required by the customer, but the needs of risk management are recognized in most of the situations.
- In case of the risk personnel, they are located under the projects. This means that not all the personnel are trained in basic risk skills and external support is necessary in projects.
- Risk experts are recognized in the Chilean Public Works. The risk experts are appointed to advice the organizations of the projects, but are not yet part of the organizations.
- The key suppliers participate structurally in the risk management processes. This is not the case for the key customers, their participation vary from case to case.
- Inside the organization as well formal as informal communication channels were desired. Direct communication channels are not common and the communications channels are also not evaluated and refined.
- Risk data are collected in the risk management process with the intention to use this data. The data are however not consistently evaluated for improvement.

5.1.3 Experience

All the four elements regarding “Experience” score “Repeatable”. The desired levels are characterized as follows:

- The performance of the risk management process are measured, but not benchmarked with historical data.
- There is in-house core expertise regarding risk management, although not all the personnel are familiar with using basic risk skills. The personnel that are capable of using risk skills have had training in risk management.
- In the Chilean Public Works is a strong base of employees with experience in accomplishing risk procedures. Beside that, the risk experts in the organization are very experienced.
- Knowledge and skills are documented and also shared within the organization. Specific processes and tools are developed and used with this information. Learning from experiences is not yet part of the process.

5.1.4 Application

In case of the elements “Resources” and “Risk profile” a level of “Initial” is desired, for the other four elements “Repeatable” is desired. The elements are described below:

- Risk management is consistently and routinely applied to all of the projects, from start to ending. Risk thinking is not part of the process.
- There is not a consistent application of risk management resources in the project, nor are they dedicated to the projects or organization.
- The Chilean Public Works use integrated sets of tools and methods that are adapted to the organization, to manage the risks. For this as well qualitative as quantitative risk analysis methodologies are in use. Valid and reliable historical data sources are not used in the methodologies.
- Gut feeling is used to determine the risk profile of the projects. There is no clear distinction between project types nor is risk tolerance in use to determine the size of measures.
- There is attention for the storage and use of historical risk data. The data is not used in risk-based reporting and the upper management do not use this information in their decision-making.
- The cause and effect chain of risks is understood in the Chilean Public Works, from top-down and bottom-up. Still the causes are not always identified, measured and managed.

5.1.5 Structure

For the element “Risk management inside project management” a level of “Initial” is desired at the Public Works in Chile, while for the other two elements a level of “Repeatable” is desired. The descriptions of the desired levels are given below:

- Risk management is linked to all the standard procedures, but not always to the corporate governance.
- The responsibilities for the risk management processes in the Chilean Public Works are clearly defined and assigned. The definitions however are not always accepted and there is not always acted to it.
- In some cases application of risk management is seen as a project on its own, but it is not as important as (e.g.) time or cost management, nor is it seen as part of holistic project management.

6 Shortcomings & ways of improvement

This chapter contains a combination of the results of chapter 4 and chapter 5. In chapter 4 is the current states of Chile and the Netherlands described, while in chapter 5 the desired levels of the Public Works in Chile is discussed. This chapter focuses on the shortcomings between the levels. In the first paragraph 6.1 the shortcomings are identified by comparing the current state of Chile to the desired level and also by benchmarking the current state of Chile to the situation the Netherlands. In the following paragraph (paragraph 6.2) a selection of the main points that require improvement is made for the Public Works in Chile.

6.1 Identification of improvement requirements

Two types of requirements are identified. The first type is based on the comparison of the current state of Chile and the desired level for Chile. The other type is based on benchmarking the current state of Chile against the current state in the Dutch organizations.

6.1.1 Comparing to desired level

A first view on the current states and the desired levels of the criteria shows an unexpected result. For some criteria the desired level is not higher than the current state (see Figure 22). This means that according to the questioned persons of the Public Works in a desired situation some criteria may score lower than the criteria score in the current. In case of “Culture” and “Process” the desired levels are lower than the current state in Chile.

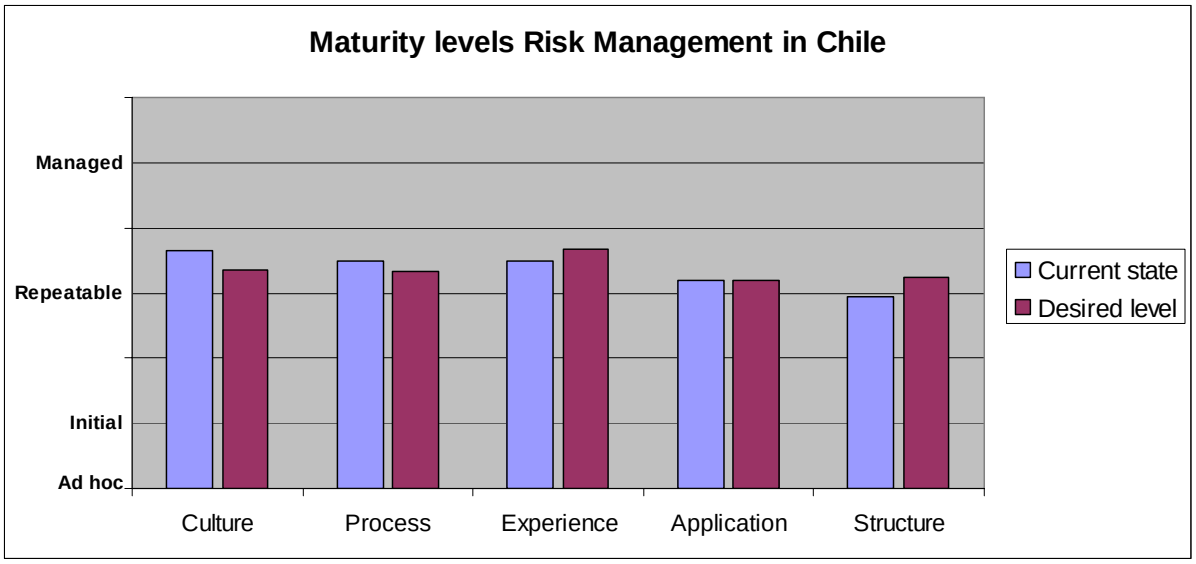

Figure 22: Current states and desired levels in Chile

In Appendix 9 a RMM model can be found that shows that six elements need to bridge one level, all from “Initial” to “Repeatable”. On the other hand, for two elements an “Initial” is desired while the current state is “Repeatable”.

6.1.1.1 Culture

For the four elements regarding the criterion “Culture” there are no shortcomings to identify. For “Awareness” “Initial” is desired which is the same as the current level in the Public Works in Chile for this element. The other three elements reach a level of “Repeatable”.

6.1.1.2 Process

The Chilean Public Works strive for seven of the eight elements to “Repeatable”. Only for the element “Personnel” a level of “Initial” is desired. The current state of Chile shows that four elements score “Initial”. This means that three elements need to bridge a shortcoming of one level. The steps to bridge these shortcomings are described below as follows:

- **Formal / informal –** The formal generic risk processes have to be applied to most of the projects. It is not yet necessary to apply these risk processes to the business processes.
- **Customer / supplier –** Key suppliers have to participate in the risk management processes on a frequent base and not only in some projects.
- **Communication –** There have to be formal and informal communications channels with the aim to communicate about the founded risks and the channels have to be evaluated.

6.1.1.3 Experience

In the current state the Public Works in Chile have three elements that score “Repeatable” and one element, “Training”, that scores “Initial”. The desired situation is that all the four elements with regard to the criterion “Experience” achieve a level of “Repeatable”. This means that for the element of “Training” a shortcoming of one level has to be bridged. To bridge this shortcoming, the steps are characterized below as follows:

- **Training –** The in-house core of risk expertise in the organization has to be enhanced and there has to be regular training for the personnel to improve the use of basic risk skills.

6.1.1.4 Application

The current state of the Public Works in Chile shows two elements with a level of “Initial” and four elements with a level of “Repeatable”. In the desired situation the Chilean Public Works want to improve the state of one element (“Project / business”). On the same time the Public Works in Chile also state that in the desired situation the element “Risk profile” may score a lower level. However, since it is unnecessary to change the level of this element, no attention is paid anymore to this element. Regarding the element “Project / business”, the step to bridge the difference is characterized below as follows:

- **Project / business –** Implement and structuralize a routine and consistent application of risk management to all the projects, from start to ending.

6.1.1.5 Structure

Two of the three elements have a level of “Repeatable” while the other element (“Business processes”) achieves “Initial”. In the desired level the element “Business processes” reaches “Repeatable” while for the element “Risk management inside project management” a level of “Initial” is desired. The step to bridge this difference is described below as follows:

- **Business processes –** Risk management has to be linked to all the standard procedures in the organization.

6.1.2 Benchmarking

The scores of the current state of Chile are benchmarked against the best scores of the Netherlands and the United States. A graph of the scores is shown in Figure 23. The smallest difference can be found for the criterion "Experience". For the other criteria the differences are larger with in case of the criterion "Application" almost the difference of one complete level. A complete overview of the differences according to the RMM model is shown in Appendix 12.

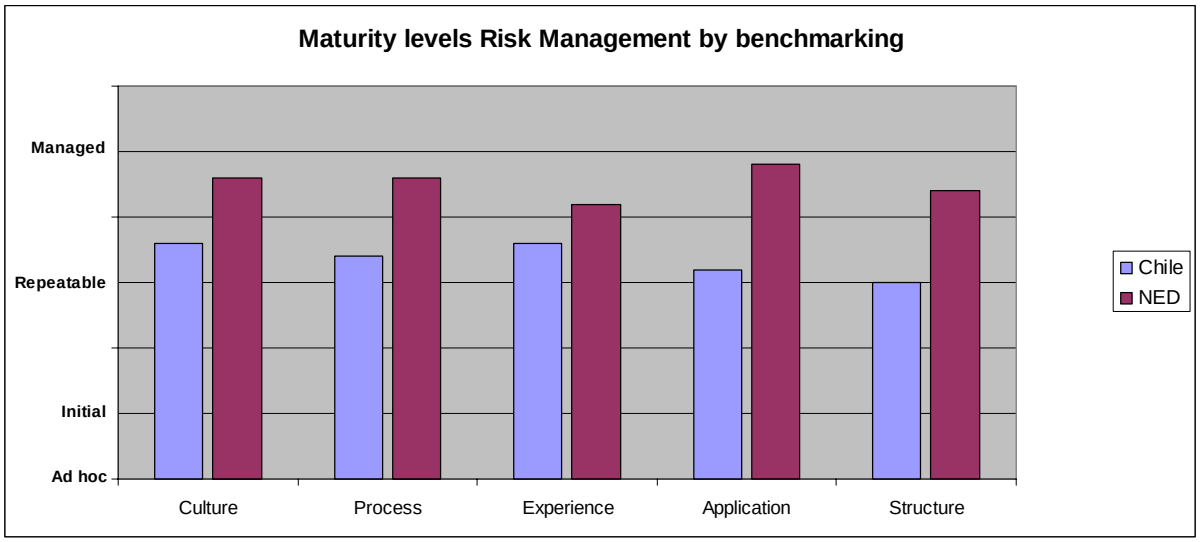

Figure 23: Current state of Chile and the Netherlands

For identifying the differences with regard to the elements two preconditions are determined:

1. Chile scores 2,7 or less for an element
2. The difference is at least 0,5

The first precondition is based on the lowest score for an element the Netherlands achieved. Also a score of 2,7 indicates that for an element a level of "Repeatable" is achieved, but that improvement is still necessary. The argumentation for the second precondition is that a score of 0,5 indicates a shortcoming that it is sensible to look at the situation in the Netherlands and to learn lessons from the Dutch situation. There are 14 elements identified that comply with these preconditions. The complete table with elements that comply with the preconditions and the country that is the benchmark for an element can be found in Appendix 13.

6.1.2.1 Culture

In case of three elements shortcomings are identified that comply with the suggested preconditions. Only for the element "Management" Chile scores better than the Netherlands. Steps to bridge the difference are described below as follows:

- **Awareness –** The employees and management have to be come aware of the risks and have to manage these risks mostly formal.
- **Potential bad news / escalation –** "Bad news" risk information is already accepted and shared, but it also has to be escalated.
- **Perception –** Risk management has to be viewed as important, the benefits of risk management have to be recognized and the upper management has to start using risk information in their decision-making.

6.1.2.2 Process

For 5 of the 8 elements areas of improvement are identified. Chile scores better on the element "Process documentation" that the Dutch organizations and for the other two elements a score higher than 2,7 is reached. To bridge the difference for the five elements, steps are characterized below as follows:

- **Formal / informal –** Formal generic risk processes have to be applied to most of the projects.
- **Personnel –** Personnel have to be trained in basic skills of risk management so that there is a limited need for external support.
- **Experts –** Risk experts have to be appointed to advice the project organization in all projects and in some projects the risks experts even have to be part of the organization.
- **Customer / supplier –** Key suppliers have to participate in the risk management process and the Chilean Public Works have to work with customer-oriented goals.
- **Communication –** There have to be formal and informal communications channels with the aim to communicate about the identified risks and the channels have to be evaluated.

6.1.2.3 Experience

The Public Works in Chile score for three of the four elements "Repeatable". Only in case of the element "Training" a level of "Initial" is achieved. The Dutch organizations score on all of the four elements "Repeatable", however, the scores are high enough to identify differences according to the preconditions.

6.1.2.4 Application

Three elements need improvement after benchmarking them against the Netherlands; the other three elements reach an acceptable level. However, also for these elements improvement may be necessary in the future. To bridge the three identified differences, steps are characterized below as follows:

- **Project / business –** Risk management has to be applied in a routine and consistent way to all the projects and risk thinking has to be applied to all the activities in the organization.
- **Resources –** The resources in the process need to be dedicated to the projects in the Chilean Public Works.
- **Risk profile –** A project risk profile has to be used for a clear distinction between the project types and for some projects risk tolerance is used to determine measures to be taken.

6.1.2.5 Structure

For all the three elements a difference is identified. The element "Business processes" scores a level of "Initial", while the other two elements reach a level of "Repeatable", but score less than 2,8. Steps to bridge these differences are characterized below as follows:

- **Business processes –** Risk management has to be linked to all the standard procedures.
- **Responsibilities –** The responsibilities for the application of risk management have to clearly defined and assigned and accepted by the personnel.
- **Risk management inside project management –** Risk management has to be viewed as important and the last aim is to see risk management part of the holistic project management.

6.2 Selection of main shortcomings

Fourteen areas of improvement in the Public Works in Chile are identified by benchmarking them against the Netherlands and one other element by comparing the current state of the Public Works in Chile with the desired levels. However, for some of the elements improvement is more urgently than for other elements. In this paragraph the shortcomings are divided in 3 groups of urgency.

The first selection of the 15 shortcomings is based on the RMM model. All the identified elements that have a level of "Initial" in this model are selected for improvement. By selecting these elements an average level of "Repeatable" for the Chilean Public Works can be achieved. The 9 selected elements are shown in Table 5.

Table 5: First selection of shortcomings

Criteria	Element	Shortcoming
Culture	Awareness	The employees and management have to be aware of the risks and have to manage these risks mostly formal.
Process	Formal / informal	The formal generic risk processes have to be applied to most of the projects.
	Personnel	Personnel have to be trained in basic skills of risk management and there is a limited need for external support in the risk management process.
	Customer / supplier	Key suppliers have to participate in the risk management process and the Public Works in Chile have to work with customer-oriented goals.
	Communication	There have to be formal and informal communications channels with the aim to communicate about the identified risks and the channels have to be evaluated.
Experience	Training	In-house expertise in the Public Works in Chile has to be enhanced and there has to be regular training for the personnel to train them in basic skill risk management.
Application	Project / business	Risk management has to be applied in a routine and consistent way to all the projects and risk thinking has to be applied to all the activities in the organization.
	Resources	The resources in the process need to be dedicated to the projects in the Chilean Public Works.
Structure	Business processes	Risk management has to be linked to all standard procedures.

The second selection is based on a question in the questionnaires regarding the importance of the elements in the application of risk management. The graph that shows the priority of the elements can be found in Appendix 14. In the second selection the shortcomings of the first selection are not included. The table with the 4 selected elements is shown Table 6.

Table 6: Second selection of shortcomings

Criteria	Element	Shortcoming
Process	Experts	Risk experts have to be appointed to advice the project organization in all projects and in some projects the risks experts even have to be part of the organization.
Application	Risk profile	A project risk profile has to be used for a clear distinction between the project types and for some projects risk tolerance is used to determine measures to be taken.
Structure	Responsibilities	The responsibilities for the application of risk management have to clearly defined and assigned and accepted by the personnel.
	Risk management inside project management	Risk management has to be viewed as important and the last aim is to see risk management part of the holistic project management.

The last two elements reach a score of 2,7 what indicates a level of "Repeatable", but still these elements need some improvement. The urgency is however less than for the other identified elements. These two elements are shown in Table 7.

Table 7: Third selection of shortcomings

Criteria	Element	Shortcoming
Culture	Potential bad news / escalation	"Bad news" risk information is accepted and shared in the organization and it is in limited way also escalated.
	Perception	The benefits of risk management have to be recognized and the upper management has to start using risk information in their decision-making.

The identified areas for improvements and also the results of the questionnaires held at the Public Works in Chile show that risk management is not yet integrated in the organization. Comparing the current levels to the desired levels shows only six shortcomings while by benchmarking the current levels of the Public Works in Chile against the levels in the Netherlands 15 shortcomings are identified. The difference between the 6 and 15 shortcomings indicates that the Public Works in Chile have the idea that their application of risk management already has an acceptable level.

Also the identification of the element "risk management inside project management" as important, but on the same time the desire of a lower level for this element than the current level shows that the importance of risk management is not fully recognized in the Public Works in Chile. All these results indicate a shortcoming for risk management in its entirety. To bridge this shortcoming, perception regarding risk management should be improved as well as the awareness of risks in projects. Communication and commitment from the upper management is necessary to establish this.

7 Conclusions and recommendations

This chapter describes the conclusions of this research and the subsequent recommendations. In paragraph 7.1 the conclusions are treated, in the following paragraph, paragraph 7.2, the recommendations are given. In paragraph 7.3, the implementation of recommendations is briefly described and finally in paragraph 7.4 related subjects for further research are discussed.

7.1 Conclusions

In chapter 2 the objective of the research was formulated as follows and supported by a main research question and four sub research questions.

The aim of the research is to improve and enhance the application of risk management in Public Works organisations in Chile.

The research is unfortunately based on a minimum of data. Regarding the Chilean situation seven persons filled in the questionnaire and for the Dutch situation three persons participated in the research by filling in the questionnaire. For this reason the conclusions and recommendations can not be used blindly.

The average maturity level of the application of risk management in the Chilean Public Works is between “Initial” and “Repeatable”. For none of the elements the Public Works in Chile score “Ad hoc” or “Managed”. A benchmark of the current levels of the Chilean Public Works against the Netherlands shows 15 shortcomings are identified while in an earlier comparison of the current levels to the desired levels of Chile only 6 shortcomings where produced.

Of the fifteen identified shortcomings nine elements have to bridge one level, from “Initial” to “Repeatable”. The other six elements have a level of “Repeatable”, but they still have room for improvement. Finally the identified shortcomings are divided in three groups, based on their urgency.

The first group is the most urgent of the three since this group contains elements that have a level of “Initial”. Nine elements are identified that have a level of “Initial” and have to bridge one level, from “Initial” tot “Repeatable”. To bridge the shortcomings of these elements in the Public Works in Chile, the following steps have to be made:

- The personnel and the management have to be come aware of the risks and manage these risks mostly in a formal way;
- The risk management processes have to be applied in a formal and structured way;
- The personnel have to have regular training in the basic skills of risk management;
- Key suppliers have to participate on a frequent base and the projects have to have customer-oriented goals;
- Communication about the identified risks has to go trough formal and informal communication channels;
- In-house risk expertise has to be enhanced;
- Risk management has to be applied in a routine and consistent way and risk thinking has to be applied to all the activities;
- Resources have to be dedicated to the projects;
- Risk management has to be linked to all the standard procedures;

The selected elements in the second group are based on the results of the questionnaires which were filled in by the persons of the Public Works in Chile. The four selected elements already have a

level of “Repeatable” but they are recognized by the Public Works as important in the application of risk management. The second group does not contain the elements of the first group. Steps to bridge the shortcomings are characterized as follows:

- Risk experts have to be appointed to advice the project organization or be part of the project organization;
- Risk profiles have to be used to make a difference in the project types and to determine the measures to be taken;
- Responsibilities have to be clearly defined and assigned and accepted by the personnel;
- Risk management has to be seen as important and as part of holistic project management;

The third group contains two elements. The urgency for this group is less than for the other two groups still there is room for improvement. The two elements with their criterion are listed below.

