André Klatt
Mats-Julian Nilsen Moksness

Molding the Competent Project Manager

A Comparative Study on Project Management Education

Master's thesis in M.Sc. in Project Management
Supervisor: Jan Alexander Langlo
June 2019

Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Economics and Management
Department of Industrial Economics and Technology
Management

NTNU
Kunnskap for en bedre verden

André Klatt
Mats-Julian Nilsen Moksness

Molding the Competent Project Manager

A Comparative Study on Project Management Education

Master's thesis in M.Sc. in Project Management
Supervisor: Jan Alexander Langlo
June 2019

Norwegian University of Science and Technology
Faculty of Economics and Management
Department of Industrial Economics and Technology Management

NTNU
Kunnskap for en bedre verden

Preface and Acknowledgements

This master thesis has been conducted at the Department of Mechanical and Industrial Engineering at NTNU, as part of the two-year master program in Project Management. The thesis is the embodiment of one years tedious and meticulous research into leadership, management and development of those skills. Here we present our findings and the results of the research. This study materialized through a research request by the Norwegian Defence Materiel Agency (Forsvarsmateriell).

There are many who deserve our sincere gratitude for standing by and helping us with this report. Firstly and foremost our supervisor, Associate Professor Jan Alexander Langlo at NTNU, for his support, guidance and belief in our research. We have been lucky to find organizations not only willing to participate, but genuinely interested in this research. A special thanks to the education program directors at Statsbygg and Forsvarsmateriell for your time and support. We are also grateful for the interview respondents, providing us with valuable insights.

To all our dear friends and fellow students at the Project Management study program; thank you for all the good times and interesting discussions, these years would not have gone so fast without you.

Last but not least, to our dear families for your continuous support during this time consuming semester. A special thank you to our respective girlfriends and Mats' daughter. We are so lucky to have you in our lives!

Trondheim, June 2019

André Klatt and Mats-Julian Nilsen Moksness

Abstract

There is an increased trend from the industry showing that organizations develop the competences of their project managers through internal Project Management Education Programs (PMEPs). This master thesis explores the potential of such education programs for the development of competent project managers. We start with a theoretical review, addressing the backlogs of today's Project Management (PM) education, the requirements for establishing effective PMEPs and the right utilization of different teaching methods. Furthermore, we identify the necessary skills a project manager should possess to be considered as competent.

At a generic level, project managers should possess competences in management and leadership. Whereas the knowledge areas of management are broadly discussed in the various PM standards, leadership is not that well explored. Previous research has been inconclusive in pinpointing the required competences of good project leadership. This is related to the challenges of teaching soft skills. While managerial skills can usually be taught in a classroom session, leadership skills are related to the personality profile of the candidate and require practical training and personal feedback. The main challenge is to develop reflective project managers who can apply the theory of their education in the project context. This is what separates a competent project manager from a pure practitioner.

In this thesis we assess the internal PMEPs of two Norwegian companies from the public sector. We investigate the structure of their education programs and use qualitative data to evaluate their efficiency. Based on the findings it appears, that both programs have a structured approach to their PM education. They, however, do not utilize the full potential of the different teaching methods. Furthermore, both programs cover most of the studied knowledge areas of management, while only one organization focuses on the leadership development of its candidates. The conducted interviews reflect the findings of our preliminary investigation. Even though most candidates were generally satisfied with the performance of the PMEP, almost all had suggestions for improvements.

The main outcome of this thesis, shows that the ideals of a project manager can not be standardized. Each organization itself is therefore encouraged to assess their expectations and ideals of a competent project manager, before developing a PMEP. We furthermore argue that an internal PMEP will benefit both the project managers and the organization, as it provides contextual knowledge that increase the relevance of the PM education.

