MASTER'S THESIS

Risks for IT Project Portfolios

Identifying and validating risks for IT project portfolio's through literature research and a case study of a semi-governmental organization

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Abstract

This research is about identifying and validating the possible risks for IT project portfolios. Previous researchers developed a list of possible risks based on a review of IT project portfolio management literature and validated those risks by conducting a case study. Within this research, the risk list is redesigned by analyzing the original risk literature and the previous case study results. The new list is validated in practice though a singular case study approach, interviewing several employees with experience regarding IT PPM. The respondents were asked if they recognized listed risks from their experience, and if not, if they could imagine it being a risk. Also, the respondents were asked to substantiate their answers with argumentation and real-life examples. All the listed risks on the redesigned list were validated in practice. Also, several arguments were discovered explaining why those risks were a risk. Both results enhance the overall understanding of risks for IT PPM, guiding further scientific exploration as well as providing practical knowledge for organizations with IT PP(M).

Key terms

IT project portfolio, IT project portfolio management, risk(s),

Summary

Organizations are constantly changing, to gain or keep competitive advantage and to keep up with IT developments. These changes are often organized within IT projects, and these projects are directed and steered via IT project portfolio management. The success of these IT project portfolios is essential for the organization. It is the task of portfolio management to manage these portfolio risks and to balance the portfolio between risks and expected benefits in accordance with the organization's risk appetite and strategy.

But the specific comprehensive risks for IT project portfolios are currently unclear, and unambiguous definition of the possible risks is lacking. Without a clear understanding of the specific portfolio risks, IT portfolio managers are unable to optimally balance their portfolios and hence not able to align with the strategic objectives. This research aims to contribute to the further understanding of the potential risks for IT project portfolios by identifying risks from existing literature and by validating those risks in practice.

Main question: *What are the possible risks for IT project portfolios?*

First, building upon previous research, a list of possible risks for IT PPM was redeveloped. The results from three past studies were carefully analyzed to improve the risk list these researchers developed and validated in practice. The original IT PPM literature and the validation results were analyzed in a structured matter leading to a redesigned list of possible IT PP(M) risk. While the original list contained 21 main risks, the redesigned list contains only 16 risks. The risk definitions are further improved and presented in Dutch and English. Several sub risks are relocated or dropped for not being a portfolio level risk.

Second, the new list is validated in practice though a singular case study approach, interviewing six employees with experience regarding IT PPM. The respondents were asked if they recognized listed risks from their experience, and if not, if they could imagine it being a risk. Also, the respondents were asked to substantiate their answers with argumentation and real-life examples. The analysis of the interview answers and the secondary sources led to two results. The validation of the redesigned list in practice since all risks were recognized from experience by at least one (but often more) respondents. And an overview of argumentation per risk explaining why it was or could be a risk for IT PPM. In total, 50 arguments were discovered to provide a further understanding of those risks.

The list of validated risk can help project portfolio management to identify possible risk for their organizations. The argumentation per risk can give more insights into the reasons why it could be a risk to make it easier to manage those risks, for instance, by taking mitigating measures. The results from this research enhance the overall understanding of risks for IT PPM, guiding further scientific exploration as well as providing practical knowledge for organizations with IT PP(M).

Contents

1. Introduction

In this first chapter, the background, relevance, and research questions are described; furthermore, the main lines of approach are presented.

1.1. Background

Organizations are operating in a continuously changing environment. In order to survive and to accomplish their business goals, organizations must be able to adapt to this changing environment. Change has become a fact of life and organizations are confronted with managing multiple projects simultaneously to implement changes. IT has become an important (success) factor in projects, and organizations are increasingly depending on IT. New developments in IT are occurring rapidly and are embraced by organizations to gain or remain competitive advantages. In this perspective, the alignment of the organizations' goals and IT can become challenging (Jeffery & Leliveld, 2004).

Changes within organizations are often implemented by conducting projects; for IT, these are IT projects. The resources available for projects are often limited, forcing organizations to make choices regarding project selection, and project prioritization, which project will be initiated, and which priority is assigned to a particular project. Organizations often use IT project portfolio management to manage a collection of IT projects. The project portfolio manager is the one responsible for creating an optimal balance between possible risks and expected benefits and by so maximizing business value for IT projects and related IT investments.

Ineffective IT PPM can have severe consequences for organizations and could lead to not achieving the organizational goals. IT portfolio risk management can increase the success rate of IT project portfolios (De Reyck et al., 2005; Teller & Kock, 2013). However, the amount of research related to risks for IT project portfolios is rather limited. It is important to have clear insights into risks for IT PP to be able to recognize and respond to these risks.

1.2. Exploration of the topic

The main terms used in this research are (project) portfolio, project portfolio management, risks, and risk management. In the following section, these terms are further defined. It must be marked that the provided definitions are of a general nature. This research focusses explicitly on IT project portfolios.

A portfolio is described by COBIT as a suite of business programs managed to optimize overall business value. It differs from a program or project which only produces specific business value. The Project Management Institute (PMI) uses a more extensive definition for a portfolio: "*A collection of projects, programs, and other work that is grouped together to facilitate the effective management of that work to meet strategic business objectives. The projects or programs of the portfolio may not necessarily be interdependent or directly related"(PMI, 2013).* The PMI definition was selected for this research because it is more explanatory.

According to the PMI (2013) project portfolio management is: "*The coordinated management of a collection of projects or programs to achieve specific organizational objectives".* Additionally, Cubeles-Márquez (2008) states in an article about IT project portfolio management that these projects must be directed within the same organization. And that PPM should focus on strategic goals and has the purpose of selecting and prioritizing projects. PPM should lead to a portfolio that is aligned with the strategic objectives and has an optimal balance between benefits and risks.

Risk is an event that, if it occurs, causes a (positive or negative) impact on a portfolio (PMI, 2013). Aspects of risks are an event, the probability of the occurrence of an event, and the effect caused by an event. Risk Management is concerned with assessing, controlling, and tracking risks. Portfolio risk management can be defined as: "*The management of uncertain events or conditions as well as their interdependencies at portfolio level that cause significant positive or negative effects on at least one strategic business objective of the project portfolio and thus influences project portfolio success"(PMI, 2008b)*. Although this PMI definition specifically mentions strategic business objectives, in this research, no distinction is made between strategic business objectives and business objectives.

1.3. Problem statement

IT has become an important factor in business. However, the success rate for IT projects or IT-related projects is low (Standish-Group, 2015). Failure can have severe consequences for an organization in terms of financial loss, not realizing strategic objectives and even future existence. Organizations are often managing a set of IT projects, called an IT project portfolio using PPM. IT PPM is being used to prioritize projects within the portfolio and to optimally allocate resources between projects. IT portfolio managers play a crucial role in balancing the portfolio between possible risks and expected benefits. IT portfolio managers should identify risks and take appropriate measures to mitigate risks. The ultimate goal of IT PPM and IT portfolio managers is to align the IT project portfolio with the organization's strategic objectives.

But, the specific comprehensive risks for IT project portfolios are currently unclear, and an unambiguous definition of the possible risks is lacking. Without a clear understanding of the specific portfolio risks, IT portfolio managers are unable to optimally balance their portfolios and hence not able to align with the strategic objectives. A better understanding of risks related to IT project portfolios is needed for organizations to be successful in IT project portfolio management. Also, a better understanding of the characteristics of these risks might provide practical guidance for IT portfolio managers.

1.4. Research objective and questions

This research aims to contribute to the further understanding of the potential risks for IT project portfolios by identifying risks from existing literature and by validating those risks in practice. The knowledge generated by this research can be used to progress in the field of risk identification for ITPPs. Also, the insights provided by this research can help IT portfolio managers to professionalize their PPM practices. This research builds upon previous research conducted by master students from the Open University.

The main question for this research is:
What are the possible risks for IT project portfolios?

To answer the main research question, two sub-questions have to be answered:

1. *Which risks are identified within IT PPM literature?*
2. *Which of the identified risks from IT PPM literature occurred within the case organization, and why was it a risk?*

The first question reviews existing literature and provides the theoretical base for this research. From the theoretical base, a list of possible risks and specific (interview) questions is developed. These identified risks and developed questions are then used to answer the second research

question resulting in an overview of validated risks and their characteristics. Finally, the results of both sub-questions are used to answer the main research question, which will provide IT portfolio managers with practical knowledge regarding identifying risks.

1.5. Motivation/relevance

This research is of both scientific and social relevance:

Scientific relevance:
Although risk management for IT project portfolios can increase success (De Reyck et al., 2005; Teller & Kock, 2013), only limited research is conducted in this specific field. The field project portfolio risk management study is relatively new and not yet mature (Hofman, Spalek, & Grela, 2017; Sanchez, Robert, Bourgault, & Pellerin, 2009). This research provides insights and orders literature for identifying risks, which is one part of overall portfolio risk management. Hence, this research aims to contribute to the development of the field of IT project portfolio risk management.

Social relevance:
The success of IT (related) projects is a concern in most organizations, especially because of the increased dependency on IT. There is an increased interest in how to effectively manage IT project portfolios in order to create an optimal balance between risks and benefits. The models and results of this research provide direction for IT portfolio managers to identify relevant risks for their project portfolios. Also, considered the strategic focus of IT project portfolios, the results can be relevant for decision-makers on board level.

1.6. Main lines of approach

This research is part of a more significant design and evaluate process. Smaele (2013) developed an initial list for possible IT PPM risks and validated this list using a singular case study (cycle1). Building upon the result from Smaele (2013), Student1 (2018); Student2 (2018); Student3 (2018) redesigned the list of possible IT PPM risks, and all conducted a singular case study to validate the list (cycle 2). Now, using the previous results, this study redevelops and re-evaluates the list for the third time. The conceptual model for this research is presented below (Figure 1).

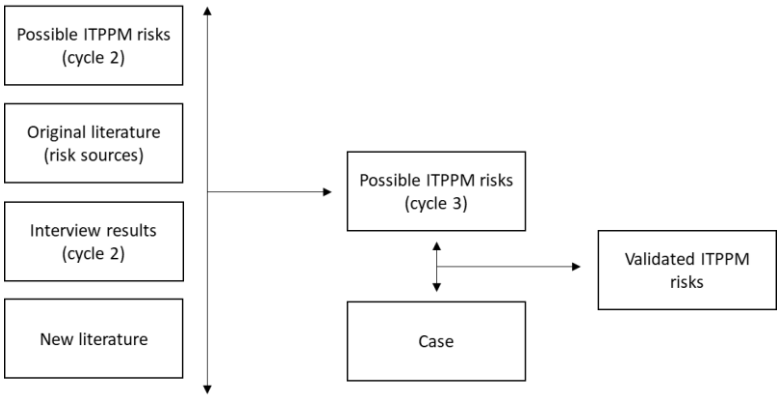


Figure 1: Conceptual model

The list of possible risks will be redesigned using the results from cycle 2, the original literature, and, if applicable, any new literature published after the 2nd cycle. Redesigning the risk list will be a group effort, and only a part of the redesign is conducted in this study. The results of all group members

will be merged into one overall redesigned risk list (cycle 3). The entire redesigned list will then be validated as part of this research by using a case study approach.

This report is structured as follows:

- Chapter 1 describes the background, research objective, research questions, and relevance.
- Chapter 2 provides the theoretical framework consisting of the redesign approach and implementation, resulting in the partially redesigned IT PPM risk list.
- Chapter 3 explains the research methodology, research design, data analysis, and a reflection on quality aspects.
- Chapter 4 presents the overall redesigned risk list, based on all individual redesign results, and presents the results of the case study to validate the possible IT PPM risks.
- Chapter 5 provides a discussion of the results, conclusions, and recommendations leading to the answer to the main research question.
- Attachments

2. Theoretical framework

2.1. Research approach

In 2018 students from the Open Universiteit developed a list consisting of possible risks for IT PPM and validated this model in multiple case studies. This list was developed by identifying potential risks from IT PMM literature followed by a categorization process, which led to 21 risks. Although some risks in the list were validated in practice, the quality of the defined risks could be further improved (Student1, 2018; Student2, 2018; Student3, 2018).

This theoretical framework aims to partially redesign this list to improve the overall quality by analyzing the collected data and literature in a structured matter. Partially because the workload to redesign the list will be divided among serval students since the complete redesign would be too extensive for a single researcher. The following points are considered in the redesign analysis:

- Do the sources of a particular risk have enough similarities to be categorized under one comprehensive definition? I.e., are the identified risks categorized correctly?
- Is the risk, as mentioned in the original literature, an actual portfolio level risk?
- Is the risk definition sufficient in a way that it covers the meaning as intended in the original literature?

Reviewing literature to discover risk is not part of the scope because this review was conducted by previous students already. However, an additional literature review should be performed to investigate whether any relevant literature was published after the list was developed, and which should be incorporated in the redesign. This is to establish a list that is as exhaustive as possible, although completeness is not a goal itself because it would be hard to determine completeness. The merged results of all students, including the results of the additional literature review, will lead to an overall improved list, answering RQ1.

Various data is available for the analysis, which will be used to redesign the list of possible risks. Student1 (2018); Student2 (2018); Student3 (2018) identified 139 possible risks from IT PPM literature. These risks were clustered using open card sorting leading to a list consisting of 21 risks (appendix 1) — each of these risks being substantiated by one or more scientific articles. The students then developed corresponding interview questions and conducted interviews in three case organizations. In total, 16 interviews were conducted, which means 16 answers per risk are available for analysis.

The following approach was used to redesign the original list. First, the workload was divided among the six students in the study group. The group was split into three couples, and every couple was assigned 7 risks to analyze: 1 through 7 or 8 through 14 or 15 through 21. Although the risks were assigned per couple, each student analyzed the assigned risks independently. The risks 8 until 14 were analyzed in this theoretical framework. A detailed description of these risks and the sub risks which were categorized under these compressive risk definitions can be found in appendix 2. The literature review was assigned to another student and is not part of this framework.

Then, the assigned risks were analyzed using the original literature, the risk definition, and the specific interview answers related to the risk. For every risk, all sub risks were thoroughly studied by reviewing the scientific publications that acted as a source. This, in order to capture the essence and

to determine what was explicitly stated about the risk in these publications. Based on these findings, conclusions are drawn whether the risk was interpreted correctly and if the risk is an actual portfolio level risk. If marked as a valid portfolio level risk, it was determined whether the sub risk was classified correctly. In other words, should the risk be placed under another risk, or should it be placed as a new overall risk in the list? For every sub risk, the lines of reasoning were noted down as well as recommendations for improvements. Incorrectly categorized sub risks that should be categorized under risks that are not part of this theoretical framework were shared with the students who were assigned those risks.

Subsequently, for each risk, the available interview answers were collected and analyzed to determine whether all answers should be included in the overall analysis. This was done by auditing if Student1 (2018); Student2 (2018); Student3 (2018) used the same definition and if similar interview questions where used. The answers were then read through in a step by step manner to interpret the given answer. Based on all interview answers, conclusions were drawn, and improvements for the risk name or risk definition proposed.

The analysis of the original sources and interview questions will lead to several recommendations to improve the quality of the list with possible risks for IT PPM. Outcomes per risk could enhance an improved risk name or definition, changes in underlying sub risks, the dropping of the risk, or it could be concluded no improvements can be made. Sub risks could even be marked as a new risk when it would not match enough with any of the other risks. All recommendations and changes per risk where processed and incorporated into one overall redesigned list.

2.1.1. Quality aspects

According to Saunders, Lewis, and Thornhill (2016), reliability refers to the replication and consistency of a research. To ensure reliability, the research process and procedures are described, allowing the research to be repeated in the same way. To prevent researcher bias, all risks were analyzed independently by two students. If possible, simple wording was used for the redesigned list to avert misinterpretation.

The construct validity reflects to some procedure for the data being gathered (Gibbert & Ruigrok, 2010). Internal validity can be described as the accuracy of the analysis of the results (Saunders et al., 2016). Several measures were taken to ensure validity. Multiple sources (triangulation) were used, such as original literature, list risk statements, and interview reports from three similar case studies. For each listed risk, the lines of reasoning including the arguments, are explicitly stated in the outcome. Also, additionally, literature research was committed to include literature that was published after the list of risks was initially developed. One shortcoming might be that the interview reports were used for the analysis and not the transcribed text.

2.2. Implementation

Each of the assigned seven risks from the list was analyzed, as described earlier. As an example, the analysis of risk number 14 (Incompetence of portfolio manager) is presented. This risk is defined as “The quality of the portfolio manager is insufficient” and is based on five sub risks from multiple sources, as presented in the table underneath.

Table 1: Overview risk 14

No.	Risk name	Risk definition	No.	Sub risk	Source
14	Incompetence of portfolio manager	The quality of the portfolio manager is insufficient.	14a	Portfolio manager's incompetence	(Ghasemi et al., 2018)
			14b	Lack of appropriate competencies of the portfolio manager and of the portfolio support structures	(Hofman et al., 2017)
			14c	Unclear responsibilities	Smaele (2013) based on an article by Frey and Buxmann (2011)
			14d	Inefficient single-project management	Smaele (2013) based on an article by Martinsuo and Lehtonen (2007)
			14e	Improper competencies of project and program managers	(Hofman et al., 2017)

These sub risks were then analyzed separately by reviewing the sources to capture the meaning and context regarding the sub risks. In case of risk identified by Smaele (2013), the original scientific publication from which the risk was deducted was also reviewed.

First, Ghasemi, Sari, Yousefi, Falsafi, and Tamošaitienė (2018) propose an overview of portfolio level risks; these risks are subsequently validated by interviewing several experts. The risk portfolio managers' incompetence (14a) is one of those risks. Obviously, this is a portfolio level risk, and because the sub risk almost literally matches the overall risk definition, it is concluded that it is categorized correctly.

Second, Hofman et al. (2017) committed a literature review to identify IT PPM risks and categorized these risks in component, structural, or overall risks. Component risks are project risks that need to go to the portfolio level for information or action. Structural risks concern risk, which deals with the composition of a group of projects. The overall risks consider interdependencies between projects. Furthermore, the identified risks were connected to selected phenomena, which were also derived from literature and used for hypothesis testing. Sub risks 14b and 14e where identified from this source and used for risk 14.

- 14b: Was marked as a portfolio risk since it concerns the portfolio manager. This risk was classified by Hofman et al. (2017) as an overall risk, which concerns the interdependencies between the projects in the portfolio. This risk complies with the overall risk definition of risk 14. Although it should be stated that this risk in Hofman et al. (2017) also refers to portfolio support structures. This specific aspect should be incorporated into the list under risk 12.
- 14e: This risk was marked as a portfolio level risk because it is explicitly marked as a portfolio level risk by Hofman et al. (2017). This risk was classified by Hofman et al. (2017) as a component risk, which is a project risk that needs to be escalated. This component risk does not reflect the portfolio manager and should be placed under risk 9.

Third, risk 14c was identified by Smaele (2013) based on an article from Frey and Buxmann (2011). Frey and Buxmann (2011) explored IT PPM regarding companies' organizational and decision-making structures. Because of the IT PPM focus, this sub risk is indeed a portfolio level risk. But, Frey and Buxmann (2011), discuss unclear responsibilities regarding IT governance. This risk should be placed under risk 10.

Fourth, risk 14d was identified by Smaele (2013) based on an article by Martinsuo and Lehtonen (2007). Martinsuo and Lehtonen (2007) prove that project management efficiency is positively related to portfolio management efficiency. Martinsuo and Lehtonen (2007) described inefficient

single project management in the context of organizational structures; it should be placed under risk 12.