- Risk information has to be accepted and beside it shared and escalated in a limited way;
- The benefits of risk management have to be recognized and the upper management has to start using risk information in their decision-making;

Despite the shortcomings that are identified, the Public Works in Chile desire on the same time for two elements a lower level that the current level for these elements. Together with the lack of recognizing other shortcomings except for the 6 shortcomings identified by comparing the current levels to the desired levels, this indicates that the benefits of risk management are not fully recognized by the Chilean Public Works and that it points to a shortcoming for risk management in its entirety. To bridge this shortcoming, the perspective on risk management has to be changed. This means a cultural shift in the Public Works in Chile, improvement of communication about risks and risk management and the commitment from the upper management is necessary to establish this.

7.2 Recommendations

The recommendations are just like the conclusions based on a minimum of data. Therefore a comprehensive research into the application of risk management in the Public Works in Chile is necessary. Still it is sensible to use the recommendations of this research.

Based on the conclusions, it is recommended to perform the improvements for the fifteen shortcomings, based on the selection made in the paragraph 6.2. A plan for the implementation is described in paragraph 7.3. However, as concluded in the previous paragraph, a culture change has to be made since the benefits of risk management are not widely acknowledged in the Chilean Public Works.

A first step to change the culture is to propagate this report. By propagating the report the personnel gain an insight into the maturity of the application of risk management in the Public Works in Chile and get aware of the benefits of risk management in general. The report can than be used as a starting point for an internal discussion about the application of risk management in the Public Works in Chile.

The role of the upper management is in that case of vital importance. The upper management should not only encourage risk management in the organization in a passive way, but also in an active way by rewarding the use of proactive risk management and show the personnel the surplus value for themselves by using risk management in their projects.

But not only the personnel should use risk management, also the upper management itself have to use risk management, for example in decision-making. The organizations in the United States use already risk management in their reporting and decision-making and can be used as an example for their personnel. Beside that, it also encourages the use of risk data.

A guideline, focused on the application of risk management in the Public Works in Chile, may help to achieve the culture shift. The guideline can improve the communication about risk management and the risks and also the risk awareness of the personnel.

In case the above recommendations are followed, it is recommended to use the RMM model to measure the improvement and enhancement of the application of risk management in the Public Works in Chile. Since the RMM model is only a tool to indicate the maturity of the application, an iterative process is necessary to improve the application of risk management. An iterative process is described in paragraph 3.3.3 and the implementation is described in paragraph 7.3.

7.3 Implementation of improvements

In paragraph 3.3.3 a combination of two models is described: the EFQM Excellence Model and the PDCA cycle. The EFQM Excellence Model focuses on measuring the results of project management, the understanding of shortcomings and stimulating solutions to bridge the shortcomings and to improve the application of project management. The PDCA cycle is an iterative process to solve problems. Combined they can bridge shortcomings and stimulate solutions on an iterative way.

The first step is to determine the level of application of risk management in the organization. This is represent by the “Check stage” of the model and performed in this research. The next step, the “Act stage”, is to analyze the differences between the objectives and the results and carry out corrective actions. The recommendations that are made can be considered as the first part of this stage, the second part of the stage includes the performance of the corrective actions.

In the “Plan stage” the objectives regarding the application of risk management into the organization have to be made. Strong leadership is necessary to create a risk aware culture in the organization and change the perception with respect to risk management. Beside that, a vision and a mission with regard to risk management have to be created and the upper management has to lead the personnel in a proactive way. It follows a policy and strategy for the risk management process. The strategy contains the objectives for the risk management process and the performance of the process should be measured. The policy describes the communication channels and the responsibilities in the process.

The next stage, the “Do stage”, contains the management of the people, the resources and the processes. The plans and objectives that are made in the previous stage are performed in this stage. The upper management has to show the personnel the surplus value of using risk management, not only the surplus value for the process, but also the surplus value for the personnel themselves. This can be achieved for instance by organizing regular training reward proactive risk management. Also the resources and the tools and methods have to be applied in a routine, frequent and consistent way to all the projects and activities to achieve the optimal result. Data and knowledge have to be documented, shared and evaluated. Evaluating is one of the key aspects on the way to perfection. This is a recurring aspect in the processes which should be integrated in the organization.

7.4 Further research

This research describes the application of risk management in the Public Works in Chile on a brief way. It gives a small insight into the level of the application and how this level can be improved. There are still issues that are related to the subject of this research and interested for further research. The proposed topics for further research are based on the researcher’s own analyses during this research.

- As a continuation of this research the implementation of the proposed recommendations and the development of the level of application of risk management in the Public Works in Chile can be investigated.

- The used questionnaires in the research are showing a general view on the application of risk management. Interviews can be considered to obtain a more detailed view on this application.

- To measure the level of application of risk management in Chile and the Netherlands a questionnaire is used. This questionnaire can be examined and improved to create a tool that can be used to determine the application of risk management in any organization.

- Aligned with the improved questionnaire, also the RMM model and the combination of the EFQM Excellence Model and the PDCA cycle can be examined and improved models can be used in other researches.

- In the recommendations a guideline for the Public Works in Chile is proposed. The development of this guideline, focuses on the Public Works in Chile, can be a future research.

8 References

Akintoye, A.S. & MacLeod, M.J. (1997). Risk analysis and management in construction. *International Journal of Project Management, 15(1)*, 31-38.

Al-Bahar, J.F. & Crandall, K.C. (1990). Systematic Risk Management Approach for Construction Projects. *Journal of Construction Engineering and Management, 116(3)*, 533-546.

Al-Jibouri, S. (2009). *Planning & control of construction projects*. College reader. Enschede: University of Twente.

Ashley, D.B., Diekmann, J.E. & Molenaar, K.R. (2006). *Guide to Risk Assessment and Allocation for Highway Construction Management*. Retrieved 20 April, 2009, Federal Highway Administration, U.S. Department of Transportation Web site: http://international.fhwa.dot.gov/

Association for Project Management (APM) (n.d.). Retrieved 15 June 2009, from http://www.apm.org.uk/Definitions.asp/

Banco Central de Chile (2008). *Gross Domestic Product by Type of Economic Activity-Annual series.* Retrieved 15 June 2009, from http://www.bcentral.cl/eng/economic-statistics/series-indicators/index_ae.htm

Boxx, W.R., Odom, R.Y. & Dunn M.G. (1991). Organizational values and value congruency and their impact on satisfaction, commitment, and cohesion: an empirical examination within the public sector. *Public Personnel Management, 20(1)*, 195-205.

California Department of Transportation (2007). *Project Risk Management Handbook*. Sacramento, CA: Office of Project Management Process Improvement.

Chapman, C. (1997). Project risk analysis and management: PRAM the generic process. *International Journal of Project Management, 15(5*), 273-281.

Ciorciari, M. & Blattner P. (2008). *Enterprise Risk Management Maturity-Level Assessment Too*l. Retrieved 13 May, 2009, Society of Actuaries Web Site: http://www.soa.org/

Committee of Sponsoring Organizations of the Treadway Commission (COSO) (2004). *Enterprise Risk Management — Integrated Framework. Executive Summary*. Retrieved 13 May, 2009, Committee of Sponsoring Organizations Web Site: http://www.coso.org/

Del Cano, A. & De la Cruz, M.P. (2002). Integrated methodology for project risk management. *Journal of Construction Engineering and Management*, 128(6), 473-485.

Hallikas, J., Karvonen, I., Pulkkinen, U., Virolainen, V.M. & Tuominen M. (2004). Risk management processes in supplier networks. *International Journal of Production Economics, 90(1)*, 47-58.

Heijden, van der, W.L.F. (2006). *Risicomanagement in de aderen?!*. Master's thesis. Enschede: University of Twente.

Hillson, D. (1997). Towards a risk maturity model. *The International Journal of Project & Business Risk Management, 1(1)*, 35-45.

Keizer, J.A., Halman, J.I.M. & Song, M. (2001). From experience: applying the risk diagnosing methodology. *The Journal of Product Innovation Management, 19*, 213-232.

Little, P., Everitt, H., Williamson, I., Warner, G., Moore, M., Gould, C., et al. (2001). Observational study of effect of patient centredness and positive approach on outcomes of general practice consultations. *BMJ 2001, 323*, 908-911.

Mango, A.W. (2008). Project Management; beyond the formal definition. *PM World Today, 10(4),* viewpoints. Retrieved 13 May, 2009, from http://www.pmworldtoday.net/

Ministerio de Obras Públicas - Gobierno de Chile (2009). Retrieved 24 June, 2009, from http://www.mop.cl/

Office of Government Commerce (OGC) (n.d.). Retrieved 15 June 2009, from http://www.ogc.gov.uk/guidance_management_of_risk_4441.asp/

Platje, A. & Wadman, S. (1998). From Plan-Do-Check-Action to PIDCAM: the further evolution of the deming-wheel. *International Journal of Project Management, 16(4)*, 201-208.

Pontificia Universidad Católica de Chile (2009). Retrieved 24 June, 2009, from http://www.puc.cl/

Project Management Institute (PMI) (2000). *A guide to the Project Management Body of Knowledge (PMBoK)*. Newton Square, PA, USA: Project Management Institute.

Risk Management R&D (Risk Management Research & Development Program Collaboration) (2002). *Risk management Maturity Level Development*. Retrieved 21 April, 2009, from http://www.pmi-switzerland.ch/.

Rusjan, B. (2005). Usefulness of the EFQM Excellence Model: Theoretical Explanation of Some Conceptual and Methodological Issues. *Total Quality Management, 16 (3)*, 363-380.

Schatteman, D., Herroelen, W., Van de Vonder S. & Boone A. (2006). *A methodology for integrated risk management and proactive scheduling of construction projects*. Retrieved 20 April, 2009, from http://www.econ.kuleuven.be/.

Schulman, K.A., Berlin, J.A., Harless, W., Kerner, J.F., Sistrunk, S., Gersh, B.J., et al. (1999). The effect of race and sex on physicians' recommendations for cardiac catheterization. *The New England Journal of Medicine, 340(8)*, 618-626.

Siegelaub, J.M. (2004). *How PRINCE2 can complement PMBoK and your PMP*. Retrieved 15 June 2009, from APMG-US Web site: http://www.apmg-us.com/

Soković, M. & Pavletić, D. (2007). Quality Improvement - PDCA Cycle vs. DMAIC and DFSS. *Journal of Mechanical Engineering, 53(6)*, 369-378.

Stamatelatos, M., Apostolakis, G., Dezfuli, H., Everline, C., Guarro, S., Moieni, P., et al. (2002). *Probabilistic Risk Assessment Procedures Guide for NASA Managers and Practitioners.* Retrieved 25 June, 2009, NASA Headquarters Web Site: http://www.hq.nasa.gov/

U.S. Department of Defense. (2006). *Risk Management Guide For DOD Acquisition*. Retrieved 25 June, 2009, Defense Acquisition University Web Site: http://www.dau.mil/

U.S. Department of Energy. (2008). *Risk Management Guide*. Retrieved 25 June, 2009, U.S. Department of Energy Web Site: http://management.energy.gov/

Zhi, H. (1995). Risk management for overseas construction projects. *International Journal of Project Management, 13(4)*, 231-237.

Zink, K.J., Steimle, U. & Schröder, D. (2008). Comprehensive change management concepts Development of a participatory approach. *Applied Ergonomics, 39(4)*, 527-538.

Appendixes to

Application of risk management in Public Works organisations in Chile

Bachelor thesis, Michiel Wolbers

University of Twente
Enschede - The Netherlands

Contents

Appendix 1 – Risk Management Maturity model

Table 1: Risk Management Maturity model (Risk Management R&D, 2002)

Criteria	Level 1 – Ad Hoc	Level 2 – Initial	Level 3 – Repeatable	Level 4 - Managed
Definition	Unaware of the need for management of uncertainties (risk). No structured approach to dealing with uncertainty. Repetitive and reactive management processes. Little or no attempt to learn from past projects or prepare for future projects.	Experimenting with risk management through a small number of individuals. No structured approach in place. Aware of potential benefits of managing risk, but ineffective implementation.	Management of uncertainty built into all organizational processes. Risk management implemented on most or all projects. Formalized generic risk process. Benefits understood at all organizational levels, although not always consistently achieved.	Risk-aware culture with proactive approach to risk management in all aspects of the organization. Active use of risk information to improve organizational processes and gain competitive advantage.
Culture	No risk awareness. No upper management involvement. Resistant/reluctance to change. Tendency to continue with existing processes even in the face of project failures. Shoot the messenger.	Risk process may be viewed as additional overhead with variable benefits. Upper management encourages, but does not require, use of Risk Management. Risk management used only on selected projects.	Accepted policy for risk management. Benefits recognized and expected. Upper Management requires risk reporting. Dedicated resources for risk management. “Bad news” risk information is accepted.	Top-down commitment to risk management, with leadership by example. Upper management uses risk information in decision-making. Proactive risk management encouraged and rewarded. Organizational philosophy accepts idea that people make mistakes.
Process	No formal process. No Risk Management Plan or documented process exists. None or sporadic attempts to apply Risk Management principles. Attempts to apply Risk Management process only when required by customer.	No generic formal processes, although some specific formal methods may be in use. Process effectiveness depends heavily on the skills of the project risk team and the availability of	Generic processes applied to most projects. Formal processes incorporated into quality system. Active allocation and management of risk budgets at all levels. Limited need for external support. Risk metrics collected.	Risk-based organizational processes. Risk Management culture permeating the entire organization. Regular evaluation and refining of process. Routine risk metrics used with consistent feedback for improvement. Key suppliers and customers

Criteria	Level 1 – Ad Hoc	Level 2 – Initial	Level 3 – Repeatable	Level 4 - Managed
		external support. All risk personnel located under project.	Key suppliers participate in Risk Management process. Informal communication channel to organization management.	participate in the Risk Management process. Direct formal communication channel to organization management.
Experience	No understanding of risk principles or language. No understanding or experience in accomplishing risk procedures.	Limited to individuals who may have had little or no formal training.	In-house core of expertise, formally trained in basic risk management skills. Development and use of specific processes and tools.	All staff risk aware and capable of using basic risk skills. Learning from experience as part of the process. Regular training for personnel to enhance skills.
Application	No structured application. No dedicated resources. No risk management tools in use. No risk analysis performed.	Inconsistent application of resources. Qualitative risk analysis methodology used exclusively	Routine and consistent application to all projects. Dedicated project resources. Integrated set of tools and methods. Both qualitative and quantitative risk analysis methodologies used.	Risk ideas applied to all activities. Risk-based reporting and decision-making. State-of-the-art tools and methods. Both qualitative and quantitative risk analysis methodologies used with great stress on having valid and reliable historical data sources. Dedicated organizational resources.

Appendix 2 – Adapted Risk Management Maturity model

Table 2: Adapted Risk Management Maturity model

Criteria	Level 1 – Ad Hoc	Level 2 – Initial	Level 3 – Repeatable	Level 4 - Managed
Definition	Unaware of the need for management of uncertainties (risk). No structured approach to dealing with uncertainty. Repetitive and reactive management processes. Little or no attempt to learn from past projects or prepare for future projects.	Experimenting with risk management through a small number of individuals. No structured approach in place. Aware of potential benefits of managing risk, but ineffective implementation.	Management of uncertainty built into all organizational processes. Risk management implemented on most or all projects. Formalized generic risk process. Benefits understood at all organizational levels, although not always consistently achieved.	Risk-aware culture with proactive approach to risk management and open communication in all aspects of the organization. Active use of risk information to improve organizational processes and gain competitive advantage.
Culture	No risk awareness. No upper management involvement. Resistant/reluctance to change. Tendency to continue with existing processes even in the face of project failures. Shoot the messenger.	Risk process may be viewed as additional overhead with variable benefits. Upper management encourages, but does not require, use of Risk Management. Risk management used only on selected projects.	Accepted policy for risk management. Benefits recognized and expected. Upper Management requires risk reporting. Dedicated resources for risk management. “Bad news” risk information is accepted.	Top-down commitment to risk management, with leadership by example. Upper management uses risk information in decision-making. Proactive risk management encouraged and rewarded. Organizational philosophy accepts idea that people make mistakes.
Process	No formal process. No Risk Management Plan or documented process exists. None or sporadic attempts to apply Risk Management principles. Attempts to apply Risk Management process only when required by customer.	No generic formal processes, although some specific formal methods may be in use. Process effectiveness depends heavily on the skills of the project risk team and the availability of	Generic processes applied to most projects. Formal processes incorporated into quality system. Active allocation and management of risk budgets at all levels. Limited need for external support. Risk metrics collected.	Risk-based organizational processes. Risk Management culture permeating the entire organization. Regular evaluation and refining of process. Routine risk metrics used with consistent feedback for improvement. Key suppliers and customers

Criteria	Level 1 – Ad Hoc	Level 2 – Initial	Level 3 – Repeatable	Level 4 - Managed
		external support. All risk personnel located under project.	Key suppliers participate in Risk Management process. Informal communication channel to organization management.	participate in the Risk Management process. Direct formal communication channel to organization management. Generic processes applied to all projects.
Experience	No understanding of risk principles or language. No understanding or experience in accomplishing risk procedures.	Limited to individuals who may have had little or no formal training.	In-house core of expertise, formally trained in basic risk management skills. Development and use of specific processes and tools. Knowledge and skills are documented and shared within the organization. Risk management performance is measured.	All staff risk aware and capable of using basic risk skills. Experts are aware of factors influencing risk behaviour and take factors into account while applying risk management Learning from experience as part of the process. Regular training for personnel to enhance skills. Risk management performance is measured and benchmarked.
Application	No structured application. No dedicated resources. No risk management tools in use. No risk analysis performed. Causes of risks are consistently evaluated.	Inconsistent application of resources. Qualitative risk analysis methodology used exclusively Gut feeling determines a project's risk profile. The cause and effect chain is not defined.	Routine and consistent application to all projects, from start to ending. Dedicated project resources. Integrated set of tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used. There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management). Risk tolerance is used to determine the size of measures to be taken. The cause and effect chain is	Risk ideas applied to all activities, from start to ending. Risk-based reporting and decision-making. State-of-the-art tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used with great stress on having valid and reliable historical data sources. Dedicated organizational resources. Both risks and opportunities are managed.

Criteria	Level 1 – Ad Hoc	Level 2 – Initial	Level 3 – Repeatable	Level 4 - Managed
			understood from top-down and bottom-up.	Causes and results are identified, measured and managed.
Structure	No embedding in the organization's structure.	Responsibilities for application of risk management are not clearly defined. Risk management is linked to some standard procedures.	Risk management is equally important compared to (e.g.) time or cost management. Application of risk management is seen as a project on its own. Responsibilities for application of risk management are clearly defined and assigned. Risk management is linked to all standard procedures.	Risk management is seen as part of holistic project management. Risk management is linked to all standard procedures and corporate governance.

N.B.: Original RMM model (Risk Management R&D, 2002) in black;
Van der Heijden's model (2006) in red;
Additions in blue;

Appendix 3 – Comparison RMM model & ERM-tool

Table 3: Comparison RMM model & ERM-tool

	RMM model	ERM-tool
Culture		
	Awareness	Risk Management Philosophy
	Management	Corporate Governance
	Potential bad news / escalation	
	Perception	Integrity and Ethical Values
Process		
	Formal / informal	Controls Basis
	Process documentation	Controls over Processes Controls over Information Processing Information Quality
	Reason	
	Personnel	Competence
	Experts	Competence
	Customer / supplier	Strategy Effectiveness
	Communication	Communication
	Data collection	Strategy Effectiveness Residual Risk
Experience		
	Performance	Assessment Metrics Monitoring Activities Monitoring Corrective Actions
	Training	Competence
	Practical experience	
	Knowledge sharing and development	Information Management Residual Risk
Application		
	Project / business	Strategy Formulation
	Resources	
	Tools and methods	Assessment Mode
	Risk profile	Strategy Formulation Risk Mitigation Strategies
	Data use	Residual Risk
	Causes	***External Factors Driving Events*** ***Internal Factors Driving Events*** ***Events Affecting Business and Strategies*** ***Event Characteristics***
Structure		
	Business processes	Controls over Objectives
	Responsibilities	Responsibility
	Risk management inside project management	Strategy Implementation Information over Objectives

N.B.: additions are in ***bold italic underlined***.

