Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Economics and Management
Dept. of Industrial Economics and Technology Management

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Managing Uncertain and Complex Change Projects

The Managerial Implications of Using a Robust Management Approach

Master's thesis in Project Management
Supervisor: Parinaz Farid, Ola Edvin Vie
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Summary

Previous studies of a combination of project management and change management, to better manage transformational changes, have raise some new questions as to how well a robust management approach will work when exposed to a high level of uncertainty. This has justified a critical research of how robust management approaches could affect the execution phase of a change project. Thus, the aim of this thesis was to provide indications to what enables and drives uncertainty in the execution phase of a project embedded in a transformational change program and provide indications to what managerial implications this have for a project manager when a traditional, robust management approach is used.

A critical case study was conducted using a traditional engineering company currently in the execution phase of a transformational change. The study identified which issues is caused by uncertainty in the transformational change project in the execution phase and how these issues affect the management of the project in terms of efficiency and effectiveness.

The evidence presented in this thesis has shown that the uncertainty impact a traditional, robust project by introducing several issues in the execution phase. The findings indicate that the main issues caused by uncertainty is changes to the milestones, approach, scope, progress and project output in the execution phase. Moreover, this thesis suggest that the combination of a robust mindset and uncertainty causes the following issues affecting the effectiveness and efficiency of the project. First, changes to the milestones, and the need for developing a compromise in the management approach. Moreover, frequent evaluation of emergent opportunities, re-planning to achieve synchronization in the program, lengthy contractual conflicts and halting negotiations with the contractor and internal stakeholders. In addition, the findings indicate that changes and delays to robust plans and decisions have a cultural impact on the project. The analysis show that this could cause a lack of trust in robust plans among the employees in the organization. The analysis further indicate that cultural issues have an impact on the operations in the organization in general as well as the effectiveness of robustness due to the uncertainty exposing plans as a false sense of certainty.

Furthermore, the analysis and discussion conclude that the issues have the following managerial implications on the change project. First, contractual negotiations is found to decrease the efficiency of the case project. Secondly, the issues of managing a complex system of internal stakeholders demonstrate that conflicting views and misunderstandings could decrease the efficiency if not managed appropriately. Third, the interdependence in the program causes issues in the case project related to re-planning. Consequently the effectiveness and efficiency is dependent on the amount of resources spent on re-planning. Lastly, the analysis indicate that changes and delays combined with a robust culture and mindset could have an affect on the efficiency by creating incentives to report misleading statements about the progress, or incentives which benefit the prioritization of efficiency ahead of quality and effectiveness.

Preface

This thesis was prepared in the spring of 2020 at the Department of Industrial Economics and Technology Management, at the Norwegian University of Science and Technology (NTNU). I was engaged in researching and writing this thesis from January to June 2020. It has been written to fulfill the graduation requirements of the International Project Management Master Program at NTNU.

Inspired by a recurring issue exposed in the project thesis the autumn of 2019, this master thesis aims to research the limitations of traditional, robust management approaches in an uncertain change context. The basis of which is a qualitative study of a single critical case company. Being the first academic research in this field I have planned and conducted on my own, the research and development of the thesis was challenging without the support of a partner to bat ideas with. However, fortunately, great help and guidance from my supervisor and extensive work with the case company allowed me to answer the questions that I had identified.

I would like to thank my supervisor, Parinaz Farid, for excellent guidance and consultation and the professors at the Institute of Industrial Economics and Technology Management for all help with literature searches and inspiring lectures through the years leading up to the master thesis. I would also like to direct a big thank you to the case company which have been very welcoming and cooperative sharing their experiences and knowledge with me, without whose cooperation I would not have been able to conduct this analysis.

I hope you enjoy the reading.

Michelle Waaler
Oslo, 15th of June, 2020.

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Chapter 1

Introduction

Over the last few decades, the number of change projects undertaken by organizations has increased substantially (By, 2007). Despite the increasing number of change projects being initiated, the cited failure rates for change projects are between 70% - 90% indicating that organizations still lack effective means to reliably implement organizational change (Maurer, 2005) (Tan, 2005). At which point there has been a growing interest in the combination of the disciplines of project management and change management in an organizational change context.

With this as a starting point, the project thesis prior to this master thesis identified where traditional project, program and portfolio management approaches could benefit the management of transformational changes. The project thesis found that on the one hand, traditional project management tools could support change management by providing clarity and control to complex processes and tools for handling ambiguous objectives, to name a few. However, on the other hand, the traditional project management field is not specifically made for the purpose of managing change projects. This caused a recurring issue regarding the use of robust management approaches in an uncertain context. In other words, the project thesis established where traditional project management could benefit the management of transformational changes, however raised some new questions as to how well a robust management approach will work when exposed to a high level of uncertainty, which is anticipated in a transformational change context.

This query has been discussed by many authors. The use of project management tools in a transformational change context has been criticized by many authors stating that the traditional stage gate approach is too linear, too rigid and too planned to handle innovative projects (Cooper, 2014). Furthermore, project management in general tend to avoid the softer aspects of management which is regarded as especially important when managing change (Parker, 2013). For the same reason, authors such as Cummings and Worley (2015), Cicmil (1999), and Hiatt (2006) present similar views, rendering project management practices in transformational change projects to be insufficient on their own.

However, some authors defend the practice and argue that the failures are due to faulty implementation and that the critics are not relevant any more because most of the criticized

deficiencies have now been corrected in newer, more recent evolutions of the traditional, robust stage gate models (Cooper, 2014). Concurrently, there are many organizations which are still practicing a robust and rigid structure reliant on a detailed up-front planning phase.

The literature seems to diverge in the question of the suitability of robust management approaches in transformational change projects. For this reason, it is important to build on previous work and expand the knowledge of how uncertainty impact the management of a project and the consequences of using a traditional, robust management approach in uncertain and complex change projects.

Thus, this master thesis is a modified continuation of the project thesis aiming to study what enables and drives uncertainty of a project embedded in a transformational change program, and provide indications to what managerial implications a robust early phase in an uncertain context have for the project manager in the execution phase.

Due to limitations in time and resources, I have chosen to focus on the relation between uncertainty and managerial implications on the project level. This limit the scope to cover the managerial consequences of using a traditional, robust project management approaches in an uncertain change context. In addition, naturally, while previous research have focused on the front-end and planning phase of projects, this thesis focus specifically on the execution phase where the consequences of the early phase emerge. Moreover, I have chosen to add elements of managing uncertainty in IT-development and engineering projects because of my own personal interest in the subject and convenience considering the available case companies. Wherefore this thesis will study a digital transformation project which contains elements of both IT-development and change management allowing me to research uncertainty management in relation to both IT-development and transformational change.

Subsequently, this thesis aims to answer the following research questions:

Research questions
How can robust management approaches affect the execution of a change project subject to a high degree of uncertainty?

- How does uncertainty impact a traditional, robust project in the execution phase? What issues arise on the project level?
- How does these issues impact the efficiency and effectiveness of managing the project?

To answer these questions, this subject is analyzed both from a theoretical and an empirical perspective conducting a qualitative, critical case study. The selected case organization is a traditional and plan-heavy company undergoing a large, digital transformation. The transformation is driven by a change program spanning over a time period of nearly a decade. The case organization have used a robust and traditional front-end and planning phase, and are currently in the execution phase. This will for the purpose of this thesis facilitate the research of the consequences which arise in this phase due to the robust management approach. Moreover, there is an element of digitalization in this case which makes the case very relevant and interesting to study as these processes are characterized by a high degree of uncertainty and complexity.

Accordingly, answering the research questions, the thesis comply to the following structure. Firstly, there is established a theoretical framework which is based on two fields of literature, both engineering and the organizational change management field. First I examine uncertainty enablers, drivers and different categories of uncertainty before a framework based on the literature review examining the issues that a robust mindset causes in relation to uncertainty management in the execution phase is presented. The framework highlight how these issues affects the management of the project in the execution phase in terms of effectiveness and efficiency. While, next, these findings are put in the context of a transformational change project where the necessary key characteristics are presented to stage the context of the case organization in which the uncertainty, issues and their impact will be studied. At the end of the literature review, there is provided an overview of what the selected authors have researched regarding uncertainty enablers, drivers and categories linked up to the issues and their impact on the project level.

Secondly, the empirical data from semi-structured interviews with the case are presented and structured using both the themes provided by the theoretical framework and emergent themes from the interviews found important to answer the research questions. In the following analysis and discussion, the research questions are answered by combining the findings from the case study and the theoretical framework centering the discussion around the issues. Subsequently, I argue how the robust approach in the face of uncertainty causes the issues linking the uncertainty enablers and the uncertainty categories to the experienced issues, and then how these issues have impacted the effectiveness and efficiency of the change project.

Finally, the thesis conclude how robust management approaches affect the execution of a change project subject to a high degree of uncertainty according to the findings. Any contrasting findings with the theoretical framework will be highlighted and a new and adjusted framework, as well as suggestions for further research, will be presented concluding the thesis.

Chapter 2

Theoretical Framework

This chapter form the theoretical framework for the master thesis. The theoretical framework is based on literature, existing knowledge and ideas which is developed to explain, draw connections and make predictions about the research.

This thesis investigate the use of traditional, robust management approaches in an uncertain change context. Thus, to answer the research questions, I find it important to first identify uncertainty definitions, enablers and drivers. This provide an overview and vocabulary to map the uncertainty of a project. Furthermore, several authors contrast robust management approaches with flexible approaches to better explain and highlight the managerial issues and impact of robust management in uncertain contexts. I find it imperative to include an overview of both robust and flexible approaches as well as the suggested managerial issues and impact already covered by the literature. This provides some concrete areas and claims that could be critically tested in the case study. Lastly, many authors have criticized the use of traditional, robust project management approaches in uncertain contexts. Especially have the use of such approaches in an organizational change context driven a controversial debate about the appropriateness of such approaches in relation to uncertainty. Therefore, I find it important to identify the nature of transformational changes highlighting the uncertainty in this context. This provide a vocabulary and framework for the thesis laying the theoretical foundations needed to discuss uncertainty management in a transformational change context.

Moreover, the selected case project have characteristics from both a traditional IT-development engineering project and a change project. As a consequence, literature from both the engineering and change management field were selected to complement each other. These two fields aims to cover the relevant concepts and theory necessary to answer the research questions and present the selected case. Accordingly, the selected literature are mainly from the engineering field and the change management field. The articles presented in this chapter discussing uncertainty management, flexibility and robustness is mainly written based on data collected from, and for, engineering project. The articles on transformational changes are written from an organizational change management perspective, specifically for change projects, emphasizing uncertainty and key characteristics of

change project management.

This chapter is divided into 5 parts. The first part, *Uncertainty: Definitions, Enablers and Drivers*, provide a vocabulary and framework to discuss uncertainty by offering definitions and differentiation of risk, opportunity and uncertainty, and suggesting enablers and drivers for uncertainty. The second part, *Uncertainty Management*, introduce two different approaches to managing uncertainty in a project, robustness or flexibility highlighting the contrast to the respective mindsets. Third, *Managerial Issues and Implications*, propose managerial issues that could arise in the execution phase when managing a project in a high uncertainty context and highlighting the impact on the project through a focus on effectiveness and efficiency. Fourth, *Uncertainty Management in an Organizational Change Context*, aims to provide an understanding of the organizational system in which a change program takes place by introducing key characteristics of transformational change management, uncertainty in such changes and its impact on the management approach was identified. Finally, the chapter is summarized in a fifth section presenting the propositions and theoretical framework based on the literature review.

The theory presented in this section serves one or both of the following purposes: to show where the theory is in relation to other known theories in the field or to actively use it in the discussion. Consequently, each section is summarized concluding the findings relevant to analyze, discuss and answer the research questions. These summaries highlight the concepts and theories which will be included in the theoretical framework presented in the final section is this chapter.

2.1 Uncertainty: Definitions, Enablers and Drivers

There is general agreement in the literature that uncertainty drives the need for flexibility. Hence, the biggest threat to traditional project management and robustness is uncertainty. Assuming that uncertainty is the root cause of issues and challenges that project managers experience when executing a robust project, the following two section will provide an overview and vocabulary to map the uncertainty of a project.

Firstly, uncertainty is often a topic of research in the project management literature making a rich field of terms and concepts related to the uncertainty categories, enablers and drivers. These definitions and terms impact our understanding of the concepts and the analysis of its impact on a project. Therefore, this section aims at clarifying the terms and concepts used in this thesis and demonstrate my understanding of the relation between different terms and concepts typically used when discussing uncertainty through a mapping of enablers and drivers of uncertainty.

2.1.1 Differentiation between risk, opportunity and uncertainty

The two terms risk and uncertainty are often used interchangeably, hence it is important to define. Project Management Institute (2013) defines *risk* as an uncertain event which could have either a positive or negative effect on a project's goal and outcome which could be calculated using probability and prediction of the consequences of the uncertain event occurring. Moreover, several authors differentiate between negative and positive outcomes

of risk by using the terms risk and opportunity respectively (Rolstadås et al, 2011) (Johansen et al., 2019). This thesis will use the term risk when describing predictable and calculable emergent events with am undesired, negative impact on the project.

Opportunities, however, is in this thesis regarded as an emergent solution which present a favorable alternative or adjustment opportunity to the original plan of concept. Johansen et al. (2019) interpret opportunities as internal and external conditions that, can emerge at any time, and hence were not considered in the front-end and planning phase when goals and plans were established. If the opportunities are exploited and as a consequence changes is made to the existing plans, concepts or contracts there is both risk and uncertainty associated with the effect of this change (Johansen et al., 2019).

Uncertainty, in contrast to risk, is defined as "an incalculable event that, if it occurs, may impact project outputs and outcomes" (Kutsch and Hall, 2016, p.8), while risk is calculable. Risk is a future event that based on past experience and information could be quantified and measured, while uncertainty on the other hand, is immeasurable which could be difficult to quantify and even articulate (Kutsch and Hall, 2016). Consequently, uncertainty is in this thesis used to express outcomes and alternatives which cannot be fully predicted. These are the definitions that will be used in this thesis to describe risk, opportunity and uncertainty.

2.1.2 Uncertainty drivers: Lack of information and ambiguous information

One definition of the term uncertainty expresses uncertainty as lack of the information necessary to make a decision that secures the realization of the desired outcome (Samset, 2015). Similarly, several authors consider the degree of uncertainty to be lack of information, and Galbraith (1977) (referenced in (Johansen et al., 2019)) define uncertainty as the relationship between the amount of information needed and information available. However, there are authors that claim that uncertainty should not only be considered as the lack of information, but also the quality and understanding of that information. Chapman and Ward (2007) (referenced in Johansen et al. (2019)) claim that uncertainty could be considered as a lack of certainty associated with ambiguity of the information. Ambiguity is, according to Johansen et al. (2019), dependent on a lack of clarity and structure to consider information and issues, what assumptions used to considering the information, and known and unknown sources of biases causing different interpretations of the same information.

Consequently, based on the reviewed literature there is considered to be two drivers of uncertainty, namely lack of information and ambiguity of information. Subsequently, one could argue that uncertainty could either be reduced by increasing the relevant information or make the project less reliant on information. However, Johansen et al. (2019) point out that ambiguity could not be reduced by providing more information.

2.1.3 Uncertainty enablers

Based on the literature review, this thesis consider two drivers for uncertainty: lack of information and ambiguity of information which in turn cold result in both risks and opportunities subsequently causing issues in the execution phase of a project. However, the

degree that these drivers are present in a project is dependent on some factors. This thesis have detected three factors, often mentioned in the literature, which is regarded as enablers for uncertainty and will be presented in this subsection, namely duration, complexity, modularity and interdependence.

Duration

Many authors discuss the duration of a project as prominent when understanding the stability of decisions and uncertainty. Olsson (2006b) claim that "the longer the time frame of a project, the less likely it is that the original prerequisite will remain unchanged and the more important it is to manage flexibility" (Olsson, 2006b, p.79). Moreover, Project Management Institute (2013) state that many agree that "accurate, detailed forecasting over a long time horizon is not possible and therefore cannot be used to develop long-term plans to ensure a competitive position in the future. In order for an organization to succeed in the future, it needs to have a ... [change process] that can continuously retune an organization's process to support the management's vision and react quickly to changes in the business environment" (Project Management Institute, 2013, p.7).

Similarly, Kreiner (1996) illustrate the concept of drifting environments and uncertainty in project management well in the following quote: "any project is designed on a set of assumptions about the world in which it is meant to achieve results" (Kreiner, 1996, p.338). There are challenges related to this, even if you assume that the planning of the project is professionally executed, that the client's interests are unambiguously and truthfully represented, and that the means and activities needed to achieve the intended results are formulated based on all relevant information. The challenge is that, even if this is done perfectly, "the environment which was in fact true at the point of design, may not be true at the point of delivery or at any particular point in between" (Kreiner, 1996, p.338). This changing environment can make the project and its results useless and irrelevant. Kreiner (1996) defines environmental drift as what happens when the environment, "relative to the projected environment conditions, on the premise of which the project was originally designed and planned", has changed (Kreiner, 1996, p.338), wherefore the need for adaptability is key in an uncertain context.

Consequently, due to long duration and the increasingly complex and dynamic environment for most businesses today, the duration of the change project influence the management approach to uncertainty and is considered by several authors a driver for flexibility, and thus considered an enabler for uncertainty in this thesis.

Complexity

Complexity is a term often appearing when discussing uncertainty and is this thesis regarded as an enabler for uncertainty. Johansen et al. (2019) claim that an agreed definition of project complexity is lacking, however there is consensus that complexity is more than simply a function of size.

Kutsch and Hall (2016) define complexity as "changing interrelatedness of risk and uncertainty"(Kutsch and Hall, 2016, p.11) characterizing how risk and uncertainty influence the performance of projects through their interaction. Moreover, Johansen et al. (2019) reference Baccarini (1996) who describe organizational complexity as a dependent on the

differentiation and inter-dependencies between "the number of organizational units, the relation between these and the type of tasks they handle" (Johansen et al., 2019, p.51).

However, Samset (2015) discuss the relation between complexity and uncertainty using systems theory. Naturally, complexity is increasing when the number of elements in a system increases. However, according to systems theory, in addition, the diversity of elements in the system and the attributes and relations between them increases the complexity as well as the number of elements, while the organization of these elements and relations contribute to reducing the complexity (Samset, 2015). In other words, whether a system is complex or not is dependent on the number of elements in the system *and* the degree of diversity in the relations between them and how they are organized. Furthermore, Samset (2015) claim it is the diversity of attributes and relations which makes the system less predictable, but also less vulnerable (Samset, 2015). This is the definition of the term used in this thesis.

Modularity and interdependence

Modularity refers to the possibility to divide the project into smaller, independent parts. Based on the reviewed literature this thesis consider modularity as a measure for the strength of the interdependence between elements in the system e.g. projects in a program with high interdependence is considered to have low modularity. Olsson (2006b) discuss high degree of modularity as means to reducing uncertainty. Similarly, Johansen et al. (2019) discuss that in projects with high level of modularity, one could achieve flexibility by committing to parts of the projects one by one in a step by step development process where for example real options could be applied for each part of the project in series. Consequently, low modularity is considered an enabler for uncertainty in this thesis.

2.1.4 Uncertainty categories

The different enablers and drivers affect the degree of uncertainty in a project, however, to create a more nuanced picture of the uncertainty in a project there is necessary to introduce different categorizations of uncertainty. This section introduce preeminent terms selected from the literature for the purpose of describing and distinguish between different types of uncertainty in this thesis.

Contextual and operational uncertainty

Christensen and Kreiner (1991) (referenced in Samset (2015)) and Johansen et al. (2019) differentiate between operational and contextual uncertainty.

Operational uncertainty is associated with the organization and execution of projects relatively independent of the context, and is characterized by decreasing uncertainty as the project develops, more information become available and the project manager gain experience and understanding about the process they are managing (Samset, 2015). The operational uncertainty is associated with internal circumstances such as "resource variations, productivity, coordination, team spirit and culture, etc." (Johansen et al., 2019, p.44) which could be controlled by the project management team.

Contextual uncertainty, on the other hand, is connected to circumstances outside of the project. These uncertainties include "competing projects, changes in ownership and management, legislation and governmental directives, media attention and extreme market conditions" (Johansen et al., 2019, p.45). Samset (2015) use the term to describe uncertainty related to the environment of the project where the project's ability gather information and to influence the uncertainty is limited.

Goal, Approach, Relational and Dynamic uncertainty

Kutsch and Hall (2016) present four aspects of project uncertainty and risk that project managers have difficulty managing with the current frameworks: Goal, Approach, Dynamic and Relational.

Goal uncertainty is related to vaguely definable outcomes where the goal, requirements or functions of the project cannot fully be defined or specified by neither the project team nor the stakeholders. This information will emerge through the progress of the project creating uncertainty and risk related to the goal (Kutsch and Hall, 2016).

Approach uncertainty is related to the "how" of the project where the process towards the project goals are uncertain rendering project managers to be able to change approach during the process away for the one initially planned (Kutsch and Hall, 2016). *Relational uncertainty* is related to variation in the perceptions of the same data. Kutsch and Hall (2016) argue that it is not uncommon that the same data could lead to different interpretations and hence a variety of actions causing confusion, misunderstandings and an incoherent approach to the project at hand. Therefore a shared understanding in the project team about how to interpret the data is imperative to handle emergent uncertainty and risk.

Dynamic uncertainty, similar to contextual uncertainty, is related to environmental changes that could cause necessity for adaption. These changes are often out of the projects control, however, the project must be able to readjust when issues such as "stakeholders updating their requirements, unforeseen acts of suppliers or competitors, changes in different parts of the organization, and wider market turbulence" (Kutsch and Hall, 2016, p.9) occur affecting the project goal and/or approach used.

2.1.5 Summary

In summation, literature highlight three concepts which enables uncertainty, two drivers for uncertainty and four uncertainty categories. In this context, drivers of uncertainty are factors that literature have highlighted as causes for uncertainty, which is creating needs or imposing pressure on projects to be flexible. Moreover, in this thesis I refer to enablers as factors that contribute to increased uncertainty, and the concepts defined in this section will be included in the theoretical framework. Furthermore, based on the reviewed literature, I draw the following conclusions.

Firstly, the theory presented from Olsson (2006b), Project Management Institute (2013) and Kreiner (1996) suggest that a long duration make prediction difficult in a dynamic environment. Consequently, there is expected that a project with a long duration will experience uncertainty and changes to the goal and/or approach due to emergent factors from the environment.

Secondly, based on the findings of Kutsch and Hall (2016), Samset (2015), Olsson (2006b) and Johansen et al. (2019), I consider modularity as a measure for the relation and dependence between the projects. According to the reviewed literature, when modularity is low, the interdependence is strong. This contribute to making a system more vulnerable to changes. While complexity on the other hand makes a system less vulnerable to changes, however introduce an uncertainty in the system increasing the uncertainty related to ambiguity. Consequently, there is expected that a project dependent on other projects and a complex system of several stakeholders increases the uncertainty related to ambiguity and misunderstandings.

Moreover, I have chosen to use the terms goal uncertainty, approach uncertainty, relational uncertainty and dynamic uncertainty to discuss uncertainty related to a project embedded in a program as defined by Kutsch and Hall (2016). Furthermore, the terms operational and contextual uncertainty as defined by Johansen et al. (2019) and Samset (2015) will be used as collective names including respectively goal and approach uncertainty, and relational and dynamic uncertainty. Operational uncertainty include circumstances inside the project, while contextual uncertainty include circumstances outside of the project.