Then, after all sub risks were analyzed, the interview answers were reviewed. The interview answers regarding risk 14 provided the following information. Student3 (2018) did not ask respondents about risk 14 since the role portfolio manager did not exist in the case organization. Student1 (2018) asked five respondents if they recognize this risk. Respondents 1.1, 1.3, 1.4, rate the portfolio manager in a very reserved way and do not provide a clear answer. Respondents 1.5 and 1.2 do not recognize the risk. The respondents from Student2 (2018) all provide nonspecific answers, and it is concluded by Student 2 that respondents cannot imagine the risk. The answers of the respondents do not give any examples or explanations.
From these interview answers is was noted that this might concern a possible sensitive topic because multiple answers were not to the point and not specific. Special attention should be paid when researching aspects which involve sensitivities and aspects respondent are not comfortable speaking about (Verschuren & Doorewaard, 2007, p. 219). Also, the word incompetent has a rather negative association. The risk name 'Incompetence of portfolio manager' is therefore replaced by 'Quality of the portfolio manager,' which is in line with the definition. For traceability reasons, the sub risk text was not changed. The results for the redesign of risk 14 are presented in Table 2.

Table 2: Overview redesigned risk 14

No.	Risk name	Risk definition	No.	Sub risk	Source	Action
14	Quality of the portfolio manager	The quality of the portfolio manager is insufficient.	14a	Portfolio manager's incompetence	(Ghasemi et al., 2018)	Unchanged
			14b	Lack of appropriate competencies of the portfolio manager and of the portfolio support structures	(Hofman et al., 2017)	Unchanged
			14c	Unclear responsibilities	Smaele (2013) based on an article by Frey and Buxmann (2011)	To risk 10
			14d	Inefficient single-project management	Smaele (2013) based on an article by Martinsuo and Lehtonen (2007)	To risk 12
			14e	Improper competencies of project and program managers	(Hofman et al., 2017)	To risk 9

The analysis of the list was conducted according to the plan. Although, during the analysis, some difficulties did arise. The students used an open card sorting method to categorize the risks but did not provide any arguments about the categorization. Also, the categorization, as proposed by Smaele (2013) in main and subcategories, was, for some reason, not followed. Without the lines of reasoning, it was hard to understand why certain categorizations decisions were made, and therefore all articles which served as a source for Smaele (2013) also had to be reviewed. And, probably with the most impact, is the fact that the students were not consistent in the list which was used. The risks list and terms used by Student1 (2018); Student2 (2018) were slightly different from the ones being used by Student3 (2018). Therefore, for some of the listed risks, not all interview questions could be used since it would be comparing apples and oranges.

2.3. Results and conclusions

In this paragraph, the results of the analysis are presented, leading to a partial answer of RQ1: *Which risks are identified within IT PPM literature?* The including backgrounds and lines of reasoning can be found in appendix 3 and the overall overview of the redesign (of the seven risks) in appendix 4.

Seven sub risks were marked as not being IT PP(M) risks, and six risks were placed under risks that were assigned to other members of the study group. Also, all risk names and definitions were improved. The redesign was not influenced by new sources because the student tasked with the literature review did not discover any additional literature. Table 3 provides a high-level overview of the results.

Table 3: Overview overall redesign

No.	Risk	Definition
8	Insufficient adaptability to internal and external changes	Insufficient insights into the internal and external environment of the organization, the possible consequences for the IT PP, and the inability to adapt to changes.
9	Quality of the portfolio component managers	The quality of the portfolio component managers is insufficient.
10	Insufficient control, roles, and responsibilities	The control, roles, and responsibilities of the project portfolio are insufficient.
11	Insufficient insights in portfolio components	Insufficient insight into changes in portfolio components and consequences for the portfolio.
12	Insufficient PPM structure	The (governance) structure of IT project portfolio management is too complex or inefficient
13	Lack of processes or process execution.	The IT PPM processes are not present, not of good quality, or not executed as intended.
14	Quality of the portfolio manager	The quality of the portfolio manager is insufficient.

2.4. Objective of the follow-up research

In the first part of this research, the theoretical framework lead to a refinement of the assigned risks. The results of the analysis of all students should now be combined into an overall list consisting of possible risks for IT PPM answering RQ1. The objective is then to validate this list in practice by empirical research answering RQ2.

3. Methodology

3.1. General

As mentioned earlier, this research is part of a more significant design and evaluate process at which design science is being used. Design science for information systems is described by Hevner, March, Park, and Ram (2004) as addressing research through the building an evaluation of artifacts designed to meet the identified business need. Hevner et al. (2004) describe that from a 'knowledge base', artifacts (or theories) can be developed. These artifacts can then be assessed by committing field study, case study, or other methods. The outcomes of this assessment provide a better understanding and should be used to improve the quality of the artifact and the design process. Often, the design and evaluate cycle must be repeated before the final artifact is developed (Markus, Majchrzak, & Gasser, 2002). The information system research framework which presents the design science approach by Hevner et al. (2004) can be found in appendix 5.

This research follows a similar approach, as described above. In this case, the artifact is the list of possible IT PPM risks. It the first cycle Smaele (2013) developed and validated the list. Building upon the result from Smaele (2013), Student1 (2018); Student2 (2018); Student3 (2018) redesigned and validated the list again. Now, using the previous results, the current study (group) redevelops and re-evaluates the list for the third time.

3.2. List redesign

In the theoretical framework, the 21 risks, as identified in the second design cycle, were divided among students for analysis. Each student was tasked to analyze seven risks independently, and by so, every risk was analyzed twice. To complete the redesign, the results of all the analyses should be merged into one improved list of possible IT PPM risks. For every risk, this list should contain a clear risk name and an unambiguous risk definition so that the risk can be validated responsibly in practice.

The following method was agreed upon by the students to merge the list together during a session. For every risk, the conclusions of the analysis of both students were compared. The parts, where the students independently concluded the same, were directly adopted into the new list. If conclusions or recommendations were not similar, both students were asked to elucidate their findings. The differences were discussed by the study group and resolved by consensus — the results of these discussions were accurately noted. And, to prevent semantic ambiguity, a glossary of terms was drafted during the process.

This approach was implemented by literally projecting the results of student A on one screen and the results of student B on another screen. Then based on the original risk, two steps were committed per overall risk. First, the findings of all sub risks were compared, and when not similar, findings were argued, and a group decision was made. Second, build on the previous sub risk decisions, the best matching overall risk name and description was selected. When both were not sufficient, adjustments were made. The two-step process was repeated for every listed risk. In the case of a sub risk being transferred to another overall risk, which was already discussed, the risk name and definition were rechecked on correctness.

This method was selected because of its simplicity and transparency. The method is merely comparing the results and discussing the differences based on the argumentation and could, therefore, be easily repeated. Furthermore, since the group members are all informed in the field of

risks for IT PPM, their knowledge and experience will add to the quality of the discussion and the overall result. It seems to be a powerful method of improving the quality of the list within a short timeframe. Although, when more resources are available, a more sophisticated or extensive method could lead to better results but would take more time and effort to perform. The objective is to come to a redesigned and responsible list for possible risks for IT PPM, answering RQ1. Therefore, it is essential that the main risks are identified, and sufficient risk names and descriptions are presented. The discussion where sources are placed is less relevant as long as the risk itself is included. For this reason, the simple approach, as presented, will be satisfactory enough.

3.3. List Validation

3.3.1. Conceptual design: empirical research

The objective of this part of the research is to validate the redesigned list of possible IT PPM risks. In other words, trying to prove in a substantiated manner that the risk actually occurred in practice. This will eventually lead to the answering of RQ2.

Real-life information and experience about occurred risks for IT PPM are needed to validate the risks on the list. Information should comprise if the risk is recognized if the risk occurred, and why it was a risk. Also, information, whether the risk could arise, with corresponding argumentation, could be relevant. This information can only be found in organizations with an IT PP and some experience with IT PPM. More specifically, this information is about experiences and can, therefore, only be collected from individuals substantiated with (internal) organization's documentation.

To collect relevant information and to transfer this information to valid answers on the research questions, multiple research strategies can be used. According to Verschuren and Doorewaard (2007), three core decisions are important when selecting the research question. First, does the research require a broad overview with results that can be generalized, or an in-depth study with more attention for details, complexity, and substantiation. The second decision is to determine if quantifying or qualifying results are needed. The third decision is about empirical research versus desk research.

This research follows an in-depth approach since a specific list, in a particular field (IT PPM risks), needs to be validated with strong arguments. The results needed are not to be expressed in numbers, so the strategy should compass qualifying results. And, given the characteristics of the required information, desk research is not an option, and empirical research should be committed. From the primary research strategies, as described by Verschuren and Doorewaard (2007), only the case study approach fits the above-mentioned criteria.

A case study is an in-depth inquiry into a topic or phenomenon within its real-life setting (Yin, 2014). In this research, the phenomenon is possible risks and the real-life setting being an organization with an IT PP. The available time to commit this research is limited and therefore, only one case will be studied. The advantages of the case study approach are flexibility during execution, acceptability of the result, and the holistic view of the research object. A disadvantage of case study research is external validity, especially when committing a singular case study (Verschuren & Doorewaard, 2007). The singular case study approach is selected as the strategy for this research.

Beyond the scope of this research, but worth mentioning is that all students within the study group are committing a singular case study. The selected cases and methods are alike so that valid general statements can be made based on all case study results. The overall strategy is aimed at achieving

saturation. For this research, saturation can be described as committing enough case studies to prove that every listed risk occurred at least once in one of the case organizations.

3.3.2. Technical design: elaboration of the method

This paragraph explains how the case study will be carried out. First, the case selection criteria are presented. Then data sources that can provide the required information are determined. Subsequently, the conditions for source selection are presented, and the data gathering method is outlined. And last, is described how the data will be gathered.

3.3.2.1. Case selection

Selecting the right case to research is crucial when conducting a case study approach (Verschuren & Doorewaard, 2007). Strategic sampling will be used to select an appropriate case, meaning that the case will be selected based on the research design and the problem statement. Saunders et al. (2016) refer to this type of sampling as purposeful sampling and explain it is useful when aiming to select cases that are particularly informative. Cubeles-Márquez (2008) describe and explain the characteristics of IT PP(M). Since this research aims at risks in the context of IT PP, the characteristic for IT PP(M) should be found within the case organization. Therefore, the case should comply with the following requirements.

- The organization has one or multiple IT PP, which can be specified as one or multiple sets of IT projects that share and compete for the same resources within the organization.
- The organization should practice IT PPM, which is a dynamic decision-making process where IT projects are selected, reviewed, prioritized based on their contribution to the organization's strategic objectives.
- The organization (IT) portfolio management has a strategic focus, medium to long term planning, and is a management responsibility.

3.3.2.2. Data sources

Given the nature of the required information, the data sources being used are individuals and the documentation that can be provided by these individuals. Individuals can provide information regarding personal experience about known situations and about personal views acting respectively as an informant or respondent (Verschuren & Doorewaard, 2007). Semi-structured interviews will be used to collect the data. A structured interview with a standard questionnaire will not provide insight into the argumentation and backgrounds and is commonly used for quantitative research. An unstructured interview is not possible because of the predefined list of possible risks that need to be validated.

With a semi-structured interview, a list of themes and key questions is covered, but the use may vary per interview (Saunders et al., 2016). In this case, all the possible risks need to be investigated, but the additional questions depend on the specific situation and are used to collect background information and argumentation. Also, a large number of questions are asked to cover all possible risks on the list. According to Saunders et al. (2016), under these circumstances, a semi-structured is probably the most beneficial approach. Saunders et al. (2016) also state that according to Creswell (2013), for a general study between 5 till 30 interviews must be undertaken. Given the limited timeframe for this research, a total of six interviews will be conducted within the case organization.

3.3.2.3. Source selection

Special attention should be paid to triangulation to expel coincidence in a singular case study (Verschuren & Doorewaard, 2007). And, because the number of interviews is limited to six, it is even more important to assure diversity among the interview population. Different angles and perspectives (source triangulation) will improve the foundation of validated risks. Therefore, individuals from different management layers, preferably different project portfolios and different roles, are selected. The articles by Mosavi (2014) and Teller and Kock (2013) shed light on the roles involved in PPM.

Mosavi (2014) explored the roles of portfolio committees for governing project portfolios. Teller and Kock (2013) identified two types of informants for their research about how portfolio risk management influences project portfolio success. The combination of the findings of those two sources led to the following roles, which will be used to select a diversity of interview respondents.

- Senior management (or top management representative), who has the authority to decide over one or more of the organization's project portfolios and is responsible for portfolio success.
- The portfolio manager. Responsible for the operational management of the project portfolio and by so for portfolio risk management and risk management quality.
- Functional or line management, who acts as a project owner or resource manager.

Additionally, besides this diversity in roles, the respondents must fulfill the following criteria:

- Experience: Respondents must be aware of the topic, and it must have crossed their minds before, for them to be able to put it into words (Verschuren & Doorewaard, 2007). Respondents should have experience with conducting one or more IT PPM tasks or roles, preferably related IT PP risk management. This experience does not have to be gained in the case organization only.
- Abstraction: Enough level of abstraction to oversee and discuss aspects of risks related to IT PP(M).

3.3.2.4. Data gathering

Semi-structured interviews will be used to collect the data. Also, interviewees will be asked if they can provide any relevant documentation which can serve as a secondary source. The interviews are conducted in person, to ensure optimal interaction and understanding between the interviewer and the interviewee. And, all interviews will be carried out in the same way, only the order of the risks related questions will vary per interview. The order is changed because of two reasons. First, the attention of the participants, which will probably decrease during the execution of the interview. And second, the interview might be pressed for time since many questions need to be asked.

The interviews start with a general explanation of the research itself, followed by the interview procedure, ethical aspects, and used terminology. After these introductory remarks, questions regarding the respondent role, responsibility, and experience were asked to verify that an acceptable respondent was selected. Then the questions related to the listed risks were asked. These questions follow a rather strict protocol since questions about experience and imagination are asked one after another. For each risk, the interview protocol followed is:

Explanation: The risk name and definition are explained.

1. *Question:* Do you understand the risk?
    a. If the answer is 'no', then further explanation is provided, and the question is re-asked.
    b. If the answer is 'yes' then the next question.
2. *Question:* Do you recognize this risk from experience?
    a. If the answer is 'yes', then question: Can you provide an example and explain why it was a risk? Then go to question 4.
    b. If the answer is 'no' then the next question.
3. *Question:* Can you imagine this being a risk?
    a. If the answer is 'yes', then question: Can you argue why? Then go to question 4.
    b. If the answer is 'no', then question: Can you argue why? Then move to the next question.
4. *Question:* Is any supporting documentation for this risk available within the organization?

End: All questions regarding this risk are asked, move to the next risk.

The first question aims at assuring that the respondents understand what is meant with the risk. Without a proper understanding, further questions cannot be answered in a responsible way. With the second question, the interviewee is asked explicitly about an experience with the risk. This experience can serve as hard evidence to validate the risk in this research. A deeper understanding of this experience and argumentation of why it was considered a risk is created by asking follow-up question 2a. If the interviewee does not recognize the risk from past experiences, the question is asked whether the interviewee can imagine the risk. The imagination of a risk could serve as soft evidence to validate the possible IT PPM risk. Again, a follow-up question (3a/3b) is asked to discover argumentation for the given answer. There might be internal documentation that can serve as a secondary source, and that is the reason why question 4 is asked.

The complete interview protocol, including a description of the introduction and ending statements, can be found in appendix 7. This protocol and the conducted interviews are in Dutch since the interviews were committed in a Dutch organization.

3.3.2.5. Data analysis

All the interviews will be recorded, obviously only with the interviewees' consent. The relevant parts of the interviews will be transcribed and sent to the interviewees for approval. Respondents are asked to react within a given timeframe to ensure the continuation of this research. In the case of no reaction, it is assumed that the respondents approve. After approval, the interviews will be analyzed in a structured form.

This research follows a deductive approach because it starts with IT PPM theory to identify possible risks and then becomes more specific by (re)designing a list. Data is then collected to validate that the risk occurred in practice. Saunders et al. (2016) describe that, according to Yin (2014), if a theory was used to shape the research, this theory may also be used as a framework to organize and steer the data analysis. The data collecting for this research is aimed at validating the risks on the list and not on exploring other things in the collected data. More specifically, the analysis should lead to a list of arguments per risk, which supports the validation and usability of the list. In that perspective, the list of possible risks can be used in a somewhat restrictive way when analyzing the data.

First, the text of all interview answers is analyzed to determine whether the given answer, at least partially reflects the questioned risk. Although, hopefully, through interaction and anticipation during the interview, all answers will completely match with the questioned risk. Answers that do not match cannot be used to validate the risk but might be useful in other ways, for instance, to improve/ redesign the list in a 4th iteration.

Secondly, the remaining interview answers will be coded to facilitate the per risk analysis. Coding is an important method in managing data and an important element for data analysis (Saunders et al., 2016). In this instance, coding is used to classify the answers in categories and used to explore the argumentation. Answers are classified as based on experience or imagination, which is rather straight forward since it is incorporated in the interview protocol. The answers then need to be explored to find argumentation of why it was or could be a risk. This is done by reading through the answers and labeling and numbering all arguments which are found. This methodology is known as open coding (Saunders et al., 2016) or initial coding (Saldaña, 2009). The text with the argument will not yet be interpreted to prevent multiple interpretation exercises. Figure 2 provides a schematic overview of the first and second step. The collected secondary sources will be coded in the same way.

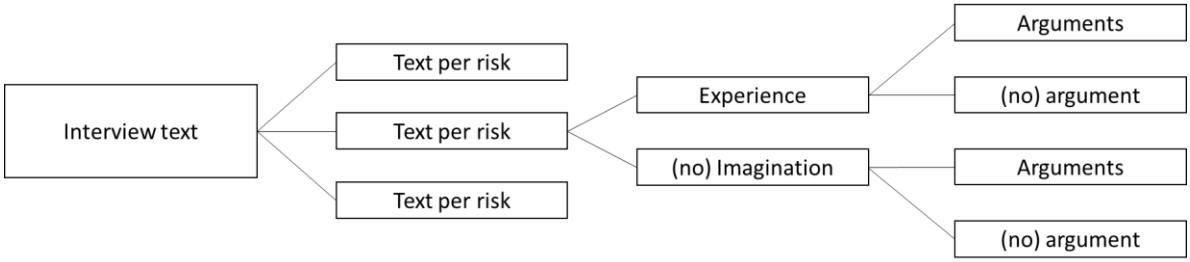


Figure 2: Interview coding

Third, a data matrix will be generated where the rows represent the risk; the columns represent the respondents, and the cells the classified answers being either experience, imagination, or no imagination. This matrix will structure the results and will help to compare results and to recognize patterns.

Fourth, the fractures of text which contain the argumentation will be interpreted and structured to come to an overall list of argumentations per listed risk. To start, all text marked as an argument from all interviews will be grouped per listed risk. Then the Metaplan method (Cloyd, 1973) for open card sorting will be used to form categories and works as follows.

The first coded argument text will be interpreted and will form the first argument. Subsequently, the next coded argument text will be interpreted, and it will be decided if the argument is similar to the previous one or that is should form is own category. This process is repeated until all coded argument text is processed into one category. Last, a congruent argument definition for all categories will be developed based on the argumentation text within those categories. These categories and definitions should meet certain criteria(Merriam, 2009). The criteria, as described by Merriam (2009), will be used. The categories should respond to the research question, be exhaustive, exclusive, and of the same conceptual level. Also, the name of the category, in this case, the overall argument definition, should be sensitizing. The result of the open card sorting will be

presented in one argumentation table. This table will consist of the risks, the final arguments per risk, and the reference to the sources of those arguments.