Appendix 4 – Adjusted RMM model

Criteria	Subject	Level 1 – Ad Hoc	Level 2 – Initial	Level 3 – Repeatable	Level 4 - Managed
Definition	Description level	The organisation is unaware of the need of managing uncertainties. There is no structured approach to dealing with risks. Management processes are mostly reactive and there is little or no attempt to learn from past projects.	Inside the organisation a small number of individuals are experimenting with risk management. There is no structured approach in place. A lot of people are aware of the potential benefits of managing risk, but it is not ineffective implemented.	Uncertainty / risk management is built into all organizational processes and is implemented on most or all projects. There exists a formalized generic risk process. Benefits are understood at all levels, although not always consistently achieved.	In the organization is a risk-aware culture. A proactive approach to risk management and open communication about risks is present in all aspects of the organization. There is an active use of risk information to improve organizational processes and gain competitive advantage.
Culture	Awareness	Employees and management are not explicit aware of the risks.	Employees and management are partly aware of the risks and manage them informal.	Employees and management are aware of the risks and manage them mostly formal.	Employees and management are completely aware of the risk and manage them formal.
	Management	Upper management may not have taught about risk management.	Upper management encourages, but does not require, use of Risk Management.	Upper Management requires risk management.	Upper Management requires risk management, but also encouraged and rewarded proactive risk management.
	Potential bad news / escalation	Shoot the messenger, escalation is not accepted.	Understanding that risks can occur, still escalation is not accepted.	“Bad news” risk information is accepted and is in limited way shared and escalated.	“Bad news” risk information is accepted, shared and escalated.
	Perception	Risk management may be viewed as useless, although projects are failing.	Risk management may be viewed as additional overhead with variable benefits and is used only on selected projects.	Risk management may be viewed as important, the benefits are recognized.	Risk management may be viewed as important, the benefits are recognized and the upper management uses risk information in decision-making.
Process	Formal / informal	No formal process. Response to risks is reactive.	No generic formal processes, although some specific formal methods may be in use.	Generic formal processes applied to most projects.	Generic formal processes applied to all projects and business processes.
	Process documentation	No risk management plan or documented process exists.	Some specific formal methods may be in use.	Formal processes are incorporated into quality system.	Formal processes are incorporated into quality system and are evaluated and refined if necessary.
	Reason	Attempts to apply risk management process only when required by customer.	Need of risk management is recognized in some situations.	Need of risk management is recognized in most situations.	Risk management may be viewed as a necessity.
	Personnel	Personnel may not have knowledge of risk management.	All risk personnel are located under projects. External support is necessary.	Personnel are trained in basic skills of risk management. Limited need for external support.	Personnel are trained in basic skills of risk management and, depending on the target group, followed special training.
	Experts	There are no risk experts.	Risk experts are not recognized and work in projects.	Risk experts are appointed to advice project organization, but are no part of it.	Risk experts in the organization support own projects.
	Customer / supplier	Key suppliers and customers do not participate in the risk management process.	In some projects suppliers participate in risk management process.	Key suppliers participate in risk management process.	Key suppliers and customers participate in the risk management process.
	Communication	No explicit communication about risks.	Little or no explicit communication about founded risks.	Formal and informal communication channels to organization management.	Direct formal and informal communication channels to organization management.
	Data collection	No collection of risks.	No risk metrics collected regarding risk management.	Risk metrics collected with intention to use it.	Routine risk metrics used with consistent evaluation for improvement.
Experience	Performance	No understanding of risk principles or language.	Risk management performance is not measured.	Risk management performance is measured.	Risk management performance is measured and benchmarked.
	Training	No one may have had a formal training.	Limited to individuals who may have had little or no formal training.	In-house core of expertise, formally trained in basic risk management skills.	All personnel are risk aware and capable of using basic risk skills. Regular training for personnel to enhance skills.
	Practical experience	No understanding or experience in accomplishing risk procedures.	Limited to individuals who may have experience in accomplishing risk procedures.	Strong base of employees with experience in accomplishing risk procedures. Experts are very experienced.	Experts are aware of factors influencing risk behaviour and take factors into account while applying risk management.
	Knowledge sharing and development	Knowledge and skills are not shared.	Knowledge and skills are shared in some situations.	Knowledge and skills are documented and shared within the organization. Specific processes and tools are developed and used.	Learning from experience as part of the process.
Application	Project / business	No structured application.	Routine and consistent application to some projects.	Routine and consistent application to all projects, from start to ending.	Risk ideas applied to all activities, from start to ending.
	Resources	No dedicated resources.	Inconsistent application of resources.	Dedicated project resources.	Dedicated organizational resources.
	Tools and methods	No risk management tools in use.	Qualitative risk analysis methodology used exclusively.	Integrated set of tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used.	State-of-the-art tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used with great stress on having valid and reliable historical data sources. Both risks and opportunities are managed.
	Risk profile	No risk analysis performed.	Gut feeling determines a project’s risk profile.	There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management).	There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management). Risk tolerance is used to determine the size of measures to be taken.
	Data use	No data available.	Storage and use of data limited to individuals.	Storage and use of data.	Risk-based reporting and decision-making.
	Causes	Causes of risks are not consistently evaluated.	The cause and effect chain is not defined.	The cause and effect chain is understood from top-down and bottom-up.	Causes and results are identified, measured and managed.
Structure	Business processes	No embedding in the organization’s structure.	Risk management is linked to some standard procedures.	Risk management is linked to all standard procedures.	Risk management is linked to all standard procedures and corporate governance.
	Responsibilities	No responsibilities are defined.	Responsibilities for application of risk management are not clearly defined.	Responsibilities for application of risk management are clearly defined and assigned.	Responsibilities for application of risk management are clearly defined and assigned. The definition is accepted and personnel acted to it.
	Risk management inside project management	Risk management is not seen as a project on its own.	In some cases application of risk management is seen as a project on its own.	Risk management is equally important compared to (e.g.) time or cost management.	Risk management is seen as part of holistic project management.

NB: Adjusted Risk Management Maturity model (2006) in black, additions in blue.

Appendix 5 – Enablers elements

Table 4: Elements of the EFQM Excellence Model compared to the elements of the RMM model

"Enablers"of EFQM Excellence Model	Elements of RMM model
1. Leadership	▪ Awareness (culture) ▪ Potential bad news / escalation (culture) ▪ Perception (culture) ▪ Reason (process) ▪ Responsibilities (structure)
2. Policy and strategy	▪ Communication (process) ▪ Performance (experience) ▪ Business processes (structure) ▪ Risk management inside project management (str)
3. People management	▪ Management (culture) ▪ Personnel (process) ▪ Experts (process) ▪ Training (experience) ▪ Practical experience (experience)
4. Resources management	▪ Customer / supplier (process) ▪ Data collection (process) ▪ Knowledge sharing and development (experience) ▪ Resources (application) ▪ Tools and methods (application) ▪ Data use (application)
5. Processes management	▪ Formal / informal (process) ▪ Process documentation (process) ▪ Project / business (application) ▪ Risk profile (application) ▪ Causes (application)

Appendix 6 – Questionnaire Dutch version

Toepassing van risicomanagement in Publieke Werken

Dit onderzoek richt zich op de toepassing van risicomanagement in Publieke Werken. Deze vragenlijst is opgesteld om informatie te verzamelen over de toepassing van risicomanagement in Publieke Werken in Chili, de Verenigde Staten van Amerika en Nederland. Met behulp van de verkregen informatie dient het niveau van toepassing in de drie bovengenoemde landen te worden vastgesteld en dienen de resultaten te worden vergeleken. Tenslotte, aanbevelingen zullen worden gemaakt voor de Publieke Werken in Chili zodat het niveau van toepassing van risicomanagement in Chili kan worden verbeterd en verhoogd.

Introductie

Dit onderzoek is in opdracht van de Universiteit Twente in samenwerking met de Ponitificia Universidad Católica de Chile in het kader van een bachelor eindopdracht.

Gegevens blijven anoniem en vertrouwelijk. Verzamelde gegevens zullen uitsluitend voor dit onderzoek worden gebruikt en niet worden overgeleverd aan derden.

Invulinstructies

De vragenlijst is verdeeld in vier delen en zal ongeveer 30 minuten duren.

In het eerste deel worden enkele algemene vragen gesteld met betrekking tot uw werksituatie. Het tweede deel bevat stellingen over de toepassingen van risicomanagement in uw organisatie. Het derde deel bevat een aantal vragen over uw eigen praktische ervaringen met risicomanagement in projecten. Het laatste deel gaat over het gewenste niveau van toepassing van risicomanagement in uw organisatie.

Er zijn 43 vragen in deze vragenlijst.

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

Algemene vragen

De vragen hebben betrekking tot uw persoonlijke situatie. Verzamelde gegevens zullen uitsluitend voor dit onderzoek worden gebruikt en niet worden verstrekt aan derden.

1 Wat is uw naam?

Deze vraag dient als identificatie en zal niet worden meegenomen in het onderzoek. Verzamelde gegevens zullen uitsluitend voor dit onderzoek worden gebruikt en niet worden verstrekt aan derden.

2 Bij welke organisatie bent u werkzaam?

3 Bij welke afdeling bent u werkzaam?

4 Kunt een korte omschrijving geven van uw baan?

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

Toepassing van risicomanagement

In dit deel worden u stellingen voorgelegd die betrekking hebben op het niveau van toepassing van risicomanagement in uw organisatie. Hierbij worden 5 thema's onderscheiden, te weten:

- Cultuur
- Proces
- Ervaring
- Toepassing
- Structuur

Deze thema's zijn vervolgens onderverdeeld in een aantal elementen waarbij u wordt gevraagd aan te geven in welke mate een stelling van toepassing is op uw organisatie. De stellingen zijn ontworpen in een Likert schaal met behulp van 7-puntsschaal.

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

5 Toepassing van risicomanagement: Cultuur

De onderstaande stellingen gaan in op het thema **CULTUUR** en het niveau van toepassing van risicomanagement in uw organisatie binnen dit thema. De stellingen zijn ontworpen in een Likert schaal met behulp van 7-puntsschaal. De opmaak van de 7-puntsschaal is:

1. Zeer mee oneens
2. Mee oneens
3. Deels mee oneens
4. Noch mee eens noch mee oneens
5. Deels mee eens
6. Mee eens
7. Zeer mee eens

Voor iedere stelling kan er maar één rondje worden ingevuld. Er zijn geen slechte of goede antwoorden; het gaat alleen om uw mening met betrekking tot de stellingen. Echter, als u niet zeker bent over een stelling, dan kunt het rondje "Weet niet" invullen.

Cultuur gaat over de situatie in een organisatie hoe het personeel en het management de risico's managen in de projecten, hun bewustzijn van projectrisico's, hun perceptie van risicomanagement en de communicatie over risico's in de organisatie.

Kies het toepasselijk antwoord voor elk onderdeel:

		Zeer mee oneens	Mee oneens	Deels mee oneens	Noch mee eens noch mee oneens	Deels mee eens	Mee eens	Zeer mee eens	Weet niet
1	Alle medewerkers en het management zijn zich volledig bewust van de projectrisico's.	○	○	○	○	○	○	○	○
2	De projectrisico's worden gemanaged door alle medewerkers en het management op een formele wijze	○	○	○	○	○	○	○	○
3	Het management verwacht altijd risicomanagement bij projecten.	○	○	○	○	○	○	○	○
4	Het management moedigt altijd pro-actief risicomanagement bij projecten aan.	○	○	○	○	○	○	○	○
5	Het management beloont altijd pro-actief risicomanagement bij projecten.	○	○	○	○	○	○	○	○
6	Slecht nieuws risico-informatie wordt altijd erkend.	○	○	○	○	○	○	○	○
7	Slecht nieuws risico-informatie wordt altijd gedeeld.	○	○	○	○	○	○	○	○
8	Slecht nieuws risico-informatie wordt altijd geëscaleerd.	○	○	○	○	○	○	○	○
9	Risicomanagement wordt beschouwd als een zeer belangrijke functie.	○	○	○	○	○	○	○	○

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

6 Toepassing van risicomanagement: Proces

De onderstaande stellingen gaan in op het thema **PROCES** en het niveau van toepassing van risicomanagement in uw organisatie binnen dit thema. De stellingen zijn ontworpen in een Likert schaal met behulp van 7-puntsschaal. De opmaak van de 7-puntsschaal is:

1. Zeer mee oneens
2. Mee oneens
3. Deels mee oneens
4. Noch mee eens noch mee oneens
5. Deels mee eens
6. Mee eens
7. Zeer mee eens

Voor iedere stelling kan er maar één rondje worden ingevuld. Er zijn geen slechte of goede antwoorden; het gaat alleen om uw mening met betrekking tot de stellingen. Echter, als u niet zeker bent over een stelling, dan kunt het rondje "Weet niet" invullen.

Proces bevat de manier risicomanagement wordt toegepast in organisatieprocessen. Dit thema omvat het soort processen welke gebruikt worden bij het managen van risico's, de redenen waarom risicomanagement wordt gebruikt en hoe risico-informatie wordt gecommuniceerd, maar ook de soort mensen die betrokken zijn bij het managen van risico's.

Kies het toepasselijk antwoord voor elk onderdeel:

		Zeer mee oneens	Mee oneens	Deels mee oneens	Noch mee eens; noch mee oneens	Deels mee eens	Mee eens	Zeer mee eens	Weet niet
1	Formele risico processen worden gebruikt in alle projecten.	○	○	○	○	○	○	○	○
2	Formele risico processen worden gebruikt in de organisatie.	○	○	○	○	○	○	○	○
3	Formele risico processen worden periodiek geëvalueerd.	○	○	○	○	○	○	○	○
4	Formele risico processen worden verfijnd indien nodig.	○	○	○	○	○	○	○	○
5	Risicomanagement is een noodzaak.	○	○	○	○	○	○	○	○
6	Alle medewerkers zijn getraind in de basisvaardigheden van het risicomanagement.	○	○	○	○	○	○	○	○
7	Externe expertise ten aanzien van risicomanagement is niet nodig.	○	○	○	○	○	○	○	○
8	Experts zijn normaal onderdeel van de projectorganisaties.	○	○	○	○	○	○	○	○
9	De belangrijkste leveranciers nemen deel in het risicomanagement proces.	○	○	○	○	○	○	○	○
10	De belangrijkste klanten nemen deel in het risicomanagement proces.	○	○	○	○	○	○	○	○
11	Direct formele communicatiekanalen worden gebruikt voor expliciete communicatie over risico's.	○	○	○	○	○	○	○	○
12	Indirecte formele communicatiekanalen worden gebruikt voor expliciete communicatie over risico's.	○	○	○	○	○	○	○	○
13	Risico data wordt verzameld met de bedoeling het te gebruiken.	○	○	○	○	○	○	○	○
14	Verzamelde risico data wordt consequent geëvalueerd voor verbetering.	○	○	○	○	○	○	○	○

5

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

7 Toepassing van risicomanagement: Ervaring

De onderstaande stellingen gaan in op het thema **ERVARING** en het niveau van toepassing van risicomanagement in uw organisatie binnen dit thema. De stellingen zijn ontworpen in een Likert schaal met behulp van 7-puntsschaal. De opmaak van de 7-puntsschaal is:

1. Zeer mee oneens
2. Mee oneens
3. Deels mee oneens
4. Noch mee eens noch mee oneens
5. Deels mee eens
6. Mee eens
7. Zeer mee eens

Voor iedere stelling kan er maar één rondje worden ingevuld. Er zijn geen slechte of goede antwoorden; het gaat alleen om uw mening met betrekking tot de stellingen. Echter, als u niet zeker bent over een stelling, dan kunt het rondje "Weet niet" invullen.

Het thema 'ervaring' behandelt de ervaringen van risicomanagement in de organisatie, op welke manier de resultaten van risicomanagement en de risicovaardigheden worden gedeeld en gedocumenteerd en hoe capabel personeel is in het gebruiken van de risicovaardigheden.

Kies het toepasselijk antwoord voor elk onderdeel:

		Zeer mee oneens	Mee oneens	Deels mee oneens	Noch mee eens; noch mee oneens	Deels mee eens	Mee eens	Zeer mee eens	Weet niet
1	Risicomanagement prestaties worden altijd gemeten en gebenchmarked.	○	○	○	○	○	○	○	○
2	Al het personeel is in staat om risicomanagement vaardigheden te gebruiken.	○	○	○	○	○	○	○	○
3	Regelmatige specifieke training om risicomanagement vaardigheden te verbeteren is een algemeen feit.	○	○	○	○	○	○	○	○
4	Alle experts zijn zich bewust van de factoren die risico gedrag beïnvloeden.	○	○	○	○	○	○	○	○
5	Alle experts nemen de factoren die risico gedrag beïnvloeden in acht bij het toepassen van risicomanagement.	○	○	○	○	○	○	○	○
6	Risicomanagement kennis en -vaardigheden zijn gedocumenteerd.	○	○	○	○	○	○	○	○
7	Risicomanagement kennis en -vaardigheden worden gedeeld binnen de organisatie.	○	○	○	○	○	○	○	○
8	Risicomanagement kennis wordt gebruikt voor het ontwikkelen van processen en tools.	○	○	○	○	○	○	○	○

6

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

8 Toepassing van risicomanagement: Toepassing

De onderstaande stellingen gaan in op het thema **TOEPASSING** en het niveau van toepassing van risicomanagement in uw organisatie binnen dit thema. De stellingen zijn ontworpen in een Likert schaal met behulp van 7-puntsschaal. De opmaak van de 7-puntsschaal is:

1. Zeer mee oneens
2. Mee oneens
3. Deels mee oneens
4. Noch mee eens noch mee oneens
5. Deels mee eens
6. Mee eens
7. Zeer mee eens

Voor iedere stelling kan er maar één rondje worden ingevuld. Er zijn geen slechte of goede antwoorden; het gaat alleen om uw mening met betrekking tot de stellingen. Echter, als u niet zeker bent over een stelling, dan kunt het rondje "Weet niet" invullen.

Toepassing is de manier hoe risicomanagement wordt uitgevoerd in de organisatie. Het focust zich op de middelen, tools en methodes die worden gebruikt en hoe de gegevens worden gebruikt en verwerkt in het risicomanagement.

Kies het toepasselijk antwoord voor elk onderdeel:

		Zeer mee oneens	Mee oneens	Deels mee oneens	Noch mee eens noch mee oneens	Deels mee eens	Mee eens	Zeer mee eens	Weet niet
1	Risico denken toegepast op alle activiteiten, van begin tot einde.	○	○	○	○	○	○	○	○
2	Specifiek toegewezen middelen binnen projecten.	○	○	○	○	○	○	○	○
3	Specifiek toegewezen middelen binnen de gehele organisatie.	○	○	○	○	○	○	○	○
4	Risico tools en methoden zijn aangepast aan de cultuur van de organisatie.	○	○	○	○	○	○	○	○
5	Kwalitatieve risicoanalyse methoden worden gebruikt.	○	○	○	○	○	○	○	○
6	Kwantitatieve risicoanalyse methoden worden gebruikt.	○	○	○	○	○	○	○	○
7	Risico's worden gemanaged.	○	○	○	○	○	○	○	○
8	Kansen zijn gemanaged.	○	○	○	○	○	○	○	○
9	Risicoprofiel van een project is bepalend voor de toepassing van risicomanagement.	○	○	○	○	○	○	○	○
10	Risicotolerantie wordt gebruikt voor het bepalen van de omvang van de te nemen maatregelen.	○	○	○	○	○	○	○	○
11	Alle risico-data wordt opgeslagen.	○	○	○	○	○	○	○	○
12	Alle opgeslagen risico-data is beschikbaar voor nieuwe gebruikers.	○	○	○	○	○	○	○	○
13	Risico-data wordt gebruikt in rapporten.	○	○	○	○	○	○	○	○
14	Risico-data wordt gebruikt in de besluitvorming.	○	○	○	○	○	○	○	○
15	Oorzaken van de risico's worden consequent geïdentificeerd.	○	○	○	○	○	○	○	○
16	Oorzaken van de risico's worden consequent gemeten.	○	○	○	○	○	○	○	○
17	Oorzaken van de risico's worden consequent beheerd.	○	○	○	○	○	○	○	○

7

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

9 Toepassing van risicomanagement: Structuur

De onderstaande stellingen gaan in op het thema **STRUCTUUR** en het niveau van toepassing van risicomanagement in uw organisatie binnen dit thema. De stellingen zijn ontworpen in een Likert schaal met behulp van 7-puntsschaal. De opmaak van de 7-puntsschaal is:

1. Zeer mee oneens
2. Mee oneens
3. Deels mee oneens
4. Noch mee eens noch mee oneens
5. Deels mee eens
6. Mee eens
7. Zeer mee eens

Voor iedere stelling kan er maar één rondje worden ingevuld. Er zijn geen slechte of goede antwoorden; het gaat alleen om uw mening met betrekking tot de stellingen. Echter, als u niet zeker bent over een stelling, dan kunt het rondje "Weet niet" invullen.

Structuur focust zich op de manier risicomanagement is toegepast in de organisatie en hoe het is georganiseerd met betrekking tot de processen en verantwoordelijkheden.

Kies het toepasselijk antwoord voor elk onderdeel:

		Zeer mee oneens	Mee oneens	Deels mee oneens	Noch mee eens noch mee oneens	Deels mee eens	Mee eens	Zeer mee eens	Weet niet
1	Risicomanagement is verbonden met alle standaard procedures.	○	○	○	○	○	○	○	○
2	Risicomanagement is gekoppeld aan corporate governance.	○	○	○	○	○	○	○	○
3	Verantwoordelijkheden voor de toepassing van risicomanagement zijn duidelijk gedefinieerd.	○	○	○	○	○	○	○	○
4	Verantwoordelijkheden voor de toepassing van risicomanagement zijn toegewezen.	○	○	○	○	○	○	○	○
5	Verantwoordelijkheden voor de toepassing van risicomanagement zijn geaccepteerd.	○	○	○	○	○	○	○	○
6	Personeel handelt volgens de toegewezen verantwoordelijkheden voor de toepassing van risicomanagement.	○	○	○	○	○	○	○	○
7	Risicomanagement wordt beschouwd als onderdeel van het holistische projectmanagement.	○	○	○	○	○	○	○	○

8

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

Praktijkervaring met risicomanagement

De vragen in dit deel focussen zich op uw eigen praktijkervaring met risicomanagement. De antwoorden op deze vragen zullen worden gebruikt bij het maken van aanbevelingen voor de Openbare Werken in Chili.