Figure 2.1 illustrate the relation between the uncertainty enablers, drivers and categories presented in this chapter. This illustration serves the purpose of summarizing the terms which will be used in this theses and make clear my use of the terms. The information are presented in a way that I found appropriate and advantageous for the purpose of this thesis and is, - even though it is based on an relative extensive literature base - not aiming to create a comprehensive map of uncertainty in general.

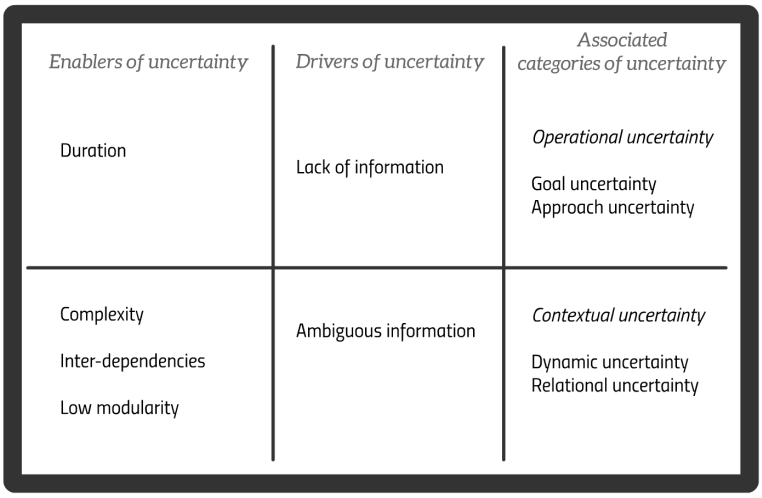

Figure 2.1: An illustration of the relation between the uncertainty enablers, uncertainty drivers and categories of uncertainty based on the literature review

2.2 Uncertainty Management

Caron (2013) suggest that companies have two options to prepare for emergent strategic surprises and introduce two common, but different, responses to uncertainty: Project Robustness and Project Flexibility. These are the terms that will be used in this thesis to differentiate and contrast approaches. The following subsections will explain the concepts through an account of the mindset and approaches associated with the two disciplines. However, the purpose of this thesis is not to evaluate the appropriateness of different management approaches in an uncertain environment, but to map threats caused by the mindset behind these disciplines when applied in an uncertain context. Therefore, the following sections will introduce robust and flexible mindset and approaches with focus on general concepts and characterizations of the two approaches and use specific management approaches for the purpose of exemplifying, concretizesing and clarifying the abstract concepts they represent.

2.2.1 Robustness mindset and approaches

Many authors state that robustness and stable decisions is concerned with the efficiency of a project. This section introduce the mindset of robustness and key characterizations of a general traditional, robust management approach.

Mindset

Caron (2013) claim that traditional project management focuses on the stability of the project plan and introduce the concept of Project Robustness. The concept is well illustrated by the following quote: While "Project Robustness aims to modify the initial configuration of the project while facing changing conditions, Project Flexibility Project Flexibility aims to modify the initial configuration of the project e.g. the project plan, in order to adapt to the changing environment" (Caron, 2013, p.29). In other words, Project Flexibility is reactive developing the ability to address unanticipated conditions, while Project Robustness is proactive addressing anticipated risk.

However, the main challenge for robust project planning is to make stable decisions (Caron, 2013). The main tools is to collect as much information as possible and use project risk management before and during the process to build robustness into the plan and prepare for unanticipated events by making decisions which could be modified or changed at minimum cost (Caron, 2013). However, Caron (2013) argue that the central difficulty with the Project Robustness in the assumptions that risk could sufficiently be forecasted. Furthermore, an over-commitment to preventive strategies might produce an overconfidence to the success of the project causing the project to be unable to cope with unanticipated, emergent events.

Traditional, robust project management model

Research show that many public and private Norwegian companies contend to the traditional, robust way of planning and executing projects having confidence in the stage gate

model using a "plan first, do second"- philosophy first introduced by Cooper (1993) (according to Johansen et al. (2019)). In this thesis, the project stage model refers to this standard model of project phases with stage gates representing specific decision points and documentation requirements. A common stage gate model is illustrated in figure 2.2, and the logic behind the model is to:

- facilitate project governance and control for base organization and project owners
- ensure that the formal decision-making is supporting the success of the organization
- reducing risk by making clear decision gates where projects could be terminated, only letting the right concepts and projects through to the next stage
- enabling the structure of a logical sequence with a set of activities in each phase which must be executed efficiently

(Cooper, 1993), (Johansen et al., 2019).

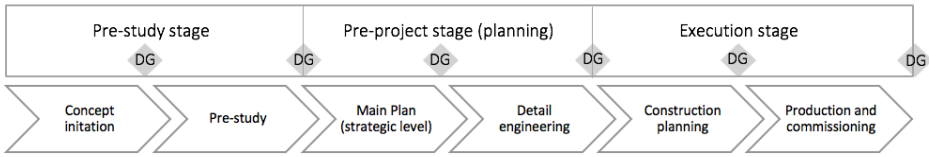

Figure 2.2: An illustration of the common stage gate model in a public and private organizations from Johansen et al. (2019)

Examples of robust management approaches

The project management field is very theory rich, so to simplify the approaches this thesis will use Project Management Institute (2017a)'s classification of different management approaches. According to PMI, there are five main types of cycles: predictive, iterative, incremental, adaptive, or hybrid (Project Management Institute, 2017a). With a predictive cycle, the parameters of the project (scope, cost, and time) are defined early on in the life cycle, and then any changes to the plan are carefully controlled. Iterative and incremental life cycles both involve scopes that are defined early, however, the time and cost expectations evolve as the organization discovers the extent of effort required to achieve the scope. The difference between an iterative and incremental life cycle is that the former works towards the project output as a whole with each iteration while the latter focuses on adding incremental functionality with each iteration that would eventually result in the final output. An adaptive life cycle involves setting a new scope for each iterative cycle and is described as agile, iterative, and incremental. Finally, a hybrid cycle is possible whereby well-known parts of a project are managed with a predictive cycle while the lesser-known parts take an adaptive approach (Project Management Institute, 2017a).

In this thesis traditional, robust project management refer to a project following a predictive life cycle either incrementally or iterative, and flexible project management refers to what Project Management Institute (2017a) classify as a project using an adaptive life

cycle. Flexible project management will be expanded on in the following subsection, but first, expanding on the predictive life cycle, Myburgh (2014) and Moran (2016) present the term waterfall methodology. *The waterfall methodology* is a methodology which project management methodologies (PRINCE2 for example) soon embodied based on a phase approach where each phase is completed before proceeding to the next, according to Moran (2016). The underlying principle being that early, comprehensive and detailed specifications and planning would prohibiting costly changes later in the development phases.

Similarly, Myburgh (2014) describe the waterfall approach as an ”controlled quality” approach where quality requirements are formally addressed and specified in each stage of the project life cycle. However, this approach require that the project have the time, resources and ability necessary to analyze, specify and design the full scope solution with it's requirements. Myburgh (2014) points out that this highly disciplined approach to management run the risk of ”analysis paralysis”.

2.2.2 Flexibility mindset and approaches

Many authors states that uncertainty drives the need for flexibility. Flexibility contrasts the robustness and is presented in this thesis to contrast the traditional and robust project management approach.

Johansen et al. (2019) describe flexibility as “a way to manage this information gap by reducing the amount of information that is needed, as compared to other project management approaches that often focus on increasing the availability of information” (Johansen et al., 2019, p.79). Husby et al. (1999) define flexibility as “the capability to adjust the project to prospective consequences of uncertain circumstances within the context of the project” (cited in (Magnussen, 2006, p.4)). Similarly, Merriam-Webster dictionary state that being flexible “is characterized by a ready capability to adapt to new, different or changing requirements” (cited in (Olsson, 2006a, p.1)). Johansen et al. (2019) offer a similar definition and this is the definition that will be used in this thesis when referring to project flexibility.

Mindset

According to Caron (2013), Project *Flexibility* in contrast to robustness, instead of risking basing decisions on incomplete information early in the project planning phase, the flexibility approach achieve high flexibility by: “postponing decisions as long as the value of information remains high, maintaining future options for taking action when goals, preferences, alternatives and their consequences become clearer, in order to minimize the gap between the knowledge necessary to take the decision and the knowledge that actually is available” and “decisions should be taken in any case according to the lead time necessary to implement the corresponding actions” (Caron, 2013, p.31). Similarly, according to Magnussen (2006), “one key idea in project flexibility is to postpone irreversible decisions in the front-end phase of projects, in addition to (or instead of) gathering more information” (Magnussen, 2006, p.3).

In addition, according to Olsson (2006b), flexibility is found to primarily improve effectiveness rather than efficiency. As a consequence, one of the major drawback related to flexibility is the reduced efficiency of the process. Moreover, as stated earlier, uncertainty

could make the way for both risks and opportunities. Johansen et al. (2019) suggest a differentiation between internal and external opportunities. These terms are creating the need for two new terms: internal project flexibility and external project flexibility, where project internal flexibility relates to flexibility within the defined scope - *how* the requirements will be met while project external flexibility relates to adjustments of project scope - *what* requirements will be met (Johansen et al., 2019). Likewise, while internal flexibility apply an efficiency perspective where the flexibility could create opportunities for optimizing resource utilization, the external flexibility have a effectiveness perspective where the flexibility could create opportunities for the project owner to adjust scope and goals increasing the value of the project (Johansen et al., 2019).

Examples of flexible management approaches

As mentioned in subsection 2.2.1 , Project Management Institute (2017a) suggest there are 5 main types of project life cycles where one of them where adaptive, the difference from the others being that the scope was set with each iterative cycle. To expand on the approaches of flexibility I have chosen to differentiate between three types of perspectives on flexibility in a project: agile, iterative and emergence. The following three subsection introduce some important characteristics with these three branches.

Agile

The agile discipline welcome change and adaption through learning loops and by postponing decisions until the necessary information is available (Moran, 2016). However, generally speaking, the agile team must balance the need for adaption and innovation with the pressure to standardize and stabilize (Moran, 2016). The purpose and mindset of the agile discipline and its contrast to the traditional, robust mindset is well illustrated by the following quote from The Agile Manifesto (Fowler et al., 2001): ”We value:

- Individuals and interactions over processes and tools
- Working software over comprehensive documentation.
- Customer collaboration over contract negotiation.
- Responding to change over following a plan”.

(Fowler et al., 2001, p.2)

Agile is not characterized by specific techniques and processes, therefore it cannot be purely defined on The Agile Manifesto alone. The Agile Manifesto present 12 principles to guide all decisions which could be interpreted and adapted by different users and to meet different needs (Moran, 2016). However, Moran (2016) portray agile as adaptive, value-driven, collaborative and empowering solution development paradigm which drive innovation in an incremental and iterative manner. Even though most applications of agile has been found in the IT sector, over time many different methodologies have been established reflecting different areas in which the methodology could be applied, for example XP, Scrum, DSDM and SAFe. Agile has grown into an adequate practice for the

new technology driven world and increasing dynamic and unstable business environment. Thus, Moran state that agile "has evolved primarily as a change management strategy" which both "deliver and require flexibility of process, organization and culture" (Moran, 2016, p.31).

Moreover, the agile approach is often referred to as customer oriented in the literature where agile approaches value frequent meetings and face-to-face communication with the customer allowing adjustments to the prioritization, resource allocation and decisions made throughout the process in close collaboration with key stakeholders (Moran, 2016) (Fowler et al., 2001).

Flexible iterative approaches

While agile is considered the "purest" form of flexibility, there are several more moderate ways of introducing flexibility to the process. As previously mentioned, uncertainty is related to the gap between the information needed and the information available to make stable decisions creating the need for flexibility. There are several approaches that manage this gap in information differently, some of which are late locking (Johansen et al., 2019)(Olsson, 2006b), real option (Johansen et al., 2019), continuous step by step planning (Olsson, 2006b)(Johansen et al., 2019), contingency planning (Olsson, 2006b) and contract flexibility. These methods incorporate flexibility following several different principles. Postponing decision making to explore options, calculate the financial value of possible options, map which decisions must be taken and plan when they must be taken, develop several alternative plans or a post in the budget to cover unexpected costs respectively (Olsson, 2006b)(Johansen et al., 2019).

Emergence

In contrast to Caron (2013), Samset (2015) presents the concept of emergence, autonomy and self-organization from systems theory as the most important for project's development and success in relation to uncertainty management. The essence of emergence is build around the idea that any project have the ability to adapt to emergent circumstances, - not necessarily because the right approach to flexibility is chosen, but because a project have an autonomy within an organization making it possible to adapt and to change focus and structure from one phase to another in a different manner than what a traditional organization could (Samset, 2015). This view underlines the importance of a process perspective in the project and comes from a complexity theory perspective where the complexity of attributes, relations and elements in a project on the one hand makes the system less predictable, but on the other hand makes a project less vulnerable when facing unforeseen challenges and uncertainty (Samset, 2015).

2.2.3 Necessary change in mindset

Based on this literature review, there is a wide spread understanding among many authors that striving for a fully planned project where all uncertainty and risk is eliminated in the front-end planning phase of a project is an utopia (Johansen et al., 2019) (Samset, 2015).

Johansen et al. (2019) stresses that there is a need for a shift in mindset in the industry which is heavily influenced by a robust, plan-centric management mindset. Johansen et al. (2019) propose that the traditional industry's best practice, execution models and procedures as they are today are "unfortunately (...) based on the principles that project uncertainties are undesired" and "encouraging decision-making based on deterministic values and execution management based on fixed objectives" (Johansen et al., 2019, p.131) causing major projects to be managed insufficiently. Johansen et al. (2019) reference Rolstadås et al. (2011) claiming that "industry track records for delivering major projects have proven that this approach [defensive, traditional, robust project management] does not work" (Johansen et al., 2019, p.132).

Likewise, according to Pollack (2016), traditional project management is focused on the efficient delivery of well-defined deliverables. Although this works well for clearly defined projects, it tends to break down when dealing with projects that cannot be so easily defined. This issue is well illustrated by the following quote by Moran: "plan-centric thinking (...) must contend with the fact that they are at their most effective within an environment of certainty. Plan-driven approaches become the limiting factor where uncertainty and change prevail at which point adaptive and multi-tiered planning becomes more appropriate" (Moran, 2016, p.50).

Consequently, because the project's concept, business strategy and execution plan must be developed before project start, the uniqueness of the project is ignored, and the execution process is reduced to follow company procedures that ate often prescriptive in nature. Johansen et al. (2019) propose that the mindset should move away from viewing

- "Uncertainties as undesired"
- "Projects as known tasks to accomplished in known environments"
- "Deviations from project baselines as inaccurate planning or inapproriate control"

(Johansen et al., 2019, p.132)

to instead be a mindset following the following principles

- "Acknowledging the nature of the project as unique and uncertain, requiring dynamic strategies and execution philosophies in order to be successfully mastered"
- "Embracing a continuum of known-unknown tasks, to be executed in unfamiliar and often turbulent locations and business environments"
- "Recognizing deviations as the rule and not the exception, applying dynamic skills to drive and deliver extraordinary project business results"

(Johansen et al., 2019, p.133)

Similarly, Samset (2015) support this view arguing that planning is necessary, however believing that risk and uncertainty can be eliminated in the early stages of a project will expose the project to an even greater risk. When a project reaches a level of complexity

and uniqueness, the assurance that all uncertainties and risks are taken into account in advance, means that no measures are built in to deal with unforeseen events. In addition, lack of room for maneuvering and deviations from the plans could lead to a less successful project execution (Samset, 2015).

Furthermore, Magnussen (2006) note that "the engineering tradition of project management is focused on stability while many other management sciences are focused on adaptability"(Magnussen, 2006, p.4). Illustrating this perspective further, Magnussen (2006) introduce the findings from Kaderfors (1995) which illustrates a similar paradox regarding projects stating that "projects are on the one hand viewed as situation-specific organizations, designed to solve a specific and unique task. However, several project intensive industries, including construction, have a reputation of being conservative and slow to change. This indicates that the potential flexibility in projects is controlled by conformity in the working process, creating a conservative tradition." (Magnussen, 2006, p.4)

2.2.4 Summary

In summation, the literature highlight two different mindsets to manage uncertainty: project robustness and project flexibility. Based in the reviewed literature, I draw the following conclusions. Based on the discussions of Caron (2013) and Magnussen (2006) it is generally found that robust approaches attempt to eliminate future risk though analysis, planning and by obtaining as much information as possible. Flexible approaches, on the other hand, seek to welcome future opportunity and introduce adaptability to the process by postponing decision making until the information in available. In contrast to proactive, robust approaches, flexible approaches are generally reactive with regard to uncertainty.

Subsequently, based on the findings of Caron (2013), Johansen et al. (2019), Moran (2016) and Myburgh (2014), the literature suggest that robust approaches reduce the risk by making clear decision gates, structuring a logical sequence of activities and facilitate project governance and control through stage gates. Consequently, several authors argue that it is expected that robust approaches increases the efficient execution of the project plan by prohibiting costly changes in the execution phase. However, the problem with the robust mindset and approaches is the assumption that uncertainty and risk could be sufficiently forecasted causing the risk of being incapable of handling emergent events. Therefore, based on the literature review I conclude that the robust management approaches are only efficient if the project is executed as planned.

In contrast to the robust approaches, several authors argue that because of the uncertainty, flexible approaches are more appropriate to secure both efficiency and effectiveness. Consequently, it is expected that a project in uncertain circumstances will introduce one form of flexibility and changes in the execution phase to secure the effectiveness of the project. However, when studying the prioritization of the Agile discipline presented by Fowler et al. (2001), the robust characteristics such as the importance of processes and tools, comprehensive documentation, contract negotiation and following a plan is deemed less important in favor of managing individuals and interactions, developing the solution, collaboration and fast response to change. This highlight the contrast between the robust and the flexible mindset. Similarly, the difference in mindset is highlighted by Johansen et al. (2019). Consequently, I expect that these conflicting prioritization could cause some

conflict in the management of a robust project in a change context where conflicting needs from both mindsets occur.

2.3 Managerial Issues and Implications

Many authors claim that robustness and flexibility creates a dilemma in the project management field creating conflicting ideas about the need for flexibility in the execution phase of a project. This dynamic is the subject of study in this thesis. Olsson (2006b) claim that project flexibility is a fundamental dilemma in project management where on the one hand, stability and control is needed for the project to be executed efficiently. While on the other hand, the need for flexibility is created because projects are influenced by its environment and therefore uncertainty causes important project decisions to be made based on limited information threatening the effectiveness. Moreover, there is widely agreed that flexibility in the front-end phase of projects is advantageous. However, flexibility in the execution phase is commonly seen as undesirable (Magnussen, 2006).

Consequently, the purpose of this thesis is to research the impact that robust management approaches have in the execution phase of a change project subject to high uncertainty. This section will provide theory to the theoretical framework describing the dilemma of uncertainty management and the managerial issues present in the execution phase. To simplify and structure the findings, the managerial issues are divided in two categories: operational and contextual. Hence, this section consists of two parts. First, the issues related to operational circumstances, and second, the issues related to contextual circumstances are presented. Furthermore, the managerial impact that these issues afflict on the project in the execution phase will be highlighted in these respective subsections as well. Many authors discuss the impact of the issues in terms of effectiveness and efficiency. I have decided that this is an appropriate approach in this thesis as well and these terms will therefore be used in the discussion of the managerial impact.

2.3.1 Operational issues and managerial implications

Operational issues are in this thesis considered to be issues related to the management and execution of the project associated with internal circumstances such as resource allocation, productivity, coordination and culture. Several authors highlight these issues in terms of their impact on effectiveness and efficiency. This section aim to mainly provide an overview of managerial issues, however their impact will be included due to it's relatedness in the literature.

Emergent opportunities driving changes to robust plans

A wide range of studies and authors highlight the differing perspectives of effectiveness versus efficiency when discussion flexibility in project management in relation to emergent opportunities driving changes to the project in the execution phase. Olsson (2004) present the views of many authors, including Morris & Hough (1984) and Eikeland (2001) and Love et al. (2003) and Christensen & Gordon (1998), which suggest that changes are associated with cost overruns and are, for this reason, considered undesirable even if there

is presented an opportunity to improve the profit. Consequently, "once a project has been decided upon and the planning and execution has begun, changes will often reduce the efficiency of the project" (Olsson, 2004, p.3). Many authors agree that flexibility in the execution process threatens the projects ability to deliver the projects output on time and withing budget, which indicates that traditional, robust project management approaches maximize the efficiency of a project by clearly defining the project specifications in the front-end and avoid changes to plan and the existing decisions (Olsson, 2004).

While, robustness and traditional project management practices are emphasize the importance of efficiency (Olsson, 2006b), the argument in favor of flexibility is the opportunity to increase the effectiveness of the project. Olsson (2004) state that "flexibility is also seen as a help to achieve the project's purpose. A project with sufficient flexibility to utilize opportunities to increase the value for owners and users might in the end prove to be more effective" (Olsson, 2004, p.4).

Furthermore, as stated earlier, flexibility is regarded undesired in the execution phase my many authors, that emphasize the negative consequences for efficiency. Johansen et al. (2019) claim that there is impossible to exploit an opportunity without allow changes to the established plans, concepts and/or contracts. In addition must the project have the necessary authority granted by the project owner and motivation to follow the change through. When considering exploiting an emergent opportunity in the execution phase of a project, Johansen et al. (2019) argue that benefits of the opportunity must be high enough to balance the required resources and uncertainty related to re-planning and re-work. Thus the project team must consider the following when an opportunity emerges. The project team must negotiate and agree on changes in the contract, concept and plan, accept the sunk cost from the work already done when abandoning the earlier accepted solution to pursue a new, and potentially more uncertain, solution, and lastly, consider the effort, time and resources necessary to evaluate the solution and re-plan in relation to the uncertainty associated with whether or not the new solution will produce the intended benefit (Johansen et al., 2019). Johansen et al. (2019) claim that "exploiting these conditions could be challenging since the project manager and the owner must accept changes to the original plan and there is a risk of failing when an opportunity is exploited" (Johansen et al., 2019, p.43).

2.3.2 Contextual issues and managerial implications

Contextual issues are in this thesis considered to be issues connected to circumstances outside of the project in particular the issues associated with stakeholders. To simplify the scope of this thesis, the stakeholders will be categorized in three categories due to their similarities in needs and management approach to handle them. First, the contractor including all the aspects of contracts and relations between the project and the contractor company. Second, the program management team including the relations to the other projects in the program and third, internal stakeholders, which in the context of this thesis will include relevant divisions and/or users within the organization receiving the output of the project. A manifold of authors highlight the need for robustness in the project in relation to stakeholder management and the importance of managing the stakeholders to secure effectiveness of the project.

Internal stakeholders: A false sense of certainty causes conflict

Based on the reviewed literature, robust approaches is reliant on the forecasting of the needs of stakeholders and plan how to communicate to accommodate these needs. In accordance with several authors such as Franklin (2014), Cummings and Worley (2015) and Kotter (1998), Olsson (2004) state that "there is also the possibility that visualizing flexibility in a project, such as the openings for later adjustments or even cancellation, will reduce the likelihood that the project will be approved and carried out as planned. In such a perspective, commitments, not adjustability, are required to communicate credibility to affected parties" (Olsson, 2004, p.3). Similarly, Miller & Lessard (2000) (referenced in Olsson (2004)) point out a similar argument stating that large, engineering project are irreverable and thus the importance of a bold of commitment from key stakeholders is an argument against flexibility in the execution phase. For this reason, changes are undesirable and thus also flexibility because flexibility increase the probability of changes (Olsson, 2004). Furthermore, Olsson (2004) argue that internal flexibility in a project could create uncertainty and frustration between the involved parties because the project is not clarified to a large enough extent.