Fifth, with the support of the matrix and argumentation table, conclusions regarding validation will be drawn. The occurrence of a risk, once or more, will be enough to validate it. The corresponding arguments and examples will provide insights about the risk occurrence and will express the foundation of the validation. The overall conclusions will lead to a substantiated answer to RQ2.

3.4. Quality and ethical aspects

3.4.1. Reliability

Reliability refers to the replication and consistency of the research (Saunders et al., 2016) or, in other words, getting more or less similar results every time under the assumption that the underlying phenomenon is not changing (Bhattacherjee, 2012).

A lack of standardization in semi-structured interviews could raise reliability concerns for this research. But, Saunders et al. (2016) argue that interviews reflect the reality and time of collection, and because circumstances can change, replication is not realistic. Also, a strict interview protocol is set up and followed during execution to promote reliability. Other actions to enhance the reliability involve explicitly describing and explaining the research design, strategy, methods, data collection. Attention was paid to define clear and unambiguous risk terms and definitions in the redesigned list to prevent any misinterpretation by the respondents. And respondents are carefully selected to ensure they have the appropriate knowledge to answer the interview questions promoting the reliability as well as the construct validity.

3.4.1. Validity

The construct validity reflects the quality of the approach to gather the data and, by so the extent to which the collected data corresponds to the reality (Gibbert & Ruigrok, 2010). According to Gibbert and Ruigrok (2010) an instrument is designed and then used to gather the data. The design, as well as the usage of the instrument, are important to enhance proper construct validity. In this research, the instrument is semi-structured interviews supplemented with internal organization documentation.

Because this research is mostly depending on individuals as sources, special attention must be paid to specific disadvantages when gathering data from these sources. In that perspective, Verschuren and Doorewaard (2007) mention asking questions about sensitive topics or asking questions about things respondents have never thought of before. Sensitivity might lead to socially desirable behavior where the interviewee might choose not to reveal the complete picture, this is known as response bias. By commenting, tone, and non-verbal communication, the interviewer might unconsciously direct interviewee's answers, which is known as interviewer bias (Saunders et al., 2016). To counter these possible disadvantages and biases, measures were taken.

- The interviews will be rigorously prepared and conducted by following a strict protocol, assuring that the right questions will be asked and that no questions will be forgotten.
- A test interview will be performed to familiarize with interviewing itself, but also to review possible aspects like interviewer bias, which could have a negative impact on the gathering.
- All interviews must be conducted in the same manner. Only the order will vary for each interview to divide the overall interviewees' attention to all possible risks.

- The interviews are conducted one on one in a private room to ensure confidentiality and to motivate interviewees to answer without limitations.
- The transcribed interview will be sent to the interviewee in order to check if the actual text matches the meaning as intended by the interviewee.
- The respondents will be promoted to provide additional documentation to substantiate argumentation, which will hopefully lead to multiple sources of evidence.

Another aspect of validity is about the quality of drawing conclusions from the gathered data, known as internal validity. Internal validity asks the question of whether the findings are congruent with reality (Merriam, 2009) or as Saunders et al. (2016) state: 'accuracy of analysis of the results.' Although argued by some (Saunders et al., 2016; Yin, 2014) as only relevant for explanatory or causal studies, a discussion of the quality of the process of concluding from the gathered data is relevant for this research as well.

The collected data is processed (coded, labeled) by the researcher before conclusions are being drawn. Since this data is quantitative, this processing involves interpretation, which might unconsciously be affected by researchers' own views, a pitfall known as researcher bias (Saunders et al., 2016). Besides this recognition and awareness, the following measures are taken to decrease potential effects.

- The strict interview protocol specifically asked respondents about experience or imagination. By so, the first classification of the answer is conducted by the respondent and not based on researcher interpretation.
- The use of a well-recognized research method, in this instance, a case study approach with semi-structured interviews and a data analysis approach of coding to decrease possible flaws.
- Answers are reviewed whether they answer the question being asked. This to ensure the quality of the data from which conclusions are drawn.
- Triangulation of sources and methods and drawing conclusions based on their synergies improved the validity.
- The processing of the data will be carefully described, and interpretations will be explained. This to provide an in-depth understanding of the integrity of the research results.

Despite the above-mentioned measures, some sort of researcher interpretation cannot be ruled out, because this research is done by a single researcher. Otherwise, a good additional measure would be to let data gathering and interpretation be checked by a fellow researcher. Also, the Metaplan method for open card sorting could be more powerful when executed by a group of researchers.

External validity is about the generalizability of the results. Expressed with more detail as: Are the results of this particular study generalizable to all relevant contexts (Saunders et al., 2016)? For this research, the answer to this question is yes. Because it could be argued that if an IT PPM risk occurred within one organization, it could also occur in any other organization. This argument is supported by Coyne (1997); Yin (2014), who both argue that the results of a properly conducted study in a well-chosen environment can be externally valid. Although, it could be mentioned that organizations across the world can be very different, for instance, due the cultural reasons and that therefore the results cannot be generalized. For a very specific situation, this could be the Fcase but overall is argued that: If organizations are practicing IT PPM, it may be assumed that the characteristics of these organizations are so similar that the results of this study are generalizable. This is also supported by the following measurements which were incorporated in the research.

- The use of theory in multiple parts of the study, for instance, to identify risks, redesign the risk list, develop the interview questions, and to analyze the collected data.
- All background data was carefully collected, described, and delivered as part of this study. This, in order to create insight in the study context and to allow comparisons.

Often a compromise between feasibility and validity needs to be made. In this case, the number of sources and used methodologies is limited. Also, the research is conducted by a single researcher due to university regulations. The pitfalls are identified, and potential effects are minimized by taking appropriate measures as far as possible within the given conditions and time frame.

3.4.2. Ethical

Ethics can be described as doing the right thing, acting morally responsible. Related to research Saunders et al. (2016) describe it as "ethics refer to the standards of behavior that guide your conduct in relation to the rights of those who become the subject of your work or are affected by it." It goes without saying that it cannot be captured in a comprehensive list of measures and procedures. It is a mindset a researcher should embrace while committing research. Without the aim of being exhaustive, some of the measures are described below. The ethical principles, as described by Saunders et al. (2016), were used to shape these measures.

The researcher tried to conduct this research with objectivity and integrity and with respect to others. Also, all data was collected with explicit consent, and the interviewees were clearly informed about the research and the implications of participation. The interviewees remained anonymous and were explained the right to withdraw at any time. The collected data was handled carefully and was not shared with individuals or organizations outside of the Open Universiteit. Last, all audio recordings remain confidential and will be deleted after the research.

4. Results

In this chapter, the implementation of the research is described. First, the results regarding the redesign of the risk list are outlined to answer RQ 1. Then the results of the risk validation through a case study are presented, leading to an answer of RQ 2.

4.1. Results list redesign

The redesign session took place on the 14th of February 2020 in a classroom at the Open University facilities in Utrecht. All the study group members, as well as the groups' mentor, were present. During this session, the results of all individual students were combined into one overall redesigned risk list.

The session started by preparing the classroom. The room was set up in a way that everybody was able to be actively involved in the session. In the middle of the room, two laptops with projectors were placed to enable the presentation of the results. Also, an audio recording device was set to record the session. Then the two students who analyzed the same risks were asked to come forward to compare their results. First, the underlying risk sources were reviewed, and second, the risk definition was assessed. The decisions made during both were carefully noted by the presenting students. It took around two hours for all couples to present the results, after which the session ended. Last, the couples were asked to process the results of the session regarding their risks and to share the results with the other students. It was agreed to draft an English and Dutch version of the redesigned risk list.

The procedure followed utterly complied with the described methodology in paragraph 3.2, except that a glossary of terms was not drafted due to the limited time available for the session. And because many risk sources did not explain or provide definitions for the terms being used. However, the implementation was not as simple as it seemed. The discussion of risk sources or definitions regularly led to new insights into risks that were already discussed. And by so, leading to further discussions, often about whether different terms used by different authors are about the same thing. But, in the end, a consensus was reached about all the risks and the placement of all risk sources. In this perspective, the audio recording turned out to be very useful to ensure that the regrouping of risks was noted as discussed during the session

The original risk contained 21 risks, and after the redesign, 16 risks are left. Multiple risk sources were relocated, and the definitions of the risks were improved. Furthermore, some of the risk sources were dropped because of being marked as project-level risks. Table 4 below provides an overview of the overall results; the detailed overview of the redesigned list can be found in appendix 6. For the interviews, it was agreed to ask risk 4 after risk 7, 11 after 10, 5 after 12, and 6 after 14 because of the similarities and the importance of explaining the differences. These couples are colored in Table 4.

Table 4: Risk list (cycle 3)

Nr.	Name risk category	Risk definition
1	Conflicts	There are conflicts with one or more decision-making stakeholders of the project portfolio
2	Communication	There is insufficient communication within the IT Project Portfolio
3	Information	There is insufficient quality information available within the IT Project Portfolio
4	Interdependencies	Lack of attention to interdependencies within the project portfolio
5	Personnel stability	There is insufficient certainty regarding the stability of the project portfolio staff.
6	Effectiveness of top management	Top Management is indecisive
7	Portfolio components	Insufficient insights in IT-PP components and what happens within these components
8	Roles, responsibilities, and mandates	Within IT PPM the roles, responsibilities, and mandates are insufficient defined or unclear
9	Project portfolio processes or execution	Poor IT project portfolio processes or execution
10	Quality of the portfolio manager	Quality of the portfolio manager is insufficient
11	Quality of the portfolio component managers	The quality of the portfolio component managers is insufficient
12	Available resources	Lack of available time, people and financial resources for the execution of the projects within the IT project portfolio
13	Organizational politics	The activities, attitudes, or behaviors that are used to get or keep power or an advantage within a business or company
14	Management commitment	The management is not committed to the IT project portfolio management
15	Adaptability to changes	Insufficient alignment of the IT project portfolio to changes of the environment
16	Stakeholders	Lack of clarity in stakeholders' roles and the intensity of their engagement.

4.2. Results case study

4.2.1. Case organization

The organization selected for this case study is a semi-government organization for public transport in the Netherlands. The organization has multiple IT PP and has broad experience in (IT) portfolio management. Also (IT) portfolio management focusses on medium to long term strategic goals and is a management responsibility. The case organization fully complies with the preferred requirements, as mentioned in paragraph 3.3.2.1. (case selection). Furthermore, as an internal researcher, the organization is familiar to the researcher. Information can be placed in the context of the organization, and the time to familiarize, which is needed as a researcher, can be expelled. This might provide benefits in acquiring information and the access and availability to sources (Saunders et al., 2016). Considering that the organization matches the criteria, and the researcher is familiar with the organization, this organization was selected. No further efforts were made to find other suitable organizations.

Acting as an internal researcher comes with certain pitfalls, for instance, the researchers' own assumptions and preconceptions. For example, you do not ask questions about things which you think you know already. Other problems involve status and time when combining roles at the same time (Saunders et al., 2016). Since the researcher's own job does not include (IT) portfolio management aspects and the researcher is not known with (IT) PPM, the chance of assumptions and not asking basic questions is limited. Furthermore, because of the nature of this study, results will not have any implications for the organization, so the researcher is not influenced by the consideration of how to report the results. Although the disadvantages of being an internal researcher seem to be small in this case, awareness is vital to exclude these influences as much as possible (Saunders et al., 2016).

4.2.2. Respondents

As an internal researcher, working in the case organization, finding interview candidates mainly depended on the researcher's network. The respondents had to fulfill the criteria of experience, abstraction, and the overall selection should be diverse (paragraph 3.3.2.3.). The procedure followed to find satisfactory candidates is similar to snowball sampling (Saunders et al., 2016). First, the researcher contacted his superior, and during a short brainstorm session, two possible candidates were identified. These potential candidates were contacted and asked to identify other possible candidates based on the set criteria. This led to an overall list of nine possible interview candidates. A diverse population of six was selected by the researcher and asked to cooperate by participating in an interview (Table 5). The four portfolio managers selected were managing different (kinds of) project portfolios to ensure diversity even more. Also, a respondent in the role of manager of the IT project portfolio managers was selected. Unfortunately, a senior management respondent was not found available for an interview.

Table 5: Selection respondents and roles

Role	Number
Senior Management	0
Portfolio management	1
Portfolio manager	4
Functional/line manager	1

4.2.3. Data gathering

All six selected respondents were interviewed in accordance with the established interview protocol (Appendix 7). Although it must be mentioned that the interview protocol was not strictly followed but used as guidance to ensure a more natural conversation and open atmosphere.
The order of the interviews was based on the availability of the candidate's calendars, and all interviews were conducted within a two-week timeframe. Because of the COVID-19 virus outbreak, two interviews were committed via phone since the general advice was not to come to the office and to work from home.

Each respondent received a printout of the risks and risk definition in English and Dutch, in order to be able to read and interpret the risk before answering. All the respondents chose to answer all questions which were asked during the interview. Furthermore, they all agreed on recording the interview. After the interview, the transcriptions were sent to the interviewees, asking them to check the transcriptions on correctness within a given timeframe. Some respondents had some minor remarks; in the end, all of them approved the transcription.

The respondents also provided a document that described the results of an internal (IT) project portfolio risk assessment. Other documentation to support the examples or arguments was unfortunately not accessible.

4.2.4. Data analysis

All gathered data was analyzed and coded according to the method, as described in paragraph 3.3.2.5. The first interview, which served as a test, was also included in the data analysis because, despite the interviewer's inexperience, the interview went well. The coded interviews and documents can be found in appendix 8. The data analysis resulted in two products.

First, all interview texts were coded on whether the respondent recognizes the risk from its own experience, could imagine it a risk, or could not imagine it begin a risk. This resulted in the matrix below (Table 6), where the rows represent the risks and the columns the respondents. The cell provides the answer to the question: Is the risk recognized? Some interview answers could be coded, but no argumentation was discovered, those are marked with a star (*) in the matrix. Also, for diverse reasons, some answers could not be classified; those are marked in the matrix with a double star (**).

It can be concluded that all risks are validated because all of them are at least once coded as recognized from experience. In other words, all the risks occurred within the case organization. However, it should be mentioned that the foundation of this validation varies per risk.

Table 6: Overview interview analysis

Risk /Respondent	A	B	C	D	E	F
Conflicts (1)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Communication (2)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Information (3)	Yes – experience	Yes – experience	Yes – experience	Yes – imagination*	Yes – experience	Yes – experience
Interdependencies (4)	Yes – experience	Yes – imagination *	Yes – imagination	Yes – experience	Yes – experience	Yes – experience
Personnel stability (5)	Yes – experience	Yes – experience	Yes – imagination *	Yes – imagination	No	No
Effectiveness of top management (6)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	**	Yes – experience
Portfolio components (7)	Yes – imagination	Yes – experience	Yes – experience	Yes – experience *	No	Yes – experience
Roles, responsibilities, and mandates (8)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Project portfolio processes or execution (9)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	**	Yes – experience
Quality of the portfolio manager (10)	No *	No	Yes – experience	Yes – experience	No	No
Quality of the portfolio component manager (11)	Yes – experience	No *	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Available resources (12)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Organizational politics (13)	**	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – imagination
Management commitment (14)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Adaptability to changes (15)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Stakeholders (16)	Yes – experience	Yes – experience	Yes – experience	No	Yes – experience	Yes – experience

* No argumentation discovered

** Answer insufficient to classify

Second, using the Metaplan method, arguments per risk were compared and grouped if needed. Also, overall argument descriptions were developed. The table below shows the overall result. The table presents per risk the arguments and the original source of those arguments. The source is the numbered argumentation text from the interviews or documents. The first letter describes the source, the first number the risk, and the second number the number of the argument per source per risk. For example, D.3.2 reflects source D, risk 3 (from the risk list) argument number 2 for this risk by this source.

For some risks, contradictory argumentation was discovered since some sources claimed it is a risk and others not—both providing argumentation to substantiate their claims. However, in the end, every risk in Table 7 is accompanied by at least one argument clarifying why it is a risk. So, it can be stated that for every risk, argumentation was discovered, which explains why it was or could be a risk for IT PPM within the case organization.

Table 7: Discovered risk argumentation

Risk	Argument	Source
Conflicts (1)	Goals might not be achieved or achieved with a delay, both negatively affecting portfolio benefits the organization expects to yield.	A1.1, B1.1, C1.1, D1.1, E1.1, F1.1
	Conflicts can have a positive effect, resulting in discussions, leading to better overall solutions.	E1.2
Communication (2)	If information is not communicated, IT PP steering is not possible, resulting in unexpected delays and negatively influencing portfolio benefits.	A2.1, B2.1, B2.2, D2.1, E2.1
	Insufficient communication harms the cooperation between business and IT within the portfolio.	C2.1, F2.1
	If portfolio goals are not communicated, the portfolio can become misaligned.	D2.2
Information (3)	Unclear information, like technical jargon, can lead to misunderstanding in the project's steering committee resulting in undirected projects within the portfolio.	A3.2, B3.2
	If information is of bad quality, portfolio steering, and decision making is not possible, which might lead to projects not solving the intended problem.	A3.1, B3.1, C3.1, E3.1, F3.1,
	Not possible to set proper project review criteria which may lead to wrong decisions	S3.1
Interdependencies (4)	Some interdependencies will only become visible during project execution. Portfolio results may not be achieved or achieved only after investing more resources than initially planned.	A4.1, C4.1, D4.1, E4.1
	The project portfolio is less efficient because projects are overlapping or working on similar things.	F4.1
Personnel stability (5)	The overall stability can be affected when the leading character for portfolio management on board level leaves.	A5.1
	It can cause disruptive effects because earlier made decisions and business cases are rechallenged.	B5.1
	Rarely a risk because portfolio management is teamwork, no one is unreplaceable, and portfolio management has a long-term focus, so the effects are negligible.	D5.1, E5.1, F5.1
Effectiveness of top management (6)	It can lead to an increase in the number of projects and a loss of focus within the portfolio.	A6.1
	The indecisiveness of top management is a risk because the organization will not be able to renew or innovate to keep up with (IT) developments.	A6.2, B6.1, C6.1, D6.1, F6.1
Portfolio components (7)	Insufficient insight is a risk because everything that happens within these components could ultimately affect the portfolio costs and benefits.	B7.1
	Portfolio component prioritization based on expected benefits is not possible.	A7.1, C7.1, E7.1, F7.1, S7.2
	Portfolio management cannot steer and direct on time, resulting in not realizing the portfolio planning.	S7.1
	It can lead to more changes than the organization can handle	S7.3
	Controlling and cashing the benefits in a structured way will not be possible.	S7.4
Roles, responsibilities, and mandates (8)	The risk is that projects can enter the portfolio and allocate resources without participating in the portfolio selection and prioritization process.	A8.1, B8.1
	Ambiguous project direction or no direction can cause delays and suboptimal choices.	C8.1, E8.1, F8.1
	Not enough courage and willingness to follow portfolio management advisements due to a lack of mandate. Resulting in a loss of credibility for project portfolio management within the organization.	D8.1, S8.1
Project portfolio processes or execution (9)	Inefficient portfolio steering due to misunderstandings, poor insights, and own objectives, eventually leading to delays.	A9.1, B9.1, C9.1, D9.1, F9.1, S9.3