Wees duidelijk en specifiek in de beantwoording van deze vragen.

10 Kunt u een project noemen waarbij u betrokken was, dat was gericht op de invoering en inbedding van risicomanagement?

- ○ Ja
- ○ Nee

Wanneer u 'ja' antwoordt, zullen er vervolgvragen volgen met betrekking tot uw eigen praktijk ervaring van risicomanagement in projecten. Wanneer u 'nee' antwoordt, kunt u verder gaan met de rest van de vragenlijst.

11 Kunt u een korte beschrijving van dit project?

12 Wat voor soort problemen had u tijdens dit project?

13 Wat waren de positieve aspecten van de invoering en inbedding van risicomanagement in dit project?

14 Wat waren de negatieve aspecten van de invoering en inbedding van risicomanagement in dit project?

15 Zijn er grote verschillen tussen de projecten met betrekking tot risicomanagement?

16 Gaan altijd dezelfde dingen goed of fout in deze projecten?

17 Wat zijn de belangrijkste lessen die u heeft geleerd met betrekking tot risicomanagement?

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

Gewenste niveau toepassing van risicomanagement

Dit deel gaat in op het gewenste niveau van toepassing van risicomanagement in uw organisatie. Hierbij wordt gebruikt gemaakt van het Risk Management Maturity model (RMM model). Dit model is verdeeld in 5 thema's en 25 elementen.

Elk element bevat beschrijvingen voor de vier niveaus van toepassingen van risicomanagement: Ad hoc, Initieel, Herhaalbaar en Gemanaged. Deze niveaus beschrijven de volwassenheid van de toepassing van het risicomanagement in een organisatie. In dit geval moet u de gewenste volwassenheid voor elk element in uw organisatie bepalen.

Het kan voorkomen dat het gewenste niveau van een element in het geval van uw organisatie niet gelijk is aan het hoogst mogelijke niveau in het model. Echter, dit betekent dat in het geval van verbeteringen in uw organisatie een hoger niveau van volwassenheid nog niet nodig is voor het moment. Bij het bepalen van de gewenste volwassenheid voor elk element, vult u slechts een één rondje per element in.

De laatste vraag gaat in op de prioriteit van een element bij de toepassing van risicomanagement. U wordt gevraagd een top 5 te maken van de 25 elementen die in het RMM-model voorkomen.

Onthoud dat er geen slechte of goede antwoorden zijn, maar alleen uw mening over de gewenste volwassenheid in uw organisatie.

Risk Management Maturity Model

In de onderstaande tabel zijn de niveaus van volwassenheid weergegeven met een kleine beschrijving van ieder niveau. Deze tabel kan u een idee geven van het niveau van de toepassing van risicomanagement in uw organisatie.

Niveau	Omschrijving
Niveau 1 – Ad hoc	De organisatie is niet op de hoogte van het belang van het managen van onzekerheden. Er is geen gestructureerde aanpak voor het omgaan met de risico's. De management processen zijn veelal reactief en er wordt weinig tot geen moeite gedaan om van projecten uit het verleden te leren.
Niveau 2 – Initieel	Binnen de organisatie wordt geëxperimenteerd met risicomanagement door een klein aantal individuen. Er is geen gestructureerde aanpak afgesproken. Veel mensen zijn op de hoogte van de voordelen van risicomanagement maar risicomanagement is nooit effectief geïmplementeerd.
Niveau 3 – Herhaalbaar	Onzekerheids / risicomanagement is ingebouwd in alle processen binnen de organisatie en wordt in (bijna) alle projecten toegepast. Er bestaat en gestandaardiseerd, formeel risicomanagement proces. De voordelen worden op alle niveaus onderkend, maar nog niet altijd bereikt.
Niveau 4 – Gemanaged	In de organisatie heerst een cultuur waarin standaard rekening gehouden wordt met mogelijke risico's. Er is een pro-actieve houding te aanzien van het toepassen van risicomanagement en er wordt open gecommuniceerd over risico's. Er wordt actief gebruikt gemaakt van risico-informatie om de bedrijfsprocessen te verbeteren en een voorsprong ten opzichte van de concurrentie op te bouwen.

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

Gewenste niveau toepassing van risicomanagement: Cultuur

18 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'bewustzijn'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Medewerkers en management zijn zich niet expliciet bewust van de risico's. (Niveau 1
- ○ Medewerkers en management zijn zich gedeeltelijk bewust van de risico's en sturen hier veelal informeel op. (Niveau 2
- ○ Medewerkers en management zijn zich bewust van de risico's en sturen hier veelal formeel op. (Niveau 3
- ○ Medewerkers en management zijn zich volledig bewust van de risico's en sturen hier volledig formeel op. (Niveau 4

19 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'management'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Management denkt nog niet aan risicomanagement. (Niveau 1
- ○ Management moedigt het gebruik van risicomanagement aan, maar vereist het niet. (Niveau 2
- ○ Management vereist het gebruik van risicomanagement. (Niveau 3
- ○ Management vereist risicomanagement, maar moedigt ook aan en beloont. (Niveau 4

20 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'potentieel slecht nieuws / escalatie'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Shoot the messenger', escalatie is niet geaccepteerd. (Niveau 1
- ○ Besef dat risico's kunnen optreden, maar escalatie is niet geaccepteerd. (Niveau 2
- ○ Negatieve risico informatie is geaccepteerd en wordt in beperkte mate gedeeld en geëscaleerd. (Niveau 3
- ○ Negatieve risico-informatie wordt geaccepteerd, gedeeld en geëscaleerd. (Niveau 4 - Gemanaged)

21 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'perceptie'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Risicomanagement wordt als nutteloos gezien, ook al falen sommige projecten. (Niveau 1 - Ad hoc)
- ○ Risicomanagement wordt als extra overhead gezien, en alleen gebruikt op bepaalde, speciaal geselecteerde, projecten. (Niveau 2 - Initieel)
- ○ Risicomanagement wordt als belangrijk ervaren, de voordelen worden onderkend. (Niveau 3 - Herhaalbaar)
- ○ Risicomanagement wordt als belangrijk ervaren, de voordelen worden onderkend en de informatie wordt gebruikt voor besluitvorming door het management. (Niveau 4 - Gemanaged)

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

Gewenste niveau toepassing van risicomanagement: Proces

22 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'formeel / informeel'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Alleen informeel. (Niveau 1 - Ad hoc)
- ○ Meestal informeel maar soms formeel, echter niet volgens een generieke manier. (Niveau 2 - Initieel)
- ○ Formele generieke processen gebruikt in bijna alle projecten. (Niveau 3 - Herhaalbaar)
- ○ Formele generieke processen gebruikt in alle projecten en in bedrijfsprocessen. (Niveau 4 - Gemanaged)

23 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'proces documentatie'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen risicomanagement plan of gedocumenteerd proces beschikbaar. (Niveau 1 - Ad hoc)
- ○ Er worden enkele formele processen gebruikt. (Niveau 2 - Initieel)
- ○ De formele generieke processen zijn gedocumenteerd en opgenomen in het kwaliteitssysteem. (Niveau 3 - Herhaalbaar)
- ○ De formele generieke processen zijn gedocumenteerd opgenomen in het kwaliteitssysteem en worden geëvalueerd en bijgesteld waar nodig. (Niveau 4 - Gemanaged)

24 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'aanleiding'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Alleen als de klant er om vraagt. (Niveau 1 - Ad hoc)
- ○ Het belang van risicomanagement wordt in bepaalde situaties gezien. (Niveau 2 - Initieel)
- ○ Het belang van risicomanagement wordt in bijna alle situaties gezien. (Niveau 3 - Herhaalbaar)
- ○ Risicomanagement wordt als noodzaak gezien. (Niveau 4 - Gemanaged)

25 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'personeel'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Er is geen personeel dat kennis heeft van risicomanagement. (Niveau 1 - Ad hoc)
- ○ Al het personeel dat kennis heeft van risicomanagement is ondergebracht onder projecten. Er is veel externe expertise nodig. (Niveau 2 - Initieel)
- ○ Het personeel is getraind in de basisvaardigheden van risicomanagement. (Niveau 3 - Herhaalbaar)
- ○ Het personeel is getraind in de basisvaardigheden van risicomanagement en heeft, afhankelijk van de doelgroep, specifieke training gevolgd. (Niveau 4 - Gemanaged)

26 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'experts'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Er zijn geen risico-experts. (Niveau 1 - Ad hoc)
- ○ Experts worden nog niet als dusdanig erkend en werken in projecten. (Niveau 2 - Initieel)
- ○ Er zijn risico-experts benoemd die de projectorganisatie adviseren maar er geen onderdeel van uitmaken. Er is weinig behoefte aan externe expertise. (Niveau 3 - Herhaalbaar)
- ○ De risico-experts in de organisatie ondersteunen de eigen projecten. (Niveau 4 - Gemanaged)

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

27 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'klanten / leveranciers'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Klanten en leveranciers zijn niet berokken, ieder heeft zijn eigen beheersmechanismen. (Niveau 1 - Ad hoc)
- ○ In een aantal projecten nemen leveranciers deel in het risicomanagement proces. (Niveau 2 - Initieel)
- ○ De belangrijkste leveranciers nemen deel in het risicomanagement proces. (Niveau 3 - Herhaalbaar)
- ○ De belangrijkste klanten en leveranciers nemen deel in het risicomanagement proces. (Niveau 4 - Gemanaged)

28 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'communicatie'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen expliciete communicatie over risico's. (Niveau 1 - Ad hoc)
- ○ Er vindt weinig tot geen explidete communicatie plaats over de gevonden risico's. (Niveau 2 - Initieel)
- ○ Explidete communicatie via formele en informele kanalen naar het management van de organisatie. (Niveau 3 - Herhaalbaar)
- ○ Explidete communicatie via directe formele en informele kanalen naar het management van de organisatie. (Niveau 4 - Gemanaged)

29 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'dataverzameling'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen vastlegging van risico's. (Niveau 1 - Ad hoc)
- ○ Er worden geen data verzameld met betrekking tot risicomanagement. (Niveau 2 - Initieel)
- ○ Risico data worden verzameld met de intentie tot gebruik. (Niveau 3 - Herhaalbaar)
- ○ Verzamelde risico data wordt gebruikt en feedback wordt gegeven voor verbetering. (Niveau 4 - Gemanaged)

13

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

Gewenste niveau toepassing van risicomanagement: Ervaring

30 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'meetbaarheid'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Er zijn geen risicomanagement resultaten. (Niveau 1 - Ad hoc)
- ○ Risicomanagement resultaten worden niet gemeten. (Niveau 2 - Initieel)
- ○ Risicomanagement resultaten worden gemeten. (Niveau 3 - Herhaalbaar)
- ○ Risicomanagement resultaten worden gemeten en gebenchmarked. (Niveau 4 - Gemanaged)

31 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'training'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Niemand heeft trainingen gevolgd. (Niveau 1 - Ad hoc)
- ○ Een enkeling heeft een training gevolgd. (Niveau 2 - Initieel)
- ○ Risico-experts hebben formele traing gehad en de werknemers algemene workshops. (Niveau 3 - Herhaalbaar)
- ○ Alle medewerkers snappen de basis aan risico-management technieken. Regelmatige specifieke training vergroot de vaardigheden. (Niveau 4 - Gemanaged)

32 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'praktijkervaring'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen praktijkervaring met risicomanagement binnen de organisatie aanwezig. (Niveau 1 - Ad hoc)
- ○ Een enkeling heeft praktijkervaring met risicomanagement. (Niveau 2 - Initieel)
- ○ Er is een sterke basis van medewerkers met praktijkervaring met risicomanagement. Experts hebben een brede ervaring. (Niveau 3 - Herhaalbaar)
- ○ Het personeel heeft ervaring met risicomanagement. Experts zijn zich bewust van factoren die risico gedrag beïnvloeden en nemen deze factoren in acht bij het toepassen van risicomanagement. (Niveau 4 - Gemanaged)

33 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'kennisdeling en -ontwikkeling'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Kennis en vaardigheden worden niet gedeeld. (Niveau 1 - Ad hoc)
- ○ Kennis en vaardigheden worden in sommige gevallen gedeeld. (Niveau 2 - Initieel)
- ○ Kennis en vaardigheden worden structureel gedocumenteerd en gedeeld binnen de organisatie. Specifieke processen en tools worden ontwikkeld. (Niveau 3 - Herhaalbaar)
- ○ Leren van gedeelde kennis en van ervaringen uit het verleden. De kennis wordt gebruikt voor de verdere ontwikkeling van processen en tools. (Niveau 4 - Gemanaged)

14

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

Gewenste niveau toepassing van risicomanagement: Toepassing

34 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'project / bedrijf'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen gestructureerde toepassing. (Niveau 1 - Ad hoc)
- ○ Enigszins gestructureerde toepassing, binnen enkele projecten. (Niveau 2 - Initieel)
- ○ Routine en gestructureerde toepassing op alle projecten, van begin tot eind. (Niveau 3 - Herhaalbaar)
- ○ Risico denken toegepast op alle activiteiten in het gehele bedrijf, van begin tot eind. (Niveau 4 - Gemanaged)

35 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'middelen'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen specifiek toegewezen middelen. (Niveau 1 - Ad hoc)
- ○ Per situatie andere inzet van middelen. (Niveau 2 - Initieel)
- ○ Specifiek toegewezen middelen binnen projecten. (Niveau 3 - Herhaalbaar)
- ○ Specifiek toegewezen middelen binnen de gehele organisatie. (Niveau 4 - Gemanaged)

36 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'tools en methoden'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen gebruik van risicomanagement tools en methoden. (Niveau 1 - Ad hoc)
- ○ Alleen toepassing van kwalitatieve tools en methoden. Hiermee worden risico's gemanaged. (Niveau 2 - Initieel)
- ○ Geïntegreerde set van kwalitatieve en kwantitatieve tools en methoden gebruikt, aangepast aan het type werkzaamheden van de organisatie. Hiermee worden risico's gemanaged. (Niveau 3 - Herhaalbaar)
- ○ State-of-the-art set van kwalitatieve en kwantitatieve tools en methoden gebruikt, aangepast aan de cultuur van de organisatie en het type werkzaamheden. Aandacht voor het hebben van accurate historische gegevens. Hiermee worden risico's en opportunities gemanaged. (Niveau 4 - Gemanaged)

37 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'risicoprofiel'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen risicoprofiel bepaald. (Niveau 1 - Ad hoc)
- ○ Inschatting van risicovolheid bepaalt het risicoprofiel van een project. (Niveau 2 - Initieel)
- ○ Het risicoprofiel bepaalt de mate van toepassing van risicomanagement. (Niveau 3 - Herhaalbaar)
- ○ Het risicoprofiel bepaalt de mate van toepassing van risicomanagement. Risico tolerantie bepaalt de omvang van de te nemen maatregelen. (Niveau 4 - Gemanaged)

38 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'datagebruik'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen data beschikbaar. (Niveau 1 - Ad hoc)
- ○ Geen opslag en gebruik van risico-data, behalve bij sommige individuen. (Niveau 2 - Initieel)
- ○ Risico-data opslag en mogelijkheid tot gebruik. (Niveau 3 - Herhaalbaar)
- ○ Risico-gebaseerde rapportages, sturing en besluitvorming. (Niveau 4 - Gemanaged)

15

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

39 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'oorzaken'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Oorzaken van de risico's worden niet consequent geëvalueerd. (Niveau 1 - Ad hoc)
- ○ De oorzaak-en-gevolg-keten wordt niet gedefinieerd. (Niveau 2 - Initieel)
- ○ De oorzaak-en-gevolg-keten is begrepen van top-down en bottom-up. (Niveau 3 - Herhaalbaar)
- ○ Oorzaken en de resultaten worden geïdentificeerd, gemeten en beheerd. (Niveau 4 - Gemanaged)

16

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

Gewenste niveau toepassing van risicomanagement: Structuur

40 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'bedrijfsprocessen'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen inbedding in de structuur van de organisatie. (Niveau 1 - Ad hoc)
- ○ Risicomanagement is gelinkt aan enkele standaard processen. (Niveau 2 - Initieel)
- ○ Risicomanagement is gelinkt aan alles standaard processen. (Niveau 3 - Herhaalbaar)
- ○ Risicomanagement is gelinkt aan alles standaard processen en coporate governance. (Niveau 4 - Gemanaged)

41 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'verantwoordelijkheden'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Geen verantwoordelijkheden toebedeeld. (Niveau 1 - Ad hoc)
- ○ Verantwoordelijkheden voor toepassing van risicomanagement worden genomen zonder expliciete toedeling. (Niveau 2 - Initieel)
- ○ Verantwoordelijkheden voor toepassing van risicomanagement zijn helder en eenduidig toebedeeld. (Niveau 3 - Herhaalbaar)
- ○ Verantwoordelijkheden voor toepassing van risicomanagement zijn helder en eenduidig toebedeeld. De toedeling is geaccepteerd en er wordt naar gehandeld. (Niveau 4 - Gemanaged)

42 Wat is volgens u het gewenste niveau van risicomanagement met betrekking tot het element 'risicomanagement binnen projectmanagement'?
Kies a.u.b. één van de volgende mogelijkheden:

- ○ Risicomanagement is geen onderdeel van projectmanagement. (Niveau 1 - Ad hoc)
- ○ In een aantal gevallen is risicomanagement een onderdeel van projectmanagement. (Niveau 2 - Initieel)
- ○ Risicomanagement wordt beschouwd als even belangrijk als (bijvoorbeeld) management van tijd of kosten en wordt gezien als project binnen een project. (Niveau 3 - Herhaalbaar)
- ○ Risicomanagement wordt beschouwd als onderdeel van holistisch project management. (Niveau 4 - Gemanaged)

17

Vragenlijst - Toepassing van risicomanagement in Publieke Werken

Gewenste niveau toepassing van risicomanagement: Prioriteit

43 Kunt u aangeven welke 5 elementen u het belangrijkste vindt bij de toepassing van risicomanagement? Met deze informatie is het mogelijk om het belang en urgentie van verbeteringen vast te stellen.

*Selecteer a.u.b **ten minste** 5 Antwoorden:*

- ○ Bewustzijn (Cultuur)
- ○ Management (Cultuur)
- ○ Potentieel slecht nieuws / escalatie (Cultuur)
- ○ Perceptie (Cultuur)
- ○ Formeel / informeel (Proces)
- ○ Proces documentatie (Proces)
- ○ Aanleiding (Proces)
- ○ Personeel (Proces)
- ○ Experts (Proces)
- ○ Klanten / leveranciers (Proces)
- ○ Communicatie (Proces)
- ○ Dataverzameling (Proces)
- ○ Meetbaarheid (Ervaring)
- ○ Training (Ervaring)
- ○ Praktijkervaring (Ervaring)
- ○ Kennisdeling en -ontwikkeling (Ervaring)
- ○ Project / bedrijf (Toepassing)
- ○ Middelen (Toepassing)
- ○ Tools en methoden (Toepassing)
- ○ Risicoprofiel (Toepassing)
- ○ Datagebruik (Toepassing)
- ○ Oorzaken (Toepassing)
- ○ Bedrijfsprocessen (Structuur)
- ○ Verantwoordelijkheden (Structuur)
- ○ Risicomanagement binnen projectmanagement (Structuur)

18

Appendix 7 – Questionnaire English version

Questionnaire - Application of risk management in Public Works

Application of risk management in Public Works

This research focuses on the implementation of risk management in Public Works. This questionnaire has been prepared to gather information about the application of risk management in Public Works in Chile, the United States of America and the Netherlands. With the obtained information, the level of implementation in the three countries will be determined and the results will be compared. Finally, recommendations can be made for the Public Works in Chile so that the application of risk management can be improved and enhanced.

Introduction

This research is part of a Bachelor degree at the the University of Twente. The work is carried out in Chile as part of the cooperation with the Ponitificia Universidad Católica de Chile.

Information remains anonymous and confidential. Collected data will only be used for this research and not be delivered to third parties.

Invulinstructies

The questionnaire is divided into four parts and will take approximately 30 minutes to complete.

In the first part some general questions will be asked relating to your work. The second part contains statements about the uses of risk management in your organization. The third part contains a number of questions about your own practical experience with risk management in projects. The last part is about the desired maturity level of risk management in your organization.

There are 43 questions in this survey.

Questionnaire - Application of risk management in Public Works

General questions

The questions are related to your personal situation. Collected data will only be used for this research and should not be provided to third parties.

1 What is your name?

This question serves as identification and will not be included in the study. Collected data will only be used for this research and will not be provided to third parties.

2 For which organization do you work?

3 In which department do you work?

4 Could you give a short description of your function within the organization?

Questionnaire - Application of risk management in Public Works

Application of risk management in Public Works

In this section statements relating to the level of application of risk management in your organization are included. There are 5 separate themes representing five sections, namely:

- Culture
- Process
- Experience
- Application
- Structure

These themes are then subdivided into a number of elements where you are asked to what extent a statement is applicable to your organization. The statements are designed in a Likert scale using 7-point scale.