However, several studies and authors contradict these views. Franklin (2014) argue that robust approaches only creates a false sense of certainty. Assuming that uncertainty increases the probability that changes must be made in the execution phase, robust plans are under pressure and changes are inevitable in the execution phase. However, Olsson (2004) argue that the critics towards flexibility highlight the negative effects of changes, not the flexibility it self. Olsson (2004) goes on to argue that a change require that something has been decided, and argue that the logic of late locking as described in subsection 2.2.2 is to postpone decisions and as a consequence reduce the amount of changes (Olsson, 2004). Furthermore, Olsson (2006a) present research that find that the main drawback to project flexibility is not the flexibility it self, but the application of flexibility without structure and preparations that allow flexibility. These findings indicate that "if a structural framework for a project is established, flexibility options could be utilized without destabilizing the project organization" (Olsson, 2006a, p.1).

Moreover, any project, and especially a change program, is reliant on the support and commitment from senior management who will be responsible for the funding and governance. To gain this support the agile approach suggest that the frequent testing of solutions and feedback is vital to prove its positive impact (Franklin, 2014), in contrast to predictive plans and up-front solution specifications. Franklin (2014) raises the issue that the success of this approach is dependent on trust between the governing management and the change project managers (Franklin, 2014).

Program interdependence hindering efficiency in the execution phase

Johansen et al. (2019) claim that a system becomes gradually more stable and controlled and that though the system becomes more controllable when transitioning from the early phase to the execution phase, it also becomes more rigid. Especially in a program, the need for cooperation and alignment across projects, organizational divisions and external parties such as contractors or regulative entities, is higher, increasing the complexity in the system. Lundin and Söderholm (1998) (referenced in Magnussen (2006)) describe that, in

contrast to the early phases, the execution phase have a closeness where the predetermined activities and tasks is supposed to be carried out according to plan.

Furthermore, Cummings and Worley (2015) state that "the amount of coordination required in a structure is a function of the amount of uncertainty in the environment, the degree to which sub-units differ from each other, and the amount of interdependence among sub-units. As uncertainty, sub-unit difference, and interdependence increase, more sophisticated coordination devises are required" (Cummings and Worley, 2015, p.99). Likewise, Olsson (2004) state that "flexibility appears as a double-edged sword: the flexibility for one project stakeholder can be another's risk. The case against project flexibility highlights the negative effects of changes along with the possibilities for frustration due to a lack of decisions and commitment" (Olsson, 2004, p.4). Consequently, a high degree of interdependence in a program could decrease the efficiency if not managed appropriately.

Contractual relations: Incentives and robust contract management

Samset (2015) argue that there are some influence strategies that project managers could chose to make use of to reduce contextual, or dynamic, uncertainty and limit the risk of any surprises. Many organizations have the opportunity to chose the actors they will collaborate with, for example by choosing which projects to pursue and which contractor. Moreover, there is also the possibility to control the uncertainty created by contextual circumstances and external parties by performing a thorough analysis of the environment and/or develop a contract between the project and contractor. The contract could be used to reduce goal and approach uncertainty by clarifying the task scope and content, degree of authority, information flow and collaboration plan, for example, and transfer the risk from the project to the contractor by including incentives and/or negative consequences for creating uncertainty in the contract (Samset, 2015).

Consequently, based on this, a robust contract is aiming to secure effectiveness and efficiency of the project by reducing uncertainty and risk by transferring the risk from the project to the contractor. However, based on the findings in section 2.3, I assume that similar to robust plans, changes to a robust contract could be difficult and time consuming putting the efficiency at risk.

2.3.3 Summary

Based on the literature reviewed in this section, there where identified several factors which causes conflict in the execution phase of an uncertain project due to the robust uncertainty management approach utilized in the project's front-end and planning phase. Consequently, these findings are assumes to be relevant in the context of uncertain transformational change project as well.

Firstly, considering the operational issues, based on the perspectives of Olsson (2006b), Olsson (2004) and Johansen et al. (2019), operational issues take the form of changes to the project output due to emergent opportunities. The argument is that once the execution phase begin any opportunities and changes to increase effectiveness and profit must be measured up against the sunk cost from the planning and work that has already been done in the early phase.

Consequently, the dilemma of efficiency and effectiveness become apparent in the execution phase when opportunities emerge. The literature suggest that exploiting the opportunity might increase effectiveness; however, a traditional, robust planning phase make changes costly because of the sunk cost, thus decreasing efficiency. Considering these findings in relation to the findings presented in 2.1.3, I expect that long duration in a project will threaten the relevance of the decisions made in the early phase. Furthermore, in combinations with emergent opportunities, evaluation of the possible changes to the initial plans and decisions must be done considering the optimization of both effectiveness and efficiency as more information is revealed in the execution phase.

Secondly, considering the contextual issues, based on the findings from Franklin (2014), Cummings and Worley (2015) and Kotter (1998), robust management approaches is considered to create a sense of certainty and stability which create less room for misunderstanding, confusion and chaos as well as securing commitment from important, internal stakeholders. This is assumed will in turn secure an efficient management of relations. However, authors such as Olsson (2006a), Olsson (2004) and Franklin (2014) argue that in an uncertain environment this is just a false sense of certainty and that the application of flexibility without the structure and preparations to support it could result in frustration and conflict. In consequence, conflicting views could lead to lengthy debates and stall decision thus reducing efficiency.

Moreover, program interdependence is highlighted in the literature. Based on the theory presented by Johansen et al. (2019), Magnussen (2006), Cummings and Worley (2015) and Olsson (2004), interdependence is causing a rigidity which is making changes difficult. Consequently, a high degree of interdependence in a program could decrease the efficiency if not managed appropriately. Lastly, based on the description of robust contract management described by Samset (2015), a robust contract is aiming to secure effectiveness and efficiency of the project by reducing uncertainty and risk by transferring the risk from the project to the contractor. However, I draw the conclusion that similar to robust plans, changes to a robust contract could be difficult and time consuming putting the efficiency at risk.

The findings from the literature is summarized in figure 2.3 illustrating the important elements expected to be prominent in the understanding of how the managerial issues impact the effectiveness and efficiency of a project in the execution phase and, thus, also expected to be prominent in a transformational change project.

2.4 Uncertainty Management in an Organizational Change Context

Many authors have criticized the use of traditional, robust project management approaches in uncertain contexts. Especially have the use of such approaches when suggested used in an organizational change context driven a controversial debate about the appropriateness of such approaches in relation to uncertainty. Conjointly, based on the literature review from the project thesis, some of the success factors for a transformational change program are based on contradicting assumptions on how the management team has chosen to handle the uncertainty. Consequently, a transformational change program is appropriate to

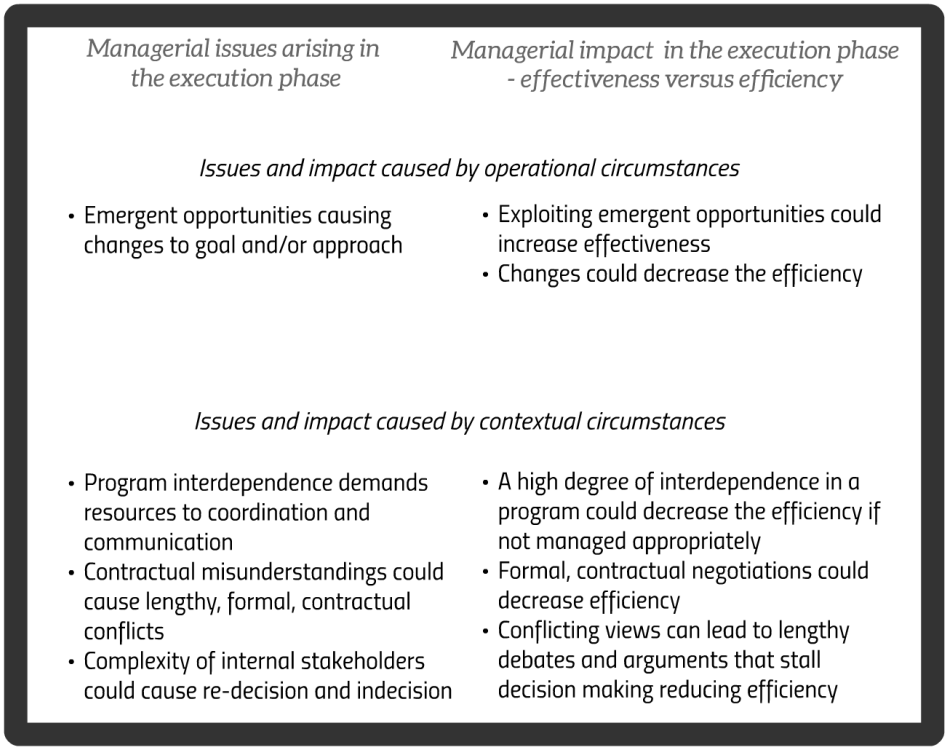

Figure 2.3: An illustration of the relation between the managerial issues and their implication based on the literature review

research how robust management approaches impact an uncertain project in the execution phase. A transformational change project facilitates a critically test the propositions of robust approaches as inadequate in this context. At the same time, the context provide important contributions to the discussion of the robust management approach's impact on the effectiveness and efficiency in the execution phase of a change project.

The following three subsections provide a vocabulary and framework for the thesis laying the theoretical foundations needed to discuss uncertainty management in a transformational change context. Firstly, to discuss transformational changes and the issues related to the management of these, it is imperative to understand the scope and nature of transformational changes and define the level of change in focus. Secondly, the characterizations important to understand the role of uncertainty drivers and enablers is presented, and lastly, some key characterizations of a change project in this context is presented.

2.4.1 Key characterizations of a transformational change

Planned change ranges from small incremental changes, limited to solving defined issues that affect limited dimensions and levels of the organization, to extensive fundamental changes of the organization's operations that influence several organizational dimen-

sions and levels (Cummings and Worley, 2015) (Griffith-Cooper and King, 2007) (Gareis, 2010). The scope of the change must be described because it influences the type of management approach needed (Kenny, 2003) (Griffith-Cooper and King, 2007). The level of change considered in this thesis is transformational change. Transformational change is described using Gareis (2010)'s model of change levels.

Gareis (2010) introduces a model that identifies four different types of change: organizational learning, further developing, transforming, and radical-new positioning. The model differentiates between the four types with regard to the demand for change and the organization's potential to change, as shown in figure 2.4. Organizational learning and further developing are considered first-order changes. They are characterized by continuous improvements in the daily business and implementation of single improvements or innovations respectively. Transforming and radical new-positioning are considered second-order changes and are defined by high demand and low potential for change. While radical new-positioning is unique and involves an existential threat to the survival of the organization, transforming is fundamentally changing an organization by considering all "identity dimensions" such as the strategy, structure and culture (Gareis, 2010). Organizations have less potential to undertake second-order changes because they have little to no experience or competence with transformational changes (Gareis, 2010). However, Gareis (2010) argues that transformational changes might happen periodically, and for this reason, the organization's potential could increase if they learn from their experiences.

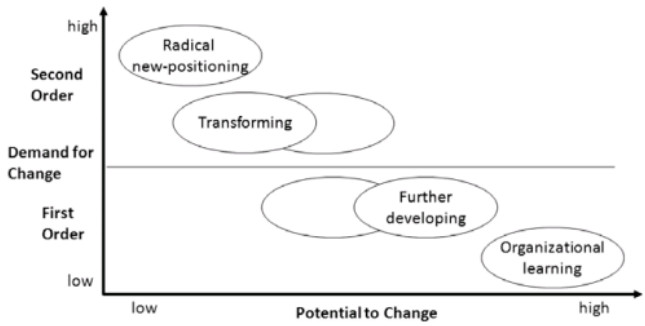

Figure 2.4: Definition of the change levels from Gareis (2010)

Similarly, Cummings and Worley (2015) considers six system factors as the organization's design components: structure, strategy, technology, management processes, HR systems and culture. These describe the conscious choices the organization makes to produce their desired output, which can be measured as the organization's efficiency in terms of, for example, performance or productivity (Cummings and Worley, 2015). A transformational change changes one or more of these factors. Moreover, Kanter (1992) introduces a similar view on transformational changes as Gareis (2010) and Cummings and Worley (2015), but Kanter (1992) considers transformational change as changes in the behavior of the entire organization. Kanter (1992) states that the "consistent patterns of behavior of an organization's members over time constitutes one of its very distinctive and most important features" (Kanter, 1992, p.11), and argues that this is what needs to change dur-

ing a transformational change. Additionally, Kanter (1992) points out that, to successfully shape the behavior in an organization, it must be encouraged instead of forced. Consequently, Kanter (1992) explains that changes to the design components should be made to encourage the desired behavior by facilitating and enabling certain behaviors. This approach makes "some things easier and some things harder, thus making the former more likely and the latter less likely" (Kanter, 1992, p.11). In other words, the design components at the organizational level should be changed to enable and induce a certain desired behavior at the individual level, by viewing the transformational changes as changes in the patterns of behavior throughout the entire organization. Consequently, it is imperative to understand the nature and scope of the change to understand the management approaches used to manage transformational changes.

2.4.2 Uncertainty in a transformational change project

In terms of Cummings and Worley (2015)'s model introduced above describes the organizational system with 6 design components, where a transformational change is a strategic change that fundamentally changes the six design components to align with changes in the environment. Subsequently, transformational changes are more "complex, extensive and long term" than continuous, smaller incremental changes, and involve redesigning several design components that influence all levels of the organization (Cummings and Worley, 2015, p.33). Consequently, transformational changes are subject to a high degree of uncertainty. Conjointly, the main characteristics and success factors critical to the management of a successful transformational change program where identified based on the literature review conducted in the project thesis fall of 2019. These characteristics have been condensed and adjusted to fit the purpose of this thesis. The following subsections, based on the findings from the project thesis, present general key characteristics of transformational change projects relevant to understand the uncertainty that characterize transformational changes.

Long duration in drifting environments

Firstly, several authors discuss the long duration of transformational changes and the uniqueness of such changes. As mentioned earlier, Gareis (2010) argue that transformational changes have little or no experience or competence with transformational changes, and in extension of this Kanter (1992) and Burnes (1996) raises the issue of envisioning a future you have not yet experienced making planning and forecasting the needs and potential outcomes difficult. Project Management Institute (2013) argue that due to the long duration of the program combined with the uncertainty of the business environment, this has forced organizations to shorten the time horizon for the forecasting and planning of their strategic business objectives (Project Management Institute, 2013).

Furthermore, the literature review found several authors suggesting flexible approaches to manage change process. Project Management Institute (2017a) points out that iterative life cycles are useful for projects with high uncertainty, which is typical of change processes. Similarly, Gareis (2010), Parker (2013) and Project Management Institute (2013) have suggested that, since second-order changes are long and operate in a dynamic environment, that agile type of project and/or program management tools could be beneficial

for change management.

Consequently, the theory suggest that long duration and dynamic environment causes lack of information about the future obstructing the stability of plans and predictions enabling goal and approach uncertainty.

Complexity and modularity in systemic changes

Secondly, several authors describe the extensiveness and complexity of transformational changes. Many authors in the literature point out that the design components organizations need to change are interconnected. The nature of interconnectedness means that change to one component effects another one. Most authors generally agree that these indirect affects must be mutually reinforcing for a successful transformation. Alignment is the issue of ensuring that changes throughout the organizational system are mutually reinforcing. This topic is discussed by several authors in literature, and this section presents perspectives from Cummings and Worley (2015), Kotter (1998) and Kanter (1992).

Cummings and Worley (2015) and Kanter (1992) argue that a systemic or holistic view is necessary to secure a successful change. Cummings and Worley (2015)'s perspective is best illustrated by the following quote: "Transformational change involves reshaping the organization's strategy and design elements to affect culture and performance. Because each of these features affect member behavior, they need to be designed and changed together to reinforce their mutual support of a new strategic direction and its desired behaviors" (Cummings and Worley, 2015, p.532). Kanter (1992) takes a similar perspective on the issue of alignment by emphasizing the systemic nature of transformational change finding that only changing single components or subsystems of an organization leads to failure.

Moreover, misalignment occurs when one design component conflicts with another. Cummings and Worley (2015) claims this can cause mixed signals about the desired behavior and vision of the change, which threatens the possibility of success. Similarly, Kotter (1996) describes the consequences of misalignment. Incompatible decisions can lead to changes that fail to "add up in a meaningful way or [to] stir up the kind of energy needed to properly implement any of [the] initiatives" (Kotter, 1996, p.8). Although Kotter (1996) does not explicitly use the concept of interconnectedness, it is clear that this is how he views an organization and that alignment is an important precursor to successful transformation. Accordingly, Cummings and Worley (2015), Kanter (1992) and Kotter (1996) view a direct connection between proper alignment and successful transformation. Consequently, the success of a transformational change program is dependent on close collaboration both between projects in the program and between the program and the organization creating a complexity in the system.

Interdependence with a diversity of stakeholders

Furthermore, Cummings and Worley (2015) state that the current performance of an organization is dependent on both the tacit and explicit coordination between several stakeholders. Consequently, there are several stakeholders with different goals and interests in the organization that need to be managed accordingly when severe disruptions, as described above, occur (Cummings and Worley, 2015). The challenge is both to monitor and

attend to a variety of stakeholders who all have different interests that could change during the change process.

Similarly, Kanter (1992) argues that, because of the many stakeholders that must be managed, "there are clear limitations to managerial action in making change" (Kanter, 1992, p.6). Kanter (1992) argues that there is a break between theory and practice when considering the management of change. The more comprehensive the change is, the more the forces of the environment grow accordingly, which makes attempts to plan and control the change more challenging, if not impossible (Kanter, 1992). Kanter (1992) argues that, contrary to the considerable amount of literature offering advice and practices to manage change, executives must realize their constraints to control and order changes in their organization. This is because conflicts of interests become more apparent and important as stakeholders become more central and their influence grows. As a result, the capacity of managers is limited because they need to consult with and consider the needs and demands of others. This issue is particularly important in major changes such as transformational changes (Kanter, 1992).

2.4.3 Key characterizations of a transformational change project

Firstly, PMI defines a project as "a temporary endeavor undertaken to create a unique product, service, or result" (Project Management Institute, 2017a, p.4). Projects are fundamental elements of project management. Each project has a defined start and finish, and produces definable deliverables that can be either tangible or intangible. Project Management Institute (2017a) describes projects as drivers of change in an organization, taking it from one state to another via the outputs that it produces as illustrated in figure 2.5. According to PMI, a program is a set of "related projects, subsidiary programs, and program activities managed in a coordinated manner to obtain benefits not available from managing them individually" (Project Management Institute, 2017b, p.3). In this thesis, the terms "project" and "program" is used using Project Management Institute (2017a) definitions in a general manner including both flexible and robust mindsets and approaches.

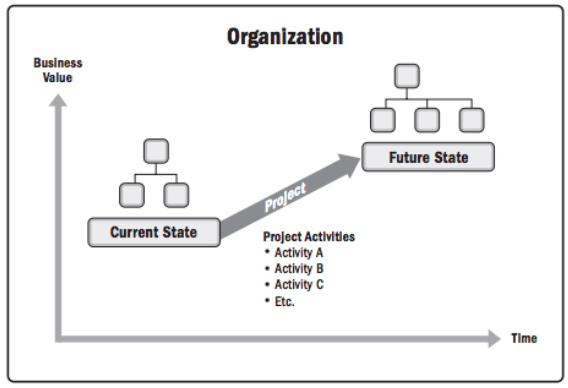

Figure 2.5: Organizational state transitioning via a project from Project Management Institute (2017a)

In accordance with Cummings and Worley (2015)'s model and Gareis (2010), Johansen et al. (2019) use the views of Hedeman & Seegers (2009) and PRINCE2 to illustrate how a change project is different from the normal operation of an organization. According to Johansen et al. (2019), "PRINCE2 points out that these projects are different from the normal operation of the organization in that they..."

- ...have specific goals to deliver new benefits to the tax-payer, companies, general public, government, sponsoring organizations, stakeholders and/or delivery partners
- ...may introduce significant changes to the way the business operates
- ...create new outputs and/or deliverables that enable benefits to be realized
- ...have a specific, temporary management organization and governance arrangement
- ...are susceptible to risk in for the duration of the project that are not usually encountered in the day-to-day operation of the organization
- ...involve a range of stakeholders from different parts of the organization and beyond
- ...may use methods and approaches that are new and familiar

(Johansen et al., 2019, p.15)

Consequently, the nature of transformational changes and thus the management of change projects is suspect for great uncertainty.

2.4.4 Summary

In summation, based on the literature review, I conclude that a transformational change project is characterized by a high degree of uncertainty. Gareis (2010), Cummings and Worley (2015) and Kanter (1992) highlight that the extensiveness of transformational changes make transformational change projects complex, extensive and long term. Based on the discussion from Kanter (1992), Burnes (1996) and Project Management Institute (2013), I expect that the long duration and dynamic environment causes a lack of information about the future which could obstruct the stability of plans and predictions enabling goal and approach uncertainty.

Moreover, based on the findings from Cummings and Worley (2015), Kanter (1992) and Kotter (1998), the complexity and interconnectedness of several projects in the change program and several stakeholders are especially prominent in a transformational change project. It is argued that because the changes are affecting several aspects of an organization, the power to manage and control these changes are limited by the need to align and content everyone affected by the changes. This complexity and interconnectedness is assumed to enable relational uncertainty and contextual uncertainty for a change project in a transformational program.

Consequently, considering the assumed uncertainty enablers present in a transformational change project, I expect that the issues described in section 2.3 emerges when a traditional, robust management approach in used.

2.5 Research Questions & Theoretical Framework

Many authors have claimed that the need for project flexibility is a dilemma. We have in this thesis recognized that this dilemma is especially prominent in a transformational change, where the different suggested approaches presented in the literature appears to be conflicting. On the one hand, control and stability is necessary to guide the whole organization in the same direction, managing the expectations of stakeholders, preventing the organization to descend to chaos. While, on the other hand, at the same time the organization must allow flexibility to exploit emergent opportunities, promote creativity, and involvement of key stakeholders in decision making in order to effectively improve business performance. This conflicting idea of what is imperative for a successful transformational change program have justified the study of this dynamic related to project robustness and uncertainty in the execution phase that is presented in this thesis.

The purpose of this research is to structure knowledge on issues related to project robustness in the execution phase of a transformational change project. Based on one case study, this research aims at providing indications as to how conflicts arising in the execution phase due to robustness in the early phase and how these issues affect the efficiency and effectiveness of a project. The following two key research questions are addressed in this thesis answering the question: How can robust management approaches affect the execution of a project subject to a high degree of uncertainty?

- How does uncertainty impact a traditional, robust project in the execution phase? What issues arise on the project level?
- How does these issues impact the efficiency and effectiveness of managing the project?

The aim of this thesis is not to cover the issue of uncertainty in a broad perspective, however project uncertainty has implications for the analysis of the issues arising in the execution phase. The literature review establish that uncertainty drives the need for flexibility and therefore I assume that consequently uncertainty drives the issues arising in the execution phase when a traditional, robust planning approach is used.

To summarize the conclusion based on the literature review, in summary 2.1.5, there where concluded that several factors enable uncertainty. I have, based on the literature, considered the factors: duration, complexity, interdependence and low modularity, as the most prominent considering these factors where discussed by several authors. However, while some authors claim that for example complexity is enabled by uncertainty, I consider complexity an enabler for uncertainty.