	Projects are not reviewed on success criteria and benefits before entering the project portfolio	B9.2
	Poor decision-making regarding resource allocation and prioritization because projects cannot be compared	S9.1
	Processes must be reinvented in case of staff turnover	S9.2
Quality of the portfolio manager (10)	**Not a risk**, it is more in the mindset of all participants, and there are no clear deliverables for the portfolio manager.	A10.1
	The maturity of IT PPM might take longer with a bad performing portfolio manager.	A10.2
	The risk is poor quality; tasks will take more time, and mistakes are made.	C10.1
	The portfolio manager does not have enough influence on the role he/she performs.	D10.1
	Projects are initiated within the portfolio, which do not align with the organizational goals.	D10.2
	Not a risk, underperformance will be noticed before it has any effects.	E10.1
	Not a risk since portfolio management is a team effort.	F10.1
Quality of the portfolio component manager (11)	Projects within programs are not well placed or not placed on time within the portfolios.	A11.1
	The component manager's deliverables are the input for the portfolio (steering).	C11.1, F11.1
	Unable to grow to mature portfolio management.	D11.1
	Delays, cost overruns, and frustration on project and portfolio level.	E11.1
Available resources (12)	The risk is that not all approved demands can be fulfilled, possibly leading to delays and budget overruns.	A12.1, A12.2, B12.1, C12.1, C12.1, E12.1, F12.1, S12.1
	Estimating which IT resources are needed can be very complicated.	C12.2
Organizational politics (13)	The risk is that sub-optimal decisions are being made.	B13.1, E13.1, F13.1
	It can cause delays during implementation and possibly not achieving the set goals.	C13.1, D13.1
Management commitment (14)	An increase of projects and a loss of portfolio focus because of no effective centralized portfolio management.	A14.1, B14.1, F14.1
	Lack of support for portfolio component managers to achieve the desired results.	C14.1
	Business units will go for their results instead of the overall organizational results.	D14.1 S14.1
	Without management commitment, changes will not be accepted, and the results will not be achieved.	E14.1
Adaptability to changes (15)	The risk is not responding quick enough on developments, caused by a misunderstanding between business and IT, and the different pace of development between them.	A15.1, B15.1, C15.1
	Misalignment between portfolio and strategy, not doing the things which add the most value to the organization.	A15.2, D15.1, E15.1, F15.1
Stakeholders (16)	The risk is that it can cause (unexpected) delays, additional investments, or overall failure.	A16.1, B16.1, C16.1, E16.1, F16.1
	Not a risk, if a stakeholder is unaware of their role or engagement, the portfolio manager will support the stakeholder. If it remains unclear, then the stakeholder does not have a part and is not a stakeholder.	D16.1

One remark regarding the data analysis must be made. The last interview question asked the respondent if any risks were not included in the list. Several respondents replied with one more risk from which, in their opinion, should be incorporated in the list. They often provided argumentation to support their claims and gave recommendations on how to improve the list. These risks and the supplied argument were coded but not included in the analysis for two reasons. First, this research is aimed at validating the redesigns risk list and at discovering the argumentation of why it was a risk, not at identifying new risks. Second, it could be stated that the 'new' risk could be classified under an already existing risk in the list. And by so the argumentation they provided as well. It was chosen not to do this because it is the respondent's firm belief that the risk was missing or not sufficiently covered in the existing list. Simply merging them under a current risk category without reviewing the

overall risk list would be too reductive. These new risks, along with the argumentation and recommendations, should be carefully analyzed and incorporated in a new design iteration of the risk list.

5. Discussion, conclusions and recommendations

In this chapter, the outcome of the research is discussed. It contains a personal reflection on the research as well as the answer to the main research question. Furthermore, recommendations for practice and further research are presented.

5.1. Discussion – reflection

This subparagraph reflects on the way the research was conducted and the effects and the effect on the research quality. Most things within this research were directed accurately, supporting the overall quality, but obviously, there are always things that could have been done better.

First, on a general note, this research is aimed at validating risks from literature in practice. Not at discovering new risks. The result of the research is a list of validated risk, but it cannot be claimed that this list is complete. Leaving the question: Are any significant risks missing from the list? By not being listed at all, or by being a sub risk which should have been a main risk on its own. At the end of the interview, respondents were asked if they missed any risks on the list. But by that time, the list was already presented, and it would have been hard for respondents to answer that question with clear thoughts. A better way of asking would have been to ask the respondent at the beginning of the interview, to name the five most significant risks for IT PP(M). And in the end, if these risks should fall under one of the 16 main risks or should form a risk on its own. But as mentioned, this research is focused on validating, so maybe this question should not have been asked after all. For this, and earlier presented reasons, the answers about the other risks were not processed for this research.

The first part of this research is about the redesign of the risk list. By analyzing original literature and earlier research in a structured matter, the study group was able to develop an improved version of the risk list. Assuring that every risk was analyzed by two researchers independently turned out to be a powerful method for improvement. Although a solid redesign list was developed, I do think that the session to merge all student results into one new redesign could have been more extensive. It takes time to order thoughts. The redesign session took about two hours, another session one or two weeks later to review the result of the first session might have led to improved insights.

The data for the validation was gathered according to plan and was collected within the organization where the researcher is working. The researcher was aware of the possible influences this could have on the research. Afterward, it can be noted that these effects were negligible because the researcher did not know most of the respondents and did not have any prior knowledge about IT PP(M). The case organization perfectly fitted the set criteria, and finding respondents went expeditiously. A nice diverse selection of respondents was located and interviewed.

Two interviews were conducted via phone because of the worldwide outbreak of the COVID-19 virus. Obviously, interacting with the respondent was harder in those interviews, and the interviews seemed to be a bit shorter. What did help was that the interviewer had met these respondents before in another setting. Also, these were the last interviews to be conducted, so the researcher was already familiar with the interview questions and procedures, making it easier to respond to the different situation. The effects on the overall validity are therefore rather limited.

However, some aspects of data gathering could have been done with more awareness. For instance, interviewing seemed easy with a strict and well-prepared interview protocol, but conducting those interviews turned out the be quite hard. The interview protocol was not strictly followed, and during the data analysis, a couple of suggestive follow-up questions were found. Also, few documents were gathered to support the experiences of the respondents, making it hard to use triangulation. By noticing those points, repairs could be made during the data analysis. Despite these points, I am convinced that the data gathered is the correct data and of sufficient quality.

Analyzing the data was a bit harder because the interview protocol was not strictly followed. Especially coding the answers based on experience or imagination took more time. Overall, the data analysis went according to the plan. The interviews were carefully coded, the text was marked, and arguments were numbered. It led to a transparent and traceable overview of the data analysis, which makes the process repeatable.
Nevertheless, one remark about the data analysis must be made. The Metaplan method was used to order the arguments in the second coding cycle. This method is more powerful when a group of researchers performs it since it generates discussion, and researcher bias can be prevented. In this case, a group session would not have been possible because of the regulations for the graduation thesis.

Overall, it can be stated that most of the research was conducted as planned, with attention to quality aspects such as reliability and validity. Some points could have been done differently, but by noticing those on time, a severe impact on the research quality was prevented.

5.2. Conclusions

The main question for this research is: *What are the possible risks for IT project portfolios?* To answer this main question, two sub-questions were formulated.

RQ1: Which risks are identified within IT PPM literature?

To answer this question, this research builds upon results from previous studies. In this earlier research projects, a list of possible IT PPM risks was developed and validated in practice. The results of these researches were accurately analyzed at which the workload was shared by the study group. During a plenary session, based on the outcome of the analysis, the list of possible risks for IT PP(M) was redesigned. This redesigned list is consisting of 16 main risks, each covered by many sub risks. Each main risk is provided with a Dutch and English definition, and for all sub risk, the sources are displayed. The redesigned list itself (Appendix 6) provides the answer to RQ1.

RQ2: Which of the identified risks from IT PPM literature occurred within the case organization, and why was it a risk?

This question consists of two parts being the occurrence of the risk and the argumentation of why it was or could be a risk. Both parts were answered by committing a singular case study within an organization. Multiple interviewees were asked about their experiences with those risks, to explain and to provide argumentation. The results were carefully analyzed in a structured way. Result one from this analysis is a matrix where for every risk and respondent is set of whether they recognized the risk from their experience. From this matrix, it can be concluded that all 16 risks occurred within the case organization, meaning that all listed risks are validated in practice. The second result from the analysis is an overview of the argumentation of why it was a risk. For every listed risk, at least one argument was discovered explaining why it is a genuine risk, answering the second part of RQ2.

Main question: What are the possible risks for IT project portfolios

The main question is answered by combining the results from RQ1 and RQ2. Since all risks are validated in this singular case study, the redesigned list provides an overview of possible risks for IT PP(M). The argumentation table substantiates why these are risks for IT PP(M).

This research is of scientific value in the field of risks for IT PP(M) because it connects theory and practice. It orders possible risks for IT PP(M) based on a literature analysis combined with validation results from previous research. The result is a redesigned list, which is then validated in a real-life setting. By so, this research develops knowledge since it proves that risks from theory occur in practice. By discovering arguments from practice, the overall understanding regarding risks for IT PPM improves. Guiding further scientific exploration as well as practical knowledge for organizations with IT PP(M).

5.3. Recommendations for practice

Organizations are constantly changing, to gain or keep a competitive advantage and to keep up with (IT) developments. These changes are often organized within projects, and these projects are directed and steered via project portfolio management. The success of these project portfolios is essential for the organization. It is the task of portfolio management to manage these portfolio risks and to balance the portfolio between risks and expected benefits in accordance with the organization's risk appetite and strategy. The list of validated risks can help project portfolio management to identify possible risks for their organizations. The argumentation per risk can give more insights into the reasons why it could be a risk to make it easier to manage those risks, for instance, by taking mitigating measures. The validated list and corresponding arguments can be used in addition to, or as a start of project portfolio risk identification and management within organizations. Although the results of this research can be of great value for organizations, be aware since this research was not focused on presenting a complete comprehensive list of all risks for IT PP(M).

5.4. Recommendations for further research

While this research tries to shed light on some aspects of risks for IT PP(M). Multiple other but relating questions can be asked. Also, the redesigned list could be further improved based on the experiences and data collected form this research. The following recommendations are made:

- Several recommendations to improve the list, for instance, regarding the risk definition or other risks, were made by the respondents during the interviews. To enhance the (usability) of the list is recommended to redesign the list once more.
- This research focuses on validating risks, not on discovering new risks. It might be interesting to conduct research aimed at finding risks that are not included in the list yet. This might indicate how complete the current list is.
- All listed risks are validated in this research, although there are differences in the foundation of these validations. For some risk contradicting classifications and arguments were discovered, this might indicate that the risk definition is too abstract. It is recommended that future list redesign focusses on those risk categories to create further understanding.
- It is recommended to further develop this list into an even more practical tool or model for IT PPM. Two research directions might be interesting for this purpose. First, to research the weighing factors of the risks, which ones from the list generated considerable impact, and how often did they occur? Second, how do these risks originate, and which measures to mitigate the risks were taken within organizations? The raw data gathered in this research and previous research might contain some measures already.

- As described earlier, this research was conducted within a study group. After the list redesign, all six students undertook a singular case study to validate the risk and discover argumentation. It is therefore recommended to conduct a comprehensive analysis of the results of all these six case studies. The conclusions from this analysis will have a solid base since the data is collected by multiple researchers, from various sources and organizations. It will also collect the arguments and can serve as a starting point for a new redesign cycle.

References

AlgemeneRekenkamer. (2007). Lessen uit ICT-projecten bij de overheid deel A.

Bhattacherjee, A. (2012). Social science research: Principles, methods, and practices.

Cloyd, H. e. a. (1973). *Gesprächstechnik fÜr Gruppen*.

Coyne, I. T. J. J. o. a. n. (1997). Sampling in qualitative research. Purposeful and theoretical sampling; merging or clear boundaries? *, 26*(3), 623-630.

Creswell, J. W. (2013). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*: SAGE Publications.

Cubeles-Márquez, A. J. E. J. f. t. I. P. (2008). IT Project Portfolio Management-The strategic vision of IT projects. *9*(1), 31-36.

De Reyck, B., Grushka-Cockayne, Y., Lockett, M., Calderini, S. R., Moura, M., & Sloper, A. J. I. J. o. P. M. (2005). The impact of project portfolio management on information technology projects. *23*(7), 524-537.

Drake, J. R., & Byrd, T. A. (2006). Risk in information technology project portfolio management. *Journal of Information Technology Theory*

Application, 8(3), 3.

Elonen, S., & Artto, K. A. J. I. J. o. P. M. (2003). Problems in managing internal development projects in multi-project environments. *21*(6), 395-402.

Frey, T., & Buxmann, P. (2011). The importance of governance structures in IT project portfolio management.

Ghasemi, F., Sari, M., Yousefi, V., Falsafi, R., & Tamošaitienė, J. (2018). Project portfolio risk identification and analysis, considering project risk interactions and using Bayesian networks. *10*(5), 1609.

Gibbert, M., & Ruigrok, W. J. O. r. m. (2010). The ‘‘what’’and ‘‘how’’of case study rigor: Three strategies based on published work. *13*(4), 710-737.

Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design Science in Information Systems Research. *MIS Quarterly, 28*(1), 75-105. doi:10.2307/25148625

Hofman, M., Spalek, S., & Grela, G. J. S. (2017). Shedding new light on project portfolio risk management. *9*(10), 1798.

ISACA. (2009). The Risk IT Framework. *Information Systems Audit and Control Association*.

Jeffery, M., & Leliveld, I. J. M. S. M. R. (2004). Best practices in IT portfolio management. *45*(3), 41.

Markus, M. L., Majchrzak, A., & Gasser, L. J. M. q. (2002). A design theory for systems that support emergent knowledge processes. 179-212.

Martinsuo, M., & Lehtonen, P. J. I. j. o. p. m. (2007). Role of single-project management in achieving portfolio management efficiency. *25*(1), 56-65.

McFarlan, W. J. J. o. S. M. (1982). Portfolio approach to information-systems. *33*(1), 12-19.

Merriam, S. B. (2009). *Qualitative Research: A Guide to Design and Implementation*: John Wiley & Sons.

Meskendahl, S. J. I. J. o. P. M. (2010). The influence of business strategy on project portfolio management and its success—a conceptual framework. *28*(8), 807-817.

Mosavi, A. (2014). Exploring the roles of portfolio steering committees in project portfolio governance. *International Journal of Project Management, 32*(3), 388-399.

Patanakul. (2015). Key attributes of effectiveness in managing project portfolio. *International Journal of Project Management, 33*(5), 1084-1097.

Petro, Y., & Gardiner, P. J. I. J. o. P. M. (2015). An investigation of the influence of organizational design on project portfolio success, effectiveness and business efficiency for project-based organizations. *33*(8), 1717-1729.

PMI. (2008b). The standard for Portfolio Management - 2nd edition.

PMI. (2013). The standard for portfolio management. Retrieved from http://www.books24x7.com/marc.asp?bookid=51358

Rank, J., Unger, B. N., & Gemünden, H. G. J. I. J. o. P. M. (2015). Preparedness for the future in project portfolio management: The roles of proactiveness, riskiness and willingness to cannibalize. *33*(8), 1730-1743.
Saldaña, J. (2009). *The coding manual for qualitative researchers*: Sage.
Sanchez, H., Robert, B., Bourgault, M., & Pellerin, R. J. I. j. o. m. p. i. B. (2009). Risk management applied to projects, programs, and portfolios. *2*(1), 14-35.
Saunders, M., Lewis, P., & Thornhill, A. (2016). *Research methods for business students*: Pearson.
Senft, S., & Gallegos, F. (2008). *Information technology control and audit*: Auerbach publications.
Smaele. (2013). IT-projectportfoliorisico.
Standish-Group. (2015). The chaos report.
Student1. (2018). *IT Project Portfolio Risk Management.* Open Universiteit,
Student2. (2018). *IT-projectportfoliorisico.* Open Universiteit,
Student3. (2018). *What are the risks of IT Project Portfolio for organizations?* Open Universiteit,
Teller, J., & Kock, A. J. I. J. o. P. M. (2013). An empirical investigation on how portfolio risk management influences project portfolio success. *31*(6), 817-829.
Verschuren, P., & Doorewaard, H. J. V. d. (2007). Het ontwerpen van een onderzoek.
Vrhovec, S. L. R., Hovelja, T., Vavpotič, D., & Krisper, M. (2015). Diagnosing organizational risks in software projects: Stakeholder resistance. *International Journal of Project Management, 33*(6), 1262-1273. doi:10.1016/j.ijproman.2015.03.007
Westerman, G. (2004). Understanding the Enterprise's IT Risk Profile.
Yin, R. K. (2014). *Case Study Research*: SAGE Publications.

Appendix 1 Risk list (cycle 2)

Nr.	Name risk category	Risk definition (Dutch)
1	Conflicts	Er is sprake van conflicten op een of meerdere besluitvormingsgremia van het portfolio
2	Communication	Er is sprake van onvoldoende transparantie in de informatievoorziening en/of gebrek daaraan wat leidt tot het nemen van verkeerde beslissingen.
3	Lack of inter project abilities	Het is niet mogelijk om resources van het ene project in te zetten bij een ander project binnen het portfolio
4	Finance	De beschikbare financiële middelen om de projecten binnen de portfolio uit te voeren is onvoldoende
5	Personnel stability	Er is onvoldoende zekerheid ten aanzien van de personele bezetting van de portfolio staf en de onderliggende projecten
6	Implement ability	Onvoldoende actiegerichtheid binnen de projecten
7	Effectiveness of top management	Topmanagement is niet besluitvaardig
8	Inadequate consideration of changes in the environment	Onvoldoende zicht op de interne en externe omgeving van de organisatie en de gevolgen daarvan voor de organisatie strategie en de samenstelling van het portfolio
9	Insufficient project risk management	Onvoldoende zicht op project risico's dan wel het onvoldoende adequaat omgaan met deze risico's.
10	Incompetence environment governance	De governance van het portfolio is onvoldoende
11	Insufficient account of change in projects	Onvoldoende zicht op veranderingen binnen projecten en de eventuele gevolgen voor het portfolio
12	Too complex processes	De structuur van de portfolio management is te complex
13	Lack of processes	De portfolio processen zijn afwezig of van onvoldoende kwaliteit
14	Incompetence of portfolio manager	De kwaliteit van de projectportfolio manager is onvoldoende
15	Resources	De beschikbare resources zijn onvoldoende om alle strategische projecten in het portfolio te realiseren
16	Organizational politics	Door het beïnvloeden van de beeldvorming en opinie van anderen over een bepaald onderwerp, door politiek te bedrijven wordt er alleen gekeken naar de kortetermijndoelstelling of eigen belang in plaats van de lange termijn doelstelling.
17	Commitment	Het management is niet betrokken bij de projecten en de portfolio
18	Top manager interference	Topmanager beïnvloed direct de keuze voor projecten waardoor er geen afgewogen keuze wordt gemaakt op basis van objectieve criteria
19	Portfolio's value	Onduidelijk wat het portfolio oplevert qua waardevermeerdering
20	Rapid changing strategic goals	Te snelle wijzigingen van strategische doelen door mogelijke positieveranderingen waardoor de aansluiting van de uitkomsten van de projecten in het portfolio niet meer aansluit bij de nieuwe strategische doelen.
21	Stakeholders	Onvoldoende rekening houden met de belangen van relevante stakeholders.