Keywords: Project management education, Project management knowledge, Project management competence development, Management, Leadership, Forsvarsmateriell, Statsbygg

Sammendrag

Det er en økende tendens at organisasjoner utvikler prosjektledere gjennom interne prosjektledelsesutdanningsprogrammer. Denne masteroppgaven undersøker potensialet for slike utdanningsprogrammer og deres kapabilitet til å utvikle kompetent prosjektledere. Vi starter med en teoretisk gjennomgang, og tar opp dagens prosjektledelsesutdanning. Vi ser på hva som skal til for å etablere en effektiv prosjektlederutdanning, og hvordan forskjellige læringsmetoder kan bli utnyttet. Videre identifiserer vi de nødvendige ferdighetene en prosjektleder burde ha for å bli ansett som kompetent.

På et overordnet nivå bør prosjektledere ha kompetanse innen styring, ledelse og lederskap. Mens kunnskapsområdene innen styring og ledelse er bredt omtalt i de ulike prosjektlederstandardene, er ikke lederskap like godt utforsket. Tidligere forskning har ikke klart å fastslå det nødvendige kompetansespekteret av lederskap. Dette er relatert til utfordringene ved å undervise såkalte myke ferdigheter. Mens styre- og lederferdigheter vanligvis kan bli undervist i et klasserom, er lederskap mer relatert til personlighetsprofilen til kandidaten og krever derfor praktisk opplæring og personlig tilbakemeldinger. Den største utfordringen er å utvikle reflekterende prosjektledere som kan anvende teorien i prosjektets kontekst, dette skiller en kompetent prosjektleder fra en nybegynner.

I denne oppgaven vurdere den interne prosjektlederutdanningen til to norske selskaper fra offentlig sektor. Vi undersøker deres oppbygging av utdanningsprogrammene og bruker kvalitative data til å evaluere effektiviteten deres. Basert på funnene ser det ut til at begge programmene har en strukturert tilnærming til deres prosjektlederutdanning. De utnytter imidlertid ikke potensialet i de ulike læringsmetodene til det fulle. Videre dekker begge programmene de fleste av de studerte kunnskapsområdene innen styring og ledelse, mens bare en av organisasjonene setter søkelys på lederskapsutvikling av kandidatene. De gjennomførte intervjuene reflekterer resultatene av vår forundersøkelse. Selv om de fleste kandidatene generelt var fornøyd med utførelsen av prosjektlederutdanningen hadde nesten alle forbedringsforslag.

Hovedresultatet av denne oppgaven viser at idealet av en prosjektleder ikke kan standardiseres. Hver organisasjon oppfordres derfor til å vurdere deres forventninger og idealer til en kompetent prosjektleder, før de utvikler et eget program for prosjektlederutdanning. Vi hevder videre at et internt prosjektlederutdanning vil være til nytte for prosjektlederne og organisasjonen, da det gir kontekstuell kunnskap som øker relevans av utdanningen.

Nøkkelord: Prosjektledelseutdanning, Projektledelsekompetanse, Kompetanseutvikling, Ledelse, Lederskap, Forsvarsmateriell, Statsbygg

Zusammenfassung

Es gibt eine steigende Tendenz in der Industrie, die zeigt, dass Unternehmen die Fähigkeiten ihrer Projektmanager zunehmend durch interne Schulungsprogramme entwickeln. Diese Masterarbeit untersucht das Potenzial solcher Schulungsprogramme für die Entwicklung von kompetenten Projektmanagern. Wir beginnen mit einer theoretischen Einleitung zu den Rückständen der heutigen Projektmanagement Ausbildung, die Voraussetzungen für die Entwicklung von effektiven Schulungsprogrammen und die richtige Nutzung unterschiedlicher Lehrmethoden. Darüber hinaus identifizieren wir die notwendigen Fähigkeiten, die ein Projektmanager besitzen sollte um als kompetent zu gelten.

Generell sollten Projektmanager über Management- und Führungskompetenzen verfügen. Während die Wissensbereiche des Managements in den verschiedenen Projektmanagement-Standards ausführlich erörtert werden, sind die erforderlichen Kompetenzen für Führungskräfte unzureichend erforscht. Der Grund dafür ist die Unschlüssigkeit bisheriger Untersuchungen bei der Darlegung notwendiger Kometenzen für gute Führungskräfte. Dies hängt mit den Herausforderungen des Lehrens von Führungskompetenzen zusammen. Während die Wissensbereiche des Managements in einer Unterrichtssitzung vermittelt werden können, korrelieren die Führungskompetenzen stark mit dem Persönlichkeitsprofil des Kandidaten. Demnach erfordert die Entwicklung von Führungskräften praktische Erfahrung und persönliches Feedback. Die größte Herausforderung besteht darin, reflektierende Projektmanager zu entwickeln, die die Theorie ihrer Ausbildung im Projektzusammenhang anwenden können.