Questionnaire - Application of risk management in Public Works

5 Application of risk management in Public Works: Culture

The statements below are about the theme **CULTURE** and the maturity level of risk management application in your organization within this theme. The statements are designed in a Likert scale, using 7 response levels. The format of the 7-level Likert item is:

1. Strongly disagree
2. Disagree
3. Partly disagree
4. Neither agree nor disagree
5. Partly agree
6. Agree
7. Strongly agree

For each statement there can be only one radio button be filled in. There are no bad or good answers; it is only about your opinion regarding to the statements. However, if you are not sure about a statement, you can fill in the radio button 'Don't know'.

Culture is about the situation in an organization how personnel and management managing the risks in projects, their awareness of projects risks, their perception of risk management and the communication about risks in the organization.

Please choose the appropriate response for each item:

		Strongly disagree	Disagree	Partly disagree	Neither agree nor disagree	Partly agree	Agree	Strongly agree	Don't know
1	All employees and management are completely aware of the project risks.	○	○	○	○	○	○	○	○
2	The project risks are managed by all employees and management on a formal way.	○	○	○	○	○	○	○	○
3	The upper management always requires risk management in projects.	○	○	○	○	○	○	○	○
4	The upper management always encouraged proactive risk management in projects.	○	○	○	○	○	○	○	○
5	The upper management always rewarded proactive risk management in projects.	○	○	○	○	○	○	○	○
6	"Bad news" risk information is always acknowledged.	○	○	○	○	○	○	○	○
7	"Bad news" risk information is always shared.	○	○	○	○	○	○	○	○
8	"Bad news" risk information is always escalated.	○	○	○	○	○	○	○	○
9	Risk management is considered a very important function.	○	○	○	○	○	○	○	○

Questionnaire - Application of risk management in Public Works

6 Application of risk management in Public Works: Process

The statements below are about the theme **PROCESS** and the maturity level of risk management application in your organization within this theme. The statements are designed in a Likert scale, using 7 response levels. The format of the 7-level Likert item is:

1. Strongly disagree
2. Disagree
3. Partly disagree
4. Neither agree nor disagree
5. Partly agree
6. Agree
7. Strongly agree

For each statement there can be only one radio button be filled in. There are no bad or good answers; it is only about your opinion regarding to the statements. However, if you are not sure about a statement, you can fill in the radio button 'Don't know'.

Process includes the way risk management is applied into the organizations processes. This topic covers the sort of processes that are used to manage risks, the reasons why to use risk management and how risk information is communicated, but also the kind of people which are involved in managing these risks.

Please choose the appropriate response for each item:

		Strongly disagree	Disagree	Partly disagree	Neither agree nor disagree	Partly agree	Agree	Strongly agree	Don't know
1	Formal risk processes are applied to all projects.	○	○	○	○	○	○	○	○
2	Formal risk processes are incorporated into the organization.	○	○	○	○	○	○	○	○
3	Formal risk processes are periodically evaluated.	○	○	○	○	○	○	○	○
4	Formal risk processes are refined if necessary.	○	○	○	○	○	○	○	○
5	Risk management is considered a necessity.	○	○	○	○	○	○	○	○
6	All personnel are trained in the basic skills of risk management.	○	○	○	○	○	○	○	○
7	External support regarding risk management is not necessary.	○	○	○	○	○	○	○	○
8	Experts are normally part of the project organizations.	○	○	○	○	○	○	○	○
9	Key suppliers participate in the risk management process.	○	○	○	○	○	○	○	○
10	Customers participate in the risk management process.	○	○	○	○	○	○	○	○
11	Direct formal communication channels are used for explicit communication about risks.	○	○	○	○	○	○	○	○
12	Indirect formal communication channels are used for explicit communication about risks.	○	○	○	○	○	○	○	○
13	Risk data are collected with the intention to use it.	○	○	○	○	○	○	○	○
14	Collected risk data are consistently evaluated for improvement.	○	○	○	○	○	○	○	○

Questionnaire - Application of risk management in Public Works

7 Application of risk management in Public Works: Experience

The statements below are about the theme **EXPERIENCE** and the maturity level of risk management application in your organization within this theme. The statements are designed in a Likert scale, using 7 response levels. The format of the 7-level Likert item is:

1. Strongly disagree
2. Disagree
3. Partly disagree
4. Neither agree nor disagree
5. Partly agree
6. Agree
7. Strongly agree

For each statement there can be only one radio button be filled in. There are no bad or good answers; it is only about your opinion regarding to the statements. However, if you are not sure about a statement, you can fill in the radio button 'Don't know'.

The topic experience handles the experiences of risk management in the organization, in which way the risk management performances and risk skills are shared and documented and how capable personnel are of using risk skills.

Please choose the appropriate response for each item:

		Strongly disagree	Disagree	Partly disagree	Neither agree nor disagree	Partly agree	Agree	Strongly agree	Don't know
1	Risk management performances are always measured and benchmarked.	○	○	○	○	○	○	○	○
2	All personnel are capable of using basic risk management skills.	○	○	○	○	○	○	○	○
3	Regular training to enhance risk management skills is a common fact.	○	○	○	○	○	○	○	○
4	All experts are aware of factors influencing risk behaviour.	○	○	○	○	○	○	○	○
5	All experts take into account the factors influencing risk while applying risk management.	○	○	○	○	○	○	○	○
6	Risk management knowledge and skills are documented.	○	○	○	○	○	○	○	○
7	Risk management knowledge and skills are shared within the organization.	○	○	○	○	○	○	○	○
8	Risk management knowledge is used to develop processes and tools.	○	○	○	○	○	○	○	○

Questionnaire - Application of risk management in Public Works

8 Application of risk management in Public Works: Application

The statements below are about the theme **APPLICATION** and the maturity level of risk management application in your organization within this theme. The statements are designed in a Likert scale, using 7 response levels. The format of the 7-level Likert item is:

1. Strongly disagree
2. Disagree
3. Partly disagree
4. Neither agree nor disagree
5. Partly agree
6. Agree
7. Strongly agree

For each statement there can be only one radio button be filled in. There are no bad or good answers; it is only about your opinion regarding to the statements. However, if you are not sure about a statement, you can fill in the radio button 'Don't know'.

Application is the way risk management is performed into the organization. It focuses on the resources, tools and methods that are used and how data is used and handled in risk management.

Please choose the appropriate response for each item:

		Strongly disagree	Disagree	Partly disagree	Neither agree nor disagree	Partly agree	Agree	Strongly agree	Don't know
1	Risk ideas applied to all activities, from start to ending.	○	○	○	○	○	○	○	○
2	Resources for risk management are specifically dedicated into the projects.	○	○	○	○	○	○	○	○
3	Resources for risk management are specifically dedicated into the organization.	○	○	○	○	○	○	○	○
4	Risk tools and methods are adapted to the organizational culture.	○	○	○	○	○	○	○	○
5	Qualitative risk analysis methodologies are used.	○	○	○	○	○	○	○	○
6	Quantitative risk analysis methodologies are used.	○	○	○	○	○	○	○	○
7	Risks are managed.	○	○	○	○	○	○	○	○
8	Opportunities are managed.	○	○	○	○	○	○	○	○
9	Project's risk profile determines the application of risk management.	○	○	○	○	○	○	○	○
10	Risk tolerance is used to determine the size of measures to be taken.	○	○	○	○	○	○	○	○
11	All risk data is stored.	○	○	○	○	○	○	○	○
12	All stored risk data is available for new users.	○	○	○	○	○	○	○	○
13	Risk data is used in reports.	○	○	○	○	○	○	○	○
14	Risk data is used in decision-making.	○	○	○	○	○	○	○	○
15	Causes of risks are consistently identified.	○	○	○	○	○	○	○	○
16	Causes of risks are consistently measured.	○	○	○	○	○	○	○	○
17	Causes of risks are consistently managed.	○	○	○	○	○	○	○	○

7

Questionnaire - Application of risk management in Public Works

9 Application of risk management in Public Works: Structure

The statements below are about the theme **STRUCTURE** and the maturity level of risk management application in your organization within this theme. The statements are designed in a Likert scale, using 7 response levels. The format of the 7-level Likert item is:

1. Strongly disagree
2. Disagree
3. Partly disagree
4. Neither agree nor disagree
5. Partly agree
6. Agree
7. Strongly agree

For each statement there can be only one radio button be filled in. There are no bad or good answers; it is only about your opinion regarding to the statements. However, if you are not sure about a statement, you can fill in the radio button 'Don't know'.

Structure focuses on the way risk management is applied into the organization and how it is organized regarding to the processes and responsibilities.

Please choose the appropriate response for each item:

		Strongly disagree	Disagree	Partly disagree	Neither agree nor disagree	Partly agree	Agree	Strongly agree	Don't know
1	Risk management is linked to all standard procedures.	○	○	○	○	○	○	○	○
2	Risk management is linked to corporate governance.	○	○	○	○	○	○	○	○
3	Responsibilities for application of risk management are clearly defined.	○	○	○	○	○	○	○	○
4	Responsibilities for application of risk management are assigned.	○	○	○	○	○	○	○	○
5	Responsibilities for application of risk management are accepted.	○	○	○	○	○	○	○	○
6	Personnel act according to the assigned responsibilities for application of risk management.	○	○	○	○	○	○	○	○
7	Risk management is seen as part of holistic project management.	○	○	○	○	○	○	○	○

8

Questionnaire - Application of risk management in Public Works

Practical experiences with risk management

The questions in this part focus on your own experience with risk management. The answers to these questions will be used to make recommendations for the Public Works in Chile.

Please be clear and specific in answering these questions.

10 Could you mention a project, in which you were involved, that was aimed at introducing and embedding risk management?

- ○ Yes
- ○ No

When you answer 'yes', there will be follow-up questions with regard to your own practical experience with risk management in projects. When you answer 'no', you can proceed with the rest of the questionnaire.

11 Could you give a short description of this project?

12 What kind of problems did you run into during this project?

13 What were positive aspects of introducing and embedding risk management in this project?

14 What were negative aspects of introducing and embedding risk management in this project?

15 Are there main differences between the projects regarding risk management?

16 Are always the same things going right or wrong in these projects?

17 What are the most important lessons learned regarding risk management?

Questionnaire - Application of risk management in Public Works

Desired maturity level of the application of risk management

This part focuses on the desired level of the application of risk management in your organization. For this, the Risk Management Maturity Model (RMM model) will be used. This model is divided into 5 topics and 25 elements.

Each element contains descriptions for 4 maturity levels: ad hoc, initial, repeatable and managed. These levels describe the maturity of risk management application in an organization. In this case you have to determine the desired maturity level for each element in your organization.

It may occur that the desired maturity level of an element in the case of your organization is not equal to the highest possible level in the model. However, this means that in the case of improvements into your organization a higher maturity level is not necessary for the moment. When determining the desired maturity level for each element, fill in only one radio button per element.

The last question relates to the priority of an element in the application of risk management. You will be asked to make a top 5 of the 25 elements that occur in the RMM model.

Remember there are no bad or good answers; it is only about your opinion regarding the desired maturity level into your organization.

Risk Management Maturity Model

In the table below are the maturity levels of the risk management maturity model given with a small description of the level. This table can give you an idea of the level of risk management application in your organization.

Level	Description
Level 1 – Ad hoc	The organization is unaware of the need of managing uncertainties. There is no structured approach to dealing with risks. Management processes are mostly reactive and there is little or no attempt to learn from past projects.
Level 2 – Initial	Inside the organization a small number of individuals are experimenting with risk management. There is no structured approach in place. A lot of people are aware of the potential benefits of managing risk, but it is never effective implemented.
Level 3 – Repeatable	Uncertainty / risk management is built into all organizational processes and is implemented on most or all projects. There exists a formalized generic risk process. Benefits are understood at all levels, although not always consistently achieved.
Level 4 – Managed	In the organization is a risk-aware culture. A proactive approach to risk management and open communication about risks is present in all aspects of the organization. There is an active use of risk information to improve organizational processes and gain competitive advantage.

Questionnaire - Application of risk management in Public Works

Desired maturity level of the application of risk management: Culture

18 What do you **think** is the desired level of risk management with respect to the element 'awareness'?
Please choose only one of the following:

- ○ Employees and management are not explicit aware of the risks. (Level 1 - Ad hoc)
- ○ Employees and management are partly aware of the risks and manage them informal. (Level 2 - Initial)
- ○ Employees and management are aware of the risks and manage them mostly formal. (Level 3 - Repeatable)
- ○ Employees and management are completely aware of the risk and manage them formal. (Level 4 - Managed)

19 What do you think is the desired level of risk management with respect to the element 'management'?
Please choose only one of the following:

- ○ Upper management may not have taught about risk management. (Level 1 - Ad hoc)
- ○ Upper management encourages, but does not require, use of Risk Management. (Level 2 - Initial)
- ○ Upper Management requires risk management. (Level 3 - Repeatable)
- ○ Upper Management requires risk management, but also encouraged and rewarded proactive risk management. (Level 4 - Managed)

20 What do you think is the desired level of risk management with respect to the element 'potential bad news / escalation'?
Please choose only one of the following:

- ○ Shoot the messenger, escalation is not accepted. (Level 1 - Ad hoc)
- ○ Understanding that risks can occur, still escalation is not accepted. (Level 2 - Initial)
- ○ "Bad news" risk information is accepted and is in limited way shared and escalated. (Level 3 - Repeatable)
- ○ "Bad news" risk information is accepted, shared and escalated. (Level 4 - Managed)

21 What do you think is the desired level of risk management with respect to the element 'perception'?
Please choose only one of the following:

- ○ Risk management may be viewed as useless, although projects are failing. (Level 1 - Ad hoc)
- ○ Risk management may be viewed as additional overhead with variable benefits and is used only on selected projects. (Level 2 - Initial)
- ○ Risk management may be viewed as important, the benefits are recognized. (Level 3 - Repeatable)
- ○ Risk management may be viewed as important, the benefits are recognized and the upper management uses risk information in decision-making. (Level 4 - Managed)

11

Questionnaire - Application of risk management in Public Works

Desired maturity level of the application of risk management: Process

22 What do you **think** is the desired level of risk management with respect to the element 'formal / informal'?
Please choose only one of the following:

- ○ No formal process. Response to risks is reactive. (Level 1 - Ad hoc)
- ○ No generic formal processes, although some specific formal methods may be in use. (Level 2 - Initial)
- ○ Generic formal processes applied to most projects. (Level 3 - Repeatable)
- ○ Generic formal processes applied to all projects and business processes. (Level 4 - Managed)

23 What do you **think** is the desired level of risk management with respect to the element 'process documentation'?
Please choose only one of the following:

- ○ No risk management plan or documented process exists. (Level 1 - Ad hoc)
- ○ Some specific formal methods may be in use. (Level 2 - Initial)
- ○ Formal processes are incorporated into quality system. (Level 3 - Repeatable)
- ○ Formal processes are incorporated into quality system and are evaluated and refined if necessary. (Level 4 - Managed)

24 What do you **think** is the desired level of risk management with respect to the element 'reason'?
Please choose only one of the following:

- ○ Attempts to apply risk management process only when required by customer. (Level 1 - Ad hoc)
- ○ Need of risk management is recognized in some situations. (Level 2 - Initial)
- ○ Need of risk management is recognized in most situations. (Level 3 - Repeatable)
- ○ Risk management may be viewed as a necessity. (Level 4 - Managed)

25 What do you **think** is the desired level of risk management with respect to the element 'personnel'?
Please choose only one of the following:

- ○ Personnel may not have knowledge of risk management. (Level 1 - Ad hoc)
- ○ All risk personnel are located under projects. External support is necessary. (Level 2 - Initial)
- ○ Personnel are trained in basic skills of risk management. Limited need for external support. (Level 3 - Repeatable)
- ○ Personnel are trained in basic skills of risk management and, depending on the target group, followed special training. (Level 4 - Managed)

26 What do you **think** is the desired level of risk management with respect to the element 'experts'?
Please choose only one of the following:

- ○ There are no risk experts. (Level 1 - Ad hoc)
- ○ Risk experts are not recognized and work in projects. (Level 2 - Initial)
- ○ Risk experts are appointed to advice project organization, but are no part of it. (Level 3 - Repeatable)
- ○ Risk experts in the organization support own projects. (Level 4 - Managed)

12

Questionnaire - Application of risk management in Public Works

27 What do you think is the desired level of risk management with respect to the element 'customer / supplier'?
Please choose only one of the following:

- ○ Key suppliers and customers do not participate in the risk management process. (Level 1 - Ad hoc)
- ○ In some projects suppliers participate in risk management process. (Level 2 - Initial)
- ○ Key suppliers participate in risk management process. (Level 3 - Repeatable)
- ○ Key suppliers and customers participate in the risk management process. (Level 4 - Managed)

28 What do you think is the desired level of risk management with respect to the element 'communication'?
Please choose only one of the following:

- ○ No explicit communication about risks. (Level 1 - Ad hoc)
- ○ Little or no explicit communication about founded risks. (Level 2 - Initial)
- ○ Informal communication channel to organization management. (Level 3 - Repeatable)
- ○ Direct formal communication channel to organization management. (Level 4 - Managed)

29 What do you think is the desired level of risk management with respect to the element 'data collection'?
Please choose only one of the following:

- ○ No collection of risks. (Level 1 - Ad hoc)
- ○ No risk metrics collected regarding risk management. (Level 2 - Initial)
- ○ Risk metrics collected with intention to use it. (Level 3 - Repeatable)
- ○ Routine risk metrics used with consistent evaluation for improvement. (Level 4 - Managed)

13

Questionnaire - Application of risk management in Public Works

Desired maturity level of the application of risk management: Experience

30 What do you think is the desired level of risk management with respect to the element 'performance'?
Please choose only one of the following:

- ○ No understanding of risk principles or language. (Level 1 - Ad hoc)
- ○ Risk management performance is not measured. (Level 2 - Initial)
- ○ Risk management performance is measured. (Level 3 - Repeatable)
- ○ Risk management performance is measured and benchmarked. (Level 4 - Managed)

31 What do you think is the desired level of risk management with respect to the element 'training'?
Please choose only one of the following:

- ○ No one may have had a formal training. (Level 1 - Ad hoc)
- ○ Limited to individuals who may have had little or no formal training. (Level 2 - Initial)
- ○ In-house core of expertise, formally trained in basic risk management skills. (Level 3 - Repeatable)
- ○ All personnel are risk aware and capable of using basic risk skills. Regular training for personnel to enhance skills. (Level 4 - Managed)

32 What do you think is the desired level of risk management with respect to the element 'practical experience'?
Please choose only one of the following:

- ○ No understanding or experience in accomplishing risk procedures. (Level 1 - Ad hoc)
- ○ Limited to individuals who may have experience in accomplishing risk procedures. (Level 2 - Initial)
- ○ Strong base of employees with experience in accomplishing risk procedures. Experts are very experienced. (Level 3 - Repeatable)
- ○ Experts are aware of factors influencing risk behaviour and take factors into account while applying risk management. (Level 4 - Managed)

33 What do you think is the desired level of risk management with respect to the element 'knowledge sharing and development'?
Please choose only one of the following:

- ○ Knowledge and skills are not shared. (Level 1 - Ad hoc)
- ○ Knowledge and skills are shared in some situations. (Level 2 - Initial)
- ○ Knowledge and skills are documented and shared within the organization. Specific processes and tools are developed and used. (Level 3 - Repeatable)
- ○ Learning from experience as part of the process. (Level 4 - Managed)

14

Questionnaire - Application of risk management in Public Works

Desired maturity level of the application of risk management: Application

34 What do you **think** is the desired level of risk management with respect to the element 'project / business'?
Please choose only one of the following:

- ○ No structured application. (Level 1 - Ad hoc)
- ○ Routine and consistent application to some projects. (Level 2 - Initial)
- ○ Routine and consistent application to all projects, from start to ending. (Level 3 - Repeatable)
- ○ Risk ideas applied to all activities, from start to ending. (Level 4 - Managed)

35 What do you **think** is the desired level of risk management with respect to the element 'resources'?
Please choose only one of the following:

- ○ No dedicated resources. (Level 1 - Ad hoc)
- ○ Inconsistent application of resources. (Level 2 - Initial)
- ○ Dedicated project resources. (Level 3 - Repeatable)
- ○ Dedicated organizational resources. (Level 4 - Managed)

36 What do you **think** is the desired level of risk management with respect to the element 'tools and methods'?
Please choose only one of the following:

- ○ No risk management tools in use. (Level 1 - Ad hoc)
- ○ Qualitative risk analysis methodology used exclusively. (Level 2 - Initial)
- ○ Integrated set of tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used. (Level 3 - Repeatable)
- ○ State-of-the-art tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used with great stress on having valid and reliable historical data sources. Both risks and opportunities are managed. (Level 4 - Managed)

37 What do you **think** is the desired level of risk management with respect to the element 'risk profile'?
Please choose only one of the following:

- ○ No risk analysis performed. (Level 1 - Ad hoc)
- ○ Gut feeling determines a project's risk profile. (Level 2 - Initial)
- ○ Project's risk profile determines the application of risk management. (Level 3 - Repeatable)
- ○ Project's risk profile determines the application of risk management. Risk tolerance is used to determine the size of measures to be taken. (Level 4 - Managed)

38 What do you **think** is the desired level of risk management with respect to the element 'data use'?
Please choose only one of the following:

- ○ No data available. (Level 1 - Ad hoc)
- ○ Storage and use of data limited to individuals. (Level 2 - Initial)
- ○ Storage and use of data. (Level 3 - Repeatable)
- ○ Risk-based reporting and decision-making. (Level 4 - Managed)

15

Questionnaire - Application of risk management in Public Works

39 What do you **think** is the desired level of risk management with respect to the element 'causes'?
Please choose only one of the following:

- ○ Causes of risks are not consistently evaluated. (Level 1 - Ad hoc)
- ○ The cause and effect chain is not defined. (Level 2 - Initial)
- ○ The cause and effect chain is understood from top-down and bottom-up. (Level 3 - Repeatable)
- ○ Causes and results are identified, measured and managed. (Level 4 - Managed)

16

Questionnaire - Application of risk management in Public Works

Desired maturity level of the application of risk management: Structure

40 What do you **think** is the desired level of risk management with respect to the element 'business processes'?
Please choose only one of the following:

- ○ No embedding in the organization's structure. (Level 1 - Ad hoc)
- ○ Risk management is linked to some standard procedures. (Level 2 - Initial)
- ○ Risk management is linked to all standard procedures. (Level 3 - Repeatable)
- ○ Risk management is linked to all standard procedures and corporate governance. (Level 4 - Managed)

41 What do you **think** is the desired level of risk management with respect to the element 'responsibilities'?
Please choose only one of the following:

- ○ No responsibilities are defined. (Level 1 - Ad hoc)
- ○ Responsibilities for application of risk management are not clearly defined. (Level 2 - Initial)
- ○ Responsibilities for application of risk management are clearly defined and assigned. (Level 3 - Repeatable)
- ○ Responsibilities for application of risk management are clearly defined and assigned. The definition is accepted and personnel acted to it. (Level 4 - Managed)

42 What do you **think** is the desired level of risk management with respect to the element 'risk management inside project management'?
Please choose only one of the following:

- ○ Risk management is not seen as a project on its own. (Level 1 - Ad hoc)
- ○ In some cases application of risk management is seen as a project on its own. (Level 2 - Initial)
- ○ Risk management is equally important compared to (e.g.) time or cost management. (Level 3 - Repeatable)
- ○ Risk management is seen as part of holistic project management. (Level 4 - Managed)

17

Questionnaire - Application of risk management in Public Works

Desired maturity level of the application of risk management: Priority

43 Can you specify which 5 elements you find the most important in the application of risk management? With this information it is possible in a later stage to determine the importance and urgency of improvements.