Source: *(Student1, 2018;* Student2*, 2018; Student3, 2018)*

Appendix 2 Detailed overview risk areas (cycle 2)

No.	Risk	Risk definition		Underlying risks	Source
8	Inadequate consideration of changes in the environment	Insufficient insights into the internal and external environment for the organization and the consequences for the organizational strategy and the composition of the portfolio.	8a	Political, social or legislative changes which lead to changing the organizational strategy, and project's objectives lack of alignment with the new strategy	Ghasemi et al. (2018)
			8b	Significant changes in the project or program environment	Hofman et al. (2017)
			8c	No adaptability to internal and external changes	P. Patanakul (2015)
			8d	Missing political objectives	Smaele (2013)
			8e	Political deadlines	Smaele (2013)
			8f	Non-compliance to legislation	Smaele (2013)
			8g	IS critical to delivery of current corporate services	Smaele (2013)
			8h	IS critical to future decision support aid	Smaele (2013)
			8i	IS critical to delivery of future corporate services	Smaele (2013)
			8j	Rapid and recurring changes in roles, responsibilities or organization structure	Smaele (2013)
			8k	Change in an approach of key project or program stakeholders	Hofman et al. (2017)
9	Insufficient project risk management	Insufficient insights in project risks and or inadequate handling of those risk.	9a	Absence of project visibility	P. Patanakul (2015)
			9b	Absence of predictability of project delivery	P. Patanakul (2015)
			9c	Risks arising from the unknowns at the cost estimation of the execution of selected portfolio elements	Hofman et al. (2017)
			9d	Risks arising from the application of innovative technical and material solutions in the portfolio elements	Hofman et al. (2017)
			9e	Understanding of risk and return – portfolio weighted accordingly.	Smaele (2013)
			9f	The portfolio is frequently evaluated in terms of overall risk and financial value	Smaele (2013)
			9g	Ignoring risks by portfolio element managers	Hofman et al. (2017)
10	Incompetence environment governance	The governance of the project portfolio is insufficient.	10a	Governance review board's incompetency	Ghasemi et al. (2018)
			10b	The roles and the responsibilities of a portfolio manager are not clear or digested	Smaele (2013)
			10c	No defined owner, business or personnel strategy for portfolio	Smaele (2013)
			10d	Unclear roles and responsibilities at the project level	Smaele (2013)
			10e	Governance structure does not map to organizational culture	Smaele (2013)
			10f	Many bodies are entitled to set up a project	Smaele (2013)
			10g	Improper organizational anchoring central control tasks	Smaele (2013)
			10h	Improperly operating steering committees of projects, project groups and programs	Hofman et al. (2017)
11	Insufficient account of change in projects	Insufficient insight into the changes within projects and the consequences for the project portfolio.	11a	Significant change in the basic parameters of particular portfolio elements	Hofman et al. (2017)
			11b	Project progress monitoring is infrequent	Smaele (2013)
			11c	Projects are not killed.	Smaele (2013)
			11d	Project delay	Smaele (2013)
			11e	Project costs overruns	Smaele (2013)
			11f	Failure to meet required functional and technical specifications	Smaele (2013)
12	Too complex processes	The structure of portfolio management is too complex.	12a	Overly complicated hierarchical structure of portfolio management	Hofman et al. (2017)
			12b	Too extensive composition of a steering committee and a project team.	Hofman et al. (2017)
13	Lack of processes	The portfolio processes are not present or not of good quality.	13a	Absence of cooperation quality	Rank, Unger, and Gemünden (2015)
			13b	The absence of a project manager with authority and/or responsibility	Petro and Gardiner (2015)
			13c	Absence of transparency in portfolio decision making	P. Patanakul (2015)
			13d	Improper control over lifecycles if projects and programs	Hofman et al. (2017)
			13e	Lack of developed methodical standards within the scope of portfolio management	Hofman et al. (2017)
			13f	Lack of centralized view: No common, real time up-to-date portfolio database	Smaele (2013)

			13g	Lack of adequate portfolio software. Real-time updates, performance, health, ability to search and analyses	Smaele (2013)
			13h	Centralized project office monitors projects	Smaele (2013)
			13j	Well-defined scheme for screening, categorizing, and prioritizing projects.	Smaele (2013)
			13k	Portfolio management approach to rank project investments.	Smaele (2013)
			13l	Methods and guidelines for portfolio evaluation, project planning and management are inadequate	Smaele (2013)
			13m	Lack of use of financial metrics in prioritizing NPV, ROI, IRR.	Smaele (2013)
			13n	Lack of formalized ITPPM activities	Smaele (2013)
			13o	Ineffective or no formal process	Smaele (2013)
			13p	Systematic review of projects at specific stages.	Smaele (2013)
			13q	Tracking of project benefits after project development is complete.	Smaele (2013)
			13r	Project outcomes are always compared with the original targets	Smaele (2013)
			13s	Project benefits are frequently centrally tracked.	Smaele (2013)
			13t	No feedback given to the project level.	Smaele (2013)
			13u	Weak Go decisions: resources, value and priority not considered properly	Smaele (2013)
			13v	Lack of developed methodical standards within the scope of portfolio element management	Hofman et al. (2017)
14	Incompetence of portfolio manager	The quality of the portfolio manager is insufficient.	14a	Portfolio manager's incompetence	Ghasemi et al. (2018)
			14b	Lack of appropriate competencies of the portfolio manager and of the portfolio support structures	Hofman et al. (2017)
			14c	Unclear responsibilities	Smaele (2013)
			14d	Inefficient single-project management	Smaele (2013)
			14e	Improper competencies of project and program managers	Hofman et al. (2017)

Source: (Student1, 2018; Student2, 2018; Student3, 2018)

Appendix 3 Analysis per risk

Analysis risk 8						
No.	Risk	Source	Source description	Portfolio level risk?	Correct category ?	Explanation & Recommendations
8a	Political, social or legislative changes which lead to changing the organizational strategy, and project's objectives lack of alignment with the new strategy	Ghasemi et al. (2018)	Ghasemi et al. (2018) propose an overview of portfolio level risks; these risks are subsequently validated by interviewing several experts. One valid risk was used as a source for the model being: 'Political, social, legislative changes which lead to changing the organizational strategy, and projects objectives lack alignment with the new strategy.' Ghasemi et al. (2018) place this risk under a more comprehensive definition of: 'Strategic Lack of alignment.'	Yes	Yes	The risk which was derived from Ghasemi et al. (2018) is about the lack of alignment because of political, social, legislative changes. This risk complies with the meaning of the original statement.
8b	Significant changes in the project or program environment	Hofman et al. (2017)	Committed a literature review to identify IT PPM risks and categorized these risks in component, structural and overall risks. Structural risks concern risk, which deals with the composition of a group of projects. Component risks are project risks that need to go to the portfolio level for information or action. The overall risks consider interdependencies between projects. Furthermore, the identified risks were connected to selected phenomena, which were also derived from literature and used for hypothesis testing.	Yes	Yes	According to Hofman et al. (2017) this risk is a component risk. Since this risk deals with changes and the reaction of changes, it is categorized correctly.
8k	Change in an approach of key project or program stakeholders			Yes	No	According to Hofman et al. (2017) this risk is a component risk. This risk deals with the change of approach of stakeholders. It would be a better fit under risk 21.
8c	No adaptability to internal and external changes	P. Patanakul (2015)	Patanakul (2015) Identifies six key attributes of PPM effectiveness. One of those attributes is the adaptability to internal and external changes, which is defined by the authors as: The adaptability to address risks and uncertainties. They also propose that 'the higher the adaptability of the portfolio to internal and external changes indicates the higher the effectiveness in managing the project portfolio.' According to Student1 (2018); Student2 (2018); Student3 (2018) the absence of adaptability to internal and external risk is a risk, and this risk was used as a source for risk 8.	Yes	Yes	Patanakul (2015) claims that IT PPM is more effective when organizations are able to address risks and uncertainties and claims that higher adaptability indicates more effective PPM. Also, Patanakul (2015) refers to adaptability to address risks and uncertainties. It can be concluded that the risk matches the overall original statement.
8g	IS critical to delivery of current corporate services	Smaele (2013) based on an article from McFarlan (1982)	McFarlan (1982) describes that IS projects has been struggling due to the failure to asses project risks, and the failure to consider the aggregate risks of portfolios of projects and because the management approaches are not tailored to the specific projects. McFarlan states that companies should develop a risk profile of the portfolio and presents issues that influence IS towards high or low-risk profiles. Three of the issues were interpreted as a risk by Smaele (2013).	No	--	The risks used from the article by McFarlan (1982) are part of questions to determine if an organization has a high or low-risk profile. For instance, if the organization is depending on IS, the portfolio would be marked as high risk. So, these are actually not risks itself but questions to determine if the portfolio is a high risk or not. Also, these 'risks' are very general and do not specifically refer to IT PPM and should therefore not be included in the redesigned list.
8h	IS critical to future decision support aid					
8i	IS critical to delivery of future corporate services					
8j	Rapid and recurring changes in roles, responsibilities or organization structure	Smaele (2013) based on an article from Elonen and Artto (2003)	In the article by Elonen and Artto (2003), problems for managing multiple internal development projects are described. Furthermore, a case study was committed to identify IT PPM risks, and all risks were categorized in problem areas.	Yes	Yes	This risk was categorized by Elonen and Artto (2003) under the problem area of 'Lacking commitment, and unclear responsibilities' was used as a risk from this article. It is not literally about lacking roles or structure, it is more about change, and therefore it fits as a source for this risk.
8f	Non-compliance to legislation	Smaele (2013) based on the Risk IT	The Risk IT Framework by ISACA (2009) provides organizations with a tool to identify, govern, and manage IT risks. Smaele (2013) mentions that according to ISACA (2009) organizations should comply with laws and regulations to prevent sanctions and	Yes	Yes	Although this risk could be valid for IT PPM, none of the sources mentions explicitly or argues why this would be the case. This risk has similarities with

		Framework by ISACA (2009)	reputational damage. Noncompliance to legalization is identified by Smaele (2013) as an ITPPM risk and used as a source for risk 8. The Risk IT Framework (ISACA, 2009) is a comprehensive framework referring to all possible IT risks, Smaele (2013) does not argue why this risk should also be credible for IT PPM.			risk 8a from Hofman et al. (2017) and thus, the decisions were made to include these risk sources in the redesigned list.
8d	Missing political objectives	Smaele (2013) based on a report by (AlgemeneRekenkamer, 2007)	The Algemene rekenkamer published a report in 2007 with lessons learned from IT projects within the government (AlgemeneRekenkamer, 2007). Smaele (2013) does not provide any argumentation for why these project risks could be valid risks for IT PPM as well.	Yes	Yes	Although this risk could be valid for IT PPM, none of the sources mentions explicitly or argues why this would be the case. The report from the AlgemeneRekenkamer (2007) is explicitly about IT projects and not about IT PPM. But, because this risk has similarities with risk 8a from Hofman et al. (2017) and thus, the decision was made to include these risk sources in the redesigned list.
8e	Political deadlines			Yes	Yes	Although this risk could be valid for IT PPM, none of the sources mentions explicitly or argues why this would be the case. The report from the AlgemeneRekenkamer (2007) is explicitly about IT projects and not about IT PPM. But, because this risk has similarities with risk 8a from Hofman et al. (2017) and thus, the decision was made to include these risk sources in the redesigned list.

Interview Content	Recommendation
All 16 respondents answered the question(s) related to this risk. From the overall analysis, it can be concluded that only one respondent (3.5) answered the question, argued why and provided an example. Other respondents (1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 3.2, 3.3, 3.4) answered that the organization is not considering changes as it should be, but did not answer the question about risk recognition and corresponding argumentation. Respondent 1.1 and 1.5 talk about projects. Respondent 2.4 states that his organization has enough insight into changes but does not mention if it could be a risk or not. Respondent 2.5 does not recognize the risk and does not argue why. And last, respondent 3.6 answers that it could be a risk but does not say anything else.	From the lack of to the point answers to the interview questions, it is concluded that risk definition is not clear enough. The following change is proposed: Insufficient adaptability to internal and external changes - Insufficient insights into the internal and external environment of the organization, the possible consequences for the IT PP, and the inability to adapt to changes.

Analysis risk 9						
No.	Risk	Source	Source description	Portfolio level risk?	Correct category ?	Explanation & Recommendations
9a	Absence of project visibility	Patanakul (2015)	Patanakul (2015) Identifies six key attributes of PPM effectiveness. Two of these attributes are project visibility and predictability of project delivery. The absence of those two attributes was classified as a risk by (Student1, 2018; Student2, 2018; Student3, 2018). By project visibility, the author means: "the degree of exposure of a project to its stakeholders". Predictability of project delivery is described as: "that the PPM committee is able to anticipate the project delivery or performance in advance".	Yes	No	According to the explanation of Patanakul (2015), the risk lack of project visibility is about exposure to stakeholders. This risk should be moved to risk 21.
9b	Absence of predictability of project delivery			Yes	No	According to the explanation of Patanakul (2015), this risk is about insights in project delivery and should be placed under risk 11.
9c	Risks arising from the unknowns at the cost estimation of the execution of selected portfolio elements	Hofman et al. (2017)	Committed a literature review to identify IT PPM risks and categorized these risks in component, structural and overall risks. Structural risks concern risk, which deals with the composition of a group of projects. Component risks are project risks that need to go to the portfolio level for information or action. The overall risks consider interdependencies between projects. Furthermore, the identified risks were connected to selected phenomena, which were also derived from literature and used for hypothesis testing.	Ye	No	Hofman et al. (2017) categorize this risk as an overall risk, so it deals with the interdependencies between projects. So it is about deep insights into portfolio components, the way they influence each other, and the consequences for the portfolio. his risk is about a portfolio component and should be placed under risk 11
9d	Risks arising from the application of innovative technical and material solutions in the portfolio elements			Yes	No	Hofman et al. (2017) categorize this risk as a component risk, which means that it is a project risk that should be escalated to the portfolio level. This risk is about a portfolio component and should be placed under risk 11
9g	Ignoring risks by portfolio element managers			Yes	Yes	Hofman et al. (2017) categorize this risk as a component risk, which means that it is a project risk that should be escalated to the portfolio level. This risk matches with the overall risk 9.
9e	Understanding of risk and return – portfolio weighted accordingly.	Smaele (2013) based on an article from (Jeffery & Leliveld, 2004)	Jeffery and Leliveld (2004) committed a survey regarding IT portfolio management adoption in order to define best practices. In their article, the IT Portfolio management maturity model is presented.	Yes	No	This risk is originated from the IT Portfolio management maturity model under the factor of 'Active Portfolio management.' It is a precondition for companies to score synchronized in the maturity model. So, this risk is not only about understating; it is even more about actively managing the portfolio. Therefore, this risk should be placed under risk 10.
9f	The portfolio is frequently evaluated in terms of overall risk and financial value	Smaele (2013) based on an article from (De Reyck et al., 2005)	The author investigates whether there is a correspondence between the use of PPM processes and the performance of those projects and project portfolios. Also, a scheme for the adoption of IT PPM is presented. The authors prove a positive correlation between the level of adoption of IT PPM processes and the decrease of project problems and a positive correlation regarding project performance.	Yes	No	This risk comes from the 'Adoption level analysis per stage' under the element of: Overall Portfolio Analysis in stage III (De Reyck et al., 2005). This element was created from three results from the survey: 1. Management of project diversification 2. Management of Risk vs. Reward analysis of project portfolio 3. Management of the financial analysis of project portfolio In line with the previous risk, this risk is also about active management and control. This risk should also be placed under risk 10.
Interview Content				Recommendation		
All respondents from Student1 (2018) rate that their organization is performing poorly on project risk management. The respondents from Student2 (2018) also rate their organization and mention that risk management is complicated, and improvement can be made within the case organization. Unfortunately, none of the respondents from Student1 (2018); Student2 (2018) answer the questions if it could be a IT PPM risk and if they are familiar with the risk. From Student3 (2018), respondent 3.1 and 3.5 answer that the organization is not performing good enough on project risk management. The other respondents (3.2, 3.3, 3.4, 3.6) admit that they recognize the risk and specify that in their organization, this is mainly because of cultural aspects.				From the interview answers, it seems that either the risks are not explained or interpreted correctly, or the risk it not recognized by many respondents. The respondents from (Student3, 2018) seemed to understand the risk. It is proposed to change the statement to: Quality of the portfolio component managers - The quality of the portfolio component managers is insufficient. This change is also necessary because only one of the original sources remains a source for this risk category.		

Analysis risk 10						
No.	Risk	Source	Source description	Portfolio level risk?	Correct category ?	Explanation & Recommendations
10a	Governance review board's incompetence	Ghasemi et al. (2018)	Ghasemi et al. (2018) propose an overview of portfolio level risks; these risks are subsequently validated by interviewing several experts.	Yes	No	Within their study the risk of incompetence regarding the portfolio manager and the governance review board was places placed in a comprehensive risk definition of incompetence. This seems legitimate but then this risk category might become so generalized that it loses its usefulness. The portfolio manager is responsible for the operational management of the portfolio. The governance review board for project selection, prioritization, review and termination (Ghasemi et al., 2018; Mosavi, 2014) with the ultimate focus on strategic alignment. Also, the governance review board often consists of multiple members so incompetence could refer to different characteristics in comparison with a single portfolio manager. Members of the board typically involve portfolio managers, functional managers (project owners), resource managers, and top management (representatives)(Mosavi, 2014). This risk should be placed under risk 7 effectiveness of top management.
10h	Improperly operating steering committees of projects, project groups, and programs	Hofman et al. (2017)	Committed a literature review to identify IT PPM risks and categorized these risks in component, structural and overall risks. Structural risks concern risk, which deals with the composition of a group of projects. Component risks are project risks that need to go to the portfolio level for information or action. The overall risks consider interdependencies between projects. Furthermore, the identified risks were connected to selected phenomena, which were also derived from literature and used for hypothesis testing.	Yes	No	This risk was marked as a component risk by Hofman et al. (2017). It reflects the quality of the steering committees and should be placed as a source for risk 9, the quality of portfolio component managers.
10b	The roles and the responsibilities of a portfolio manager are not clear or digested	Smaele (2013) based on an article from Elonen and Artto (2003)	In the article by Elonen and Artto (2003), problems for managing multiple internal development projects are described. Furthermore, a case study was committed to identify IT PPM risks, and all risks were categorized in problem areas.	Yes	Yes	Elonen and Artto (2003) placed this risk in the problem area of: inadequate definition, planning, and management of single projects. The risk matches with overall risk, but the overall risk definition should be rephrased.
10c	No defined owner, business or personnel strategy for portfolio			Yes	Yes	Elonen and Artto (2003) placed this risk in the problem area of: inadequate definition, planning, and management of single projects. The risk matches with overall risk, but the overall risk definition should be rephrased.
10d	Unclear roles and responsibilities at the project level			Yes	Yes	Elonen and Artto (2003) placed this risk in the problem area of: inadequate definition, planning, and management of single projects. The risk matches with overall risk, but the overall risk definition should be rephrased.
10f	Many bodies are entitled to set up a project			Yes	Yes	Elonen and Artto (2003) placed this risk in the problem area of: inadequate definition, planning, and management of single projects. The risk matches with overall risk, but the overall risk definition should be rephrased.
10e	Governance structure does not map to organizational culture	Smaele (2013) based on article from Frey and Buxmann (2011)	Frey and Buxmann (2011) explored IT PPM regarding companies' organizational and decision-making structures.	Yes	No	This risk is about governance structures and would fit under risk 12.
10g	Improper organizational anchoring central control tasks			Yes	Yes	The risk matches with overall risk, but the overall risk definition should be rephrased.
Interview Content				Recommendation		
Only Student1 (2018); Student2 (2018) asked interview questions regarding the incompetence of portfolio governance. For unknown reasons, Student 3 did list this possible risk. Respondent 1.1, 1.2, 1.3, 1.5 provide answers aiming at governance and are mostly focused on project direction/ steering. The answer of respondent 1.4 does not direct the question being				The interview answers are not specific, which might be the case because governance is a catch-all term. The underlying sources discuss roles, responsibilities, ownership, structure, procedures, and control		

asked. Respondents 2.1, 2.2, 2.4 state that the governance in their organization is not good enough, but do not specify if they consider it is a risk. Respond 2.3 and 2.3 argue that governance within their organization is sufficient and does not think it a risk.	tasks. The name and explanation should be more specific, also because the composition of the sources for this risk has changed. The following change is proposed: Insufficient control, roles, and responsibilities - The control, roles, and responsibilities of the project portfolio are insufficient.