Die gesammelten Informationen werden verwendet, um die internen Schulungsprogramme von zwei norwegischen Unternehmen aus dem öffentlichen Sektor zu bewerten. Wir untersuchen die Struktur ihrer Schulungsprogramme und verwenden qualitative Daten, um ihre Effizienz zu bewerten. Basierend auf den Studienergebnissen verfolgen beide Programme einen strukturierten Ansatz für die interne Entwicklung ihrer Projektmanager. Jedoch nutzen sie nicht das volle Potenzial der verschiedenen Lehrmethoden aus. Darüber hinaus decken beide Programme die meisten der untersuchten Wissensbereiche des Managements ab. Allerdings konzentriert sich nur eines der untersuchten Unternehmen auf die Entwicklung von Führungskompetenzen ihrer Projektmanager. Die durchgeführten Interviews spiegeln die Ergebnisse unserer Voruntersuchung wider. Obwohl die meisten Kandidaten mit den erbrachten Leistungen ihres Schulungsprogramms zufrieden waren, hatten fast alle Verbesserungsvorschläge.

Das Fazit dieser Arbeit ist, dass die Ideale eines Projektmanagers nicht standardisiert werden können. Jede Organisation selbst wird daher aufgefordert, ihre Erwartungen und Vorstellungen von einem kompetenten Projektmanager zu bewerten. Wir argumentieren ferner, dass ein internes Schulungsprogramm sowohl den Projektmanagern als auch der Organisation zugute kommt. Die Konzentration auf die organisationsspezifischen Anforderungen, steigert die Relevanz der Projektmanagement Ausbildung.

Keywords: Projektmanagement Ausbildung, Projektmanagement Wissensbereiche, Projektmanagement, Kompetenzentwicklung, Führungskräfte, Forsvarsmateriell, Statsbygg

Contents

List of Figures

List of Tables

Abbreviations

APM Association for Project Management

BoK Body of Knowledge

ECTS European Credit Transfer and Accumulation System

EPD Education Program Director

EQ Emotional leadership competences

FMA Forsvarsmateriell

GAPPS Global Alliance for the Project Professions

HG Hay Grade

HR Human Resource

ICB Individual Competence Baseline

IPMA International Project Management Association

IQ Intellectual leadership competences

ISO International Organization for Standardization

MQ Mangerial leadership competences

NTNU Norwegian University of Science and Technology

PM Project Management

PMBoK Project Management Body of Knowledge

PMEP Project Management Education Program

PMI Project Management Institute

PMP Project Management Professional

P2F PRINCE2 Foundation

P2P PRINCE2 Practitioner

RQ Research Question

SRQ Sub-Research Question

Chapter 1

Introduction

In recent decades, there has been a noticeable shift in organization to become more and more project-driven. Today, projects have become one of the most important ways in which organizations create value. With the increased technology and the interconnection of our world, these projects have become drastically more complex and interactive. This complexity has caused more projects to perform poorer than expected. The challenge, is thus, to manage and control these projects, by taking everything possible parameters.

Even though the lists of applicable tools and techniques to control the project outcomes is long, it still requires competent people that are able of understand and apply those tools in practice. Those "*reflective practitioners who can operate, learn and adapt quickly*" (Farashah et al., 2019) are broadly known as project managers. To predict the competencies and performance of the project managers, organizations have focused more on professional Project Management (PM) certifications (Farashah et al., 2019). This has created a market for the education of project managers.

Today there are several opportunities to develop and verify the competences of project managers. Most of these approaches involve either academic institutions or independent associations. While the academic approach aims wide to provide its candidates with a broad picture on PM, the certifications are commonly designed to verify existing PM knowledge based on formal PM standards (Body of Knowledges (BoKs)) (Morris et al., 2006). The dilemma of both approaches is that they convey their PM knowledge separated from the organizational context. This makes them often too shallow to reflect the diversity of today's PM practice (Morris et al., 2006; Johansen et al., 2015).