*Please choose **at most** 5 answers:*

- ○ Awareness (Culture)
- ○ Management (Culture)
- ○ Potential bad news / escalation (Culture)
- ○ Perception (Culture)
- ○ Formal / informal (Process)
- ○ Process documentation (Process)
- ○ Reason (Process)
- ○ Personnel (Process)
- ○ Experts (Process)
- ○ Customer / supplier (Process)
- ○ Communication (Process)
- ○ Data collection (Process)
- ○ Performance (Experience)
- ○ Training (Experience)
- ○ Practical experience (Experience)
- ○ Knowledge sharing and development (Experience)
- ○ Project / business (Application)
- ○ Resources (Application)
- ○ Tools and methods (Application)
- ○ Risk profile (Application)
- ○ Data use (Application)
- ○ Causes (Application)
- ○ Business processes (Structure)
- ○ Responsibilities (Structure)
- ○ Risk management inside project management (Structure)

18

Appendix 8 – Questionnaire Spanish version

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

La aplicación de la gestión de riesgos en las Obras Públicas

Esta investigación se centra en la aplicación de la gestión de riesgos en las obras públicas. Este cuestionario fue preparado para reunir información acerca de la aplicación de la gestión de riesgos en las obras públicas en Chile, los Estados Unidos de América y los Países Bajos. El objetivo de la investigación es determinar el nivel de madurez de la gestión de riesgos, en las obras públicas en los tres países anteriormente mencionados, y para comparar los resultados. Por último, se realizarán recomendaciones para las obras públicas en Chile a fin de que puedan mejorar y aumentar su nivel de madurez de la gestión del riesgo.

Introducción

Esta investigación es realizada por orden de la Universidad de Twente, en cooperación con la Ponitificia Universidad Católica de Chile, como parte de una tesis de licenciatura.

La información permanecerá anónima y confidencial. Los datos recogidos se utilizarán exclusivamente para esta investigación y no serán entregados a terceros.

Instrucciones para responder a la encuesta

El cuestionario está dividido en cuatro partes y durará aproximadamente 30 minutos.

La primera parte contiene afirmaciones acerca de la aplicación de la gestión de riesgos en su organización. La segunda parte incluye algunas preguntas acerca de su propia experiencia práctica en la gestión del riesgo en los proyectos.
La tercera parte del cuestionario se centra en los objetivos deseados con respecto a la aplicación de la gestión de riesgos en la organización. La última parte es sobre el nivel de madurez deseado de la gestión de riesgos en su organización.

Hay 43 preguntas en esta encuesta.

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

Preguntas generales

Las preguntas están relacionadas con su situación personal. Los datos recogidos se utilizarán exclusivamente para esta investigación y no deben ser proporcionados a terceros.

1 ¿Cual es su nombre?

Esta pregunta sirve como identificación y no se incluirá en el estudio. Los datos recogidos se utilizarán exclusivamente para esta investigación y no serán proporcionada a terceros.

2 ¿Para qué organización trabaja usted?

3 ¿En qué departamento trabaja usted?

4 ¿Podría dar una breve descripción de su trabajo?

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

La aplicación de la gestión de riesgos en las Obras Públicas

En esta sección se presentan a usted las tesis relacionadas con el nivel de aplicación de la gestión de riesgos en su organización. Están divididas en 5 temas, a saber:

- La cultura
- El proceso
- La experiencia
- La aplicación
- La estructura

Estos temas estan luego subdivididos en una serie de elementos donde usted es consultado en qué medida una declaración es aplicable a su organización. Las afirmaciones se han diseñado en una escala Likert, usando una escala de 7 puntos.

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

5 La aplicación de la gestión de riesgos en las Obras Públicas: La cultura

Las siguientes afirmaciones tratan acerca de **LA CULTURA** y el nivel de madurez de la aplicación de la gestión de riesgos en su organización. Las afirmaciones se han diseñado en una escala Likert, con 7 niveles de respuesta. El formato Likert de 7 niveles es:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Parcialmente en desacuerdo
4. Ni de acuerdo ni en desacuerdo
5. Parcialmente de acuerdo
6. De acuerdo
7. Totalmente de acuerdo

Para cada afirmación sólo puede haber una respuesta. No hay respuestas buenas o malas, únicamente es su opinión al respecto. Sin embargo, si usted no está seguro de una respuesta, puede marcar la alternativa "No sabe".

La cultura se refiere a la situación en una organización; es decir, cómo el personal y la gerencia administran los riesgos en los proyectos, su conocimiento de los riesgos del proyecto, la percepción de la gestión del riesgo y la comunicación acerca de los riesgos en la organización.

Por favor, seleccione la respuesta apropiada para cada concepto:

		Totalmente en desacuerdo	En desacuerdo	Parcialmente en desacuerdo	Ni de acuerdo ni en desacuerdo	Parcialmente de acuerdo	De acuerdo	Totalmente de acuerdo	No sabe
1	Todos los empleados y la gerencia son completamente conscientes de los riesgos de los proyectos.	○	○	○	○	○	○	○	○
2	Los riesgos de los proyectos son administrados por todos los empleados y la gerencia de una manera formal.	○	○	○	○	○	○	○	○
3	La alta dirección siempre requiere que se realice gestión del riesgo en los proyectos.	○	○	○	○	○	○	○	○
4	La alta dirección siempre alienta proactivamente la gestión del riesgo en los proyectos.	○	○	○	○	○	○	○	○
5	La alta dirección siempre recompensa proactivamente la gestión del riesgo en los proyectos.	○	○	○	○	○	○	○	○
6	Las "Malas noticias" sobre riesgos siempre se llegan a conocer.	○	○	○	○	○	○	○	○
7	Las "Malas noticias" sobre riesgos siempre se comparten.	○	○	○	○	○	○	○	○
8	Las "Malas noticias" sobre riesgos siempre se escalan a los niveles superiores.	○	○	○	○	○	○	○	○
9	La gestión de riesgo se considera una función muy importante.	○	○	○	○	○	○	○	○

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

6 La aplicación de la gestión de riesgos en las Obras Públicas: El proceso

Las siguientes afirmaciones tratan acerca de **EL PROCESO** y el nivel de madurez de la aplicación de la gestión de riesgos en su organización. Las afirmaciones se han diseñado en una escala Likert, con 7 niveles de respuesta. El formato Likert de 7 niveles es:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Parcialmente en desacuerdo
4. Ni de acuerdo ni en desacuerdo
5. Parcialmente de acuerdo
6. De acuerdo
7. Totalmente de acuerdo

Para cada afirmación sólo puede haber una respuesta. No hay respuestas buenas o malas, únicamente es su opinión al respecto. Sin embargo, si usted no está seguro de una respuesta, puede marcar la alternativa "No sabe".

Los procesos aborda la forma en que la gestión del riesgo se aplica a los procesos en las organizaciones. Este tema abarca el tipo de procesos que se utilizan para gestionar los riesgos, las razones por las cuales se usa la gestión del riesgo, como se comunica la información de los riesgos y también a quienes participan en la gestión de estos riesgos.

Por favor, seleccione la respuesta apropiada para cada concepto:

		Totalmente en desacuerdo	En desacuerdo	Parcialmente en desacuerdo	Ni de acuerdo ni en desacuerdo	Parcialmente de acuerdo	De acuerdo	Totalmente de acuerdo	No sabe
1	Se aplican procesos formales de la gestión de riesgo a todos los proyectos.	○	○	○	○	○	○	○	○
2	Se han incorporado procesos formales de la gestión de riesgo en la organización.	○	○	○	○	○	○	○	○
3	Los Procesos formales de la gestión de riesgo son periódicamente evaluados.	○	○	○	○	○	○	○	○
4	Los Procesos formales de la gestión de riesgo son periódicamente refinadas si es que es necesario.	○	○	○	○	○	○	○	○
5	La gestión de riesgo se considera una necesidad.	○	○	○	○	○	○	○	○
6	Todo el personal está entrenado en los fundamentos básicos de la gestión de riesgos.	○	○	○	○	○	○	○	○
7	El apoyo externo en relación con la gestión del riesgo no es necesario.	○	○	○	○	○	○	○	○
8	Los expertos son normalmente parte de la organización del proyecto.	○	○	○	○	○	○	○	○
9	Los principales proveedores participan en el proceso de la gestión de riesgos.	○	○	○	○	○	○	○	○
10	Los clientes participan en el proceso de la gestión de riesgos.	○	○	○	○	○	○	○	○
11	Se utilizan canales de comunicación formales y directos para la comunicación explícita sobre los riesgos.	○	○	○	○	○	○	○	○
12	Se utilizan canales de comunicación informales para la comunicación explícita sobre los riesgos.	○	○	○	○	○	○	○	○
13	Se recogen datos sobre los riesgos con la intención de utilizarlos.	○	○	○	○	○	○	○	○
14	Los datos de riesgo recogidos se evaluan continuamente para poder mejorar.	○	○	○	○	○	○	○	○

5

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

7 La aplicación de la gestión de riesgos en las Obras Públicas: La experienca

Las siguientes afirmaciones tratan acerca de **LA EXPERIENCA** y el nivel de madurez de la aplicación de la gestión de riesgos en su organización. Las afirmaciones se han diseñado en una escala Likert, con 7 niveles de respuesta. El formato Likert de 7 niveles es:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Parcialmente en desacuerdo
4. Ni de acuerdo ni en desacuerdo
5. Parcialmente de acuerdo
6. De acuerdo
7. Totalmente de acuerdo

Para cada afirmación sólo puede haber una respuesta. No hay respuestas buenas o malas, únicamente es su opinión al respecto. Sin embargo, si usted no está seguro de una respuesta, puede marcar la alternativa "No sabe".

Este tema cubre las experiencias sobre gestión de riesgos en la organización; de qué manera el desempeño de la gestión de los riesgos y las competencias se comparten, documentan y que tan desarrolladas están las habilidades del personal en este tópico.

Por favor, seleccione la respuesta apropiada para cada concepto:

		Totalmente en desacuerdo	En desacuerdo	Parcialmente en desacuerdo	Ni de acuerdo ni en desacuerdo	Parcialmente de acuerdo	De acuerdo	Totalmente de acuerdo	No sabe
1	El desempeño de la gestión de riesgos siempre se mide y se compara.	○	○	○	○	○	○	○	○
2	Todo el personal es capaz de aplicar competencias básicas de la gestión de riesgos.	○	○	○	○	○	○	○	○
3	Es común que se capacite regularmente para mejorar las habilidades de la gestión de riesgos.	○	○	○	○	○	○	○	○
4	Todos los expertos están conscientes de los factores que influyen en el comportamiento de los riesgos.	○	○	○	○	○	○	○	○
5	Todos los expertos tienen en cuenta los factores que influyen en el riesgo, en la aplicación de la gestión del riesgo.	○	○	○	○	○	○	○	○
6	Los conocimientos y competencias sobre la gestión de riesgos se documentan.	○	○	○	○	○	○	○	○
7	Los conocimientos y competencias sobre la gestión de riesgo son compartidos dentro de la organización.	○	○	○	○	○	○	○	○
8	El conocimiento sobre riesgos se utiliza para desarrollar procesos y herramientas.	○	○	○	○	○	○	○	○

6

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

8 La aplicación de la gestión de riesgos en las Obras Públicas: La aplicación

Las siguientes afirmaciones tratan acerca de **LA APLICACIÓN** y el nivel de madurez de la aplicación de la gestión de riesgos en su organización. Las afirmaciones se han diseñado en una escala Likert, con 7 niveles de respuesta. El formato Likert de 7 niveles es:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Parcialmente en desacuerdo
4. Ni de acuerdo ni en desacuerdo
5. Parcialmente de acuerdo
6. De acuerdo
7. Totalmente de acuerdo

Para cada afirmación sólo puede haber una respuesta. No hay respuestas buenas o malas, únicamente es su opinión al respecto. Sin embargo, si usted no está seguro de una respuesta, puede marcar la alternativa "No sabe".

La aplicación es la forma en que la gestión del riesgo se realiza en la organización. Se centra en los recursos, herramientas y métodos que se utilizan y cómo se utilizan y manejan datos para la gestión del riesgo.

Por favor, seleccione la respuesta apropiada para cada concepto:

		Totalmente en desacuerdo	En desacuerdo	Parcialmente en desacuerdo	Ni de acuerdo ni en desacuerdo	Parcialmente de acuerdo	De acuerdo	Totalmente de acuerdo	No sabe
1	Se aplican ideas sobre gestión de riesgos a todas las actividades, desde el principio hasta el final.	○	○	○	○	○	○	○	○
2	Se asignan recursos exclusivos para la gestión de riesgos en los proyectos	○	○	○	○	○	○	○	○
3	Se asignan recursos exclusivos para la gestión de riesgos en la organización.	○	○	○	○	○	○	○	○
4	Se han adaptado herramientas y métodos de la gestión de riesgos a la cultura organizacional.	○	○	○	○	○	○	○	○
5	Se utilizan metodologías de análisis cualitativo de riesgos.	○	○	○	○	○	○	○	○
6	Se utilizan metodologías de análisis cuantitativo de riesgos.	○	○	○	○	○	○	○	○
7	Se manejan los riesgos.	○	○	○	○	○	○	○	○
8	Se manejan las oportunidades.	○	○	○	○	○	○	○	○
9	El perfil de riesgo del proyecto determina la aplicación de la gestión del riesgo.	○	○	○	○	○	○	○	○
10	La tolerancia al riesgo se utiliza para determinar el tamaño de las medidas que deben adoptarse.	○	○	○	○	○	○	○	○
11	Todos los datos sobre riesgos se almacenan.	○	○	○	○	○	○	○	○
12	Todos los datos almacenados sobre riesgos están disponibles para nuevos usuarios.	○	○	○	○	○	○	○	○
13	Los datos sobre riesgos son utilizados en los informes.	○	○	○	○	○	○	○	○
14	Los datos sobre riesgos se utilizan en la toma de decisiones.	○	○	○	○	○	○	○	○
15	Las causas de los riesgos son identificadas continuamente.	○	○	○	○	○	○	○	○
16	Las causas de los riesgos se miden continuamente.	○	○	○	○	○	○	○	○
17	Las causas de los riesgos son gestionadas continuamente.	○	○	○	○	○	○	○	○

7

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

9 La aplicación de la gestión de riesgos en las Obras Públicas: La estructura

Las siguientes afirmaciones tratan acerca de **LA ESTRUCTURA** y el nivel de madurez de la aplicación de la gestión de riesgos en su organización. Las afirmaciones se han diseñado en una escala Likert, con 7 niveles de respuesta. El formato Likert de 7 niveles es:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Parcialmente en desacuerdo
4. Ni de acuerdo ni en desacuerdo
5. Parcialmente de acuerdo
6. De acuerdo
7. Totalmente de acuerdo

Para cada afirmación sólo puede haber una respuesta. No hay respuestas buenas o malas, únicamente es su opinión al respecto. Sin embargo, si usted no está seguro de una respuesta, puede marcar la alternativa "No sabe".

La estructura se centra en la forma en que la gestión del riesgo se aplica dentro de la organización y como están organizados sus procesos y responsabilidades.

Por favor, seleccione la respuesta apropiada para cada concepto:

		Totalmente en desacuerdo	En desacuerdo	Parcialmente en desacuerdo	Ni de acuerdo ni en desacuerdo	Parcialmente de acuerdo	De acuerdo	Totalmente de acuerdo	No sabe
1	La gestión del riesgo está relacionada con procedimientos estándar.	○	○	○	○	○	○	○	○
2	La gestión del riesgo está ligada a la dirección superior.	○	○	○	○	○	○	○	○
3	Las responsabilidades para la aplicación de la gestión de riesgos están claramente definidas.	○	○	○	○	○	○	○	○
4	Las responsabilidades para la aplicación de la gestión del riesgo están asignadas	○	○	○	○	○	○	○	○
5	Las responsabilidades para la aplicación de la gestión del riesgo son aceptadas.	○	○	○	○	○	○	○	○
6	El personal actúa de acuerdo con las responsabilidades asignadas para la gestión del riesgo.	○	○	○	○	○	○	○	○
7	La gestión del riesgo es vista como parte de una gestión de proyectos integral.	○	○	○	○	○	○	○	○

8

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

Experiencias prácticas de la gestión de riesgo

Las preguntas en esta sección se centran en su propia experiencia práctica en la gestión del riesgo. Las respuestas se utilizarán para dar recomendaciones para mejorar el proceso de las obras públicas en Chile.

Por favor, sea tan claro y específico como pueda en sus respuestas.

10 ¿Podría mencionar un proyecto, en el que estuvo involucrado, cuyo objeto fue la introducción y adopción de la gestión del riesgo?

- ○ Si
- ○ No

Cuando su respuesta es "si", habrá preguntas de seguimiento con respecto a su propia experiencia práctica en la gestión del riesgo en proyectos. Cuando su respuesta es "no", puede continuar con el resto del cuestionario.

11 ¿Podría dar una breve descripción de este proyecto?

12 ¿Qué tipo de problemas tuvo durante ese proyecto?

13 ¿Cuáles fueron los aspectos positivos de la introducción y la adopción de la gestión del riesgo en dicho proyecto?

14 ¿Cuáles fueron los aspectos negativos de la introducción y la adopción de la gestión del riesgo en dicho proyecto?

15 ¿Existen grandes diferencias entre proyectos en relación a la gestión de riesgos?

16 ¿Son siempre las mismas cosas, las que van bien o mal en estos proyectos?

17 ¿Cuáles son las lecciones aprendidas más importantes en relación a gestión de riesgos?

9

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

Nivel de madurez deseado de la aplicación de la gestión de riesgos

Esta parte se centra en el nivel deseado de la aplicación de la gestión de riesgos en su organización. Para ello, se utilizará el Modelo de Madurez de la Gestión del Riesgo (modelo MGR). Este modelo se divide en 5 temas y 25 elementos.

Cada elemento contiene las descripciones para 4 niveles de madurez: ad hoc, inicial, repetible y gestionados. Estos niveles describen la madurez de la aplicación de la gestión de riesgos en una organización. En este caso hay que determinar el nivel de madurez deseado para cada elemento de su organización.