Moreover, I have in this thesis decided to differentiate between two drivers of uncertainty: lack of information and ambiguous information because these two drivers seem to introduce different types of issues. Considering both the conclusion drawn in summary 2.1.5 and summary 2.3.3, the lack of information directly drives issues of efficiency and effectiveness because the lack of information drives changes to be made to the solution and the process. When decisions are made in the early phases of project, the long duration threatens the relevance of the decisions. In addition, emergent opportunities and evaluation of the possible changes to the initial plans and decisions must be done considering the optimization of both effectiveness and efficiency as more information is revealed

in the execution phase. Ambiguous information, on the other hand, drives issues rooted in communication causing conflicts both externally and internally related to contractors and contractual misunderstandings and between internal stakeholders raising several issues affecting the efficiency and effectiveness of the project. I propose that ambiguous information causes managerial issues related to communication and coordination within the program, contractual misunderstandings, and difficulty with management of the internal stakeholders. Consequently, a high degree of interdependence in a program could decrease the efficiency if not managed appropriately, while likewise, formal, contractual negotiations could reduce efficiency and lastly, conflicting views can lead to lengthy debates and arguments that stall decision making thus reducing efficiency.

In summation, this chapter have provided a theoretical framework illuminating the subject of project uncertainty and the managerial implications robust management approaches to uncertainty have on the management of a change project embedded in a transformational change program. The main findings and propositions made in relation to this topic based on this literature review is presented in figure 2.6.

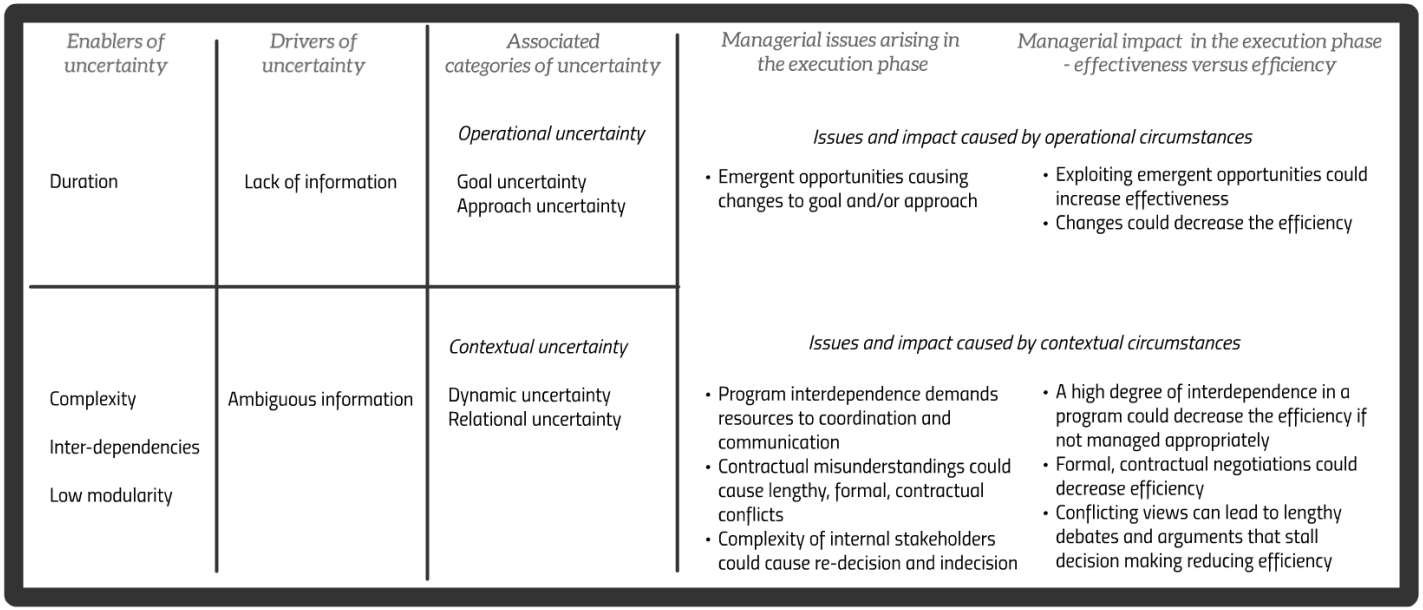

Figure 2.6: Illustration of the main findings and propositions made regarding uncertainty management and issues related to robustness in the front-end and planning phase based on the literature review

Chapter 3

Methodology

This chapter is divided in three parts describing the research strategy, design and methodology as well as reflections on their advantages and limitations and how these might impact the understanding and interpretation of the findings in this thesis. First the research strategy and design is outlined, before the methodology that have been used to develop the theoretical framework, and collect and analyze data is described. Then the strengths and weaknesses of the research design and methods in question are discussed and how the weaknesses have been addressed to provide reliable and valid data material. Lastly, I introduce some personal reflections and the lessons I have learned about the process of writing an academic master thesis.

3.1 Account of the Research Strategy and Design

At the outset, my research proposal was to critically test the framework which was developed in the project thesis of 2019 providing propositions about how traditional, project management tools could benefit the management of transformational change projects. A comparative case study sampling data from several similar traditional organization undergoing transformational changes was considered used in this thesis to increase the external reliability of the findings and to increase the variation of the sample increasing the likelihood of all the variables of interest in this study to be included (Bryman, 2012). Therefore, in January I held introductory interviews with a representative from four different public Norwegian companies asking them what they thought of my framework from the project thesis and if they could tell me how they use traditional project management tools when managing their transformational change processes. The results were that 3 out of 4 mentioned the same thing: they are moving away from using traditional, robust approaches when managing their transformational change processes in favor of flexible approaches explaining that a traditional, robust approach where not adequate for managing such projects. This inspired the idea of researching how robust management approaches affect the execution of a change project through a qualitative case study.

The following two subsections describe in more detail the selected research strategy and research design.

3.1.1 A qualitative, abductive research strategy

This thesis aims to investigate possible causal links between uncertainty and managerial issues and their impact in a change project and for this reason the study demands a rich, deep data material providing contextual understanding of the circumstances of the case and where the theory will and will not hold (Bryman, 2012). These qualities are emphasized in a qualitative research strategy (Bryman, 2012), thus using a qualitative case study was considered appropriate for the purpose of this thesis.

Moreover, this thesis uses an abductive reasoning strategy which is described by Bryman (2012) as "with abduction the researcher grounds theoretical understanding of the contexts and the people he or she is studying in the language, meanings and perspectives that form their world view" (Bryman, 2012, p.401). In other words, the researcher collect a set of observations and then seeks to find the most plausible explanation based on these observations. By way of explanation, the aim of the thesis is to develop a theoretical framework through which I will understand, test and adjust the understanding of the phenomena of uncertainty and related issues and its impact on a change project by presenting plausible conclusions based on observations from a case study.

3.1.2 A critical single case study design

Notably, the research design was selected through an iterative approach where the literature review was crucial. The choice was influenced by the available cases of which I could choose to retrieve data and, as mentioned initially, several companies and a comparative case study design were considered. However, due to limitations of time and resources, a single case study was selected in this thesis. Out of the four case companies in question, the selected case company was selected because I had a good connection with the company and they showed great interest in participating in my research.

Furthermore, a *critical* case is described by Bryman (2012) as a case chosen because the study allow "a better understanding of the circumstances in which the hypothesis will and will not hold" (Bryman, 2012, p.70). In other words, in a critical case study a case is deliberately selected to provide specific focus for analyzing propositions assumed to be valid in a specific context.

This study aims to increase the understanding of the consequences of using a traditional, robust management approaches in uncertain circumstances. Thus, an investigation of an uncertain, transformation change project facilitates the circumstances in which one can critically test if the consequences of a robust management approach by researching the managerial issues and impact of the approach in this context. Consequently, because the aim of this thesis is to critically test and contribute to the understanding of the critics of the use of traditional, robust management approaches in uncertain circumstances, I found that a critical case study design was an appropriate research design in this thesis.

3.2 Account of the Methodology

This section consist of an account of the methodology used in this thesis. The following subsections describe in more detail how the case and participants is selected and how the data is collected, anonymized and analyzed.

3.2.1 Description of the literature review

The literature review forms the basis for developing the theoretical framework on which this research is conducted, consequently how the literature were selected and why is prominent to understand the significance of this research and its credibility (Bryman, 2012). The fields from which I have selected the literature are mainly from the engineering field and the change management field. The articles which discuss uncertainty management, flexibility and robustness is mainly written based on data collected from, and for, engineering projects, while the articles on transformational changes are written from an organizational change management perspective specifically for change projects emphasizing the human aspect. In conjunction, the selected case project have characteristics from both a traditional engineering project and a change project. As a consequence, literature from both the engineering and change management field were selected to complement each other in relation to the selected case.

The literature from the change management field presented in this thesis is based on the literature review conducted in the project thesis prior to this master thesis in the fall of 2019. The literature in the project thesis where selected by searching for articles on the topics of change management and project management in a change context. To do so, the search was restricted to the databases of Google Scholar and Oria. Given the large numbers of articles on these topics, we limited the search to articles with "change management" and "project management" in the title and generally favored taking articles with the highest number of citations. In addition, we had some knowledge of popular literature on change management and project management such as Kotter, Kanter, Cummings and Worley, and Project Management Institute (PMI). Given their high regard in the field, we decided to include these sources as part of the literature review. Subsequently, in this master thesis, the relevant literature where selected from this literature review, and condensed and angled to fit the purpose of this thesis. While the purpose of the project thesis where to recognize where traditional project management could benefit the management of a transformational change project, this thesis aims to recognize the limitations, challenges and issues related to such a combination. Hence, the literature describing the nature of transformational changes and characterizations of the process of managing such changes are relevant in both thesis' and is mainly the contributions from the project thesis included in this thesis.

Additionally, more sources were selected to cover the fields necessary to answering my research questions related to uncertainty and uncertainty management strategies and common approaches. When searching for relevant literature from these fields, I asked a professor at NTNU with high number of publications in the fields of flexibility and large, Norwegian public investments. The professor recommended seven articles and one book, and because of the relevance of the articles providing specifically theories and empiricism based on large Norwegian, public investment project, these articles was used to find additional articles. I limited my search for theory to the authors and concepts that was provided

in the recommended articles using only the search engine Google scholar. As a result the literature from these fields are heavily influenced by the views and perspectives of a limited amount of authors and sources which limits the comprehensiveness of the theories formed.

3.2.2 Data collection

The data was collected through two rounds of interviews. First, there were completed introductory interviews primarily with my contact in the organization and different key people in the organization's change program. This data served the purpose of providing preparatory and orienting information to restrict the research topic and the scope of the case study by selecting the change project which fitted the most into the base criteria for critically studying the concept and propositions. Secondly, 9 semi-structured interviews with relevant program managers, project managers and employee representatives was conducted and recorded with consent to gain a better insight into the specified research topic of uncertainty and the managerial issues in the execution phase.

Selection of case and participants

Introductory interviews were used to limit the scope of the thesis and selecting an appropriate case project in the organization. The selected case organization have from a historical perspective a robust traditional project management approach to projects, while at the same time has embarked on a long and comprehensive transformational change program with several uncertainties. For this reason, the case was chosen because the circumstances of the organization expedite a critical research of the concept.

The first participants where selected based on their position in the transformational change program and in close collaboration with one representative from the organization with a comprehensive overview of the case organization and the change program. After the first interview with the project manager, a snowball approach was utilized to gather the next participants with the most relevant information for my research based on the interviewee's recommendation.

The positions that were covered by the interviews are presented in figure 3.1. It is worth noting that there are 10 positions and 9 interviews because the project governance manager and project director of change is the same person. The interviews where planned to last for 60 minutes, however, the free time in the schedules of the participants varied, so the length of the interviews varied as well as shown in the figure 3.1.

Category	Participants	Length of the interview
Project member	The project manager	60 minutes
	The product coordinator	45 minutes
	The risk manager	60 minutes
	The training manager	40 minutes
	A representative for the users	60 minutes
Program representative	The project director of change	40 minutes
	The project governance manager	
	The PMO manager	40 minutes
	The project director of the case project	30 minutes
	The project manager for organizational development and change	75 minutes

Figure 3.1: An overview of the participants, the length of the interview and their level in the program

Semi - structured interviews

Semi-structured in-depth interviews was the main source of data material in this master thesis. The interviews were conducted in a small meeting room in the office building of the case company, and lasted between 30 minutes and 1 hour each dependent on how much time the participants had in their schedule.

The questions that were asked were related to the theoretical framework model presented in section 2.5, and were intended to form a picture of the uncertainty affecting the project and the issues and impact they experience and why. Moreover, to gain a more nuanced picture from different perspectives, the where also held interviews with program level employees and employee representatives related to the case project. The interview guide where developed before the first interview consisting of 4 main themes developed based on the theoretical framework. In addition there were a last open ended part of the interview where the participants were asked to share any other ideas, perspectives or thoughts on the general topic of the interview that has not already been covered. Due to the many different positions of the participants, the interview guide where adjusted to each interview with the same themes, but with questions to accommodate the difference in perspectives. For example, while the project manager where asked how the project communicate with the employees, the representative for the employees where asked about the employees experienced with the communication. The full general interview guide could be found in appendix 1.

Securing of data and anonymization of the participants

To secure a correct and safe collection and handling of the information and the informants in the case, the research methodology were refined following the recommendations and requirements from the Norwegian Center for Research Data (NSD). This subsection includes some of the most prominent measures taken to secure a safe collection and handling of data and anonymization of the participants.

All interviews where recorded with consent using a phone. The recordings were deleted immediately after the interview was transcribed. Moreover, the transcribed interviews were saved on my personal google drive without any information revealing the identity of the participant. The transcripts are deleted after the submission of this thesis.

Furthermore, the participants were well informed and the information where collected with consent from all participants. Consent were documented through an information sheet and contract which where given to the participants prior to the interview. The information sheet described the purpose of the research, who are responsible as well as contact information and what it means to participate in this study. Moreover, the information sheet informed the participants about how the data will be anonymized, how the information will be treated as well as describing how the participants could receive access to, correct or delete information about them selves and withdraw their consent. The full information sheet and contract which was signed by the participants is included in appendix 3.

To secure the sources the participants have been anonymized in this thesis. The identity of the participants are secured in this thesis by referring to statements from the participants in the program level as "program representative 1,2,3 and 4" as shown in figure 3.1. Likewise, statements and quotes from the project team members are referred to as statements from "project member 1,2,3,4 and 5". The numbers are randomly assigned to the different positions.

Additionally, to respectfully render the participants views and statements, the quotes was subject to minor simplifications and reformulations to condense the ideas and views of the interviews without altering the meaning of the statements. Furthermore, the statements and quotes presented in this thesis was translated from Norwegian to English, which also have anonymizing effect on the data.

This method for securing and processing the data were evaluated and approved by NSD, and the approval verification is found in appendix 4.

3.2.3 Data analysis

According to Bryman (2012) there are several strategies to chose from when analyzing qualitative data. This subsection describe the method of data analysis used in this thesis explaining why this method was chosen.

Thematic analysis

This thesis uses a thematic analysis approach combined with elements of a narrative analysis technique. Thematic analysis is one of the most common approaches to qualitative data analysis (Bryman, 2012). Bryman (2012) argue that this approach is not an identifiable approach, meaning that the method is interpreted differently by different authors

due to the difference in defining what a "theme" is. However, there is presented a general strategy to perform a thematic analysis by Bryman (2012) where the general idea is to construct central themes and sub-themes based on the collected qualitative data, which is then applied to organize and present the data. A narrative approach, on the other hand, handle data which is unsuitable for a coding method, where according to Bryman (2012) the focus shifts from "'what actually happened' to 'how do people make sense of what happened'" (Bryman, 2012, p.582).

The first aspect to point out about the analysis of the empirical data in this thesis, is the theoretical framework. The framework was used to develop a set of themes to structure the collection of data from the interviews around as well as organizing the findings to clearly answer the research questions. There was an iterative process were the theory determined the categories in which the findings where placed and the findings which did not fit into the the existing framework where placed in new categories and evaluated if they where relevant or not to the research topic.

Moreover, the process that were used to process the empirical data was a variant of the 3-column method. The 3-column method is a method that attempts to summarize the content of the data material by a 3 step approach to reduce and consolidate the findings from the interviews, and then placing similar statements and findings across interviews together in themes. I was inspired by the 3-column method working through the empirical data, limiting it and drawing out the essence. Thus, the in-depth interviews were analyzed using a variant of the 3-column method.

However, equally relevant to the issue of the analysis of data is that it contains elements of narrative analysis. Similarly to an illustrative example used by Bryman (2012), I experienced that some of the interviewees knotted several themes together making categorization by the selected themes difficult without losing the context and relevance of what was said. Therefore, many long examples and direct quotes from the interviews are included in its entirety to cover the complexity and interconnectedness of some of the concepts which this thesis is studying.

3.3 Reflections on the Research Design and Methodology

This section discuss the impact of my findings and aims to provide an accurate picture of what can and cannot be concluded from this study. This section identify limitations and factors which have impacted the reliability and validity of the study, and my own reflections and lessons learned are included concluding this chapter.

3.3.1 Advantages and disadvantages of the research strategy and design

Firstly, the advantages and limitations of the research strategy and design is discussed. This research design builds on a qualitative, critical single case study that investigate how robust management approaches can affect the execution of a project subject to a high degree of uncertainty. This thesis are critically testing the critics of the use of robust management approaches in an uncertain context by researching how uncertainty impact a

traditionally, robust planned project in the execution phase and how the issues impact the efficiency and effectiveness of the project.

The methodological choices were constrained by the limited time and resources of the research and my personal interest to gain a deeper understanding of the case organization. As a result, the research questions was adjusted to accommodate the limitations of the methodology directing the research to appropriately fit a qualitative research strategy in a holistic study of a single case. However, the generalizability of the results is limited by the study of only one case. Nonetheless, according to Bryman (2012) "the findings of qualitative research are to generalize to theory rather than population", where he goes on to argue that "it is the quality of the theoretical inferences that are made out of qualitative data that s crucial to the assessment of generalization" (Bryman, 2012, p.406). In this respect, on the one hand, one of the main advantages of qualitative research is the rich, deep data material which in this case increased the internal validity of the findings, and thus increase the value of the findings with regard to the significance for general theory. A disadvantage, on the other hand, of the selected approach is the subjectivity of the data and the personal bias which is generally considered a weakness of qualitative data (Bryman, 2012). The reliability of the collected data is impacted by the unsystematic approach to collect and select important findings. Moreover, my personal bias and relationship with the case organization could influenced the reliability of the data by influencing what is highlighted as significant and important.

However, I believe that the building of the theoretical framework and developing the interview guide before the interviews contribute to decrease role of personal bias and subjective selection of important findings. Additionally, I believe that the awareness of this threat have contributed to reduce the personal bias and possible influences from the personal relationship with the case organization and the participants.

3.3.2 Advantages and disadvantages of the research method

Secondly, in this subsection the research method is discussed, including the data collection method and the data analysis, revealing advantages and limitations to the selected methods.

Data collection: Semi-structured interviews

Semi-structured in-depth interviews was chosen as the most sufficient data collection method for the purposes of this thesis for several reasons. The main advantage is that the method is very flexible and provide a "rich" data material (Cummings and Worley, 2015). Moreover, interviews are targeted focusing directly at the research topic providing explanations as well as personal views, opinions and perceptions (Yin, 2017).

However, there are also weaknesses associated with in-depth interviews that it is important to be aware of. An inexperienced interviewer run the risk of creating bias due to poorly articulated questions which for example encourage certain types of answers (Yin, 2017). Furthermore, according to Cummings and Worley (2015), the nature of the questions and the interaction between interviewer and interviewees could cause reflexivity and response bias, that is, interviewees saying what the interviewer wants to hear. Thus, both the interviewer's and the informant's personal bias will affect the data material generated (Bryman, 2012). To strengthen the credibility of the generalizations within the case that

have been taken as a result, statements that do not coincide with any other of the interviews have been disregarded or presented as a finding which contradict the general findings in the other interviews. Furthermore, the interview guide was developed in collaboration with the supervisor to diminish leading questions and use of ambiguous terms. For example, explanations of ambiguous terms such as "flexibility" and "uncertainty" was added to the interview agenda and explained to the interviewees in the interview to spark ideas and create a common understanding of the concept between all interview objects and between interview object and interviewer.

Data analysis: Thematic analysis

A thematic analysis is a popular analysis approach because of its flexibility to be used in many different contexts (Bryman, 2012). The advantage of a thematic approach is that the coding and systematization of the data in themes helps sharpen an understanding of the collected data, revealing patterns and associations with the existing literature or similar findings (Bryman, 2012). Moreover, the approach help separate the significant findings from irrelevant data providing mechanism for evaluating the meaning of the data while reducing the amount of empirical data (Bryman, 2012).

Having said that, the approach also have some disadvantages. Similar to the criticisms that is directed at coding, it is a possibility of losing the context of what was said altering the interpretation and meaning of the original quote. To reduce the impact of this disadvantage many comprehensive narrative quotes and examples where included when presenting the empirical data. However, an important point to be aware of is that by relying on a narrative presentation of the data the motivation behind that narrative and what the narrative is suppose to be revealing is crucial for the interpretations of the arguments they represent (Bryman, 2012). On the one hand, one could question to what extent the narrative data represent an underlying truth. On the other hand, it is the perceptions of the interview objects that is important. The narrative quotes and examples I have included in this thesis aims to draw attention to the competing understandings of the circumstances and issues in the case highlighting the perceptions of the involved participants.

3.3.3 Personal reflections and lessons learned

This thesis have been very enriching both with regard to broadening my own knowledge about robust uncertainty management, flexibility and transformational change projects, but also with regard to conducting social research from developing a research proposal to writing up an academic thesis. Naturally, retrospectively, there are some things that I wish could have done differently.

Firstly, I planned to execute the interviews early march, this was a good choice in retrospect considering the corona crisis closing the offices. However considering the time necessary to prepare for the interviews, I wish that I had spent more time on the interview guide before starting conducting the interviews.

In spite of having developed a theoretical framework, the exact research questions where still unclear at the time of the interviews. This uncertainty combined with the variety of different positions of the participants both in and outside of the project demanding an adjusted interview guide resulted in many unnecessary and purposeless questions being

asked in the interviews. This is reflected in the amount of excess information not tied to answering the research questions in the transcripts from the interviews. This excess information was time consuming to include in the transcripts and process in the analysis.

Secondly, I should have reached out sooner to my peers to collaborate and discuss issues related to the master thesis. Due to the Corona virus, there was a severe reduction in contact with my peers, and I believe that frequent informal and formal discussion and contact with my peers could have had a positive impact on both mine and their thesis. For example, agreeing to conduct peer reviews could have helped to get feedback and perspectives from someone outside of the thesis. This was mentioned earlier in the semester, but because of the lock down I lost touch and it was never followed up.

Chapter 4

Empirical Data

The aim of this thesis is to critically test the issues related to traditional, robust management approaches in a change context with high uncertainty. Consequently, this thesis will map the uncertainty in a project embedded in a transformational change program and research what managerial implications the robust uncertainty management mindset used in the early project phase have for the project in the execution phase. A case study was carried out to investigate to what extent the expectations based on the theoretical framework proposed in the previous section corresponds with observations from a real transformational change project. This section describes the data material and present the findings from the case study in four parts based on the theoretical framework.

The first part provides a case description introducing the case and displaying important organizational design factors, any enablers or inhibitors which could be used to further explain the choices of management tools, mindset and processes used in the case. Next, the interviewees' views on uncertainty enablers in the change project are presented. Thereafter, when exploring the issues which the project team experience in the execution phase, there are two sources of circumstances inducing uncertainty and managerial issues, namely operational and contextual circumstances. Consequently, the third and fourth part are presenting the uncertainty, issues and impact that operational circumstances and contextual circumstances have on the case project respectively. Each part consists of an uncertainty analysis of the case presenting the uncertainty in the change project structured around the four uncertainty categories defined in subsection 2.1.4 and present the managerial issues and their impact on the project level through the interviewees' experiences in the execution phase. Lastly, cultural issues and its impact on the management of the project was highlighted by several interviewees and is presented in the last section.