Analysis risk 11						
No.	Risk	Source	Source description	Portfolio level risk?	Correct category ?	Explanation & Recommendations
11a	Significant change in the basic parameters of particular portfolio elements	Hofman et al. (2017)	Committed a literature review to identify IT PPM risks and categorized these risks in component, structural and overall risks. Structural risks concern risk, which deals with the composition of a group of projects. Component risks are project risks that need to go to the portfolio level for information or action. The overall risks consider interdependencies between projects. Furthermore, the identified risks were connected to selected phenomena, which were also derived from literature and used for hypothesis testing.	Yes	Yes	This risk was marked as a component risk by Hofman et al. (2017). It is about changes in portfolio components and matches the overall risk definition.
11b	Project progress monitoring is infrequent	Smaele (2013) based on an article from Elonen and Artto (2003)	In the article by Elonen and Artto (2003), problems for managing multiple internal development projects are described. Furthermore, a case study was committed to identify IT PPM risks, and all risks were categorized in problem areas.	Yes	Yes	Elonen and Artto (2003) place this risk under the problem area of: inadequate definition, planning, and management of single projects. It matches with the overall risk definition.
11c	Projects are not killed.			Yes	Yes	Elonen and Artto (2003) place this risk under the problem area of: resource allocation and inadequate definition, planning, and management of single projects. They explain that projects are not killed even if the justification to continue is missing. It matches with the overall risk definition.
11d	Project delay	Smaele (2013) based on article from Jeffery and Leliveld (2004)	Jeffery and Leliveld (2004) committed a survey regarding IT portfolio management adoption in order to define best practices. In their article, the IT Portfolio management maturity model is presented.	No	--	In the article by Jeffery and Leliveld (2004) and in the report by Smaele (2013) no argumentation is provided why these risks are valid for project portfolios. If this risk occurs, it could affect the portfolio, but when following this line of reasoning every project risk could be categized as a portfolio level risk. This research aims at finding specific IT PP risks; therefore, this project focused risk should not be included in the revised model.
11e	Project costs overruns			No	--	In the article by Jeffery and Leliveld (2004) and in the report by Smaele (2013) no argumentation is provided why these risks are valid for project portfolios. If this risk occurs, it could affect the portfolio, but when following this line of reasoning every project risk could be categized as a portfolio level risk. This research aims at finding specific IT PP risks; therefore, this project focused risk should not be included in the revised model.
11f	Failure to meet required functional and technical specifications	Smaele (2013) based on an article from Westerman (2004)	Unable to find this article in the library or online.	No	--	Based on the description, this seems to be a project risk. Also, Smaele (2013) does not mention why this is a portfolio level risk. If this risk occurs, it could affect the portfolio, but when following this line of reasoning every project risk could be categized as a portfolio level risk. This research aims at finding specific IT PP risks; therefore, this project focused risk should not be included in the revised model.

Interview Content	Recommendation
16 interview answers were given by the respondents. Respondents 1.2, 1.4, 1.5, 2.2, and 3.3 answer by explaining interconnections and interdependencies between projects and recognize project changes are not always clear. Respondents 2.3, 2.5, 3.1, 3.2, 3.4, and 3.6 tell that change is always a factor in project management. Answers include changing scopes, project initiation, steering committees, and escalation and are all focused on the project level. Respondent 2.2 talks about expectations and the actual delivery of suppliers and. Respondent 2.4 does not recognize the risk. Respondent 3.5 explains that the organization is looking for methods for project specifications. Changes of strategic objectives are not translated to project-level goals, according to respondent 1.1. And, respondent 1.3 recognized that changes are not clear enough within the organization but does not mention if this applies to the project or the portfolio level.	From the interview answers, it can be concluded that the case organizations do not have consistent insight into project changes. It can also be concluded the answers focus on projects and not on the effects for the portfolio. Therefore, it is proposed to change risk 11 to: Insufficient insights in portfolio components – Insufficient insight in (changes of) portfolio components and consequences for the portfolio.

Analysis risk 12						
No.	Risk	Source	Source description	Portfolio level risk?	Correct category ?	Explanation & Recommendations
12a	Overly complicated hierarchical structure of portfolio management	Hofman et al. (2017)	Committed a literature review to identify IT PPM risks and categorized these risks in component, structural and overall risks. Structural risks concern risk, which deals with the composition of a group of projects. Component risks are project risks that need to go to the portfolio level for information or action. The overall risks consider interdependencies between projects. Furthermore, the identified risks were connected to selected phenomena, which were also derived from literature and used for hypothesis testing.	Yes	Yes	This risk was marked as a structural risk by Hofman et al. (2017). It is about dealing with a composition of projects. This does not match the risk name regarding processes. The risk name and definition should be changed to: Insufficient PPM structure - The (governance) structure of project portfolio management is too complex or inefficient
12b	Too extensive composition of a steering committee and a project team.	Smaele (2013) based on an article from Elonen and Artto (2003)	In the article by Elonen and Artto (2003), problems for managing multiple internal development projects are described. Furthermore, a case study was committed to identify IT PPM risks, and all risks were categorized in problem areas.	Yes	Yes	Elonen and Artto (2003) place this risk under the problem area of: resource shortage and allocating resources improperly. This problem with allocation could have several causes but since the risk is about composition, it should be placed under the new definition of risk 12.
Interview Content				Recommendation		
Many respondents (1.2, 1.5, 2.1,2.2, 2.3,2.5, 2.5, 3.1, 3.3, 3.4, 3.6) state that it is not complex in their own organization if they specifically refer to the IT PPM is unclear. Respondent 1.1 answers that in the current situation, it is unclear who does what, why this is the case is not explained. Respondent 1.3 tells that PM is currently complex because of high ambitions. Respondent 1.4 explains that projects are being clustered to prevent complexity. Respondent 3.2 sets out that things are complex within the organization but not regarding IT PPM. Respondent 3.5 stated that there is no complexity and gives his vision on the organizations' culture. From all respondents, only three can imagine that this kind of risk can occur.				None of the respondents answered that this risk occurred, and only three out of fifteen could imagine the risk. It can be concluded that either the risk does not exist or that the risk description and the way of interviewing was not done correctly. The definition should be changed, as proposed in the analysis of source 12a.		

Analysis risk 13						
No.	Risk	Source	Source description	Portfolio level risk?	Correct category ?	Explanation & Recommendations
13a	Absence of cooperation quality	Rank et al. (2015)	The main goal of the research is to test the hypothesis that management quality will be positively associated with preparedness for the future and portfolio synergy. They describe that multiple dimensions reflect the execution quality of processes that take place during steering and management. One of those dimensions is the cooperation quality which is 'a measure of the degree of excellence to which different management role (in terms of cross-project cooperation and the sharing of information) work together supportively in project portfolio management while driving their individual projects' The absence of cooperation quality was marked as a risk by Student1 (2018); Student2 (2018); Student3 (2018).	Yes	No	The researcher defined it as management roles that cooperate within PPM and mention cross-project cooperation and sharing of information. This seems to be a portfolio level risk but does not the overall statement of risk 13. This risk should be placed under risk 2.
13b	The absence of a project manager with authority and/or responsibility	Petro and Gardiner (2015)	Their research proved that "a project manager's degree of influence in the organization, translated into his authority and responsibilities, has a positive effect on portfolio success, client satisfaction, strategic alignment, preparedness, and PPM effectiveness." The researchers define authority as the influence a project manager has over project decisions as employee matters, budget, materials, and other resources. Responsibilities can consist of technical responsibilities, overall delivery and/or like functional managers. Furthermore, the authors state that the authority and responsibilities of project managers should go hand in hand with an increased level of management involvement to ensure the overall goals of the business are met.	Yes	No	Since it influences portfolio success, it is a portfolio risk. But this risk does not refer to a lack of processes. It refers to a lack of authority and responsibility regarding projects. I should be placed under risk 10.
13c	Absence of transparency in portfolio decision making	Patanakul (2015)	Patanakul (2015) Identifies six key attributes of PPM effectiveness. One of these operational attributes is transparency in portfolio decision making, which is defined as: 'The stakeholders' clear understanding of the reasons behind portfolio decisions". The final decisions and reasons behind decisions must be transparent because it improves the integrity and supports the cohesion and morale of the project community. The absence of transparency in the portfolio decision making was identified as a risk by Student1 (2018); Student2 (2018); Student3 (2018).	Yes	No	This risk is about the *stakeholders' clear understanding of the reasons behind portfolio decisions and its effect on PPM effectiveness. It is considered a portfolio risk, but it should be placed under risk 21.*
13d	Improper control over lifecycles of projects and programs	Hofman et al. (2017)	Committed a literature review to identify IT PPM risks and categorized these risks in component, structural and overall risks. Structural risks concern risk, which deals with the composition of a group of projects. Component risks are project risks that need to go to the portfolio level for information or action. The overall risks consider interdependencies between projects. Furthermore, the identified risks were connected to selected phenomena, which were also derived from literature and used for hypothesis testing.	Yes	Yes	This risk was classified by Hofman et al. (2017) as a structural portfolio, so it deals with the composition of a group of projects. Hofman et al. (2017) do not explain the reason for this improper control. Is could be argued that a lack of processes or lack of process execution is a reason or that an insufficient IT PPM structure is the reason. Since it does not matter where it is classified as long as the risk in included in the redesign, the decision is made to keep it under risk 13.
13e	Lack of developed methodical standards within the scope of portfolio management			Yes	Yes	This risk was classified by Hofman et al. (2017) as a structural portfolio, so it deals *with the* composition of a group of projects. It is plausible that a lack of developed methodical standards refers to organizational processes.
13u	Lack of developed methodical standards within the scope of			Yes	Yes	*This risk was classified by Hofman et al. (2017) as a* component risk, which are project risks that need to go to the portfolio level for information or action.

	portfolio element management					Again, it is plausible that a lack of developed methodical standards refers to organizational processes. Although this risk is referring to elements, it is about a lack of methodical standards and should, therefore, be placed under risk 13.
13f	Lack of centralized view: No common, real-time up-to-date portfolio database	Smaele (2013) based on an article from Elonen and Artto (2003)	In the article by Elonen and Artto (2003), problems for managing multiple internal development projects are described. Furthermore, a case study was committed to identify IT PPM risks, and all risks were categorized in problem areas.	Yes	No	Elonen and Artto (2003) place this risk under the problem area of: lacking commitment and unclear responsibilities. By placing it under this problem area, they suggest that this risk is because of a lack of commitment or unclear responsibilities. Is should, therefore, act as a source for risk 10.
13k	Methods and guidelines for portfolio evaluation, project planning, and management are inadequate			Unknown	No	This risk cannot be found (literally) in the article and seems to be a combination of several risks. It seems to be most familiar with a risk in the problem area of Inadequate definition, planning and management of single projects. But this is in contradiction with the term portfolio evaluation. Because of the lack of synergy between the risk description, the article, and the problem area, this risk should not be included in the redesign.
13s	No feedback given to the project level.			Yes	No	In the article, a more comprehensive definition is used: Feedback on projects is rarely given to the project level by the portfolio level. This risk is placed under two problem areas being: lacking commitment and unclear responsibilities and inadequate portfolio level activities. The reason for the lack of feedback in unknown and probably versatile. We do know that *Elonen and Artto (2003) did not place it under the problem areas of* authority, planning, the flow of information, resources or single projects. Although it could be argued that this risk could be placed under multiple other risks in the list, is probably matches the best with risk 10.
13t	Weak Go decisions: resources, value, and priority not considered properly			Yes	No	Elonen and Artto (2003) place this risk under the problem area of: resource shortage and allocation resources improperly, and inadequate portfolio level activities. The risk is about decision making and the possible consequences. Decision making is about the IT PPM governance structure and thus should this risk be placed under risk 12.
13g	Lack of adequate portfolio software. Real-time updates, performance, health, ability to search and analyses	Smaele (2013) based on article from Jeffery and Leliveld (2004)	Jeffery and Leliveld (2004) committed a survey regarding IT portfolio management adoption in order to define best practices. In their article, the IT Portfolio management maturity model is presented.	Yes	No	This risk is originated from the IT Portfolio management maturity model under the factor of centralization. It is a precondition for companies to score synchronized in the maturity model. Since it is about insights in portfolio components, this risk should be placed as a source for risk 11.
13h	Centralized project office monitors projects			Yes	No	To determine the IT PM maturity (relatively to other companies), Jeffery and Leliveld (2004) committed a survey within several organizations. One of the questions was: 'A centralized project office monitors current and future IT projects'? Because the centralized project office is a condition to score the maturity stage defined in the model. This reflects insights in portfolio components and this risk should be placed as a source for risk 11.
13i	Well-defined scheme for screening, categorizing, and prioritizing projects.			Yes	Yes	This risk is originated from the *IT Portfolio management maturity model under the factor of* demand management. The definition is about planning (scheme) and acting (screening, categorizing). Both of them require processes to be executed. This risk is categorized correctly.
13j	Portfolio management approach to rank project investments.			Yes	Yes	This risk is originated from the *IT Portfolio management maturity model under the factor of* demand management. It explains that some kind of approach (process) is needed to rank investments.
13l	Lack of use of financial metrics in prioritizing NPV, ROI, IRR.			Yes	No	*This risk is originated from the* IT Portfolio management maturity model under the factor of financial metrics. It means that these metrics are calculated continuously and used in reviews with the business to align IT spending with strategy (Jeffery & Leliveld, 2004). Since the aim of these metrics is: information and decision making this risk should be placed under risk 2.

13p	Tracking of project benefits after project development is complete.			Yes	No	To determine the IT PM maturity (relatively to other companies), Jeffery and Leliveld (2004) committed a survey within several organizations. One of the questions was: 'My IT department actively tracks, and monitors benefits realized after a project is complete'? Because the centralized project office is a condition to score the maturity stage synchronized in the model. This reflects insights in portfolio components and this risk should be placed as a source for risk 11.
13o	Systematic review of projects at specific stages.	Smaele (2013) based on an article from De Reyck et al. (2005)	The author investigates whether there is a correspondence between the use of PPM processes and the performance of those projects and project portfolios. Also, a scheme for the adoption of IT PPM is presented. The authors prove a positive correlation between the level of adoption of IT PPM processes and the decrease of project problems and a positive correlation regarding project performance.	Yes	Yes	This risk comes from the 'Adoption level analysis per stage' under the element of: 'Categorization, selection, accountability, and governance' in stage III (De Reyck et al., 2005). The full text in the article under this element contains three bullets: • Significant alignment of the portfolio to the organization's strategy. • Systematic review of projects at specific stages. • Top management frequently involved in the project selection process, and business leaders are accountable for project results. So, this relates more to the selection process and alignment process than to insight into specific IT PPM elements. This risk should stay under risk 13.
13n	Ineffective or no formal process	Smaele (2013) based on an article from Drake and Byrd (2006)	In their study, Senft and Gallegos (2008) found five types of risks for project portfolios. The risks are strategic alignment risk, organizational and management risk, culture and climate risk, project relationship risk, and financial risk. Besides these risks, the authors also identified 13 other risks that should be further investigated.	Yes	Yes	In the overview of the five risk factors in IT PPM (table 2 (Drake & Byrd, 2006)) the risk of 'Ineffective or no formal process' is mentioned under the overall risk of organization and management risk. In the article, this risk is described as a lack of formal processes leading to a lack of insights in IT PPM components. The authors advise: "With the help of an IT governance council, project selection and review, becomes better organized while simultaneously providing a platform for various interested parties to participate in the process." Because of the project focus is it decided to keep this risk under risk 13 instead of risk 12.
13q	Project outcomes are always compared with the original targets	Smaele (2013)	Risk is listed by Smaele (2013), but an original source or explanation is missing.	Yes	No	Although argumentation is missing, this risk has similarities with risk 13p and should be placed as a source for risk 11.
13r	Project benefits are frequently centrally tracked.	Smaele (2013)	Risk is listed by Smaele (2013), but an original source or explanation is missing.	Yes	No	Since argumentation and sources are missing, it is hard to analyze this risk. Although, it seems very similar to the factor centralization as mentioned in the IT Portfolio management maturity model by Jeffery and Leliveld (2004). Therefore, it is decided to keep this risk in the redesigned model and to place it under risk 11 about insights in portfolio components
13 m	Lack of formalized ITPPM activities	Smaele (2013) based on article Meskendahl (2010)	In the paper by Meskendahl (2010) the linkage between strategy, PPM, and success. A model is developed that considers the earlier mentioned aspects aiming to smaller the gap between strategy formulation and implementation.	Yes	Yes	They state that formalization of IT PPM processes have a positive influence on portfolio management efficiency and specifically on the project portfolio structuring process. This risk is clearly about processes and is categorized correctly.

Interview Content	Recommendation
Many respondents related this question to the performance of their own organization. They were actually answering another question. Respondents 1.1, 1.2, 1.3, 1.4,2.1, 2.2, 2.4, 2.5 al evaluate their own organization but do not mention it is a risk or possible risk; neither do they provide any argumentation. Respondents 1.5 and 2.3 explain that this is not a risk in their organizations and they also do not recognize this risk. Remarkably the respondents from Student3 (2018) answer more specific and to the point. They all recognize the risk, and respondent 3.1, 3.2 provide clear examples and argumentation. Respondents 3.3, 3.5, 3.6 recognize the risk but do not argue why and explain how it is currently working in their organization. Respondent 3.4 recognized the risk but did not say anything else.	The interviews by Student1 (2018); Student2 (2018) regarding this risk could have been committed better. The answers are not connected to the question asked. Because of the unclarity among the respondent from Student1 (2018); Student2 (2018) and because of the several changes is sources for this risk, the definition should be changed to: Lack of processes or process execution - The IT PPM processes are not present, not of good quality, or not executed as intended.