Puede ocurrir que el nivel de madurez de un elemento en el caso de su organización no es igual al más alto nivel posible en el modelo. Esto podría significar que en el caso de mejoras en su organización, un mayor nivel de madurez no es necesario por el momento. Al determinar el nivel de madurez deseado para cada elemento, **rellene sólo una casilla por cada elemento.**

La última pregunta se refiere a la prioridad de un elemento en la aplicación de la gestión del riesgo. Se le pedirá que haga un Top 5 de los 25 elementos que se producen en el modelo MGR.

Recuerde que no hay respuestas buenas o malas, sino que es sólo acerca de su opinión sobre el nivel de madurez de la gestión de riesgos en su organización.

Modelo de Madurez de la Gestión del Riesgo

En la tabla siguiente se muestran los niveles del modelo de madurez de la gestión de riesgo con una pequeña descripción del nivel. Este cuadro puede darle una idea del nivel de aplicación de la gestión de riesgos en su organización.

Nivel	Description
Nivel 1 – ad hoc	La organización desconoce la necesidad de gestionar la incertidumbre. No se tiene un enfoque estructurado para controlar riesgos. Los procesos de la gestión son principalmente reactivos y hay poco o ningún intento de aprender de los proyectos anteriores.
Nivel 2 – Inicial	En el interior de la organización hay un pequeño número de personas que están experimentando con la gestión del riesgo. No hay un enfoque estructurado. Muchas personas son conscientes de los posibles beneficios de la gestión del riesgo pero nunca se aplica de forma efectiva.
Nivel 3 – Repetible	La incertidumbre/gestión del riesgo se implementa en todos los procesos de la organización y se aplica en la mayoría o todos los proyectos. Existe un proceso genérico de la gestión de riesgos. Los beneficios se entienden en todos los niveles, aunque no siempre se alcanzan.
Nivel 4 – Gestionado	En la organización existe una cultura de conciencia sobre el riesgo. Un enfoque proactivo a la gestión del riesgo y la comunicación abierta acerca de los riesgos está presente en todos los aspectos de la organización. Hay un uso activo de la información sobre los riesgos para mejorar los procesos de organización y obtener ventajas competitivas.

10

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

Nivel de madurez deseado de la aplicación de la gestión de riesgos: La cultura

18 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'atención'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ Los empleados y directivos no están explícitamente conscientes de los riesgos. (Nivel 1 – Ad hoc)
- ○ Los empleados y directivos son parcialmente conscientes de los riesgos y los gestionan informalmente. (Nivel 2 – Inicial)
- ○ Los empleados y directivos son conscientes de los riesgos y los gestionan principalmente de manera formal. (Nivel 3 – Repetible)
- ○ Los empleados y directivos son completamente conscientes de los riesgos y los gestionan formalmente. (Nivel 4 – Gestionado)

19 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'gestión'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ La alta dirección no ha recibido formación acerca de la gestión del riesgo. (Nivel 1 – Ad hoc)
- ○ La alta dirección fomenta, pero no exige el uso de la Gestión de Riesgos. (Nivel 2 – Inicial)
- ○ La alta dirección, exige el uso de la Gestión de Riesgos. (Nivel 3 – Repetible)
- ○ La alta dirección exige la gestión del riesgo, además fomenta y recompensa la gestión proactiva del riesgo. (Nivel 4 – Gestionado)

20 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'potenciales malas noticias / escalada'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ Comunicar malas noticias sobre riesgos no es aceptable y se tiende a "Matar al mensajero". (Nivel 1 – Ad hoc)
- ○ Se entiende que los riesgos pueden ocurrir, pero aún así las malas noticias sobre riesgos no son aceptables (Nivel 2 – Inicial)
- ○ Las malas noticias sobre riesgos son aceptadas y son comunicadas y escaladas de forma limitada (Nivel 3 – Repetible)
- ○ Las malas noticias sobre riesgos son aceptadas, compartidas y escaladas. (Nivel 4 – Gestionado)

21 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'percepción'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ La gestión del riesgo es considerada inútil, aunque los proyectos están fallando. (Nivel 1 – Ad hoc)
- ○ La gestión del riesgo es considerada un gasto general con beneficios variables y sólo se utiliza en ciertos proyectos. (Nivel 2 – Inicial)
- ○ La gestión del riego se considera importante y sus beneficios son reconocidos (Nivel 3 – Repetible)
- ○ La gestión del riesgo se considera importante, los beneficios son reconocidos y la alta gerencia usa la información sobre riesgos para la toma de decisiones. (Nivel 4 – Gestionado)

11

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

Nivel de madurez deseado de la aplicación de la gestión de riesgos: El proceso

22 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'formal / informal'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ Sin proceso formal. La respuesta a los riesgos es reactiva. (Nivel 1 – Ad hoc)
- ○ Sin procesos genéricos formales, a pesar de eso se utilizan algunos métodos formales específicos. (Nivel 2 – Inicial)
- ○ Procesos formales genéricos aplicados a muchos proyectos. (Nivel 3 – Repetible)
- ○ Procesos genéricos formales aplicados a todos los proyectos y procesos de negocios. (Nivel 4 – Gestionado)

23 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'documentación de procesos'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No hay plan de manejo de riesgos o procesos documentados (Nivel 1 – Ad hoc)
- ○ Algunos métodos formales pueden estar en uso. (Nivel 2 – Inicial)
- ○ Existen procesos formales incorporados en el sistema de calidad. (Nivel 3 – Repetible)
- ○ Existen procesos formales incorporados en el sistema de calidad, son revisados y mejorados si es necesario. (Nivel 4 – Gestionado)

24 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'motivos'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ Intentos de aplicar el proceso de la gestión del riesgo únicamente cuando es requerido por los clientes. (Nivel 1 – Ad hoc)
- ○ La necesidad de la gestión del riesgo es reconocida en algunas situaciones. (Nivel 2 – Inicial)
- ○ La necesidad de la gestión del riesgo es reconocida en muchas situaciones. (Nivel 3 – Repetible)
- ○ La gestión del riesgo se considera una necesidad. (Nivel 4 – Gestionado)

25 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'personal'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ El personal no tiene conocimiento de la gestión del riesgo. (Nivel 1 – Ad hoc)
- ○ Falta personal para la gestión de riesgo en los proyectos. Se necesita apoyo externo. (Nivel 2 – Inicial)
- ○ El personal tiene habilidades básicas de la gestión de riesgos. Se necesita apoyo externo limitado (Nivel 3 – Repetible)
- ○ Personal capacitado en las competencias básicas de la gestión del riesgo y, según el grupo objetivo, se realiza una formación especial. (Nivel 4 – Gestionado)

26 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'expertos'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No hay expertos en gestión de riesgos. (Nivel 1 – Ad hoc)
- ○ Los expertos no son reconocidos y trabajan en los proyectos. (Nivel 2 – Inicial)
- ○ Expertos en riesgo se utilizan para asesorar proyectos, pero no son parte de ellos. (Nivel 3 – Repetible)
- ○ Los expertos en riesgo de la organización asesoran a los proyectos (Nivel 4 – Gestionado)

12

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

27 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'cliente / proveedor'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ Principales proveedores y clientes no participan en el proceso de la gestión de riesgos. (Nivel 1 – Ad hoc)
- ○ En algunos proyectos, los proveedores participan en el proceso de la gestión de riesgos. (Nivel 2 – Inicial)
- ○ Los principales proveedores participan en el proceso de la gestión de riesgos. (Nivel 3 – Repetible)
- ○ Los principales proveedores y clientes participan en el proceso de la gestión de riesgos. (Nivel 4 – Gestionado)

28 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'comunicación'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No hay comunicación explícita acerca de los riesgos. (Nivel 1 – Ad hoc)
- ○ Poca o ninguna comunicación sobre los riesgos encontrados. (Nivel 2 – Inicial)
- ○ Canal de informal comunicación a la dirección de la organización. (Nivel 3 – Repetible)
- ○ Canal formal y directo de comunicación a la dirección de la organización. (Nivel 4 – Gestionado)

29 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'recolección de datos'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No hay información sobre los riesgos. (Nivel 1 – Ad hoc)
- ○ No hay mediciones de riesgos en relación a la gestión del riesgo. (Nivel 2 – Inicial)
- ○ Se recolectan mediciones sobre riesgos con la intención de utilizarlos (Nivel 3 – Repetible)
- ○ Mediciones rutinarias de riesgo se utilizan continuamente para mejorar (Nivel 4 – Gestionado)

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

Nivel de madurez deseado de la aplicación de la gestión de riesgos: La experiencia

30 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'rendimiento'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No se entienden los principios de riesgo o su terminología. (Nivel 1 – Ad hoc)
- ○ El desempeño de la gestión del riesgo no se mide. (Nivel 2 – Inicial)
- ○ El desempeño de la gestión del riesgo se mide. (Nivel 3 – Repetible)
- ○ El desempeño de la gestión del riesgo es medido y comparado. (Nivel 4 – Gestionado)

31 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'entrenamiento'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ Nadie ha tenido entrenamiento formal. (Nivel 1 – Ad hoc)
- ○ Solo algunos individuos tienen algún conocimiento y no tienen formación práctica. (Nivel 2 – Inicial)
- ○ Los expertos de la empresa son formalmente capacitados en destrezas básicas de la gestión de riesgos. (Nivel 3 – Repetible)
- ○ Todo el personal es consciente del tema de riesgos y es capaz de utilizar competencias básicas. El personal se entrena de forma regular para mejorar las competencias. (Nivel 4 – Gestionado)

32 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'la experiencia práctica'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ Ninguna comprensión o experiencia en la aplicación de procedimientos sobre riesgos. (Nivel 1 – Ad hoc)
- ○ Solo algunas personas tienen experiencia en la aplicación de procedimientos sobre riesgos. (Nivel 2 – Inicial)
- ○ Sólida base de empleados con experiencia en la aplicación de los procedimientos de la gestión de riesgo. Los expertos son muy experimentados. (Nivel 3 – Repetible)
- ○ Los expertos son conscientes de los factores que influyen en el comportamiento de los riesgos y los toman en cuenta para la aplicación de la gestión del riesgo. (Nivel 4 – Gestionado)

33 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'distribución del conocimiento y desarrollo'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ Conocimientos y competencias no son compartidas. (Nivel 1 – Ad hoc)
- ○ Conocimientos y competencias son compartidos en algunas situaciones. (Nivel 2 – Inicial)
- ○ Conocimientos y habilidades son documentados y compartidos dentro de la organización. Procesos específicos y herramientas son desarrollados y utilizados. (Nivel 3 – Repetible)
- ○ Aprender de la experiencia como parte del proceso. (Nivel 4 – Gestionado)

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

Nivel de madurez deseado de la aplicación de la gestión de riesgos: La aplicición

34 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'proyecto / negocio'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No hay aplicación estructurada. (Nivel 1 – Ad hoc)
- ○ Aplicación continua y rutinaria a algunos proyectos. (Nivel 2 – Inicial)
- ○ Aplicación continua y rutinaria a todos los proyectos, de inicio a fin. (Nivel 3 – Repetible)
- ○ Ideas sobre riesgos aplicadas a todas las actividades, desde el principio hasta el final. (Nivel 4 – Gestionado)

35 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'recursos'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No se tiene recursos dedicados (Nivel 1 – Ad hoc)
- ○ Aplicación de recursos no exclusiva (Nivel 2 – Inicial)
- ○ Recursos del proyecto exclusivos (Nivel 3 – Repetible)
- ○ Recursos organizacionales exclusivos (Nivel 4 – Gestionado)

36 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'herramientas y métodos'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No hay herramientas de la gestión del riesgo en uso. (Nivel 1 – Ad hoc)
- ○ Únicamente se aplica la metodología de análisis de riesgos cualitativos. (Nivel 2 – Inicial)
- ○ Conjunto integrado de herramientas y métodos, adaptados a la cultura organizacional. Se utilizan las metodologías cualitativa y cuantitativa para el análisis de riesgos. (Nivel 3 – Repetible)
- ○ Herramientas y métodos actualizados y adaptados a la cultura organizacional. Metodologías de análisis cualitativas y cuantitativas utilizadas enfatizando el uso de datos históricos confiables y válidos. Tanto los riesgos como las oportunidades son gestionados. (Nivel 4 – Gestionado)

37 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'perfil de riesgo'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No se realizan análisis de riesgos. (Nivel 1 – Ad hoc)
- ○ La intuición determina el perfil de riesgo del proyecto. (Nivel 2 – Inicial)
- ○ El perfil de riesgo del proyecto determina la aplicación de la gestión del riesgo. (Nivel 3 – Repetible)
- ○ El perfil de riesgo del proyecto determina la aplicación de la gestión del riesgo. La tolerancia al riesgo se utiliza para determinar la magnitud de las medidas que deben adoptarse. (Nivel 4 – Gestionado)

38 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'uso de datos'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No hay datos disponibles. (Nivel 1 – Ad hoc)
- ○ Almacenamiento y utilización de datos limitados. (Nivel 2 – Inicial)
- ○ Almacenamiento y utilización de los datos. (Nivel 3 – Repetible)
- ○ Reportes y decisiones basadas en información de riesgos. (Nivel 4 – Gestionado)

15

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

39 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'causas'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ Las causas de los riesgos no son constantemente evaluadas. (Nivel 1 – Ad hoc)
- ○ La cadena de causa y efecto no está definida. (Nivel 2 – Inicial)
- ○ La cadena de causa y efecto se entiende de arriba-abajo y de abajo arriba dentro de la organización. (Nivel 3 – Repetible)
- ○ Causas y los resultados son identificados, medidos y gestionados. (Nivel 4 – Gestionado)

16

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

Nivel de madurez deseado de la aplicación de la gestión de riesgos: La estructura

40 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'procesos de negocio'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No embebida en la estructura de la organización. (Nivel 1 – Ad hoc)
- ○ La gestión del riesgo está vinculada a algunos procedimientos estándar. (Nivel 2 – Inicial)
- ○ La gestión del riesgo está relacionada con todos los procedimientos estándar. (Nivel 3 – Repetible)
- ○ La gestión del riesgo está relacionada con todos los estándares y procedimientos de gobierno corporativo. (Nivel 4 – Gestionado)

41 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'responsabilidades'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ No se definen responsabilidades. (Nivel 1 – Ad hoc)
- ○ Las responsabilidades para la aplicación de la gestión del riesgo no están claramente definidas. (Nivel 2 – Inicial)
- ○ Las responsabilidades para la aplicación de la gestión de riesgos están claramente definidos y asignados. (Nivel 3 – Repetible)
- ○ Las responsabilidades para la aplicación de la gestión de riesgos están claramente definidas y asignadas. La definición es aceptada y el personal trabaja según ella. (Nivel 4 – Gestionado)

42 ¿Qué cree usted que es el nivel deseado de la gestión de riesgos en relación con el elemento 'la gestión del riesgo dentro de la gestión de proyectos'?
Por favor seleccione sólo una de las siguientes opciones:

- ○ La gestión del riesgo no es vista como un proyecto en sí. (Nivel 1 – Ad hoc)
- ○ En algunos casos la aplicación de la gestión del riesgo es vista como un proyecto en sí. (Nivel 2 – Inicial)
- ○ La gestión del riesgo es tan importante como la gestión de costos o la gestión del tiempo. (Nivel 3 – Repetible)
- ○ La gestión del riesgo es vista como parte integral de la gestión de proyectos. (Nivel 4 – Gestionado)

17

Cuestionario - La aplicación de la gestión de riesgos en las Obras Públicas

Nivel de madurez deseado de la aplicación de la gestión de riesgos: La prioridad

43 ¿Puede especificar 5 elementos que usted encuentra los más importantes en la aplicación de la gestión del riesgo? Con esta información es posible en una fase posterior, determinar la importancia y la urgencia de mejoras.

*Por favor seleccione **a la suma** 5 opciones:*

- ○ Atención (Cultura)
- ○ Gestión (Cultura)
- ○ Potenciales malas noticias / escalada (Cultura)
- ○ Percepción (Cultura)
- ○ Formal / informal (Proceso)
- ○ Documentación de procesos (Proceso)
- ○ Motivos (Proceso)
- ○ Personal (Proceso)
- ○ Expertos (Proceso)
- ○ Cliente / proveedor (Proceso)
- ○ Comunicación (Proceso)
- ○ Recolección de datos (Proceso)
- ○ Rendimiento (Experiencia)
- ○ Entrenamiento (Experiencia)
- ○ La experiencia práctica (Experiencia)
- ○ Distribución del conocimiento y desarrollo (Experiencia)
- ○ Proyecto / negocio (Aplicación)
- ○ Recursos (Aplicación)
- ○ Herramientas y métodos (Aplicación)
- ○ Perfil de riesgo (Aplicación)
- ○ Uso de datos (Aplicación)
- ○ Causas (Aplicación)
- ○ Procesos de negocio (Estructura)
- ○ Responsabilidades (Estructura)
- ○ La gestión del riesgo dentro de la gestión de proyectos (Estructura)

18

Appendix 9 – Filled RMM model for Chile

Criteria	Subject	Level 1 – Ad Hoc	Level 2 – Initial	Level 3 – Repeatable	Level 4 - Managed
Definition	Description level	The organisation is unaware of the need of managing uncertainties. There is no structured approach to dealing with risks. Management processes are mostly reactive and there is little or no attempt to learn from past projects.	Inside the organisation a small number of individuals are experimenting with risk management. There is no structured approach in place. A lot of people are aware of the potential benefits of managing risk, but it is not ineffective implemented.	Uncertainty / risk management is built into all organizational processes and is implemented on most or all projects. There exists a formalized generic risk process. Benefits are understood at all levels, although not always consistently achieved.	In the organization is a risk-aware culture. A proactive approach to risk management and open communication about risks is present in all aspects of the organization. There is an active use of risk information to improve organizational processes and gain competitive advantage.
Culture	Awareness	Employees and management are not explicit aware of the risks.	Employees and management are partly aware of the risks and manage them informal.	Employees and management are aware of the risks and manage them mostly formal.	Employees and management are completely aware of the risk and manage them formal.
	Management	Upper management may not have taught about risk management.	Upper management encourages, but does not require, use of Risk Management.	Upper Management requires risk management.	Upper Management requires risk management, but also encouraged and rewarded proactive risk management.
	Potential bad news / escalation	Shoot the messenger, escalation is not accepted.	Understanding that risks can occur, still escalation is not accepted.	"Bad news" risk information is accepted and is in limited way shared and escalated.	"Bad news" risk information is accepted, shared and escalated.
	Perception	Risk management may be viewed as useless, although projects are failing.	Risk management may be viewed as additional overhead with variable benefits and is used only on selected projects.	Risk management may be viewed as important, the benefits are recognized.	Risk management may be viewed as important, the benefits are recognized and the upper management uses risk information in decision-making.
Process	Formal / informal	No formal process. Response to risks is reactive.	No generic formal processes, although some specific formal methods may be in use.	Generic formal processes applied to most projects.	Generic formal processes applied to all projects and business processes.
	Process documentation	No risk management plan or documented process exists.	Some specific formal methods may be in use.	Formal processes are incorporated into quality system.	Formal processes are incorporated into quality system and are evaluated and refined if necessary.
	Reason	Attempts to apply risk management process only when required by customer.	Need of risk management is recognized in some situations.	Need of risk management is recognized in most situations.	Risk management may be viewed as a necessity.
	Personnel	Personnel may not have knowledge of risk management.	All risk personnel are located under projects. External support is necessary.	Personnel are trained in basic skills of risk management. Limited need for external support.	Personnel are trained in basic skills of risk management and, depending on the target group, followed special training.
	Experts	There are no risk experts.	Risk experts are not recognized and work in projects.	Risk experts are appointed to advice project organization, but are no part of it.	Risk experts in the organization support own projects.
	Customer / supplier	Key suppliers and customers do not participate in the risk management process.	In some projects suppliers participate in risk management process.	Key suppliers participate in risk management process.	Key suppliers and customers participate in the risk management process.
	Communication	No explicit communication about risks.	Little or no explicit communication about founded risks.	Formal and informal communication channels to organization management.	Direct formal and informal communication channels to organization management.
	Data collection	No collection of risks.	No risk metrics collected regarding risk management.	Risk metrics collected with intention to use it.	Routine risk metrics used with consistent evaluation for improvement.
Experience	Performance	No understanding of risk principles or language.	Risk management performance is not measured.	Risk management performance is measured.	Risk management performance is measured and benchmarked.
	Training	No one may have had a formal training.	Limited to individuals who may have had little or no formal training.	In-house core of expertise, formally trained in basic risk management skills.	All personnel are risk aware and capable of using basic risk skills. Regular training for personnel to enhance skills.
	Practical experience	No understanding or experience in accomplishing risk procedures.	Limited to individuals who may have experience in accomplishing risk procedures.	Strong base of employees with experience in accomplishing risk procedures. Experts are very experienced.	Experts are aware of factors influencing risk behaviour and take factors into account while applying risk management.
	Knowledge sharing and development	Knowledge and skills are not shared.	Knowledge and skills are shared in some situations.	Knowledge and skills are documented and shared within the organization. Specific processes and tools are developed and used.	Learning from experience as part of the process.
Application	Project / business	No structured application.	Routine and consistent application to some projects.	Routine and consistent application to all projects, from start to ending.	Risk ideas applied to all activities, from start to ending.
	Resources	No dedicated resources.	Inconsistent application of resources.	Dedicated project resources.	Dedicated organizational resources.
	Tools and methods	No risk management tools in use.	Qualitative risk analysis methodology used exclusively.	Integrated set of tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used.	State-of-the-art tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used with great stress on having valid and reliable historical data sources. Both risks and opportunities are managed.
	Risk profile	No risk analysis performed.	Gut feeling determines a project's risk profile.	There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management).	There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management). Risk tolerance is used to determine the size of measures to be taken.
	Data use	No data available.	Storage and use of data limited to individuals.	Storage and use of data.	Risk-based reporting and decision-making.
	Causes	Causes of risks are not consistently evaluated.	The cause and effect chain is not defined.	The cause and effect chain is understood from top-down and bottom-up.	Causes and results are identified, measured and managed.
Structure	Business processes	No embedding in the organization's structure.	Risk management is linked to some standard procedures.	Risk management is linked to all standard procedures.	Risk management is linked to all standard procedures and corporate governance.
	Responsibilities	No responsibilities are defined.	Responsibilities for application of risk management are not clearly defined.	Responsibilities for application of risk management are clearly defined and assigned.	Responsibilities for application of risk management are clearly defined and assigned. The definition is accepted and personnel acted to it.
	Risk management inside project management	Risk management is not seen as a project on its own.	In some cases application of risk management is seen as a project on its own.	Risk management is equally important compared to (e.g.) time or cost management.	Risk management is seen as part of holistic project management.