4.1 Case Description

This section include descriptions of the most important characteristics of the case project and the front-end and planning phase. These characteristics are prominent when I am later describing the decisions and challenges in the execution phase.

The selected case organization is a public organization undergoing a transformational technology change initiated due to new efficiency requirements by the Norwegian government. Thus, there is established a transformational change program to drive the change in the organization through developing new technical solutions and preparing for these changes by communication and developing the necessary competencies in the organization. Moreover, technology changes are changes which affect how the organization works to provide services to their customers including changes to the production methods, workflows and equipment. These changes are resulting in changes in the workday for the individual employees in the case company and also line organizations (Cummings and Worley, 2015). Accordingly, this thesis study one project in the technology change program. The project which this thesis have been studying in dept, aims to standardize and centralize an IT-system with the intent of making it easier to communicate and discuss challenges and solutions throughout the organization.

Organizational system and important relations

The organization is divided in functional divisions. The transformational change program follow a matrix organization linking the projects in the change program to the line organizations and divisions of the case company. The change program is divided into 3 areas managed by 3 project directors. Two areas deliver a technical solution through 3 technical projects, while the third have the responsibility to prepare the organization for the new technological solutions through communication and training. The technical solution have three contracts with three contractors which together in parts will deliver the full technical solution. Hence the purpose of the project teams in the program is to follow up the contracts, the relations between the other projects in the program and the rest of the organization. This structure and relations are illustrated in figure 4.1.

Management processes

Traditional robust, project management tools and stage gate approaches are used to track progress and coordinate between the projects in the program. An important aspect of the management processes in the case is the quality assurance and documentation approval system which determines the approval of the project output in the change program. Governmental laws and regulations require thorough documentation to approve the solution and secure a viable and secure solution. Hence, the management process in the project is characterized by documentation and traditional waterfall planning tools.

An important aspect of the management processes in the case project is the contractual strategy and incentives characterizing the management process and coordination between the project and the contractor. As mentioned earlier, the main task for the project teams in this change program is to conduct contract follow-up. The contracts specify the features of the technical solution clarifying the scope and content of the project as well as a plan for information flow, authority and collaboration. In other words, the contract is developed by the case company with detailed specifications to both the goal and approach in the project. Several interviewees mention this as unusual compared to other companies. This is illustrated by the following quote by program representative 1 which state that:

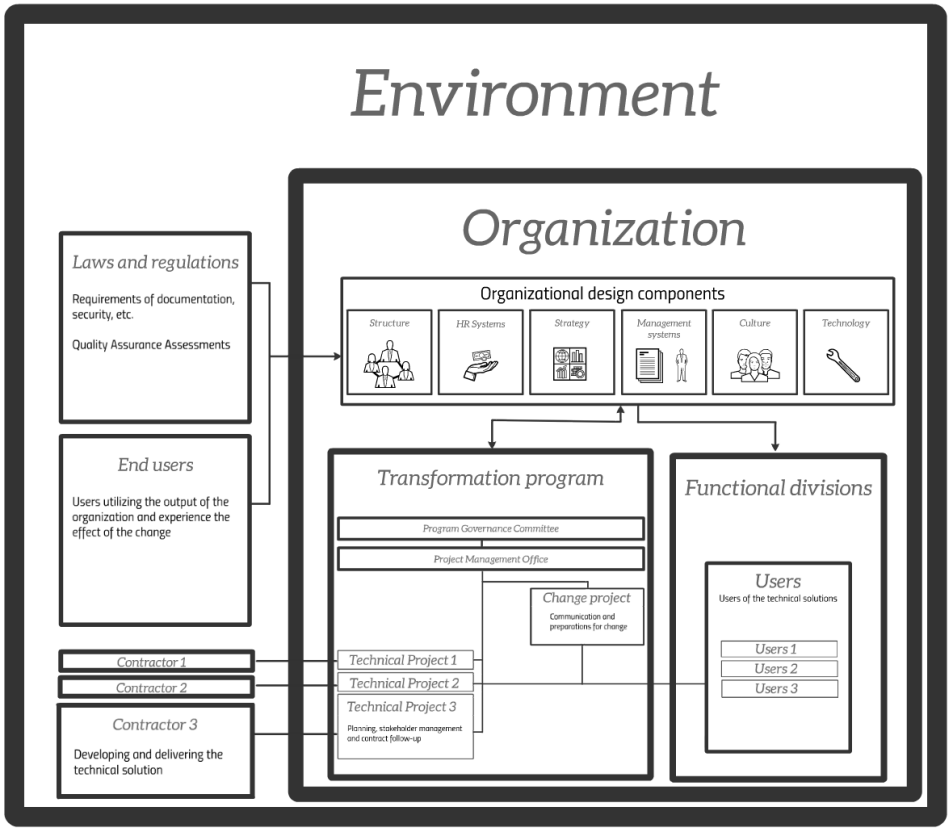

Figure 4.1: Illustration of the case company and important components and relations in the organizational system and environment

"what I'm not used to is that you create a competitive basis in which we as a customer define the timeline. (...) The whole schedule is basically defined by us. The suppliers have not responded with coming up with a plan, they have been managed - the whole plan template and everything has been controlled by us".

4.2 Uncertainty Enablers in a Change Project

The framework presented in subsection 2.1.3 suggest duration, complexity, inter-dependencies and modularity as enablers of uncertainty. This section present the findings when the interviewees where asked about uncertainty enablers in the case change project.

4.2.1 Duration and prediction

The majority of the interviewees does not consider the long duration of the program as an obstacle with any particular influence on the case project arguing that any possible issues is

neglected by shortening the time horizon by working towards milestones. However, some interviewees mention the duration of the project and it's impact on the project. Project member 3 exemplifies this stating that:

"when user experience is part of what you are going to deliver, it is terribly difficult to predict what a good user experience is. (....) Now it is 6 years since [the project] started to be specified and planned what it should look like and when you see it in light of the lightning fast technological development we have today, it is quite certain that what was specified at that time will be perceived as terrible old fashioned in our days".

4.2.2 Complexity and interdependence

In exploring the system complexity in the case organization, two main themes of the interviewees responses where identified: complexity, and interdependence, rigidity and modularity. The findings will be presented in this subsection structured by these themes.

Complexity

Firstly, several interviewees consider the number and diversity of stakeholders in relation to the project. The technology used in the case organization today is characterized by a network of several different systems and will through this change program be merged and standardized to only one. The main case project output is a standardized system which remove and merge several existing systems into one. In the case project this means to remove or merge 28 systems into only one standardized, secure system for 32 different user interfaces. Consequently, there is general agreement among the interviewees that the many system managers and contractors is creating a complexity in the system.

Interdependence, low modularity and rigidity

Several interviewees consider the project in relation to the other two contracts managed by the other projects in the program when asked about uncertainty in the project.

Firstly, prior to project start, specifications for all three contracts where specified in detail. Several interviewees, claim that these specification plays an important role in the integration between the solutions from the projects in the program. For the case project, over 4000 demands and specifications where developed in the front-end phase describing the functionality of the solution. The high security requirements determine the specifications in this case. Moreover, project member 5 explain that the flexibility in the product is very limited due to the technical regulations which is required by law. Consequently, the back-end software have detailed specifications, while the front-end of the software is suggested to be developed using agile methods in the contract. In spite of being an IT-development project, the system specification and technical regulations builds the foundations for a traditional, robust process and contract in the project. This is an highlighted issue in the case and is illustrated by the following quote by project member 4 stating that:

"This is an IT-project in a waterfall contract. It is a giant waterfall contract where it is assumed that everything is so well defined in advance that it is just to sign and start

delivering. But it's not like that. It's software, so it's not like that. We must have iterative processes".

Similarly, program representative 1 explain the interdependence of the three contracts and their shared milestones in the following quote:

"we are dependent on a comprehensive entirety to reach [the first milestone], so there are many threads that must be ready until then" creating a rigidity in the system.

Moreover, in relation to this interdependence, the Project member 1 state that the size of the program influence the pace of which changes can happen stating that "Due to the size of the program, which is very large and heavy and has been for 6 years already, changes do not happen quickly". Similarly, project member 3 state that the freedom of action and decision-making in the project is limited due to the relations between the projects in the program stating that "it may be that we incur costs where the gains are found elsewhere in the program". Likewise, the contracts creates a low modularity between the three contractors which is reflected in the following quote by the project member 2 who state that:

"The deliveries are linked to milestones and so are the payment to contractor and any fines as well. (...) If this had been an internal development project then we would have had the opportunity to make changes to the plans, but now we have to get into the formal and contractual every time".

4.3 Operational Uncertainty, Managerial Issues and Impact

Operational issues are considered to be issues related to the management and execution of the project associated with internal circumstances such as resource allocation, productivity, coordination and culture. The framework presented in subsection 2.1.3 highlights two categories of operational uncertainty which is linked to corresponding issues and their expected impact on a project in the execution phase. Following a similar logic, this section consists of two parts. Firstly, the findings related to operational uncertainty in the case is presented, before the managerial issues and impact that related to the operational circumstances and uncertainty is presented.

4.3.1 Operational uncertainty

This subsection is structured around the uncertainty categories defined and described in subsection 2.1.4 structuring the findings describing the contextual uncertainty in the case project.

Goal uncertainty

The goal uncertainty in the case project is exemplified by several interviewees. Examples of their responses include the program representative 4's comment that: "the major challenge for this program is that it is both an IT project in the form of software development

and an infrastructure project that is very traditional". Additionally, in spite of the projects 4000 predefined specifications, several interviewees claim that the project is characterized by a high degree of goal uncertainty. Illustrating this point, project member 4 state that:

"it is an IT project, it is a development project, you do not know what the product is or what the product becomes. (...) when creating a development product it is not wise to have many specifications in advance".

Approach uncertainty

Several interviewees suggest that here is a lack of experience in both the contractor and the case company with flexible approaches causing uncertainty in the project approach. Several interviewees indicate that there is a desire to utilize a flexible approach, however the lack of experience contribute to hinder a successful execution of this. Illustrating this point, project member 4 explain that:

"the contractor claimed that they where to work using the agile method SAFe, however, when they delivered their plans and documentation prior to project start describing their work process it was using a predictive, waterfall approach where the milestones and progress where constituted by the delivered documentation".

4.3.2 Managerial issues and impact

The findings suggest that the issues and challenges described in the previous subsection causes managerial implications for the project team. This section will describe the findings on what management implications these challenges have caused in the case project. The findings from the interviews are categorized into 2 themes: Changes to the project milestones and management approach in the execution phase and Lack of experience and support functions to flexible approaches.

Changes to the project milestones and management approach in the execution phase

There is a general agreement among the interviewees that the goal and approach uncertainty have induced changes to the project milestones and management approach in the execution phase. The approach to manage and execute the project was determined and described in the contract in the front-end and planning phase of the project, however all interviewees discussed the need to change the management approach when the execution phase started.

The project team started early in the execution phase to notify the program and the contractor that the planned contractual milestones and management approach would not be adequate for the purpose of the project. Subsequently, the project have introduced operational milestones between the contractual milestones. An operational milestone do not have to do with the contract, but with the fulfillment of a series of operational milestones, where the contractual milestones will be fulfilled as well. The operational milestones are creating an operational flexibility in the project. Consequently, in accordance with the interviews from the project team, program representative 1 states that:

"the flexibility is least where the effects are spanning across the different projects in the program and the biggest in between the operational framework from one contractual milestone to the next".

Further, project member 4 experience the introduction of operational milestones as "*actually* measuring progress. (...) Firstly, instead of measuring progress by the number of documents, we linked it [the operational milestones] up so that it targets functionality and releases. So, the milestones, - instead of being linked to documents, they are connected to some kind of delivery (functionality or a working software) *and* documents". Collectively, the interviewees explain that the compromise has been a planning process where the contractual milestones relevant to the program stay fixed, while the project have an operational flexibility introducing operational milestones spreading the documentation over time.

Lack of experience and support functions to flexible approaches

The aforementioned changes to the milestones and approach have been challenging for the project. Several interviewees from the project team imply that the project still is in a transition where there is a shift in mindset from a focus on documentation towards a focus on deliverables and functionality. program representative 2 state that from a program perspective:

"I do not see what the project really does, but what I see in relation to plans, in relation to mindset and in relation to the challenges one has to work with this [project], is that [the organization] does not have a flexible mindset and the supplier is working to get it. (...) I feel that [the project] are in a break where [the project] try to think agile, but they do not have a contract that supports it, they do not have a mindset that supports it and [the project team] has worked very well to turn it around".

Several interviewees point out a conflict between the nature and needs of an IT- development project and the project methodology that is the standard in the organization and rest of the program. program representative 2 state that:

"I am used to that when developing software you have to develop some documentation in advance, but overall the solution emerges. (...) Here [in the project] you try to detail the solution and design before you start and it goes against all principles of agile development. (...) I came in just over a year ago and what I met then was statistics on how many documents one had delivered, which for me was so far away from the mindset I'm used to. I'm used to thinking that functionality is what one delivers, and the documentation is just a tiny bit of it".

As a consequence, several interviewees state that the planning tools are not optimal for managing an agile project in the organization. The project has chosen to follow an agile planning process for the operational milestones and in the everyday work, and then translate their project plan into the traditional waterfall plan which is shared with the entire program. Consequently, there is made a compromise in the project management approach used in the case project, illustrated by the following quote by project member 4 who state that

"First of all, if we were freed from everything then we would rather have a kanban or a board, also we would have worked 100 % agile with backlog and everything like that, but because we are in [this organization] and that there are high requirements for documentation and standardization, and all those things are done the same way, then we are forced into a template simply as that".

On the other hand, several interviews also highlight the need for robustness in the plans due to the interdependence with other engineering projects and the laws and regulations which govern the processes. Illsuatrting this point, program representative 1 argue that:

"agile processes are well suited for IT- development, however, heavy processes developing technical infrastructure governed by many rules and regulations is difficult to manage using agile mindset and approaches."

Moreover, project member 4 states that the demands to documentation is not compatible with the agile mindset and approach and recognizes the value in documentations stating that documentation keeps the project focused and attentive to the decisions made throughout the process. Similarly, in accordance with the other interviewees, project member 2 state that a balance in the amount of documentation and degree of detail put into these documents is needed in the projects and implies that it is challenging that the time spent on evaluating documentation goes at the expense of the development of the solution.

4.4 Contextual Uncertainty, Managerial Issues and Impact

Contextual issues are considered to be issues connected to circumstances outside of the project in particular the issues associated with stakeholders. The framework presented in subsection 2.1.3 highlights two categories of contextual uncertainty which is linked to corresponding issues and their expected impact on a project in the execution phase. Following a similar logic, this section consists of two parts. Firstly, the findings related to contextual uncertainty is presented, before the managerial issues and impact that related to the contextual circumstances and uncertainty is presented.

4.4.1 Contextual uncertainty

This subsection is structured around the uncertainty categories defined and described in subsection 2.1.4 structuring the findings describing the contextual uncertainty in the case project. Firstly, the relational uncertainty in the case project is presented. To simplify the scope of this thesis, the stakeholders will be categorized in three categories due to their similarities in needs and management approach to handle them. First, the contractor including all the aspects of contracts and relations between the project and the contractor company. Second, the program management team including the relations to the other projects in the program and third, the internal stakeholders including the users of the new solution, the system managers of related systems and the divisions in the case organization receiving the technical solution denoted internal stakeholders. The interviewees perspective on these three relations are presented in the following two subsections.

Lastly, the dynamic uncertainty in the case project is presented. The case project subject to this research is embedded in a program where the projects are dependent both in terms of technical functionality and in terms of progress and time. This is considered the most significant source of dynamic uncertainty by the interviewees in the context of the project and due to the limitations of the thesis this is the only dynamic uncertainty that will be presented in this section.

Relational uncertainty with the contractor

Several interviewees highlight relational uncertainty stating that the balance between co-operation and contract is challenging. Project member 2 explain this challenge in the following quote: "strictly speaking, we could only let [the contractor] deliver according to the specification's in the contract, and just follow up. This is one of the hardest things for us, because [the contractor] may have addressed the requirement but we don't think it's quite the way we want it to be (...)". Similarly, project member 1 describe a relational uncertainty as a difference in expectations and understanding of the specifications described in the contract. Consequently, ambiguity in the contract specifications create conflicts between the contractor and the project team. Project member 2 offer an example of this in the following quote:

"[The contractor] had a concept with how they intended the training, also it says in our requirements that all the training should be held in Norwegian, but for special groups it can be held in English. The purpose of the phrasing of that requirement was that [the users] must have training in Norwegian, but that it could be, for example, that there was an engineer in the project here which had to accept to get the training in English. That's what the idea was. But then it is so that it is much easier for the contractor if they can have it in English, because everything is written in English and must be translated correctly, so when we got the first draft of the offer, they had made the biggest courses in English. And it became food for the lawyers! Because then they believed, and argued, that the requirement could be interpreted in this way".

Furthermore, project member 5 experience uncertainty in the communication with the contractor where the relational uncertainty is on the contractor side. Project member 5 illustrate this with the following example:

"[The contractor] have the same communication problems as we have in our project; that not everyone knows everything and it is very difficult to keep everyone at an information level that is enough, not too much and not too little. Especially for us. We can have workshops with a designer at [the contractor] who accept our ideas completely, then, after a few days, we write a note describing what we agreed on, and that it is just to start to develop. However, when the leader of that workshop explain this to the system development team at [the contractor], [the system development team] says that 'no, it is not possible technically'. And then we are like 'why not? After all, we paid for it and you signed the requirements and our ideas are within those requirements, etc.'".

Relational uncertainty with internal stakeholders

As mentioned earlier, the project have over 32 user interfaces having interest and stakes in the projects output which creates a complex system. There is general agreement among the interviewees that due to the many stakeholders and their interests in the new system, it is difficult to understand and address all of them.

Project member 5 expresses that there is a challenge in the internal communication with the stakeholders due to the high number of stakeholders. Project member 5 explain that the high number of stakeholders inhibits everyone to be present at every meeting as this will be inefficient. As a consequence he states that:

> *"it is challenging to get the whole project to have the same overall picture".*

Dynamic uncertainty in the program

There is general agreement among the participants that if one project in the program is delayed that affects the planning of all the other projects in the program. The dynamic uncertainty in this project is exemplified by project member 1's comment that states "this project is smaller than several of the projects in the program. It is an uncertainty that if one of the major projects in the program is delayed then we will be delayed as well".

Similarly, program representative 1 state that the challenge to stability created in the shared master milestone plan between the three contracts in the program is that the contracts individually do not keep pace. Program representative 1 state that:

> *"Initially, [the project plans] were synchronized so that all milestones should be synchronized, but it was on the premise that we should sign the contract on the same day. (...) So what was synchronized at the starting point became asynchronous very quickly".*

Moreover, program representative 1 explain that because of often delays the synchronized master plan is continuous under pressure. In addition, program representative 1 claim that "the big challenge with stability now, that is, although we manage to stabilize per project, we must also synchronize towards the whole, and that is what is the unstable element now".

4.4.2 Managerial issues and impact

The findings suggest that the issues and challenges described in the previous subsection causes managerial implications for the project team. This section will describe the findings on what management implications these challenges have caused in the case project. The findings from the interviews are categorized into three themes: Relational uncertainty with contractor induce contractual conflicts, relational uncertainty with internal stakeholders causes changes and delays and dynamic uncertainty introduce opportunities and risk.

Relational uncertainty with contractor induce contractual conflicts

In spite of detailed specifications of the project solution and the cooperation processes is described in the contract in the front-end phase, the interviews reveal that conflicts

and misunderstandings still arise in the execution phase. Project member 1 among other interviewees experience that the formal communication and contract creates conflicts and delays, and a stressful situation for everyone in the project. Project member 1 offer the following example to illustrate:

"We are far too detail oriented and have far too many opinions on the product. So to take an example then, on one of the documents we sent back 100 comments where 27 of these were defined as "major", and then it is clear that then the supplier does not know where to start once. So the whole process of documenting the solution has taken 4 times as long as it should".

In addition, project member 5 expresses that the detailed specifications in the contract are both too broad and too specific at the same time causing issues with creating a user friendly solution. The following example illustrate the issue:

"With today's solution, the user uses analogue notes passing on important information from one shift to another. The new solution includes an electronic journal which will inherit this function, and the requirements in the contract states that everything that is operationally important should be in that journal automatically, but then we start to see that if everything that happens must be there then it will be to much to go through".

Relational uncertainty with internal stakeholders causes changes and delays

In addition, several interviewees highlight changes and delays due to ineffective management of internal stakeholders. Project member 5 report that several smaller conflicts had arisen due to insufficient allocation of relevant information between the stakeholders causing made decisions to be reconsidered due to emergent internal stakeholder's need.

Furthermore, project member 1 describe the challenge as an issue of understanding each other across disciplines as well as indecision delaying the progress as a result of difficulties when communicating with stakeholders in the following quote:

"The challenge is to find out when and how to involve and keep [the stakeholders] at a distance while pulling them in because they want so much information that it becomes immersive. This applies to the solution, but also dates because they are greatly influenced by the roll-out schedule".

Dynamic uncertainty introduce opportunities and risk

Several interviewees indicate that the interdependence between internal stakeholders in the organization enables opportunities to emerge in the execution phase. program representative 3 state that this program is characterized by several stakeholders in relation to several of the projects in the program which suggest that the program exploit opportunities which emerges.

The program representative 3 illustrate the opportunity emergence in the program. Program representative 3 explain that representatives from different departments in organization have suggested to initiate different additional extensions to the program as they see the opportunities for these emerge in the execution phase. These changes influence

the scope of the program causing changes to the respective projects in the program. Such changes causes negotiations with the contractor and increases the cost and scope, thus increasing the time horizon.

In accordance with this, project member 3 describes such changes as an contextual uncertainty where he claims that the project experience this as an inconvenience for the project where the positive outcome of this inconvenience is experienced outside of the project.

4.5 Cultural Issues and Impact

Culture was a highlighted topic among the interviewees in the discussion on challenges related to uncertainty. Culture is considered an operational factor by several authors, however, the findings in this thesis suggest that both operational and contextual circumstances are impacting the cultural aspect of management and thus the cultural issues and impact have a separate section presenting the findings. The interviews introduce three themes which will be presented in the following three subsections.

4.5.1 Interdependence and changes and delays causes frustration

Several interviewees refer to the members of the organization as "detail oriented", "quality-conscious" and skeptical to deviations from the plan. Illustrating this point, project member 1 state that:

"We are a project that consists of many quality conscious, detail oriented people that need to have things within the agreed framework. It's not very agile and lean here (...), when the supplier then deviates from what is planned, they [the project team] become very uncertain".

In conjunction, as mentioned earlier, the project team insisted that changes is made to the management approach in the execution phase of the project, moreover, several interviewees describe consequences in relation to this change. Project member 1 express that the project is in a period characterized by uncertainty because of delays and poor quality on the documentation.

Additionally, project member 1 state that the collaborative processes must improve, hence several interviewees describe frustrations in the work day and express that the delays and uncertainty that these changes have caused, have had social consequences as well. This was a focal point for several of the interviewees. Examples of their responses include one interviewee who state that the reputation of the project in the program suffered and likewise for the contractor due to the changes in the execution phase:

"I was advised not to go to [the project] for example. The project has a very bad reputation for some reason, but I think it is the most exciting [project] in the program. We don't have a bad reputation anymore in the organization (...) I think they finally kind of recognize that we are competent, in the project team. Because we've had people who are a bit skeptical of us".