Analysis risk 14						
No.	Risk	Source	Source description	Portfolio level risk?	Correct category ?	Explanation & Recommendations
14a	Portfolio manager's incompetence	Ghasemi et al. (2018)	Ghasemi et al. (2018) propose an overview of portfolio level risks; these risks are subsequently validated by interviewing several experts.	Yes	Yes	The risk almost literally matching with the overall risk definition of risk 14.
14b	Lack of appropriate competencies of the portfolio manager and of the portfolio support structures	Hofman et al. (2017)	Committed a literature review to identify IT PPM risks and categorized these risks in component, structural and overall risks. Structural risks concern risk, which deals with the composition of a group of projects. Component risks are project risks that need to go to the portfolio level for information or action. The overall risks consider interdependencies between projects. Furthermore, the identified risks were connected to selected phenomena, which were also derived from literature and used for hypothesis testing	Yes	Yes	This risk was classified by Hofman et al. (2017) as an overall risk; in the end, it is about the interdependencies between the projects in the portfolio. This risk complies with the overall risk definition of risk 14. Although it should be stated that this risk in Hofman et al. (2017) also refers to portfolio support structures. This specific aspect should be incorporated into the list under risk 12.
14e	Improper competencies of project and program managers			Yes	No	This risk was classified by Hofman et al. (2017) as a component risk, which is a project risk that needs to be escalated. This component risk does not reflect the portfolio manager and should be placed under risk 9.
14c	Unclear responsibilities	Smaele (2013) based on article from Frey and Buxmann (2011)	Frey and Buxmann (2011) explored IT PPM regarding companies' organizational and decision-making structures.	Yes	No	Frey and Buxmann (2011), as described in Smaele (2013) discuss unclear responsibilities regarding IT governance. This risk should be placed under risk 10.
14d	Inefficient single-project management	Smaele (2013) based on article from Martinsuo and Lehtonen (2007)	Martinsuo and Lehtonen (2007) prove that project management efficiency is positively related to portfolio management efficiency.	Yes	No	Martinsuo and Lehtonen (2007) described inefficient single project management, which should be placed under risk 12 since the article is about organizational structures.
Interview Content				Recommendation		
The analyzed interview answers regarding risk 14 provided the following information. Student3 (2018) did not ask respondents about risk 14 since the role portfolio manager did not exist in the case organization. Student1 (2018) asked five respondents if they recognize this risk. Respondents 1.1, 1.3, 1.4, rate the portfolio manager in a very reserved way and do not provide a clear answer. Respondent 1.5 and 1.2 do not recognize the risk. The respondent from Student2 (2018) all provide nonspecific answers, and it is concluded by Student 2 that respondents cannot imagine the risk. The answers of the respondents do not give any examples or explanations.				Special attention should be paid when researching aspects which involve sensitivities and aspects respondent are not comfortable speaking about (Verschuren & Doorewaard, 2007, p. 219). This might be the case here since multiple interview answers not to the point and not specific; also, the word incompetent has a negative association. The risk name 'Incompetence of portfolio manager' is therefore replaced by 'Quality of the portfolio manager,' which is in line with the definition.		

Appendix 4 Detailed overview of redesigned risk areas (cycle 3)

No.	Risk	Risk definition		Underlying risks	Source
8	Insufficient adaptability to internal and external changes	Insufficient insights into the internal and external environment of the organization, the possible consequences for the IT PP, and the inability to adapt to changes.	8a	Political, social or legislative changes which lead to changing the organizational strategy, and project's objectives lack of alignment with the new strategy	Ghasemi et al. (2018)
			8b	Significant changes in the project or program environment	Hofman et al. (2017)
			8c	No adaptability to internal and external changes	P. Patanakul (2015)
			8d	Missing political objectives	Smaele (2013)
			8e	Political deadlines	Smaele (2013)
			8f	Non-compliance to legislation	Smaele (2013)
			8j	Rapid and recurring changes in roles, responsibilities or organization structure	Smaele (2013)
9	Quality of the portfolio component managers	The quality of the portfolio component managers is insufficient.	9g	Ignoring risks by portfolio element managers	Hofman et al. (2017)
			14e	Improper competencies of project and program managers	Hofman et al. (2017)
			10h	Improperly operating steering committees of projects, project groups, and programs	Hofman et al. (2017)
10	Insufficient control, roles and responsibilities	The control, roles, and responsibilities of the project portfolio are insufficient.	10b	The roles and the responsibilities of a portfolio manager are not clear or digested	Smaele (2013)
			10c	No defined owner, business or personnel strategy for portfolio	Smaele (2013)
			10d	Unclear roles and responsibilities at the project level	Smaele (2013)
			10f	Many bodies are entitled to set up a project	Smaele (2013)
			10g	Improper organizational anchoring central control tasks	Smaele (2013)
			14c	Unclear responsibilities	Smaele (2013)
			13b	The absence of a project manager with authority and/or responsibility	Petro and Gardiner (2015)
			13f	Lack of centralized view: No common, real-time up-to-date portfolio database	Smaele (2013)
			13s	No feedback given to the project level.	Smaele (2013)
11	Insufficient insights in portfolio components	Insufficient insight into changes in portfolio components and consequences for the portfolio.	11a	Significant change in the basic parameters of particular portfolio elements	Hofman et al. (2017)
			11b	Project progress monitoring is infrequent	Smaele (2013)
			11c	Projects are not killed.	Smaele (2013)
			9b	Absence of predictability of project delivery	P. Patanakul (2015)
			9c	Risks arising from the unknowns at the cost estimation of the execution of selected portfolio elements	Hofman et al. (2017)
			9d	Risks arising from the application of innovative technical and material solutions in the portfolio elements	Hofman et al. (2017)
			9e	Understanding of risk and return – portfolio weighted accordingly.	Smaele (2013)
			9f	The portfolio is frequently evaluated in terms of overall risk and financial value	Smaele (2013)
			13g	Lack of adequate portfolio software. Real-time updates, performance, health, ability to search and analyses	Smaele (2013)
			13h	Centralized project office monitors projects	Smaele (2013)
			13p	Tracking of project benefits after project development is complete.	Smaele (2013)
			13q	Project outcomes are always compared with the original targets	Smaele (2013)
			13r	Project benefits are frequently centrally tracked.	Smaele (2013)
12	Insufficient PPM structure	The (governance) structure of IT project portfolio management is too complex or inefficient	12a	Overly complicated hierarchical structure of portfolio management	Hofman et al. (2017)
			12b	Too extensive composition of a steering committee and a project team.	Hofman et al. (2017)
			14b	Lack of the portfolio support structures	Hofman et al. (2017)
			14d	Inefficient single-project management (regarding organizational and decision structures).	Smaele (2013)
			10e	Governance structure does not map to organizational culture	Smaele (2013)

			13t	Weak Go decisions: resources, value and priority not considered properly	Smaele (2013)
13	Lack of processes or process execution.	The IT PPM processes are not present, not of good quality, or not executed as intended.	13d	Improper control over lifecycles if projects and programs	Hofman et al. (2017)
			13e	Lack of developed methodical standards within the scope of portfolio management	Hofman et al. (2017)
			13i	Well-defined scheme for screening, categorizing and prioritizing projects.	Smaele (2013)
			13j	Portfolio management approach to rank project investments.	Smaele (2013)
			13m	Lack of formalized ITPPM activities	Smaele (2013)
			13n	Ineffective or no formal process	Smaele (2013)
			13o	Systematic review of projects at specific stages.	Smaele (2013)
			13u	Lack of developed methodical standards within the scope of portfolio element management	Hofman et al. (2017)
14	Quality of the portfolio manager	The quality of the portfolio manager is insufficient.	14a	Portfolio manager's incompetence	Ghasemi et al. (2018)
			14b	Lack of appropriate competencies of the portfolio manager and of the portfolio support structures	Hofman et al. (2017)

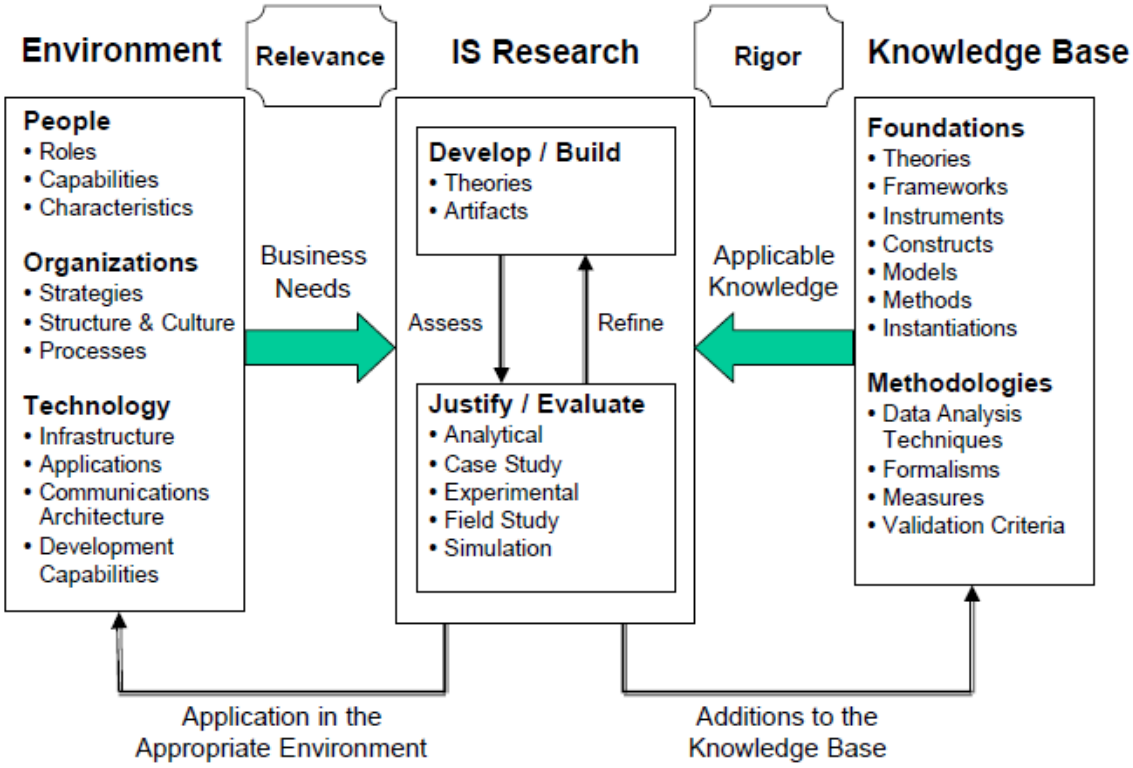
Placed elsewhere within the model:

No.	Risk	Source	New location
8k	Change in an approach of key projects or program stakeholders	Hofman et al. (2017)	Risk 21
9a	Absence of project visibility	P. Patanakul (2015)	Risk 21
10a	Governance review board's incompetence	Ghasemi et al. (2018)	Risk 7
13a	Absence of cooperation quality	Rank et al. (2015)	Risk 2
13c	Absence of transparency in portfolio decision making	P. Patanakul (2015)	Risk 21
13l	Lack of use of financial metrics in prioritizing NPV, ROI, IRR.	Smaele (2013)	Risk 2

Not considered a portfolio level level risk:

No.	Risk	Source
8g	IS critical to delivery of current corporate services	Smaele (2013)
8h	IS critical to future decision support aid	Smaele (2013)
8i	IS critical to delivery of future corporate services	Smaele (2013)
11d	Project delay	Smaele (2013)
11e	Project costs overruns	Smaele (2013)
11f	Failure to meet required functional and technical specifications	Smaele (2013)
13k	Methods and guidelines for portfolio evaluation, project planning, and management are inadequate	Smaele (2013)

Appendix 5 Information systems research framework



Source: (Hevner et al., 2004)

Appendix 6 Risk list (cycle 3)

No.	Risk	Risk definition	Underlying risks	Source
1	Conflicts	There are conflicts with one or more decision-making stakeholders of the project portfolio	Conflicts between project and program managers within the portfolio	Hofman et al. (2017)
			Conflicts among objectives of projects and programs executed within the portfolio	Hofman et al. (2017)
			Conflicts between portfolio managers and portfolio element managers	Hofman et al. (2017)
			Conflict among project managers	Ghasemi et al. (2018)
			'Own' objectives of units	Smaele (2013)
			Resistance from business units	Smaele (2013)
			Mismatch between the portfolio structure and the parent organisation's strategy	Hofman et al. (2017)
			Collective action problems	Vrhovec, Hovelja, Vavpotič, and Krisper (2015)
			Groupthink	Vrhovec et al. (2015)
2	Communication	There is insufficient communication within the IT Project Portfolio	Disturbances in information flow and communication within the portfolio elements	Hofman et al. (2017)
			Lack of transfer of information and knowledge among the portfolio elements	Hofman et al. (2017)
			Lack of sharing or transparency in information (which leads to the making of wrong decisions)	Ghasemi et al. (2018)
			Lack of information on projects. Inadequate flow of information across organization	Smaele (2013)
			No feedback given to the project level	Smaele (2013)
			Ignoring risks by portfolio element managers	Smaele (2013)
3	Information	There is insufficient quality information available within the IT Project Portfolio	Inaccuracy and lack of quality in information (which leads to the making of wrong decisions)	Ghasemi et al. (2018)
			Information flow from projects to the other parts of the organization and vice versa, is not defined	Smaele (2013)
			Absence of Information quality	Rank et al. (2015)
4	Interdependencies	Lack of attention to interdependencies within the project portfolio	Lack of inter-project abilities; Not having cross-trained staff who can easily switch from project to project	Ghasemi et al. (2018)
			Lack of consideration of project-project resource interdependencies	Smaele (2013)
			Lack of consideration of project interdependencies	Smaele (2013)
			Lack of consideration of project-project knowledge interdependencies	Smaele (2013)
			Lack of consideration of project-project hard and soft interdependencies	Smaele (2013)
			Lack of consideration of project-project technology interdependencies	Smaele (2013)
			Cross-project dependencies and implementation bottlenecks are considered	Smaele (2013)
			Lack of consideration of project and application interdependencies	Smaele (2013)
			Lack of consideration of project and infrastructure interdependencies	Smaele (2013)
			Absence of cooperation quality	Rank et al. (2015)
			Lack of quality in cooperation among project teams	Ghasemi et al. (2018)
5	Personnel stability	There is insufficient certainty with regards to the stability of the project portfolio staff.	Risks related to the personnel stability of the portfolio managing team and the possibility of losing key portfolio element managers	Hofman et al. (2017)
			Achieving performance goals and turnover of staff	Smaele (2013)
			Achieving performance goals and turnover of managers	Smaele (2013)
			Rapid and recurring changes in roles, responsibilities or organization structure	Smaele (2013)
6	Effectiveness of top management	Top Management is indecisive	Absence of termination quality,	Rank et al. (2015)
			Conservatism	Vrhovec et al. (2015)
			Reactive mindset	Vrhovec et al. (2015)
			Governance review board's reluctance to kill poor projects during their implementation and when they are no longer aligned with organizational strategy	Ghasemi et al. (2018)

			Delays in decision making	Smaele (2013)
			Governance review board reluctance to kill off or suspend projects when their required resources are no longer available	Ghasemi et al. (2018)
7	Insufficient insights in portfolio components	Insufficient insights in IT-PP components and what happens within these components	Absence of project visibility	P. Patanakul (2015)
			Absence of predictability of project delivery	P. Patanakul (2015)
			Risks arising from the unknowns at the cost estimation of the execution of selected portfolio elements	Hofman et al. (2017)
			Risks arising from the application of innovative technical and material solutions in the portfolio elements	Hofman et al. (2017)
			Understanding of risk and return – portfolio weighted accordingly.	Smaele (2013)
			The portfolio is frequently evaluated in terms of overall risk and financial value	Smaele (2013)
			Significant change in the basic parameters of particular portfolio elements	Hofman et al. (2017)
			Project progress monitoring is infrequent	Smaele (2013)
			Projects are not killed.	Smaele (2013)
			Failure to meet required functional and technical specifications	Smaele (2013)
			Lack of centralized view: No common, real-time up-to-date portfolio database	Smaele (2013)
			Centralized project office monitors projects	Smaele (2013)
			Tracking of project benefits after project development is complete.	Smaele (2013)
			Project outcomes are always compared with the original targets	Smaele (2013)
			Project benefits are frequently centrally tracked.	Smaele (2013)
			Not clear what the expected value of the portfolio is	P. Patanakul (2015)
			Lack of perceived value	Vrhovec et al. (2015)
8	Insufficient roles responsibilities and mandates	The ITPPM the roles, responsibilities and mandates are insufficient defined or unclear	Unclear roles and responsibilities between portfolio decision makers and the other parts of the organization.	Smaele (2013)
			The roles and the responsibilities of a portfolio manager are not clear or digested	Smaele (2013)
			No defined owner, business or personnel strategy for portfolio	Smaele (2013)
			Unclear roles and responsibilities at the project level	Smaele (2013)
			Governance structure does not map to organizational culture	Smaele (2013)
			Many bodies are entitled to set up a project	Smaele (2013)
			Improper organizational anchoring central control tasks	Smaele (2013)
			Overly complicated hierarchical structure of portfolio management	Hofman et al. (2017)
			Too extensive composition of a steering committee and a project team.	Hofman et al. (2017)
			The absence of a project manager with authority and/or responsibility	Petro and Gardiner (2015)
			Absence of transparency in portfolio decision making	P. Patanakul (2015)
			Unclear responsibilities	Smaele (2013)
9	Poor IT project portfolio processes or execution	Poor IT project portfolio processes or execution	Improperly operating steering committees of projects, project groups, and programs	Hofman et al. (2017)
			Improper control over lifecycles if projects and programs	Hofman et al. (2017)
			Lack of developed methodical standards within the scope of portfolio management	Hofman et al. (2017)
			Lack of adequate portfolio software. Real-time updates, performance, health, ability to search and analyses	Smaele (2013)
			Well-defined scheme for screening, categorizing and prioritizing projects.	Smaele (2013)
			Portfolio management approach to rank project investments.	Smaele (2013)
			Methods and guidelines for portfolio evaluation, project planning, and management are inadequate	Smaele (2013)
			Lack of use of financial metrics in prioritizing NPV, ROI, IRR.	Smaele (2013)
			Lack of formalized ITPPM activities	Smaele (2013)
			Ineffective or no formal process	Smaele (2013)
			Systematic review of projects at specific stages.	Smaele (2013)
			Weak Go decisions: resources, value and priority not considered properly	Smaele (2013)

			Lack of developed methodical standards within the scope of portfolio element management	Hofman et al. (2017)
			Top manager's interference in governance review board's decisions (which leads to choosing projects whose required resources are not available or that are not aligned with strategic objectives of the organization).	Ghasemi et al. (2018)
			Top management frequently involved in the project selection process.	Smaele (2013)
10	Quality of the portfolio manager	Quality of the portfolio manager is insufficient	Portfolio manager's incompetence	Ghasemi et al. (2018)
			Lack of appropriate competencies of the portfolio manager and of the portfolio support structures	Hofman et al. (2017)
11	Quality of the portfolio component managers	The quality of the portfolio component managers is insufficient	Ignoring risks by portfolio element managers	Hofman et al. (2017)
			Inefficient single-project management (regarding organizational and decision structures).	Smaele (2013)
			Improper competencies of project and program managers	Hofman et al. (2017)
12	Available resources	Lack of available time, people and financial resources for the execution of the projects within the IT project portfolio	Too large a portfolio from the point of view of the portfolio executors' capacity	Hofman et al. (2017)
			Problems with access to the portfolio financing capital	Hofman et al. (2017)
			Possibility of the lack of financial liquidity within the portfolio	Hofman et al. (2017)
			Lack of coordination of the involvement of key resources in the execution of the portfolio	Hofman et al. (2017)
			Portfolio financing collapse	Hofman et al. (2017)
			Choosing too many projects for the available resources	Ghasemi et al. (2018)
			The lack of consideration of direct costs	Vrhovec et al. (2015)
			Lack of considering portfolio effect on operational costs	Smaele (2013)
			Frequently evaluate budget/financial capacity and competition for scarce resources in the portfolio	Smaele (2013)
13	Organizational politics	The activities, attitudes, or behaviors that are used to get or keep power or an advantage within a business or company	Incommensurable beliefs: a strong disagreement between groups about the nature of the problem and its consequent alternative solution	Vrhovec et al. (2015)
			Organizational politics	Vrhovec et al. (2015)
			Inability of the management to look into the future with clarity due to the expected dominance of short-term goals over long term goals	Vrhovec et al. (2015)
14	Management commitment	The management is not committed to the IT project portfolio management	Lack of top management commitment	Vrhovec et al. (2015)
			The absence of an increased level of involvement from management in the form of either support or a steering committee level of involvement	Petro and Gardiner (2015)
			Portfolio management not empowered by senior management	Smaele (2013)
			Lack of management support	Smaele (2013)
			Lack of commitment	Smaele (2013)
			Business leaders not accountable for project results	Smaele (2013)
			Lack of involvement of top-level and middle level managers in portfolio execution	Hofman et al. (2017)
15	Adaptability to changes	Insufficient alignment of the IT project portfolio to changes of the environment	Speed and complexity	Vrhovec et al. (2015)
			Recurrent and rapid changes in positions, responsibilities and organizational structure, which hampers continuity in work	Ghasemi et al. (2018)
			Political, social or legislative changes which lead to changing the organizational strategy, and project's objectives lack of alignment with the new strategy	Ghasemi et al. (2018)
			IS critical to delivery of current corporate services	McFarlan (1982)
			IS critical to future decision support aid	McFarlan (1982)
			IS critical to delivery of future corporate services	McFarlan (1982)
			Significant changes in the project or program environment	Hofman et al. (2017)
			No adaptability to internal and external changes	P. Patanakul (2015)
			(Strategy) Unclear or often changing strategy	Smaele (2013)