Legend
Current state
Desired level
Current state = desired level

Appendix 10 – Filled RMM model for the Netherlands

Criteria	Subject	Level 1 – Ad Hoc	Level 2 – Initial	Level 3 – Repeatable	Level 4 - Managed
Definition	Description level	The organisation is unaware of the need of managing uncertainties. There is no structured approach to dealing with risks. Management processes are mostly reactive and there is little or no attempt to learn from past projects.	Inside the organisation a small number of individuals are experimenting with risk management. There is no structured approach in place. A lot of people are aware of the potential benefits of managing risk, but it is not ineffective implemented.	Uncertainty / risk management is built into all organizational processes and is implemented on most or all projects. There exists a formalized generic risk process. Benefits are understood at all levels, although not always consistently achieved.	In the organization is a risk-aware culture. A proactive approach to risk management and open communication about risks is present in all aspects of the organization. There is an active use of risk information to improve organizational processes and gain competitive advantage.
Culture	Awareness	Employees and management are not explicit aware of the risks.	Employees and management are partly aware of the risks and manage them informal.	Employees and management are aware of the risks and manage them mostly formal.	Employees and management are completely aware of the risk and manage them formal.
	Management	Upper management may not have taught about risk management.	Upper management encourages, but does not require, use of Risk Management.	Upper Management requires risk management.	Upper Management requires risk management, but also encouraged and rewarded proactive risk management.
	Potential bad news / escalation	Shoot the messenger, escalation is not accepted.	Understanding that risks can occur, still escalation is not accepted.	"Bad news" risk information is accepted and is in limited way shared and escalated.	"Bad news" risk information is accepted, shared and escalated.
	Perception	Risk management may be viewed as useless, although projects are failing.	Risk management may be viewed as additional overhead with variable benefits and is used only on selected projects.	Risk management may be viewed as important, the benefits are recognized.	Risk management may be viewed as important, the benefits are recognized and the upper management uses risk information in decision-making.
Process	Formal / informal	No formal process. Response to risks is reactive.	No generic formal processes, although some specific formal methods may be in use.	Generic formal processes applied to most projects.	Generic formal processes applied to all projects and business processes.
	Process documentation	No risk management plan or documented process exists.	Some specific formal methods may be in use.	Formal processes are incorporated into quality system.	Formal processes are incorporated into quality system and are evaluated and refined if necessary.
	Reason	Attempts to apply risk management process only when required by customer.	Need of risk management is recognized in some situations.	Need of risk management is recognized in most situations.	Risk management may be viewed as a necessity.
	Personnel	Personnel may not have knowledge of risk management.	All risk personnel are located under projects. External support is necessary.	Personnel are trained in basic skills of risk management. Limited need for external support.	Personnel are trained in basic skills of risk management and, depending on the target group, followed special training.
	Experts	There are no risk experts.	Risk experts are not recognized and work in projects.	Risk experts are appointed to advice project organization, but are no part of it.	Risk experts in the organization support own projects.
	Customer / supplier	Key suppliers and customers do not participate in the risk management process.	In some projects suppliers participate in risk management process.	Key suppliers participate in risk management process.	Key suppliers and customers participate in the risk management process.
	Communication	No explicit communication about risks.	Little or no explicit communication about founded risks.	Formal and informal communication channels to organization management.	Direct formal and informal communication channels to organization management.
	Data collection	No collection of risks.	No risk metrics collected regarding risk management.	Risk metrics collected with intention to use it.	Routine risk metrics used with consistent evaluation for improvement.
Experience	Performance	No understanding of risk principles or language.	Risk management performance is not measured.	Risk management performance is measured.	Risk management performance is measured and benchmarked.
	Training	No one may have had a formal training.	Limited to individuals who may have had little or no formal training.	In-house core of expertise, formally trained in basic risk management skills.	All personnel are risk aware and capable of using basic risk skills. Regular training for personnel to enhance skills.
	Practical experience	No understanding or experience in accomplishing risk procedures.	Limited to individuals who may have experience in accomplishing risk procedures.	Strong base of employees with experience in accomplishing risk procedures. Experts are very experienced.	Experts are aware of factors influencing risk behaviour and take factors into account while applying risk management.
	Knowledge sharing and development	Knowledge and skills are not shared.	Knowledge and skills are shared in some situations.	Knowledge and skills are documented and shared within the organization. Specific processes and tools are developed and used.	Learning from experience as part of the process.
Application	Project / business	No structured application.	Routine and consistent application to some projects.	Routine and consistent application to all projects, from start to ending.	Risk ideas applied to all activities, from start to ending.
	Resources	No dedicated resources.	Inconsistent application of resources.	Dedicated project resources.	Dedicated organizational resources.
	Tools and methods	No risk management tools in use.	Qualitative risk analysis methodology used exclusively.	Integrated set of tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used.	State-of-the-art tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used with great stress on having valid and reliable historical data sources. Both risks and opportunities are managed.
	Risk profile	No risk analysis performed.	Gut feeling determines a project's risk profile.	There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management).	There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management). Risk tolerance is used to determine the size of measures to be taken.
	Data use	No data available.	Storage and use of data limited to individuals.	Storage and use of data.	Risk-based reporting and decision-making.
	Causes	Causes of risks are not consistently evaluated.	The cause and effect chain is not defined.	The cause and effect chain is understood from top-down and bottom-up.	Causes and results are identified, measured and managed.
Structure	Business processes	No embedding in the organization's structure.	Risk management is linked to some standard procedures.	Risk management is linked to all standard procedures.	Risk management is linked to all standard procedures and corporate governance.
	Responsibilities	No responsibilities are defined.	Responsibilities for application of risk management are not clearly defined.	Responsibilities for application of risk management are clearly defined and assigned.	Responsibilities for application of risk management are clearly defined and assigned. The definition is accepted and personnel acted to it.
	Risk management inside project management	Risk management is not seen as a project on its own.	In some cases application of risk management is seen as a project on its own.	Risk management is equally important compared to (e.g.) time or cost management.	Risk management is seen as part of holistic project management.

Legend

Current state

Appendix 11 – Filled RMM model for USA

Criteria	Subject	Level 1 – Ad Hoc	Level 2 – Initial	Level 3 – Repeatable	Level 4 - Managed
Definition	Description level	The organisation is unaware of the need of managing uncertainties. There is no structured approach to dealing with risks. Management processes are mostly reactive and there is little or no attempt to learn from past projects.	Inside the organisation a small number of individuals are experimenting with risk management. There is no structured approach in place. A lot of people are aware of the potential benefits of managing risk, but it is not ineffective implemented.	Uncertainty / risk management is built into all organizational processes and is implemented on most or all projects. There exists a formalized generic risk process. Benefits are understood at all levels, although not always consistently achieved.	In the organization is a risk-aware culture. A proactive approach to risk management and open communication about risks is present in all aspects of the organization. There is an active use of risk information to improve organizational processes and gain competitive advantage.
Culture	Awareness	Employees and management are not explicit aware of the risks.	Employees and management are partly aware of the risks and manage them informal.	Employees and management are aware of the risks and manage them mostly formal.	Employees and management are completely aware of the risk and manage them formal.
	Management	Upper management may not have taught about risk management.	Upper management encourages, but does not require, use of Risk Management.	Upper Management requires risk management.	Upper Management requires risk management, but also encouraged and rewarded proactive risk management.
	Potential bad news / escalation	Shoot the messenger, escalation is not accepted.	Understanding that risks can occur, still escalation is not accepted.	“Bad news” risk information is accepted and is in limited way shared and escalated.	“Bad news” risk information is accepted, shared and escalated.
	Perception	Risk management may be viewed as useless, although projects are failing.	Risk management may be viewed as additional overhead with variable benefits and is used only on selected projects.	Risk management may be viewed as important, the benefits are recognized.	Risk management may be viewed as important, the benefits are recognized and the upper management uses risk information in decision-making.
Process	Formal / informal	No formal process. Response to risks is reactive.	No generic formal processes, although some specific formal methods may be in use.	Generic formal processes applied to most projects.	Generic formal processes applied to all projects and business processes.
	Process documentation	No risk management plan or documented process exists.	Some specific formal methods may be in use.	Formal processes are incorporated into quality system.	Formal processes are incorporated into quality system and are evaluated and refined if necessary.
	Reason	Attempts to apply risk management process only when required by customer.	Need of risk management is recognized in some situations.	Need of risk management is recognized in most situations.	Risk management may be viewed as a necessity.
	Personnel	Personnel may not have knowledge of risk management.	All risk personnel are located under projects. External support is necessary.	Personnel are trained in basic skills of risk management. Limited need for external support.	Personnel are trained in basic skills of risk management and, depending on the target group, followed special training.
	Experts	There are no risk experts.	Risk experts are not recognized and work in projects.	Risk experts are appointed to advice project organization, but are no part of it.	Risk experts in the organization support own projects.
	Customer / supplier	Key suppliers and customers do not participate in the risk management process.	In some projects suppliers participate in risk management process.	Key suppliers participate in risk management process.	Key suppliers and customers participate in the risk management process.
	Communication	No explicit communication about risks.	Little or no explicit communication about founded risks.	Formal and informal communication channels to organization management.	Direct formal and informal communication channels to organization management.
	Data collection	No collection of risks.	No risk metrics collected regarding risk management.	Risk metrics collected with intention to use it.	Routine risk metrics used with consistent evaluation for improvement.
Experience	Performance	No understanding of risk principles or language.	Risk management performance is not measured.	Risk management performance is measured.	Risk management performance is measured and benchmarked.
	Training	No one may have had a formal training.	Limited to individuals who may have had little or no formal training.	In-house core of expertise, formally trained in basic risk management skills.	All personnel are risk aware and capable of using basic risk skills. Regular training for personnel to enhance skills.
	Practical experience	No understanding or experience in accomplishing risk procedures.	Limited to individuals who may have experience in accomplishing risk procedures.	Strong base of employees with experience in accomplishing risk procedures. Experts are very experienced.	Experts are aware of factors influencing risk behaviour and take factors into account while applying risk management.
	Knowledge sharing and development	Knowledge and skills are not shared.	Knowledge and skills are shared in some situations.	Knowledge and skills are documented and shared within the organization. Specific processes and tools are developed and used.	Learning from experience as part of the process.
Application	Project / business	No structured application.	Routine and consistent application to some projects.	Routine and consistent application to all projects, from start to ending.	Risk ideas applied to all activities, from start to ending.
	Resources	No dedicated resources.	Inconsistent application of resources.	Dedicated project resources.	Dedicated organizational resources.
	Tools and methods	No risk management tools in use.	Qualitative risk analysis methodology used exclusively.	Integrated set of tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used.	State-of-the-art tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used with great stress on having valid and reliable historical data sources. Both risks and opportunities are managed.
	Risk profile	No risk analysis performed.	Gut feeling determines a project’s risk profile.	There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management).	There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management). Risk tolerance is used to determine the size of measures to be taken.
	Data use	No data available.	Storage and use of data limited to individuals.	Storage and use of data.	Risk-based reporting and decision-making.
	Causes	Causes of risks are not consistently evaluated.	The cause and effect chain is not defined.	The cause and effect chain is understood from top-down and bottom-up.	Causes and results are identified, measured and managed.
Structure	Business processes	No embedding in the organization’s structure.	Risk management is linked to some standard procedures.	Risk management is linked to all standard procedures.	Risk management is linked to all standard procedures and corporate governance.
	Responsibilities	No responsibilities are defined.	Responsibilities for application of risk management are not clearly defined.	Responsibilities for application of risk management are clearly defined and assigned.	Responsibilities for application of risk management are clearly defined and assigned. The definition is accepted and personnel acted to it.
	Risk management inside project management	Risk management is not seen as a project on its own.	In some cases application of risk management is seen as a project on its own.	Risk management is equally important compared to (e.g.) time or cost management.	Risk management is seen as part of holistic project management.

Legend

Current state

Appendix 12 – Filled RMM model after benchmarking

Criteria	Subject	Level 1 – Ad Hoc	Level 2 – Initial	Level 3 – Repeatable	Level 4 - Managed
Definition	Description level	The organisation is unaware of the need of managing uncertainties. There is no structured approach to dealing with risks. Management processes are mostly reactive and there is little or no attempt to learn from past projects.	Inside the organisation a small number of individuals are experimenting with risk management. There is no structured approach in place. A lot of people are aware of the potential benefits of managing risk, but it is not ineffective implemented.	Uncertainty / risk management is built into all organizational processes and is implemented on most or all projects. There exists a formalized generic risk process. Benefits are understood at all levels, although not always consistently achieved.	In the organization is a risk-aware culture. A proactive approach to risk management and open communication about risks is present in all aspects of the organization. There is an active use of risk information to improve organizational processes and gain competitive advantage.
Culture	Awareness	Employees and management are not explicit aware of the risks.	Employees and management are partly aware of the risks and manage them informal.	Employees and management are aware of the risks and manage them mostly formal.	Employees and management are completely aware of the risk and manage them formal.
	Management	Upper management may not have taught about risk management.	Upper management encourages, but does not require, use of Risk Management.	Upper Management requires risk management.	Upper Management requires risk management, but also encouraged and rewarded proactive risk management.
	Potential bad news / escalation	Shoot the messenger, escalation is not accepted.	Understanding that risks can occur, still escalation is not accepted.	"Bad news" risk information is accepted and is in limited way shared and escalated.	"Bad news" risk information is accepted, shared and escalated.
	Perception	Risk management may be viewed as useless, although projects are failing.	Risk management may be viewed as additional overhead with variable benefits and is used only on selected projects.	Risk management may be viewed as important, the benefits are recognized.	Risk management may be viewed as important, the benefits are recognized and the upper management uses risk information in decision-making.
Process	Formal / informal	No formal process. Response to risks is reactive.	No generic formal processes, although some specific formal methods may be in use.	Generic formal processes applied to most projects.	Generic formal processes applied to all projects and business processes.
	Process documentation	No risk management plan or documented process exists.	Some specific formal methods may be in use.	Formal processes are incorporated into quality system.	Formal processes are incorporated into quality system and are evaluated and refined if necessary.
	Reason	Attempts to apply risk management process only when required by customer.	Need of risk management is recognized in some situations.	Need of risk management is recognized in most situations.	Risk management may be viewed as a necessity.
	Personnel	Personnel may not have knowledge of risk management.	All risk personnel are located under projects. External support is necessary.	Personnel are trained in basic skills of risk management. Limited need for external support.	Personnel are trained in basic skills of risk management and, depending on the target group, followed special training.
	Experts	There are no risk experts.	Risk experts are not recognized and work in projects.	Risk experts are appointed to advice project organization, but are no part of it.	Risk experts in the organization support own projects.
	Customer / supplier	Key suppliers and customers do not participate in the risk management process.	In some projects suppliers participate in risk management process.	Key suppliers participate in risk management process.	Key suppliers and customers participate in the risk management process.
	Communication	No explicit communication about risks.	Little or no explicit communication about founded risks.	Formal and informal communication channels to organization management.	Direct formal and informal communication channels to organization management.
	Data collection	No collection of risks.	No risk metrics collected regarding risk management.	Risk metrics collected with intention to use it.	Routine risk metrics used with consistent evaluation for improvement.
Experience	Performance	No understanding of risk principles or language.	Risk management performance is not measured.	Risk management performance is measured.	Risk management performance is measured and benchmarked.
	Training	No one may have had a formal training.	Limited to individuals who may have had little or no formal training.	In-house core of expertise, formally trained in basic risk management skills.	All personnel are risk aware and capable of using basic risk skills. Regular training for personnel to enhance skills.
	Practical experience	No understanding or experience in accomplishing risk procedures.	Limited to individuals who may have experience in accomplishing risk procedures.	Strong base of employees with experience in accomplishing risk procedures. Experts are very experienced.	Experts are aware of factors influencing risk behaviour and take factors into account while applying risk management.
	Knowledge sharing and development	Knowledge and skills are not shared.	Knowledge and skills are shared in some situations.	Knowledge and skills are documented and shared within the organization. Specific processes and tools are developed and used.	Learning from experience as part of the process.
Application	Project / business	No structured application.	Routine and consistent application to some projects.	Routine and consistent application to all projects, from start to ending.	Risk ideas applied to all activities, from start to ending.
	Resources	No dedicated resources.	Inconsistent application of resources.	Dedicated project resources.	Dedicated organizational resources.
	Tools and methods	No risk management tools in use.	Qualitative risk analysis methodology used exclusively.	Integrated set of tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used.	State-of-the-art tools and methods, adapted to the organizational culture. Both qualitative and quantitative risk analysis methodologies used with great stress on having valid and reliable historical data sources. Both risks and opportunities are managed.
	Risk profile	No risk analysis performed.	Gut feeling determines a project's risk profile.	There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management).	There is a clear distinction between project types shown by a project risk profile (determined in close cooperation with line management). Risk tolerance is used to determine the size of measures to be taken.
	Data use	No data available.	Storage and use of data limited to individuals.	Storage and use of data.	Risk-based reporting and decision-making.
	Causes	Causes of risks are not consistently evaluated.	The cause and effect chain is not defined.	The cause and effect chain is understood from top-down and bottom-up.	Causes and results are identified, measured and managed.
Structure	Business processes	No embedding in the organization's structure.	Risk management is linked to some standard procedures.	Risk management is linked to all standard procedures.	Risk management is linked to all standard procedures and corporate governance.
	Responsibilities	No responsibilities are defined.	Responsibilities for application of risk management are not clearly defined.	Responsibilities for application of risk management are clearly defined and assigned.	Responsibilities for application of risk management are clearly defined and assigned. The definition is accepted and personnel acted to it.
	Risk management inside project management	Risk management is not seen as a project on its own.	In some cases application of risk management is seen as a project on its own.	Risk management is equally important compared to (e.g.) time or cost management.	Risk management is seen as part of holistic project management.

Legend
Current state
Benchmark level
Current state = benchmark level

Appendix 13 – Gaps by benchmarking

Table 5: Scores of Chile benchmarked against the scores of the Netherlands

Element	Score Chile	Score Benchmark	Gap
Awareness	2,4	3,0 (NED)	0,6
Management	3,4	3,4 (CHILE)	-
Potential bad news / escalation	2,7	3,3 (NED)	0,6
Perception	2,7	3,3 (NED)	0,6
Formal / informal	2,4	3,0 (NED)	0,6
Process documentation	3,3	3,3 (CHILE)	-
Reason	3,0	4,0 (NED)	1,0
Personnel	2,4	3,0 (NED)	0,6
Experts	2,7	3,3 (NED)	0,6
Customer / supplier	2,4	3,0 (NED)	0,6
Communication	2,3	3,0 (NED)	0,7
Data collection	3,4	3,7 (NED)	0,3
Performance	2,9	3,3 (NED)	0,4
Training	2,4	2,7 (NED)	0,3
Practical experience	3,0	3,5 (NED)	0,5
Knowledge sharing and development	2,7	3,0 (NED)	0,3
Project / business	2,1	3,0 (NED)	0,9
Resources	2,1	3,0 (NED)	0,9
Tools and methods	2,9	3,7 (NED)	0,8
Risk profile	2,7	3,3 (NED)	0,6
Data use	2,9	4,0 (NED)	1,1
Causes	2,9	3,7 (NED)	0,8
Business processes	2,1	3,0 (NED)	0,9
Responsibilities	2,6	3,3 (NED)	0,7
Risk management inside project management	2,7	3,3 (NED)	0,6

Legend
Selected gap

Appendix 14 – Priority of elements