Furthermore, another interviewee express that the execution phase was difficult for the project because the project were blamed for the delays in the program causing a frustrating time for the project manager. Program representative 3 state that recount that:

"they struggled in the period before they landed it, then it was frustrating to be a project manager. I think everyone struggled then because they were blamed 'they are lagging behind, why are you lagging behind, why are we not spending enough money? Why do you have such large discrepancies in progress in all monthly and status reports?' and 'we are delayed because of [the project]'".

Likewise, the transparency where all the other projects see the delays and challenges of the other programs is described by program representative 2 as "unpleasant" and insinuate it as a mild deterrent to report delays and challenges truthfully. Moreover, program representative 3 express concern that the negative focus that was put on the delayed project took important time and focus away from the other projects in the program which might have needed that time and attention.

4.5.2 Operational uncertainty causes lack of trust in robust plans

Program representative 4 stresses that the need for information drives a need for specifying the solution and goal and output of the project. Program representative 4 claim that:

"the challenge is that, if you do not inform, then people know that something is happening, so the train leaders out there know that something is happening, and if they do not get any information, then there will be one such vacuum filled with rumors. Both rumors about what is done or not done, who works with what and who does not work with what, and how the solution will be".

Based on this it is argued that it is crucial that one know what is being done in the project, who is doing what and who are the contacts. And especially how the solution will be.

However, project member 5 state that the users are not pleased with the information. In spite of several attempt from the project to arrange information events and share the plans and expected output from the project, the representative argue that the reason for the users dissatisfaction is the lack of a physical prototype or visual representation of the new solution illustrating the changes to their workday. At the same time, the representative explain that there is a hesitation to provide the users with to broad information or a prototype that is under developed because it will steer the users expectations and could create conflict later in the process when the solution is closer to being finally developed.

Furthermore, when asked whether or not the project uses the plans or any of the project planning tools to communication, project member 5 state that such plans gives little to the employees through the following qoute:

"now I have worked there for 10 years and there are those who have worked there for 40 years who are still there and they have never experienced such a plan has held, no matter what we show them and I say that 'I believed in this and that it is going to be good on that date' they just say 'yeah, we will see..'".

4.5.3 Conflicting mindsets drives a change in culture

When asked to elaborate on the challenges associated with the uncertainty management in relation to the case project, several interviewees highlight conflicting mindsets and culture change as prominent. One of the main topics that the participants highlighted was a dilemma of effectiveness and efficiency. Interviewees differed in the their perspectives on efficiency in two key respects. Some interviewees express concern that the strict demand to keep the time restriction of the project will go on the expense of the effectiveness of the project. Project member 2 illustrate this point in the following quote:

"the strictest thing that really hinders flexibility, is that we must be ready by [the first contractual milestone] (...) and it is very high prestige to keep that date".

Hence, the general mindset of the interviewees is that the time constraint is hindering flexibility in the project and several sources state that they are concerned that the high focus on efficiency will compromise the effectiveness and quality of the solution. Project member 2 exemplifies this view, stating that the time constraint is very strict, and the project will reduce the functionality of the solution to be able to meet the time constraints.

On the contrary, program representative 1 imply that the quality of the product is secured by the contract claiming that

"there are many people in this organization who feel that there is a contradiction between focusing on time and focusing on quality and safety. (...) [The program owner] has been confronted with statements that imply that quality is no longer important, but that is exactly what it is! Of course, our contracts have the scope and quality we demand in the foundation, but getting the organization to manage both the contract and the quality requirements while focusing on delivering on time, that is a little change journey for the organization".

Additionally, several interviewees claim that the project is in a transformation phase in it self. Project member 4 state that the transitioning that the project is undergoing now is challenging the mindset and status quo in the organization; "that is what we are trying to cut through now as we operate with the operational milestones. We try to challenge the established. We don't need to have all the documents for all the operative milestones, we want [the contractor] to code, not to write documentation". Similarly, program representative 2 offer the following quote:

"I feel that we basically have a culture that is quite static and operates by fixed processes, fixed routines and it takes the time it takes. And here we have a project that has completely new routines, completely new ways of working, new standards and regulations, while at the same time demanding that we be quite flexible and dynamic and solution-oriented in the way of thinking".

Accordingly, program representative 1 explain that the transformational change program are influencing more that just the technology of the organization stating that "[this organization]is an organization that is used to implement solutions themselves, and now with [this program] we are being a big customer." Consequently, program representative 1 conclude that:

“That means we can’t, and we don’t, necessarily have to work the same way we did before. We have to do things in a different way and it is a cultural journey to treat our contractor as partners because it is our contractor/partners who will deliver the system, not us.”

Chapter 5

Analysis and Discussion

To understand the consequences of robust management in an uncertain change context, this chapter provide a discussion of the managerial issues and implications a robust mindset have for a change project in an operationally and contextually uncertain context. This chapter seeks to investigate the impact of robust management mindset in relation to managing uncertainty in the execution phase of a change project. Based on the empirical data presented in the previous chapter, the findings will be discuss relation to the theoretical framework established in chapter 2 highlighting any contrasting findings to the theory.

Generally, the results indicate that the case project is subject to a high degree of operational and contextual uncertainty and as a result there has been several changes. Firstly, there were changes to the project milestones and management approach to accommodate the goal and approach uncertainty enabled by a lack of experience. This uncertainty is driven further by emergent opportunities made current by dynamic uncertainty enabled by the internal stakeholders and other projects in the program. Furthermore, the study demonstrates a correlation between the complexity and interdependence of stakeholders and the increasing contextual uncertainty in the project. In addition, the relational uncertainty between the project and the contractor are causing several contractual issues and negotiations. Consequently, the data suggests that as a result the project experience contractual conflicts and difficulty with managing internal stakeholders sufficiently.

Accordingly, based on the empirical data, I have identified seven themes related to operational changes to the case project caused by operational, contextual and cultural circumstances which will be presented in this chapter accordingly. The seven themes presented in the three sections are: Changes to the project milestones linked to the duration of the project, changes to the approach linked to a lack of experienced, changes to the project output linked to both ambiguity of the detailed specifications and complexity of internal stakeholders, changes to the scope linked to emergent opportunities, and changes to the progress linked to the program interdependence and rigidity. Lastly, several themes related to cultural issues and impact on the project caused by the aforementioned changes and delays where highlighted by the interviewees and is therefore presented and discussed in relation to the research questions.

This chapter aims to answer both research questions and have divided the chapter in three sections which contain the issues found in the empirical data making seven subsections in total. Each subsection first discuss the uncertainty's impact on the project highlighting the issues caused by uncertainty while exploring the relation to the robust, traditional choices that was made in the early phase answering the first research question: *How does uncertainty impact a traditional, robust project in the execution phase? What issues arise on the project level?*. Second, there is discussed the issues' impact on the project in terms of effectiveness and efficiency answering the second research question: *How does these issues impact the efficiency and effectiveness of managing the project?* The results from the analysis and discussion is then summarized for each issue and conclusions is made in relation to the propositions in the corresponding summaries in chapter 2 which made the foundation for the theoretical framework.

5.1 Operational Uncertainty, Managerial Issues and Impact

Section 2.1 highlight lack of information as one of two main drivers for uncertainty. The findings from the interviews contribute to further our understanding of how lack of information drive uncertainty and succeeding managerial issues as a result in the execution phase of a project.

The theoretical framework suggest based on the reviewed literature that long duration is prominent when studying the goal and approach uncertainty in a project, however long duration was not found prominent in this case as an enabler for goal uncertainty. Nevertheless, "lack of experience" emerged as a prominent enabler for approach uncertainty. Moreover, this thesis proposed that the uncertainty enablers enable a lack of information in the execution phase which drives goal and approach uncertainty causing changes affecting the efficiency and effectiveness of the project. The semi-structured interviews in this study contributes a clearer understanding of the proposed relationship between the operational uncertainty, managerial issues and implications as illustrate din the upper half of the theoretical framework in figure 2.6. This section is based on the uncertainty enablers presented in section 2.1 and discuss the propositions presented in summary 2.1.5 and summary 2.3.3 related to impact that changes to the goal and approach in the execution phase have on the efficiency and effectiveness of the project.

5.1.1 Changes to the project milestones: Duration

To answer my first research question *How does uncertainty impact a traditional, robust project in the execution phase? What issues arise on the project level?*, the theoretical framework suggest that duration is an prominent factor to consider driving goal uncertainty and thus emergent opportunities which change the project output. Furthermore, to answer my second research question, *How does these issues impact the efficiency and effectiveness of managing the project?*, the theoretical framework suggest that any changes to robust plans could reduce the efficiency of the project.

The data suggest that the long duration is not considered as an enabler for uncertainty

or an obstacle by the participants for the case project. One participant mention the risk of the project output becoming "old fashioned" due to the fast technology development and the long duration of the project by the time of project delivery. However, the majority of the interviewees argue that the long duration has less impact on the project because the several operational and contractual milestones are shortening the time horizon and allowing adjustments to the project in the process.

On the one hand, the results do not suggest that long duration is a prominent enabler for goal uncertainty threatening the robust project specifications defines in the early phase as was proposed in the theoretical framework. As described in summary 2.1.5 and summary 2.3.3, Olsson (2006b), Project Management Institute (2013) and Kreiner (1996) discuss the impact of a long duration proposing that changes to the project output is necessary in drifting environments to secure effectiveness. Based on this literature this thesis proposed that long duration enable uncertainty driven by a lack of information either because the information is not available or the available information becomes irrelevant with time causing changes to the decisions based on the foundation of these assumptions. Contrary to the hypothesized association, there is not support for these claims in the interviews. A plausible explanation to this is that the specifications are made based on industry specific regulations required by law which are less likely to change, and even lesser likely to change fast. Supposedly, this creates an environment with less uncertainty related to the goal than other technology development projects, thus less need for changes.

On the other hand, in line with the theory described in subsection 2.4.2, the findings support the claims of Project Management Institute (2013), stating that the long duration of the program combined with the uncertainty of the business environment has forced organizations to shorten the time horizon for forecasting and planning. Based on the findings of similar studies, a plausible explanation for introducing internal flexibility in this case is that regardless of the duration, it is challenging to picture a future one as not yet seen. This is in line with the theories presented by Gareis (2010), Kanter (1992) and Burnes (1996), which confirms that a flexible approach to the management of an uncertain project, such as an IT development project, is desirable as suggested by authors such as Gareis (2010), Parker (2013) and Project Management Institute (2013) to secure efficient and effective management of the project.

Summary

To summarize the findings from the analysis and discussion in relation to the expectations presented in the theoretical framework answering the two research questions, there are two aspects: the issues caused by uncertainty and the impact. Accordingly, the long duration was not found prominent in this case as an enabler for goal uncertainty. The analysis conclude that the goal uncertainty is low due to the stability of laws and regulations determining the project specifications. However, the goal uncertainty of an IT project in general are high creating the need for an internal flexibility in the project to adjust the project according to both meet the requirements by law and create an effective solution. Consequently, considering the impact of this in the execution phase, internal flexibility was implemented to secure effectiveness of the project reducing the impact of the long duration in the project.

5.1.2 Changes to the approach: Lack of experience

To answer my first research question *How does uncertainty impact a traditional, robust project in the execution phase? What issues arise on the project level?*, the theoretical framework suggest duration as the only prominent factor to consider driving goal and approach uncertainty and thus changes the project output and management approach. However, the results indicate that a lack of experience is a driver for approach uncertainty which hinder a successful utilization of flexible management approaches as this is a mindset and method both the case organization and the contractor is less familiar with.

Lack of experience was not as aspect covered by the literature review. However, in line with the perspective of Johansen et al. (2019) described in section 2.4, a change project may use methods and approaches that are new and unfamiliar to deliver new outputs enabling benefits to be realized. Hence, these results should be taken into account when initiating a project demanding methods and approaches that the organization lack the experience and/or competence in.

There is a general agreement among the interviewees that there is a substantial approach uncertainty in the project where there has been induced extensive changes to the management approach in the early execution phase. The approach to manage and execute the project was determined and described in the contract in the front-end and planning phase of the project. However, the reoccurring focus from all interviewees discussing the need to change the management approach when the execution phase began, suggest that this necessary change was impactful for the project and program as a whole.

The project team realized that the approach is not adequate for the purpose of the project. The findings suggest that this is due to the organization's lack of experience with managing software development projects which traditionally is managed using flexible management approaches. Lack of experience with flexible approaches from both the case organization and the contractor enable the approach uncertainty even more. Hence, lack of experience emerged as an enabler for uncertainty from the semi - structured interviews. These findings helped explain the approach uncertainty in the project suggesting that the approach uncertainty is enabled by a lack of experience and driven by constant changes and adjustments being made to the approach during the process.

To answer my second research question, *How does these issues impact the efficiency and effectiveness of managing the project?*, the theoretical framework suggest that any changes to robust plans could reduce the efficiency of the project.

The findings show that the interdependence and standardization of management processes in the program creates systems and processes which are more and less suitable for different projects in the program. Likewise, several interviewees highlight that the case project is dependent on other projects developing traditional engineering outputs, which are managed using a robust management approach stating that these approaches cannot be combined. There is general agreement that the case project does not have suitable planning tools, contracts or the mindset to support a pure flexible approach to manage uncertainty in the project. Consequently, the uncertainty caused by lack of experience and necessary support functions to manage flexible projects in the organization have led to the spending of a significant amount of time and resources to develop a compromise to the management approach in the execution phase.

Summary

To summarize the findings from the analysis and discussion in relation to the expectations presented in the theoretical framework answering the two research questions, there are two aspects: the issues caused by uncertainty and the impact. Accordingly, lack of experience emerged as an enabler for uncertainty and as an important factor affecting effectiveness and efficiency considering the time and resources that necessary changes and adjustments to the approach cost in the execution phase. Consequently, considering the impact of this issue in the execution phase, the findings show that the uncertainty caused by lack of experience and necessary support functions to manage flexible projects in the organization have led to the spending of a significant amount of time and resources to develop a compromise to the management approach in the execution phase.

5.2 Contextual Uncertainty, Managerial Issues and Impact

Section 2.1 highlight ambiguity as one of two main drivers for uncertainty. The findings from the interviews contribute to further our understanding of how ambiguity drive uncertainty and succeeding managerial issues as a result in the execution phase of a project.

The theoretical framework suggest based on the reviewed literature that complexity, interdependence and low modularity are prominent when studying the dynamic and relation uncertainty in a project enabling ambiguity and misunderstands which is assumed to drive contextual uncertainty. The analysis and discussion in this section support this thesis' hypothesis that ambiguity drives issues related to communication and coordination within the program, contractual misunderstandings, and difficulty with management of the internal stakeholders. Moreover, the discussion will show that a high degree of interdependence in a program could decrease the efficiency if not managed appropriately, while likewise, formal, contractual negotiations could reduce efficiency and lastly, conflicting views can lead to lengthy debates and arguments that stall decision making thus reducing efficiency.

Consequently, this section is divided in four subsection each analyzing and discussing in dept the issues and the managerial impact proposed in the theoretical framework. The semi-structured interviews in this study contributes a clearer understanding of the proposed relationship between the contextual uncertainty and managerial issues and implications as illustrate din the lower half of the theoretical framework in figure 2.6. This section is based on the uncertainty enablers presented in section 2.1 and discuss the propositions presented in summary 2.1.5 and summary 2.3.3 related to impact that changes to the project output, scope and progress in the execution phase have on the efficiency and effectiveness of the project.

5.2.1 Changes to the project output: Ambiguity of specification

To answer my first research question *How does uncertainty impact a traditional, robust project in the execution phase? What issues arise on the project level?*, the theoretical framework suggest that complexity driving ambiguity and relational uncertainty could

cause contractual misunderstandings and lengthy, formal and contractual conflicts in the execution phase.

The reoccurring focus from the participants on the contractual relationship between the project and the contractor suggest that there are a high degree of relational uncertainty despite a robust contract. The analysis confirms that ambiguity of the information is driving relational uncertainty between the project and the contractor resulting in misunderstandings leading to either re-deciding decisions or contractual negotiations.

The findings suggest that the specifications in the contract describing the functionality of the product is ambiguous causing issues. This is exemplified by quotes such as "(...) they may have addressed the requirement, but we don't think it is quite the way we want it to be" and examples where the contractor's wrongful interpretations of the specifications resulted in a prolonged bureaucratic and formal process to correct the error. Hence, there is general agreement among the interviewees that they wished that they had phrased the specifications differently, instead of specifying *what* they wanted, they wished that they specified what they wanted it *for*. In other words, the relational uncertainty revealed that the specifications did not unambiguously describe the actual needs causing what seems to be changes to the specifications in the project in the execution phase. Subsequently, causing contractual negotiations affecting the project and the relationship with the contractor.

These results build on existing evidence of the findings presented in section 2.1 by Johansen et al. (2019) claiming that ambiguity as a lack of clarity and structure to interpret the information causes misunderstandings and uncertainty which are especially challenging because it cannot simply be reduced by providing more information. Furthermore, the many examples of lengthy debates and contractual conflicts caused by misunderstandings and misinterpretations of the specifications between the project and the contractor in the case, support the hypothesized association presented in summary 2.1.5.

Equally relevant is the question of how the issue of contractual negotiations impact the management of efficiency and effectiveness of the project. To answer my second research question, *How does these issues impact the efficiency and effectiveness of managing the project?*, the theoretical framework suggest that formal, contractual negotiations could decrease the efficiency of the project.

The findings suggest that robust contractual negotiations demands a lot of resource due to the formality and bureaucracy when subject to changes caused by uncertainty. The contract's purpose was to remove the risk away from the organization by describing in detail the functionality, time and resource limitations for the contractor. However, while a detailed solution description is aiming to increase efficiency in the execution phase, the findings from the interviews suggest that the relational uncertainty causes misunderstanding and conflicts with the contractor related to ambiguous solution specifications consequently reducing the efficiency in the execution phase. Consequently, the analysis suggest that a robust contract creates inefficient contractual negotiations for each change that happens due to high uncertainty in both the goal and approach.

Based on the literature review in section 2.3, many authors agree that flexibility in the execution process threatens the projects ability to deliver the projects output on time and withing budget. This indicates that traditional, robust project management approaches maximize the efficiency of a project by clearly defining the project specifications in the front-end and avoid changes to plans and the existing decisions (Olsson, 2004).

However, in summary 2.3.3, it is proposed that based on the character of a robust contract management described by Samset (2015), a robust contract is aiming to secure effectiveness and efficiency of the project by reducing uncertainty and risk by transferring the risk from the project to the contractor. In addition, in line with the characteristic of a robust mindset as described in summary 2.2.4, a robust contract is an attempt to eliminate future risk by obtaining as much information as possible (Caron, 2013) (Magnussen, 2006). However, as indicated by the analysis, the relational uncertainty and ambiguity causes different interpretation of the same information resulting in issues and conflict as described above contradicting the assumption that robustness secures efficiency.

Moreover, this claim is based on the assumption that, similar to robust plans, changes to a robust contract could be difficult and time consuming putting the efficiency at risk. Moreover, this analysis support the hypothesized association, that in an uncertain context the robustness decreases the efficiency because of the sunk cost of the time and resources spent on plans and specifications which must change or continuously be corrected or explained. In line with the claims of (Johansen et al., 2019) (Olsson, 2004), this is creating a high threshold which could in utmost consequence affect the effectiveness of the project rendering the project sub-optimal, or even irrelevant.

Nevertheless, the results might suggest that the robustness in the project was an inefficient approach considering the substantial time spent on developing the specifications up-front, however the detailed specifications have a second purpose. The detailed specification were highlighted by several interviewees as essential to align the three contracts and to have a complete program put out to tender. Similarly, several interviewees state that the detailed up-front specifications of the project output and functionality was important to align the contracts and the projects in the program together. This aspect is described in more detail below in subsection 5.2.4.

Summary

To summarize the findings from the analysis and discussion in relation to the expectations presented in the theoretical framework answering the two research questions, there are two aspects: the issues caused by uncertainty and the impact. Accordingly, while previous research has focused on the long duration driving changes to robust plans and specifications, these results demonstrate that the use of robust plans and specifications are threatened by the relational uncertainty between the project and the contractor. The relational uncertainty are causing consistent misunderstandings and corrections which decreases the efficiency and threatens the effectiveness of the project. Consequently, the reoccurring focus by participants on the ambiguity of the specifications demonstrates that detailed specifications is not tantamount to secure efficiency nor effectiveness. However, there is found a correlation between detailed specifications and robust plans and the need for alignment with other projects. These results should be taken into account when considering how to develop interdependent robust contracts.

5.2.2 Changes to the project output: Complexity of stakeholders

To answer my first research question *How does uncertainty impact a traditional, robust project in the execution phase? What issues arise on the project level?*, the theoretical

framework suggest that complexity of internal stakeholders are prominent factors which could cause relational uncertainty and thus re-decision and indecision of important choices in the project.

The findings indicate that there is a relational uncertainty enabled by the complexity of internal stakeholders. Moreover, the data suggest that the project have difficulties with predicting the appropriate level of involvement and communication with the stakeholders considering who to include and when.

The project have over 32 user interfaces having interest and stakes in the projects output. The representative for the user expresses that there is a challenge in the internal communication due to the high number of stakeholders. The representative for the users explain further that the high number of stakeholders inhibits everyone to be present at every meeting as this will be inefficient. As a consequence, it is challenging to get the whole project to have the same overall picture. In addition, the representative for the user report that several smaller conflicts had arisen due to insufficient allocation of relevant information between the stakeholders causing made decisions to be reconsidered due to emergent internal stakeholder's need. Furthermore, the project manager describe the challenge as an issue of understanding each other across disciplines as well as indecision delaying the progress as a result of difficulties when communicating with stakeholders.

Based on the reviewed literature, robust management approaches is considered to handle uncertainty related to stakeholders by creating a sense of certainty and stability which create less room for misunderstanding, confusion and chaos between important stakeholders related to the project securing an efficient management of relations. In relation to the change management literature, Cummings and Worley (2015) states that the challenge is both to monitor and attend to a variety of stakeholders who all have different interests that could change during the change process. Moreover, robust approaches is reliant on the forecasting of the needs of stakeholders and plan how to communicate to accommodate these needs. However, the research suggest that the project team find it difficult to predict these needs.

To answer my second research question, *How does these issues impact the efficiency and effectiveness of managing the project?*, the theoretical framework suggest that conflicting views with important internal stakeholders could lead to lengthy debates and arguments which stall decision making and thus reduce efficiency of the project.

The findings indicate that inefficiency related to including everyone in every meeting is in this context substituted with inefficiency related to revising decisions. Moreover, in line with the hypothesis, the data suggest that conflicting views can lead to lengthy debates and arguments that stall decision making. The findings indicate that the internal stakeholders could influence the progress in the project. The results fit with the claims of Cummings and Worley (2015) presented in subsection 2.4.2 explaining that especially in transformational changes, conflicts of interests become more apparent and important as stakeholders become more central and their influence grows. As a result, the capacity of managers is limited because they need to consult with and consider the needs and demands of others. Consequently, seen in relation to the findings of this case, the analysis shows that the relational uncertainty caused by a complex system of internal stakeholders could decrease the efficiency if not managed appropriately.

Summary

To summarize the findings from the analysis and discussion in relation to the expectations presented in the theoretical framework answering the two research questions, there are two aspects: the issues caused by uncertainty and the impact. Accordingly, complexity of internal stakeholders enable a relation uncertainty which causes challenges with predicting the appropriate level of involvement and communication with the stakeholders considering who to include and when. The issues the project face as a result of difficulties with efficient management of internal stakeholders are re-decision and indecision in the project delaying the progress. Consequently, the reoccurring focus by participants on these issues demonstrate that conflicting views and misunderstandings could decrease the efficiency if not managed appropriately.