			Missing political objectives	Smaele (2013)
16	Stakeholders	Lack of clarity in stakeholders' roles and the intensity of their engagement (Ghasem, et al. 2018)	Lack of clarity in stakeholders' roles and the intensity of their engagement	Ghasemi et al. (2018)
			Change in an approach of key project or program stakeholders	Hofman et al. (2017)

Dutch translation

No.	Risk	Risk definition
1	Conflicten	Er is sprake van conflicten bij één of meerdere besluitvormingsstakeholders van het IT projectportfolio
2	Communicatie	Er is sprake van onvoldoende communicatie in de IT-Projectportfolio
3	Informatie	Er is sprake van onvoldoende beschikbare kwalitatief goede informatie binnen de IT-Projectportfolio
4	Onderlinge afhankelijkheden	Gebrek aan aandacht voor onderlinge afhankelijkheden binnen de IT-projectportfolio
5	Stabiliteit van het personeel	Er is onvoldoende zekerheid ten aanzien van de stabiliteit van de staf binnen de projectportfolio
6	Effectiviteit van topmanagement	Top Management is niet besluitvaardig
7	Portfolio componenten	Onvoldoende zicht in de onderliggende ITPP-componenten en wat daarin gebeurt
8	Rollen, verantwoordelijkheden en mandaten	Binnen ITPPM zijn de rollen, verantwoordelijkheden en mandaten niet goed of niet duidelijk vastgelegd
9	IT PP(M) processen en of procesuitvoering	De kwaliteit van het ontwerp of uitvoering van IT PPM processen is onvoldoende
10	Kwaliteit van de portfoliomanager	De kwaliteit van de IT PP manager is onvoldoende
11	Kwaliteit van de portfolio componenten managers	De kwaliteit van portfolio component managers is onvoldoende
12	Beschikbaarheid van middelen	De beschikbaarheid van tijd, mensen en financiële middelen voor het uitvoeren van de projecten binnen de IT-projectportfolio
13	Organisatie politiek (verschillende belangen hebben)	De activiteiten, houdingen of gedragingen die worden gebruikt om macht of een voordeel binnen een bedrijf of bedrijf te verkrijgen of te behouden (merriam-webster.com, 2020)
14	Management toewijding	Het management zet zich niet in voor het IT-project portfoliomanagement
15	Aanpassingsvermogen naar aanleiding van veranderingen	Onvoldoende aanpassing van de IT-project portfolio naar aanleiding van een gewijzigde omgeving
16	Stakeholders (belanghebbenden)	Gebrek aan duidelijkheid in de rollen en de mate van betrokkenheid van de belanghebbenden

Appendix 7 Interview protocol

A. Introductie en voorstellen.

Na het voorstellen wordt het onderzoek toegelicht. Er wordt uitgelegd wat het de onderzoeksvragen zijn en hoe het onderzoek wordt uitgevoerd.

B. Gebruikte terminologie

De gebruikte terminologie binnen het wordt toegelicht:

- Portfolio management: "*Portfolio management refers to the centralized management of one or more portfolios to achieve strategic objectives. Portfolio management focuses on ensuring that projects and programs are reviewed to prioritize resource allocation, and that the management of the portfolio is consistent with and aligned to organizational strategies.*" (PMI, 2013).
- Project portfolio management: "*Project portfolio management deals with the coordination and control of multiple projects pursuing the same strategic goals and competing for the same strategic resources, whereby managers prioritize among projects to achieve strategic benefits.*" (Martinsuo, 2013)
- Risk: "*Risk is an event that, if it occurs, causes a (positive or negative) impact on a portfolio* (PMI, 2013)."

C. Concrete doelstellingen interview

De doelstellingen van het interview worden toegelicht. Eerst worden er een aantal vragen gesteld over de respondent om te valideren dat de juisten respondent is geselecteerd.

Daarna worden risico specifieke vragen gesteld om de vooraf bepaalde lijst met risico's te valideren. Het gaat om het valideren van een lijst van vooraf gedefinieerde risico's. Deze lijst is afkomstig uit IT PPM literatuur en in meerdere iteraties ontwikkeld. Het gaat om de argumenten waarom is dit specifiek het geval voor IT-project portfolio's, de risico's zelf zijn niet baanbrekend.

Er wordt speciale aandacht besteedt aan de opzet van de interview vragen. Eerst vragen we naar ervaring en als deze ervaring er niet is vragen we naar voorstellingsvermogen.

D. Ethische aspecten

- De resultaten worden geanonimiseerd en zijn niet terug te leiden naar organisatie en specifieke personen.
- Bij voorkeur worden de interviews opgenomen, deze opname zal na afloop van het onderzoek worden vernietigd.
- De uitwerkingen van het interview wordt ter beoordeling voorgelegd.
- Het beantwoorden van vragen is niet verplicht en eveneens kan op ieder moment worden gestopt met het interview.
- De gedragscode van de Open Universiteit is van toepassing, en is schriftelijk beschikbaar.

E. Algemeen

Vraag: Welke functie/ rol vervult u?

Vraag: Wat zij uw rol en verantwoordelijkheden op het gebied van IT-project portfolio management?

Vraag: Hoeveel jaar ervaring heeft u met (IT) project portfolio managementtaken/rollen?

F. Interview protocol per risico

Voor ieder risico in de lijst wordt een procedure van uitleg en vragen gevolg. Deze procedure met bijbehorende vragen staan hieronder in volgorde van behandeling beschreven.

Uitleg: Het risico en de risico definitie worden uitgelegd.

1. *Vraag*: Begrijpt u het omschreven risico?
    a. Als het antwoord 'nee' is, dan wordt een verdere uitleg gegeven en vervolgens wordt de vraag opnieuw gesteld.
    b. Als het antwoord 'ja' is wordt verdergegaan met de volgende vraag.

2. *Vraag:* Herkent u dit risico vanuit uw ervaring?
    a. Als het antwoord 'ja' is, dan *vraag:* Kunt u een voorbeeld geven en uitleggen waarom het een risico was? Daarna door naar vraag 4.
    b. Als het antwoord 'nee' is wordt verdergegaan met de volgende vraag.

3. *Vraag:* Kunt u zich voorstellen dat dit een risico is?
    a. Als het antwoord 'ja' is, dan *vraag:* Kunt u beargumenteren waarom? Daarna door naar einde.
    b. Als het antwoord 'nee' is, dan *vraag:* Kunt u beargumenteren waarom? Daarna door naar einde.

4. *Vraag:* Is er voor dit risico documentatie beschikbaar binnen de organisatie dat kan dienen als secundaire bron?

Einde: Ga naar het volgende risico

G. Aanvullende risico's

Vraag: Zijn er nog risico's niet aan bod gekomen die u wel herkent? Zo ja waarom was dit een risico?

H. Afsluiting en dankwoord

Vraag: Heeft u nog aanvullende vragen en of opmerkingen?

Afsluiting: Bedanken voor deelname

Appendix 8 Data analysis

This appendix presents the data analysis and consists of three parts:

1. The interview analysis
   In this part, the committed interviews are coded. The interviews are places in a table with three columns. The middle column contains the interview text, as spoken during the interview. The left column contains the codes for the risk category and the codes, whether the answer was classified based on experience, imagination, or no imagination. The right column contains the codes for the argumentation. The text parts containing this argumentation are also highlighted in yellow.

   The interview analysis was removed from this attachment before publishing to ensure the anonymity of the respondents.

2. The analysis of secondary sources
   The analysis of secondary sources is outlined in this part

3. Overview results
   One matrix shows how the risks were classified for each respondent. A table provides an overview of the interpreted arguments per risk.

Remarks:

- In the interview, examples were anonymized so they could not be directed to any persons or the case organization. The text which was changed to anonymized was placed between […].
- In the interview text, R reflects the respondent, M: reflect the interviewer. *** is a text which is not relevant for the research and, therefore, not transcribed. The text between (…) is a summary of the spoken text.
- All discovered argumentation is numbered, the first letter reflects the respondent, the following number the risk, and the last number the argument for that respondent. For instance, G2.3, respondent G, risk 2, 3rd argument for risk 2 by respondent G.

Analysis of secondary sources

Document name (S): Risico's voor project portfolio management,

This document was provided by two respondents and is the result of risk assessment for project portfolio management within the case organization. In this document, eight risks are identified and assessed. For each risk, the cause, consequences/impact, and possible measures are described. The following table provides an anonymized summary of the document, along with the researchers' analysis and the coded arguments.

Nr.	Cause	Risk	Consequences	Analysis	Arguments
1.	• The criteria are incomplete • The criteria are frequently and severely changed • Not the right information is available to develop an unambiguous set of criteria.	Projects are not reviewed with the correct criteria.	• Criteria are insufficient, leading to possibly wrong decisions.	This risk is about qualitative information to set the overall portfolio criteria. It is categorized under the risk information (3) in the overall model.	Argument S3.1
2.	• Portfolio management does not have an unambiguous model to determine the benefits	Portfolio benefits can be traced or planned.	• Portfolio components cannot be compared • Afterward, it turns out that not the right decisions are made.	This risk is similar to the sub risk 'well-defined scheme for screening, categorizing, and prioritizing projects,' this sub risk was placed under risk 9 in the overall model. This risk should, therefore, also be placed under risk 9.	Argument S9.1
3.	• Insufficient insights on the availability of resources • The demands for resources from projects are unclear.	Portfolio management decides regarding projects based on insufficient insights into the availability of critical resources.	• Suboptimal decisions • Portfolio planning cannot be realized • Insights into the availability of resources, not on time.	This risk is about the availability of resources and matches the risk available resources (12) in the overall model.	Argument S12.1
4.	• Transition to Agile • System limitations • Initiatives are kept secret • Studies and innovations are not in sight.	Not all initiatives are included in the portfolio process.	• Suboptimal decisions • Resources are working on a task that does not have the highest priority. • Prioritizing is based on poor insights.	This risk can have many causes but is in the end about portfolio processes or process execution. It is categorized under risk 9 in the overall model.	Argument S9.1
5.	• Incomplete or not update information regarding project progress • Documents are of low quality when projects are initiated.	Portfolio management cannot steer and direct on time	• Portfolio planning cannot be realized • Afterward, it turns out that not the right decisions are made.	The risk mentioned here is about not enough insights in portfolio components either in the beginning or while progressing. This risk is captured under the risk 7 (insufficient insights in portfolio components) in the overall risk list.	Argument S7.1 Argument S7.2
6.	• Portfolio processes are not anchored within the organization • Portfolio managers are not involved enough on all management layers to share the workload between each other.	Portfolio management processes and procedures are weakly guaranteed.	• Processes must be reinvented in case of staff turnover • The connection with higher management might get lost.	This risk is almost literally the same a risk 9 (poor project portfolio processes or execution).	Argument S9.2 Argument S9.3

7.	• Insufficient insight into all occurring changes • Insufficient clustering of interdepending components.	Insufficient insight into the impact of all cohesive programs, projects, and changes on the organization.	• Too many changes for the organization to handle • Insufficient control over the cashing of benefits.	It is about insufficient insights in portfolio components, and their cohesion ad should be placed under risk 7 in the overall model.	Argument S7.3 Argument S7.4
8.	• Culture • Projects are too big.	Not enough courage and willingness to follow portfolio management advisements to stop projects	• Loss of credibility for project portfolio management • Resources are used for wrong activities.	This risk seems to be about the mandate of portfolio management but also about commitment. Consequence one provides an argument regarding the mandate, and consequences two regarding commitment.	Argument S8.1 Argument S14.1

Overview results

Matrix: Risk x Answers

Risk /Respondent	A	B	C	D	E	F
Conflicts (1)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Communication (2)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Information (3)	Yes – experience	Yes – experience	Yes – experience	Yes – imagination*	Yes – experience	Yes – experience
Interdependencies (4)	Yes – experience	Yes – imagination *	Yes – imagination	Yes – experience	Yes – experience	Yes – experience
Personnel stability (5)	Yes – experience	Yes – experience	Yes – imagination *	Yes – imagination	No	No
Effectiveness of top management (6)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	**	Yes – experience
Portfolio components (7)	Yes – imagination	Yes – experience	Yes – experience	Yes – experience *	No	Yes – experience
Roles, responsibilities, and mandates (8)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Project portfolio processes or execution (9)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	**	Yes – experience
Quality of the portfolio manager (10)	No *	No	Yes – experience	Yes – experience	No	No
Quality of the portfolio component manager (11)	Yes – experience	No *	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Available resources (12)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Organizational politics (13)	**	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – imagination
Management commitment (14)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Adaptability to changes (15)	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience	Yes – experience
Stakeholders (16)	Yes – experience	Yes – experience	Yes – experience	No	Yes – experience	Yes – experience

* No argumentation discovered

** Answer insufficient to classify

Table: Discovered and interpreted risk argumentation

Risk	Argument	Source
Conflicts (1)	Goals might not be achieved or achieved with a delay, both negatively affecting portfolio benefits the organization expects to yield.	A1.1, B1.1, C1.1, D1.1, E1.1, F1.1
	Conflicts can have a positive effect, resulting in discussions, leading to better overall solutions.	E1.2
Communication (2)	If information is not communicated, IT PP steering is not possible, resulting in unexpected delays and negatively influencing portfolio benefits.	A2.1, B2.1, B2.2, D2.1, E2.1
	Insufficient communication harms the cooperation between business and IT within the portfolio.	C2.1, F2.1
	If portfolio goals are not communicated, the portfolio can become misaligned.	D2.2
Information (3)	Unclear information, like technical jargon, can lead to misunderstanding in the project's steering committee resulting in undirected projects within the portfolio.	A3.2, B3.2

	If information is of bad quality, portfolio steering, and decision making is not possible, which might lead to projects not solving the intended problem.	A3.1, B3.1, C3.1, E3.1, F3.1,
	Not possible to set proper project review criteria which may lead to wrong decisions	S3.1
Interdependencies (4)	Some interdependencies will only become visible during project execution. Portfolio results may not be achieved or achieved only after investing more resources than initially planned.	A4.1, C4.1, D4.1, E4.1
	The project portfolio is less efficient because projects are overlapping or working on similar things.	F4.1
Personnel stability (5)	The overall stability can be affected when the leading character for portfolio management on board level leaves.	A5.1
	It can cause disruptive effects because earlier made decisions and business cases are rechallenged.	B5.1
	Rarely a risk because portfolio management is teamwork, no one is unreplaceable, and portfolio management has a long-term focus, so the effects are negligible.	D5.1, E5.1, F5.1
Effectiveness of top management (6)	It can lead to an increase in the number of projects and a loss of focus within the portfolio.	A6.1
	The indecisiveness of top management is a risk because the organization will not be able to renew or innovate to keep up with (IT) developments.	A6.2, B6.1, C6.1, D6.1, F6.1
Portfolio components (7)	Insufficient insight is a risk because everything that happens within these components could ultimately affect the portfolio costs and benefits.	B7.1
	Portfolio component prioritization based on expected benefits is not possible.	A7.1, C7.1, E7.1, F7.1, S7.2
	Portfolio management cannot steer and direct on time, resulting in not realizing the portfolio planning.	S7.1
	It can lead to more changes than the organization can handle	S7.3
	Controlling and cashing the benefits in a structured way will not be possible.	S7.4
Roles, responsibilities, and mandates (8)	The risk is that projects can enter the portfolio and allocate resources without participating in the portfolio selection and prioritization process.	A8.1, B8.1
	Ambiguous project direction or no direction can cause delays and suboptimal choices.	C8.1, E8.1, F8.1
	Not enough courage and willingness to follow portfolio management advisements due to a lack of mandate. Resulting in a loss of credibility for project portfolio management within the organization.	D8.1, S8.1
Project portfolio processes or execution (9)	Inefficient portfolio steering due to misunderstandings, poor insights, and own objectives, eventually leading to delays.	A9.1, B9.1, C9.1, D9.1, F9.1, S9.3
	Projects are not reviewed on success criteria and benefits before entering the project portfolio	B9.2
	Poor decision-making regarding resource allocation and prioritization because projects cannot be compared	S9.1
	Processes must be reinvented in case of staff turnover	S9.2
Quality of the portfolio manager (10)	**Not a risk**, it is more in the mindset of all participants, and there are no clear deliverables for the portfolio manager.	A10.1
	The maturity of IT PPM might take longer with a bad performing portfolio manager.	A10.2
	The risk is poor quality; tasks will take more time, and mistakes are made.	C10.1
	The portfolio manager does not have enough influence on the role he/she performs.	D10.1
	Projects are initiated within the portfolio, which do not align with the organizational goals.	D10.2
	Not a risk, underperformance will be noticed before it has any effects.	E10.1
	Not a risk since portfolio management is a team effort.	F10.1
Quality of the portfolio component manager (11)	Projects within programs are not well placed or not placed on time within the portfolios.	A11.1
	The component manager's deliverables are the input for the portfolio (steering).	C11.1, F11.1
	Unable to grow to mature portfolio management.	D11.1
	Delays, cost overruns, and frustration on project and portfolio level.	E11.1
Available resources (12)	The risk is that not all approved demands can be fulfilled, possibly leading to delays and budget overruns.	A12.1, A12.2, B12.1, C12.1, C12.1, E12.1, F12.1, S12.1

	Estimating which IT resources are needed can be very complicated.	C12.2
Organizational politics (13)	The risk is that sub-optimal decisions are being made.	B13.1, E13.1, F13.1
	It can cause delays during implementation and possibly not achieving the set goals.	C13.1, D13.1
Management commitment (14)	An increase of projects and a loss of portfolio focus because of no effective centralized portfolio management.	A14.1, B14.1, F14.1
	Lack of support for portfolio component managers to achieve the desired results.	C14.1
	Business units will go for their results instead of the overall organizational results.	D14.1 S14.1
	Without management commitment, changes will not be accepted, and the results will not be achieved.	E14.1
Adaptability to changes (15)	The risk is not responding quick enough on developments, caused by a misunderstanding between business and IT, and the different pace of development between them.	A15.1, B15.1, C15.1
	Misalignment between portfolio and strategy, not doing the things which add the most value to the organization.	A15.2, D15.1, E15.1, F15.1
Stakeholders (16)	The risk is that it can cause (unexpected) delays, additional investments, or overall failure.	A16.1, B16.1, C16.1, E16.1, F16.1
	Not a risk, if a stakeholder is unaware of their role or engagement, the portfolio manager will support the stakeholder. If it remains unclear, then the stakeholder does not have a part and is not a stakeholder.	D16.1