5.2.3 Changes to the scope: Complexity and emergent opportunities

To answer my first research question *How does uncertainty impact a traditional, robust project in the execution phase? What issues arise on the project level?*, the theoretical framework only suggest that complexity of internal stakeholders are prominent factors which could cause re-decision and indecision in a project as discussed in the previous subsection. However, the findings suggest that the complexity of internal stakeholders have managerial impact beyond this, introducing emergent opportunities affecting the scope of the project.

In addition to the aforementioned points, the empirical data provides insight into the issue of emergent opportunities introducing changes to the scope of the project in the execution phase. Opportunities is in this thesis regarded as an emergent solution which present a favorable alternative or adjustment opportunity to the original plan of concept. Johansen et al. (2019) interpret opportunities as internal and external conditions that, can emerge at any time, and hence were not considered in the front-end and planning phase when goals and plans were established.

As described in summary 2.1.5, the theory presented from Olsson (2006b), Project Management Institute (2013) and Kreiner (1996) suggest that a long duration make prediction difficult in a dynamic environment. Consequently, there is expected that a project with a long duration will experience uncertainty and changes to the goal and/or approach due to advantageous opportunities emerging from changes in the environment. However, the results indicate that the emergent opportunities are mainly introduced as a result of a complex system of internal stakeholders which propose opportunities where the case project could increase their scope in order to benefit the organization's other projects. Hence, the findings suggest that the contextual uncertainty enable unexpected, emergent opportunities which could cause changes to the scope of the project. The project risk manager states that the project some times have to adjust and change their scope due to emergent opportunities which benefit some other part of the organization. Hence, the data suggest that these changes are aiming to increase the efficiency of other projects in the organization, causing the efficiency of the case project to be under pressure.

To answer my second research question, *How does these issues impact the efficiency and effectiveness of managing the project?*, the theoretical framework suggest that emergent opportunities could increase the effectiveness, however reduce the efficiency. As

described in summary 2.3, the findings from Olsson (2006b), Olsson (2004) and Johansen et al. (2019) suggest that operational issues take the form of changes to the project output due to emergent opportunities. The argument is that once the execution phase begin any opportunities and changes to increase effectiveness and profit must be measured up against the sunk cost from the planning and work that has already been done in the early phase threatening the efficiency of the project. The results build on these existing evidence, however indicate that changes to a project which does not directly provides benefits to the project in terms of increased efficiency or effectiveness could be experienced as barren to the project team. This point was highlighted by Johansen et al. (2019), stating that flexibility is a "double edged sword", where one possibility could be someone else's risk.

Furthermore, the results show that any changes to the scope must be approved by the program and negotiations with the contractor must be initiated. As a consequence, the emergent opportunities initiates a prolonged process of evaluation. The study demonstrates that there is a correlation between the emergent opportunity's impact on the project and the time and resources it takes to evaluate the opportunity and negotiate the necessary changes with the contractor. In accordance with the findings from the semi-structured interviews, there is impossible to exploit an opportunity without allowing changes to the established plans, concepts and/or contracts. The findings support the claims of Johansen et al. (2019) which state that the project team must negotiate and agree on changes in the contract, concept and plan, accept the sunk cost from the work already done when abandoning the earlier accepted solution to pursue a new, and potentially more uncertain, solution. In addition, the project must consider the effort, time and resources necessary to evaluate the solution and re-plan in relation to the uncertainty associated with whether or not the new solution will produce the intended benefit. This is in line with the findings of Johansen et al. (2019).

However, the findings in this case cannot directly link the issues caused by emergent opportunities to the robustness of the management approach. The findings indicate that utilizing the emergent opportunities could increase the value for both owners and users proving to be more effective and increase the efficiency in other parts of the organization. However, the flexibility to utilize these opportunities are in this case not limited by the robustness of the plans or any sunk costs, but on the limitations of the resources that are allocated to the project. The time and resources necessary to evaluate the opportunity, develop and negotiate changes to the scope with the contractor is crucial to determine the efficiency and effectiveness of the change. Consequently, how these changes are affecting the effectiveness and efficiency of the project is dependent on the budget, and the time and resources this process takes weighted against the benefits.

Summary

To summarize the findings from the analysis and discussion in relation to the expectations presented in the theoretical framework answering the two research questions, there are two aspects: the issues caused by uncertainty and the impact. Accordingly, the analysis and discussion show that the contextual uncertainty driven by dynamic uncertainty from internal stakeholders causes the issue of emergent opportunities in the execution phase. However, there was expected to emerge opportunities beneficial for the case project, instead, the observed emergent opportunities in the case were to the benefit of other projects

in the organization. Consequently, findings show that the impact of this issue is dependent on the time and resources of the process of evaluating the opportunity weighted against the benefits. The efficiency of the case project is pressured in favor of the efficiency of a different project in the organization, however, exploiting the opportunity could benefit the efficiency of the organization as a whole.

5.2.4 Changes to the progress: Program interdependence and rigidity

To answer my first research question *How does uncertainty impact a traditional, robust project in the execution phase? What issues arise on the project level?*, the theoretical framework suggest that inter-dependencies and low modularity drives dynamic uncertainty which demands resources to coordination and communication within the program to successfully manage a robust project.

As described in summary 2.1.5, Samset (2015), Johansen et al. (2019) and Kutsch and Hall (2016) discuss complexity defining complexity as dependent on the number of elements in the system *and* the degree of diversity in the relations between them and how they are organized. In light of the theory presented by Olsson (2006b) and Johansen et al. (2019) suggesting that modularity and low interdependence could reduce uncertainty, and Cummings and Worley (2015), Kanter (1992) and Kotter (1998) stating that interdependence is prominent specifically directed towards transformational change, this thesis proposed in summary 2.3.3 that the complexity and interdependence of the parts related to the project enables uncertainty in a project. Consequently, a high degree of interdependence in a program could decrease the efficiency if not managed appropriately. The hypothesized association is supported by the findings. The reoccurring focus by participants on the interdependence and rigidity in the program demonstrates how the stable and robust plans are constantly pressured by uncertainty induced changes and delays in different parts of the program. The findings indicate that the projects embedded in the program are subject to high degree of interdependence which causes rigidity and limits the flexibility of the case project enabling dynamic uncertainty.

One the one hand, robust project management offer governance structure, clear project base line, project road map which enable aligned decision making within the program resulting in control of the achieving of benefits, mutually reinforcing efforts and securing of strategic relevance. On the other hand, the complexity and rigidity of the program makes the program slow and incommodious to change. Hence, the findings suggest that the most advantageous possibility to introduce flexibility and changes are to project specific changes, while changes in the project influencing several parts of the program is undesired due to the resources it takes to manage such changes. Consequently, the analysis show that internal flexibility, as defined in subsection 2.2.2 by Johansen et al. (2019), is more practical in a project where the interdependence in high.

To answer my second research question, *How does these issues impact the efficiency and effectiveness of managing the project?*, the theoretical framework suggest that a high degree of interdependence in a program could decrease the efficiency if not managed appropriately.

Considering both the suggestions in summary 2.1.5 and summary 2.4.4, when the need for cooperation and alignment across projects in a program, organizational divisions and external parties such as contractors or regulative entities, is higher, the complexity in the

system increases. Accordingly, Cummings and Worley (2015), Kanter (1992) and Kotter (1996) view a direct connection between proper alignment and successful transformation. Consequently, the success of a transformational change program dependent on close collaboration both between projects in the program and between the program and the organization creating a complexity in the system.

On the one hand, as discussed earlier, the necessary resources spent on developing the compromise introducing internal flexibility to the case project have been considered vital for the project's progress and execution. On the other hand however, this study provides new insight into the necessity of the robustness in the project and program. The study demonstrates a correlation between the low modularity in the program and the need for robust plans and contracts. The results indicate that the interdependence with the other projects, several of which are using a traditional, robust management approach, have introduced the necessity for robust plans and contracts to secure alignment and synchronization between the projects. This is necessary to secure an effective, on time delivery of the program output. These results fit with the claims of Cummings and Worley (2015) presented in subsection 2.4.2 explaining that "as uncertainty, sub-unit difference, and interdependence increase, more sophisticated coordination devises are required" (Cummings and Worley, 2015, p.99)

However, the findings indicate that the complexity of the system combined with interdependence affect the efficiency of the project. There is general agreement among the participants that if one project in the program is delayed that affects the planning of all the other projects in the program. The project director states that "what was synchronized at the starting point became asynchronous very quickly", and goes on to explain that the synchronization of the program is the unstable part of the governance. Consequently, there is spent a substantial amount of time an resources on re-planning in the case project, however, suddenly, some other part of the program is delayed making new plans worthless.

Summary

To summarize the findings from the analysis and discussion in relation to the expectations presented in the theoretical framework answering the two research questions, there are two aspects: the issues caused by uncertainty and the impact. Accordingly, the results indicate that interdependence in the program has motivated the robustness in the plans because delivering on time is paramount in this case. However, the dynamic uncertainty is enhanced by the interdependence and rigidity in the program constantly pressuring the robust plans. Consequently the effectiveness and efficiency is dependent on the amount of resources spent on re-planning to secure synchronization of the milestones between the contracts.

5.3 Cultural Issues and Implications

The findings from the research indicate that the managerial issues presented in the previous sections driven by both operational and contextual uncertainty has caused secondary managerial implications, namely cultural issues and implications. One of the main topics highlighted by the interviewees were cultural challenges which the project experienced

in the execution phase as a result of changes and delays. Cummings and Worley (2015) define organizational culture as a representation of "the basic assumptions, values, and norms shared by organization members" (Cummings and Worley, 2015, p.99). According to Cummings and Worley (2015)'s organizational model, culture represents both an outcome and a limitation. In other words, culture guides employees' perceptions of what is needed for the business to succeed and is necessary to understand in light of the impact that the issues, changes and delays have on a project. The cultural aspect is in this thesis defined as a part of the operational circumstances. However, culture emerged as an highlighted theme by several participants in the semi-structures interviews in relation to both operational and contextual circumstances, and is therefore analyzed and discussed in it's own section. The following subsection will analyze and discuss the cultural impact caused by changes and delays in the case in relation to the theoretical framework.

5.3.1 Changes and delays causing cultural impact

The findings from the semi-structured interviews indicate that several parts of the organization experience effectiveness and efficiency as conflicting ideas. There is general agreement among the project members that efficiency is valued especially in the form of on-time delivery of the solution. This is expressed through the traditional, robust plans focusing around the time perspective which seem to emphasize the contrast between efficiency and effectiveness. This is causing the organizational members to experience this as conflicting ideas when uncertainty and change threatens the plans. Accordingly, many authors in the literature point out that the design components in the organization are interconnected, and one must ensure that changes throughout the organizational system are mutually reinforcing to successfully change (Cummings and Worley, 2015) (Kotter, 1998) (Kanter, 1992). Concurrently, the analysis indicate that the case project is contravening with the original organizational design components challenging the established norms and management processes in the organization. Moreover, the findings suggest that by driving changes in the case project with regard to the management processes, several interviewees believe it could be a part of driving a change in the whole organization's culture and mindset. Consequently, the findings contributed to a clearer understanding of the cultural aspect of the operational management and how uncertainty and the changes and delays impact the project.

In addition, the results build on existing evidence of the hypnotized propositions presented in summary 2.2.4, supporting the claims of Johansen et al. (2019) stating that it is a need for a shift in mindset. Moreover, considering the culture as the behavior necessary for the business to succeed, several authors such as Cummings and Worley (2015), Kanter (1992) and Kotter (1998) claims that mixed signals about the desired behavior threatens the possibility of success. It follows that cultural issues and impact are prominent factors to consider when researching the managerial implications of the issues presented in the earlier sections. Consequently, the following three subsections are further answering the second research question emphasizing the managerial impact that the changes and delays in combination with a robust mindset have caused in the case.

Internal cultural issues

Firstly, the findings show that the employees exalt robust, detailed plans and quality especially directed at security expressed through documentation and avoiding deviations from the plan. Thus, there is a general agreement among the project members that efficiency is valued especially in the form of on-time delivery of the solution. However, there is reported from several sources that there is a lot of stress and frustration internally in the project caused by the changes and delays and lack of certainty in the goal and approach of the project.

Olsson (2004) argue that internal flexibility in a project could create uncertainty and frustration between the involved parties because the project is not clarified to a large enough extent. Consequently, these results build on existing evidence of Olsson (2004), supporting that not having clarified the project cause frustration in a project. Moreover, these results fit with the theory presented by Olsson (2006b) who find that the main drawback to project flexibility is not the flexibility it self, but the application of flexibility without structure and preparations that allow flexibility. Moreover, the study suggest that uncertainty increases the probability that changes must be made in the execution phase, hence robust plans are under pressure and changes are inevitable in the execution phase. Consequently, the findings support the claims of Franklin (2014) who argue that robust approaches only creates a false sense of certainty.

External cultural issues

In addition, the reoccurring focus by participants on the negative attention that the project experienced due to these changes demonstrates that changes in the execution phase is viewed - not only in the project as undesired, but considered a threat to the efficiency by the stakeholders in the program in which the project is embedded. The data demonstrates that the project experienced skepticism and shame from the rest of the program and hence the data contributes a clearer understanding of the impact a robust mindset have on the cultural aspect of the organization. The study demonstrates a correlation between the culture in the organization and the stress and frustration related to changes and delays.

Johansen et al. (2019) and Samset (2015) propose that there is a necessary shift in mindset away from viewing uncertainties and deviations from the project baseline as undesired and inaccurate planning or inappropriate control. They suggest that instead organizations must embrace the uniqueness of the project, and recognize uncertainty and deviations as unavoidable. Thus, there is created room and acceptance for maneuvering and changing to be able to successfully master such projects. Hence, these findings contribute to extend our understanding of the potential risks that the concept of conformity and a conservative tradition, described by Olsson (2006b), could expose on a project as several interviewees suggest potential risk associated with this culture. The study suggest that the potential risk when negative attention and focus in given to one project it could affect the perspective of the program to be too narrow. As a result, other risks and potential risks to be overlooked and there is created incentives to cover up mistakes and potential delays in fear of social repercussions.

Lack of trust in robust plans among employees

According to the literature review, robust project management offer tools to make the process, output and goals more stable and easier to map and communicate. Concrete, definable project baseline, deliverables and goals is important to gain the support of employees through a clearly communicated plan which motivates the changed behavior and reduce confusion about the process and outcomes of the change. However, contrary to this hypothesized association, the findings indicate that the employees do not have trust in the robust plans presented by the management team. The representative for the users explain that their former experience with plans similar to these have ended up being changed causing the employees to distrust the claims of the robust plans. Accordingly, the representative point out that the employees "believe it when they see it", referencing both their distrust to robust plans and their desire to physically see and test the output of the project to truly understand the projects impact on their work. These findings support the claims of Gareis (2010), stating that an organization learn from previous experience with transformational changes.

Securing effective management of a change project, the literature state that the support of the employees are paramount to successfully implement a change, hence the communication with the end users are very important. Consequently, in relation to the communication and gaining the support of important stakeholders, the results supports the claims of Franklin (2014) presented in subsection 2.3.2, stating that the agile approach to communication and collaboration with the end user are concerned with delivering output and get feedback throughout the process. These findings indicate that frequent testing of the solution on the end user is vital to prove its positive impact and gaining support.

However, on the other hand, the representative for the user points out that an important consideration when deciding to present unfinished solutions, is that this might form the expectations of the users. The risk is that if you present a solution to early, it will create the expectation of a poor solution which could trigger a negative attitude towards the change which could in the utmost consequence hinder the solution of being used.

Summary

This subsection summarize the findings from the analysis and discussion in relation to the findings in relation to cultural issues and their managerial impact on the change project.

Firstly, the analysis provide clear evidence that Olsson (2006b)'s concept of applying flexibility without the structure and preparations that allow flexibility can be usefully employed to extend our understanding of the impact that a robust mindset and culture have on the management of projects exposed to high uncertainty. The results build on this exiting theory explaining that a false sense of certainty could create frustration and stress in the project team when there is constants changes to the approach and delays in the progress.

Additionally, the analysis provide new insight into the risks of the traditional culture and robust mindset could expose in the interdependent relationship between a project and other projects in the same program. The analysis indicate that changes and delays combined with a robust culture and mindset could have an affect on the efficiency by creating incentives to report misleading statements about the progress, or incentives which benefit the prioritization of efficiency ahead of quality and effectiveness. Thus, these results

should be taken into account when considering further research on this topic and potential risk for robust projects in high uncertainty environments.

Lastly, the findings contribute to the understanding of the issues of the communication of changes and indicate that the previous experience could cause skepticism and lack of trust in robust plans rendering the benefits of stable and concrete plans less effective in the context of communication.

5.4 Summary

The following section is a summary of summaries presenting the main conclusions from the analysis and discussion which in conjunction will answer the two research questions.

How does uncertainty impact a traditional, robust project in the execution phase? What issues arise on the project level?

Firstly, considering the operational uncertainty and circumstances, the theoretical framework suggested that a long duration enable a lack of information which drives operational uncertainty. The framework further suggest that the uncertainty would drive changes to the project goal and approach in the execution phase.

The discussion and analysis in this chapter conclude based on the findings from the semi-structured interviews that long duration was not found prominent in this case as an enabler for goal uncertainty. The goal uncertainty is on the one hand low due to the stability of laws and regulations determining the project specifications, however the goal uncertainty of an IT project in general are high creating the need for an internal flexibility in the project. Nevertheless, "lack of experience" emerged as a prominent enabler for approach uncertainty and as an important factor affecting effectiveness and efficiency considering the time and resources that necessary changes and adjustments to the approach cost in the execution phase.

Considering the contextual uncertainty and circumstances, the theoretical framework suggest that complexity, inter-dependencies and low modularity enable contextual uncertainty driven by ambiguity. The theoretical framework further suggest that complexity drive ambiguity and relational uncertainty which could cause contractual misunderstandings and lengthy, formal and contractual conflicts in the execution phase. Furthermore, the theory suggest that complexity of internal stakeholders are prominent factors which could cause relational uncertainty and thus re-decision and indecision of important choices in the project. Lastly, the theoretical framework suggest that inter-dependencies and low modularity drives dynamic uncertainty which demands resources to coordination and communication within the program to successfully manage a robust project.

The discussion and analysis in this chapter conclude that while previous research has focused on the long duration driving changes to robust plans and specifications, the results demonstrate that the use of robust plans and specifications are threatened by the dynamic uncertainty and relational uncertainty between the project, internal stakeholders and the contractor.

Firstly, the data indicate that relational uncertainty between the project and the contractor is causing consistent misunderstandings and corrections to the project specifications.

Second, the analysis support the hypothesis that complexity of internal stakeholders enable a relation uncertainty which causes challenges with predicting the appropriate level of involvement and communication with the stakeholders. The issues the project face as a result of difficulties with efficient stakeholder management are re-decision and indecision in the project delaying the progress. Third, the results indicate that interdependence in the program has motivated the robustness in the plans because delivering on time is paramount in this case. However, the dynamic uncertainty is enhanced by the interdependence and rigidity in the program constantly pressuring the robust plans.

Lastly, in addition to the hypothesized propositions in the theoretical framework, the analysis and discussion show that the contextual uncertainty driven by dynamic uncertainty from internal stakeholders causes the issue of emergent opportunities in the execution phase. However, there was expected to emerge opportunities beneficial for the case project, instead, the observed emergent opportunities in the case were to the benefit of other projects in the organization.

How does these issues impact the efficiency and effectiveness of managing the project?

Firstly, considering the operational circumstances and managerial issues, the theoretical framework suggested that any changes to robust plans could reduce the efficiency of the project. Correspondingly, the analysis and discussion conclude that considering the impact of the changes to the milestones in the execution phase due to the long duration, internal flexibility was implemented to secure effectiveness of the project reducing the impact of the long duration in the project. Moreover, considering the impact of the changes to the approach in the execution phase, the findings show that the uncertainty caused by lack of experience and necessary support functions to manage flexible projects in the organization. This have led to the spending of a significant amount of time and resources to develop a compromise to the management approach in the execution phase.

Furthermore, considering the contextual circumstances and managerial issues, the theoretical framework suggested that changes to the project output causes formal, contractual negotiations which could decrease the efficiency of the project. Moreover, the theory suggest that conflicting views about the details of the project output between important internal stakeholders could lead to lengthy debates and arguments which stall decision making and thus reduce efficiency of the project. Lastly, the theoretical framework suggest that a high degree of interdependence in a program could decrease the efficiency if not managed appropriately.

Correspondingly, the analysis and discussion conclude respectively that, firstly, the reoccurring focus by participants on the ambiguity of the specifications demonstrates that detailed specifications is not tantamount to secure efficiency nor effectiveness due to contractual negotiations. This is found to decrease the efficiency of the case project. Secondly, the reoccurring focus by participants on the issues of managing a complex system of internal stakeholders demonstrate that conflicting views and misunderstandings could decrease the efficiency if not managed appropriately. Third, the results suggest that the interdependence in the program causes issues in the case project related to re-planning. Consequently the effectiveness and efficiency is dependent on the amount of resources spent on re-planning to secure synchronization of the milestones between the contracts.

Likewise, the data contributes a clearer understanding of how emergent opportunities

causes changes to robust plans and consequently reducing the efficiency of a project as proposed in the theoretical framework. The findings show that the impact of emergent opportunities is dependent on the time and resources of the process of evaluating the opportunity weighted against the benefits. The analysis conclude that the efficiency of the case project is pressured in favor of the efficiency of a different project in the organization. However, exploiting the opportunity could benefit the efficiency of the organization as a whole.

In addition, the analysis and discussion revealed that the issues caused cultural issues which too have significant consequences for the management of a change project. Firstly, the analysis provide clear evidence that Olsson (2006b)'s concept of applying flexibility without the structure and preparations that allow flexibility can be usefully employed to extend our understanding of the impact that a robust mindset and culture have on the management of projects exposed to high uncertainty. The results build on this exiting theory explaining that a false sense of certainty could create frustration and stress in the project team when there is constants changes to the approach and delays in the progress.

Additionally, the analysis provide new insight into the risks of the traditional culture and robust mindset could expose in the interdependent relationship between a project and other projects in the same program. The analysis indicate that changes and delays combined with a robust culture and mindset could have an affect on the efficiency. The findings suggest that there there is a risk of creating incentives to report misleading statements about the progress, or incentives which benefit the prioritization of efficiency ahead of quality and effectiveness. Thus, these results should be taken into account when considering further research on this topic and potential risk for robust projects in high uncertainty environments.

Lastly, the findings contribute to the understanding of the issues of the communication of changes. The discussion and analysis indicate that the previous experience could cause skepticism and lack of trust in robust plans rendering the benefits of stable and concrete plans less effective with regard to supporting communication.

Chapter 6

Conclusion

More and more organizations find themselves in a dynamic environment, causing them to undergo transformational changes. This is reflected in the literature which continually offers new approaches for managing such changes. Previous studies of a combination of project management and change management, to better manage transformational changes, have raise some new questions as to how well a robust management approach will work when exposed to a high level of uncertainty. This has justified a critical research of how robust management approaches could affect the execution of a change project subject to a high degree of uncertainty. Consequently, the aim if this thesis was to provide indications to what enables and drives uncertainty in the execution phase of a project in a transformational change program, and provide indications to what managerial implications this have for a project manager when a traditional, robust management approach is used. Subsequently, a critical case study was conducted using a traditional engineering company currently in the execution phase of a transformational change.

6.1 Main findings

This research aimed to identify which issues is caused by uncertainty in a transformational change project in the execution phase and how these issues affect the management of the project in terms of efficiency and effectiveness. The evidence presented in this thesis has shown that the uncertainty impact a traditional, robust project by introducing several issues in the execution phase. The findings indicate that the main issues caused by uncertainty is changes to the project milestones, approach, scope, progress and project output in the execution phase.

Moreover, this thesis suggest that the combination of a robust mindset and uncertainty causes the following issues affecting the effectiveness and efficiency of the project. First, changes to the milestones, and the need for developing a compromise in the management approach. Moreover, frequent evaluation of emergent opportunities, re-planning to achieve synchronization in the program, lengthy contractual conflicts and halting negotiations with the contractor and internal stakeholders. In addition, the findings indicate that changes and

delays to robust plans and decisions have a cultural impact on the project. The analysis show that this could cause a lack of trust in robust plans among the employees in the organization. The analysis indicate that cultural issues have an impact on the operations in the organization in general, and the effectiveness of robustness due to the uncertainty exposing the plans as a false sense of certainty.

Furthermore, the analysis and discussion conclude that the issues have the following managerial implications on the change project. First, contractual negotiations is found to decrease the efficiency of the case project. Secondly, the issues of managing a complex system of internal stakeholders demonstrate that conflicting views and misunderstandings could decrease the efficiency if not managed appropriately. Third, the interdependence in the program causes issues in the case project related to re-planning. Consequently the effectiveness and efficiency is dependent on the amount of resources spent on re-planning to secure synchronization of the milestones between the contracts. Lastly, the analysis indicate that changes and delays combined with a robust culture and mindset could have an affect on the efficiency. The analysis conclude that there is a risk of creating incentives to report misleading statements about the progress, or incentives which benefit the prioritization of efficiency ahead of quality and effectiveness.

To conclude, this thesis has addressed a number of significant issues which show how the traditional, robust management approach and mindset affect the effectiveness and efficiency of managing a change project in the execution phase. The results indicate that the long duration did not have the expected impact on uncertainty by driving changes to the project goal and output in the execution phase as was assumed based on the theory. A plausible explanation is that the detailed specifications in the case are based on laws and regulations, hence not strictly impacted by the dynamic environment developing new technology over time. Moreover, the case project had, because of the long duration, included internal flexibility by changing the project milestones to operational milestones, thus securing effectiveness of the solution. However, due to the lack of available data, the results cannot confirm that a long duration is an enabler for uncertainty nor that it is not. Nevertheless, lack of experience was discovered as an enabler for uncertainty in the case. The lack of experience was considered an important factor which affected the effectiveness and efficiency considering the time and resources that necessary changes and adjustments to the approach cost in the execution phase.

In addition, the analysis found that the interdependence and complexity enable ambiguity and drives relational uncertainty. The study demonstrates a correlation between the high degree of relational uncertainty between a wide range of internal stakeholders and the contractor, and the revision of decisions and changes to the robust specifications of the project output. The study demonstrates how a range of stakeholders from different parts of the organization and beyond affect the management causing decision paralysis and re-decision when the needs of an important stakeholder has been bypassed. Moreover, the analysis indicate that robust contracts hinder efficient changes to the contract specifications.

Furthermore, the reoccurring focus by interviewees on the importance of communication with the end-user demonstrates the need for reducing the goal uncertainty. However, the findings suggest, contrary to the theory presented, that the most effective is not a stable and robust solution description, but a realistic representation of the solution to present

early. The findings from the interviews failed to provide empirical support for the proposition that robust, detailed plans could be beneficial for communicating changes to the employees. On the contrary, the findings suggest that due to earlier experiences where employees have been presented with such plans, the plans have changed and thus caused the employees to distrust in such plans.

These findings are presented below in the new and adjusted framework.

6.2 New and adjusted framework

By analyzing the issues that the case organization experienced in the execution phase this thesis have shown how a robust management approach and mindset can affect the management of uncertainty and change in the execution phase. The findings are presented in figure 6.1. Based on the analysis and discussion of the findings, I found it necessary to make some adjustments to the theoretical framework presented in chapter 2 which will be further described in this section.

Firstly, the findings from the case contributed to a clearer understanding of the operational uncertainty enablers and operational uncertainty, consequently causing several changes to this part of the framework. The reviewed literature considered emergent opportunities as changes to the project output due to drifting environment causing changes to the assumptions about the project solution. However, the findings from the case reveal that the environment in which the case project is developed is stable. Consequently, the results cannot confirm a correlation between a long duration and emergent opportunities causing changes to the project goal. Nevertheless, the findings indicate a correlation between the long duration and need for internal flexibility to secure effectiveness of the project, which is reflected in the new and adjusted framework. Furthermore, "lack of experience" emerged as a an enabler for approach uncertainty, thus it is included the framework. Wherefore the framework contains the corresponding issues and impact as described above.

Secondly, instead of emergent opportunities causing changes to the project output, the findings found a correlation between complexity of internal stakeholders and the changes to the scope of the project. The data show that opportunities emerged frequently benefiting the efficiency of projects outside of the program. These findings are included in the new and adjusted framework. Furthermore, the cultural impact on the management of the project is included as this was proven a prominent factor by the participants in the case.

Additionally, I found it necessary to expand the framework describing the managerial issues and impact. The adjusted framework distinguishes between the issues which arises in the execution phase as a result of uncertainty, namely changes to project milestones, approach, output, scope and progress, and the issues which arise due to the combination of the mentioned changes and robust plans, mindset and approach. The latter is included under "Managerial impact in the execution phase - in relation to the robustness of the plans, approach and mindset" in the new and adjusted framework. Furthermore, several re-phrasings and specifications have been done. For example, the theoretical framework suggest that "program interdependence demands resources to coordination and communication" reflecting the findings from the literature review, while the adjusted framework state "Program interdependence demands resources to coordination and synchronization

which induces frequent re-planning". The latter is more accurately reflecting the findings from the case study.

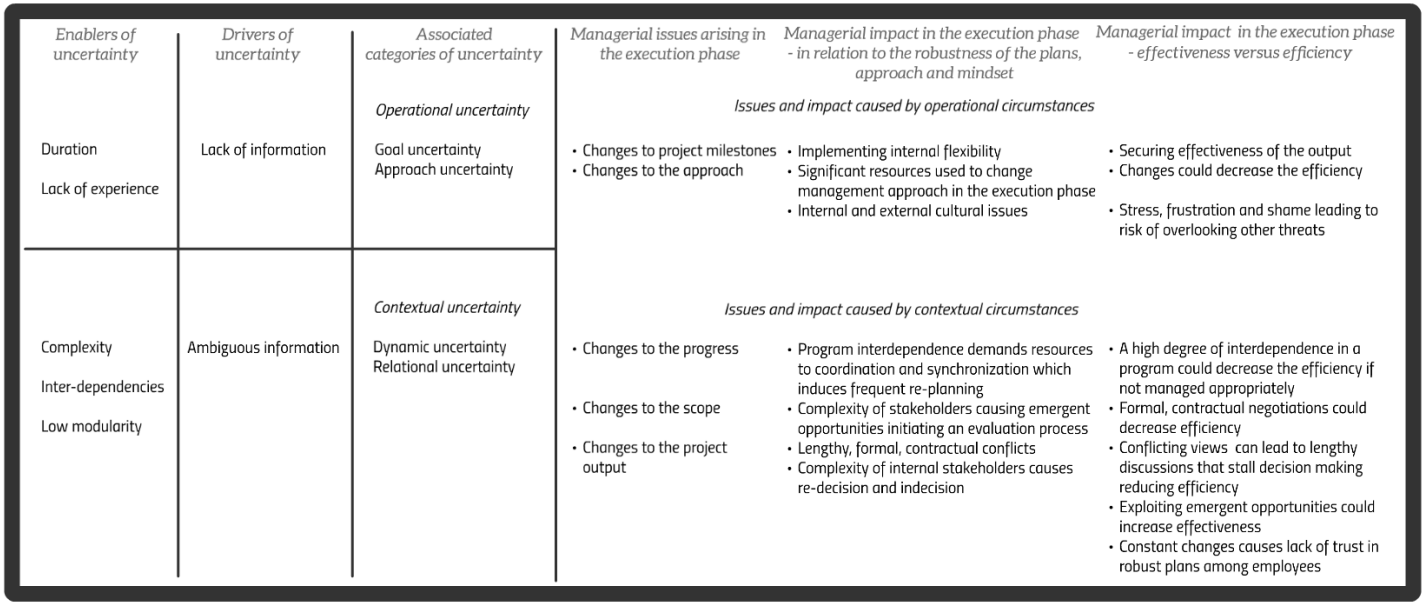

Figure 6.1: Illustration of the main findings regarding robust uncertainty management, issues and managerial implications based on the empirical data

6.3 Limitations of the results and suggestions for further research

A qualitative case study was selected to gain in-dept insight into this phenomena in a practical context, however due to the limitations of time and resources the scope was limited to researching only one case. While the qualitative research strategy and research design in this case limits the generalizability of the results, this approach provides new insight into emergent issues caused by uncertainty and it's impact on the project level in the execution phase of a change project. Furthermore, as mentioned in Chapter 3, a limitation to only using one case company is the low variation which decrease the likelihood that all the variables of interest in this study is included. This limitation is reflected in this study by the limited results to discuss the impact of duration as an uncertainty enabler.

This research clearly illustrates a correlation between the use of robust management approaches in an uncertainty environment and issues arising impacting the effectiveness and efficiency of a change project in the execution phase. Yet, it also raises new questions and suggestions for further research. Firstly, all conclusions in this thesis are abductive, consequently further research is needed to determine with certainty the relationship between traditional robust approach and the issues that arise in the execution phase. Moreover, to better understand the implications of these results, future studies could address the possible different factors affecting the issues and the impact which was experienced in this case study beyond uncertainty. For example, how contracting strategies influence the project or how the prerequisites and earlier experiences of the organization influence new transformations in an organization.

Simultaneously, the results suggest that the combination of flexible and robust planning in different projects in the same program offered issues. The findings suggest that these issues are due to the lack of experience with flexible approaches. However, due to the lack of available data, the results cannot confirm or elaborate on the managerial implications the combination of different management approaches in a program have on a project in general. Moreover, it is beyond the scope of this thesis to study how the combination of several management approaches in the same program affect the management of the projects. Nevertheless, these results could be taken into account when considering to combine the management of both robust and flexible projects in the same program and could be an interesting topic for future research.

Lastly, the data can only provide indications about the impact of robustness in an uncertain context, and not make any conclusions as to how flexibility could have been a better choice. Therefore, based on these conclusions, practitioners should consider conducting a critical study to investigate the managerial issues and implications of flexible approaches in a transformational change project.

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Appendix

Appendix 1: General Interview Guide

Intervjuguide

1. Din rolle i transformasjons-programmet, relasjonene til prosjekter, håndteringen av avhengigheter og kartlegging av kompleksiteten i systemet.

    a. Hvilke avhengigheter er det mellom prosjektet og organisasjonen, andre prosjekter i programmet, entreprenører..?
    b. Hvordan blir disse avhengighetene håndtert?
    c. Opplevde du utfordringer med håndteringen av avhengigheter?

2. Usikkerheter og risiko er knyttet til ledelsen av prosjektet.

    *Usikkerhet er i denne sammenhengen kan for eksempel være usikkerhet knyttet til **målet** (vanskelig å definere spesifikasjoner), **prosessen** (må kanskje endre fremgangsmåte underveis), **miljøet** (usikkerheter rundt prosjektet grunnet ny input fra interessenter eller markedet) eller **relasjonene** (mange involvert, og tolkningen av det samme info varierer).*

    a. Hva er kilde til usikkerheten og risiko i dette prosjektet?
    b. Hvordan håndterer prosjektet eventuell usikkerhet og risiko?

3. Behovet for fleksibilitet.

    Fleksibilitet er i denne sammenhengen muligheten til å justere prosjektet ettersom konsekvenser av forskjellige usikkerheter oppstår underveis i prosessen. For eksempel ta avgjørelser som er reversible, utsette irreversible avgjørelser, risikoanalyse, utvikle alternative planer i tilfelle, osv.

    a. Hvordan har den lange tidshorisonten på programmet påvirket planleggingen? (Eksempler?)
    b. Har det vært noen aspekter ved dette som har vært utfordrende? (Eksempler?)
    c. Har det vært et behov for å inkludere fleksibilitet i prosjektet?
        i. Enten i prosessen eller i produktet eller begge?
        ii. Eksempler?
    d. Hva regner du som den største trusselen mot å utvikle en løsning som er brukervennlig (en løsning som vil gi den ønskede effekten)?

4. Involvering og kommunikasjon med nøkkelinteressenter.

Nøkkelinteressenter inkluderer andre prosjekter i programmet, entreprenøren og øvrige deler av organisasjonen og ansatte berørt av endringene.

a. Hvordan har involveringen av nøkkelinteressenter foregått i dette prosjektet? (Eksempler?)
b. Hva har vært hovedmotivasjonen for involveringen?
c. Har det vært noen aspekter ved dette som har vært utfordrende? (Eksempler?)

d. Hvordan foregår kommunikasjonen mellom prosjektene?
e. Hvordan foregår kommunikasjonen mellom prosjektgruppen og nøkkelinteressenter?
f. Benyttes det noen prosjektledelse verktøy til kommunikasjon?
g. Har det vært noen aspekter ved dette som har vært utfordrende? (Eksempler?)

Appendix 2: Master's Agreement

Master`s Agreement

Faculty	**ØK - Fakultet for økonomi**
Institute	**Institutt for industriell økonomi og teknologiledelse**
Programme code	**MSPROMAN**
Course code	**194_TIØ4920_1**

Personal information

Family name, first name	**Waaler, Michelle**
Date of birth	**13.11.1995**
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The Master`s thesis

Starting date	**15.01.2020**
Submission deadline	**15.06.2020**
Thesis working title	**Change Management and Project Management Contributions in Leading Transformational Change Processes**
Thematic description	**Over the last few decades, the number of change projects undertaken by organizations has increased substantially. Despite the increasing number of change projects being initiated, the cited failure rates are between 70% - 90% for change indicating that organizations still lack effective means to reliably implement organizational change. At which point there has been a growing interest in the combination of the disciplines of project management and change management in an organizational change context. This thesis will research theories related to the combination of these disciplines in a transformational change context through a qualitative case study collecting empirical data using semi-structured interviews.**

Supervision and co-authors

Supervisor	**Ola Edvin Vie**
Any co-supervisors	**Parinaz Farid**
Any co-authors	

Topics to be included in the Master`s Degree (if applicable)

Course code	Course name	Credits	Level	Term

Guidelines – Rights and Obligations

Purpose

Agreement on supervision of the Master's thesis is a cooperation agreement between the student, supervisor and the department that governs the relationship of supervision, scope, nature and responsibilities.

The master's program and the work of the master's thesis are regulated by the Act relating to universities and university colleges, NTNU's study regulations and current curriculum for the master's program.

Supervision

The student is responsible for

- Agre upon supervision within the framework of the agreement
- Set up a plan of progress for the work in cooperation with the supervisor, including the plan for when the guidance should take place
- Keep track of the number of hours spent with the supervisor
- Provide the supervisor with the necessary written material in a timely manner before the guidance
- Keep the institute and supervisor informed of any delays

The supervisor is responsible for

- Explain expectations of the guidance and how the guidance should take place
- Ensure that any necessary approvals are requested (REC, ethics, privacy)
- Provide advice on the formulation and demarcation of the topic and issue so that the work is feasible within the standard or agreed upon study time
- Discuss and evaluate hypotheses and methods
- Advice on professional literature, source material / data base / documentation and potential resource requirements
- Discuss the presentation (disposition, linguistic form, etc.)
- Discuss the results and the interpretation of them
- Stay informed about the progression of the student's work according to the agreed time and work plan, and follow up the student as needed
- Together with the student, keep an overview of the number of hours spent

The institute is responsible for

- Make sure that the agreement is entered into
- Find and appoint supervisor(-s)
- Enter into an agreement with another department / faculty / institution if there is a designated external supervisor
- In cooperation with the supervisor, keep an overview of the student's progress, an overview of the number of hours spent, and follow up if the student is delayed by appointment
- Appoint a new supervisor and arrange for a new agreement if
    - supervisor will be absent due to research term, illness, travel, etc., and if the student wishes
    - student or supervisor requests to terminate the agreement because one of the parties does not follow it
    - other circumstances make the parties find it appropriate with a new supervisor
- Notify the student when the guidance relationship expires.
- Inform supervisors about the responsibility for safeguarding ethical issues, privacy and guidance ethics
- Should the cooperation between student and supervisor become problematic for one of the parties, a student or supervisor may ask to be freed from the Master`s agreement. In such case, the institute must appoint a new supervisor

This Master`s agreement must be signed when the guidelines have been reviewed.

Approved by

Michelle Waaler	Ola Edvin Vie	Cecilie Marhaug
Student	**Supervisor**	**Institute**
14.01.2020	14.01.2020	17.01.2020
place and date	place and date	place and date

Appendix 3: Information sheet and contract signed by all participants

Vil du delta i forskningsprosjektet

"Change Management and Project Management Contributions in Leading Transformational Change Processes"

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å studere problemstillinger knyttet til ledelsen av større transformasjons programmer. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Formålet med prosjektet er å studere hvordan prosjektlederne i et endringsprogram balanserer behovet for kontroll og stabilitet samtidig som fleksibilitet i planleggingen og gjennomføringen av transformasjonsprogrammer. Mitt forskningsspørsmål er:

How does the project managers in a transformational change program balance the demand for robust plans, goals and objectives to manage the needs of key stakeholders and demand for flexibility to adjust plans, goals and objectives to utilize emergent opportunities to achieve an effective and optimal solution?

Dette er en masteroppgave skrevet for NTNU, ved Institutt for industriell økonomi og teknologiledelse.

Hvem er ansvarlig for forskningsprosjektet?
Institutt for industriell økonomi og teknologiledelse ved NTNU Trondheim er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?
Utvalget som blir spurt om å ta del i prosjektet består av rundt 10 programledere, prosjektledere, og representanter for nøkkelinteressenter knyttet til samme endringsprogram. Du får spørsmål om å delta i dette prosjektet fordi du har en av disse posisjonene i forhold til et større endringsprogram og derfor sitter på informasjon som kan belyse problemstillingen som det forskes på.

Hva innebærer det for deg å delta?
Hvis du velger å delta i prosjektet, innebærer det at du deltar på ett intervju. Det vil ta deg cirka 1 time. Intervjuet innebærer spørsmål om din rolle i prosjektet, prosessen som du er en del av og hvilke utfordringer du har møtt med tanke på håndteringen av usikkerhet knyttet til prosessen. Jeg tar lydopptak og notater fra intervjuet.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykke tilbake uten å oppgi noen grunn. Alle opplysninger om deg vil da bli anonymisert. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

- Kun Michelle Waaler (student) og Parinaz Farid (veileder) vil ha tilgang til de opplysningene som du deler i intervjuet.
- Lydopptaket fra intervjuene vil bli slettet umiddelbart etter at transkripsjon av intervjuet er gjort.
- Navnet og kontaktopplysningene dine vil jeg erstatte med en kode som lagres på egen navneliste adskilt fra øvrige data slik at opplysningene du oppgir er anonymisert.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?
Prosjektet skal etter planen avsluttes 15.juni.
Alle personopplysninger og lydopptak vil bli slettet ved prosjektslutt.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:
- innsyn i hvilke personopplysninger som er registrert om deg,
- å få rettet personopplysninger om deg,
- få slettet personopplysninger om deg,
- få utlevert en kopi av dine personopplysninger (dataportabilitet), og
- å sende klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra NTNU har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:
- Veileder ved Institutt for industriell økonomi og teknologiledelse, Parinaz Farid, Tlf: 73412123.
- Masterstudent ved M.S Project Management, NTNU, Michelle Waaler, Tlf: 47857727
- Vårt personvernombud: Thomas Helgesen ved NTNU, Tlf: 93079038
- NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen

Prosjektansvarlig
(Forsker/veileder)

Eventuelt student

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet "Change Management and Project Management Contributions in Leading Transformational Change Processes" og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta i intervju

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, ca. *15.juni*

(Signert av prosjektdeltaker, dato)

Appendix 4: NSD Approval

NSD Personvern
20.02.2020 14:36

Det innsendte meldeskjemaet med referansekode 707732 er nå vurdert av NSD.

Følgende vurdering er gitt:

Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet 20.02.2020 med vedlegg. Behandlingen kan starte.

MELD VESENTLIGE ENDRINGER
Dersom det skjer vesentlige endringer i behandlingen av personopplysninger, kan det være nødvendig å melde dette til NSD ved å oppdatere meldeskjemaet. Før du melder inn en endring, oppfordrer vi deg til å lese om hvilke type endringer det er nødvendig å melde:
nsd.no/personvernombud/meld_prosjekt/meld_endringer.html

Du må vente på svar fra NSD før endringen gjennomføres.

TYPE OPPLYSNINGER OG VARIGHET
Prosjektet vil behandle alminnelige kategorier av personopplysninger frem til 15.06.2020.

LOVLIG GRUNNLAG
Prosjektet vil innhente samtykke fra de registrerte til behandlingen av personopplysninger. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 og 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse som kan dokumenteres, og som den registrerte kan trekke tilbake. Lovlig grunnlag for behandlingen vil dermed være den registrertes samtykke, jf. personvernforordningen art. 6 nr. 1 bokstav a.

PERSONVERNPRINSIPPER
NSD vurderer at den planlagte behandlingen av personopplysninger vil følge prinsippene i personvernforordningen om:
- lovlighet, rettferdighet og åpenhet (art. 5.1 a), ved at de registrerte får tilfredsstillende informasjon om og samtykker til behandlingen
- formålsbegrensning (art. 5.1 b), ved at personopplysninger samles inn for spesifikke, uttrykkelig angitte og berettigede formål, og ikke viderebehandles til nye uforenlige formål
- dataminimering (art. 5.1 c), ved at det kun behandles opplysninger som er adekvate, relevante og nødvendige for formålet med prosjektet
- lagringsbegrensning (art. 5.1 e), ved at personopplysningene ikke lagres lengre enn nødvendig for å oppfylle formålet

DE REGISTRERTES RETTIGHETER
Så lenge de registrerte kan identifiseres i datamaterialet vil de ha følgende rettigheter: åpenhet (art. 12), informasjon (art. 13), innsyn (art. 15), retting (art. 16), sletting (art. 17), begrensning (art. 18), underretning (art. 19), dataportabilitet (art. 20).
NSD vurderer at informasjonen som de registrerte vil motta oppfyller lovens krav til form og innhold, jf. art. 12.1 og art. 13.

Vi minner om at hvis en registrert tar kontakt om sine rettigheter, har behandlingsansvarlig institusjon plikt til å svare innen en måned.

FØLG DIN INSTITUSJONS RETNINGSLINJER
NSD legger til grunn at behandlingen oppfyller kravene i personvernforordningen om riktighet (art. 5.1 d), integritet og konfidensialitet (art. 5.1. f) og sikkerhet (art. 32).

Ettersom det ikke behandles sensitive opplysninger i prosjektet vurderer vi at Google Docs kan benyttes som databehandler, forutsatt at bruk av Google er avklart og godkjent av behandlingsansvarlig institusjon, NTNU.

For å forsikre dere om at kravene oppfylles, må dere følge interne retningslinjer og eventuelt rådføre dere med behandlingsansvarlig institusjon.

OPPFØLGING AV PROSJEKTET
NSD vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet.

Lykke til med prosjektet!

Kontaktperson hos NSD: Marita Ådnanes Helleland
Tlf. Personverntjenester: 55 58 21 17 (tast 1)

Michelle Waaler

Managing Uncertain and Complex Change Projects

NTNU
Norwegian University of
Science and Technology