But what are the alternatives to this "one size fits all" approach of PM certification? Several organizations have started to internally develop and certify their own project managers. They have devoted substantial time and resources to develop an internal Project Management Education Program (PMEP) that suits their specific organizational needs and requirements.

While PM is generally considered an integral part of the organizational performance, the required competences fluctuate with their specific tasks. But what is actually needed to develop a competent project managers? And what are the challenges of developing these competences within organizations? This study seeks to answer these questions and assesses the results by evaluating the performance of two Norwegian organizations, from the public sector.

1.1 Scope, Limitations and Assumptions

This study was initiated by the Norwegian Defence Materiel Agency (Forsvarsmateriell (FMA)). They wanted to investigate the educational performance of their PMEP compared to others, with respect to the content and the resources spent. With this approach, we will only able to investigate the quantitative data of the education program, and compare them to each other. This will not give us any clear indication about the effects of the education program. We thus decided to extend the research scope. Through the implementation of personal interviews with the Education Program Directors (EPDs) and the program participants are able to evaluate the effects of the PMEP in more detail.

The scope of this thesis is to investigate and compare the PMEP of two Norwegian organizations, from the public sector. We investigate how the education programs are structured, how much time they require, how the classes are organized, what content they convey (learning outcomes) and what impact the PMEP has on its participants. The organizational environment, culture, and its context are recognized as important factors that will influence the behaviour of the project manager, and eventually the project success. However, these dimensions will not be analyzed in detail, as they will create a to comprehensive and complex system for this research. Nevertheless, we will try to include these dimensions to some extent, as they will provide a more comprehensive picture of the performance of both PMEPs.

1.1.1 Limitations

A major limitation of this study is the language barrier. Most of the information provided by the investigated organizations is in Norwegian. Since one author has an international background, it is decided to conduct this study in English. Therefore, all available information must be translated into English. To reduce the possibility of errors, the translations will be checked by the second author, who is Norwegian. Another limitation of this study is the availability of information. Not all information required to investigate the PMEPs is available on the web page of the respective organizations. Thus, some information must be requested from the EPDs. This leads us to another limitation. We have to rely on the information provided by the EPDs. The same applies to the information received through the interviews. By not taking everything for granted and asking questions, we will reduce the possibilities of errors.

Other limitations that should be mentioned in this context are: the duration of the thesis, the availability of literature, the accessibility of the EPDs, the availability of right candidates for the interviews, the sample size of interviewees, the equipment used to conduct the interviews, the applied methods and so on. There are many more limitations that could be mentioned. However, we tried to restrict our limitations to the ones that have the greatest impact on our research.

1.1.2 Assumptions

Measuring the direct effects of a PMEP is challenging. The most applicable method would be to measure the results of the project outcomes. Unfortunately, this proves challenging, as there are too many variables that have to be consider. In addition, this method requires a reference point (i.e. project performance before implementation of PMEP) which is not always given. We therefore assume that measuring the project managers satisfaction of the PMEP will give an indication about the quality of the education program. In our investigation of the PMEPs we have identified a different focus in the development of management and leadership skills. However, in this study we have not investigated the direct effect of leadership education on the personal development of the project managers. Based on the theoretical findings, we assume that management and leadership are important for the development of project managers.

1.2 Structure of the Thesis

The first chapters of this report is structured according to the scientific standard within our department. Where we first introduce the required theory to grasp the concept of what we are presenting. We continue describing the methodological approaches chosen for this report, and how they support the data gathering. Chapter 4 and 5 present the empirical data. For the readers to understand the aspects presented in these chapters, we have included a brief discussions of the topics by themselves. The following chapter discusses how the empirical findings with regards to the Research Questions (RQs) and is designed to fit the pieces in a bigger picture. In Chapter 7 and 8 we give our recommendations to the research subjects. The last chapters are dedicated to the conclusions and recommendations for further research.

Chapter 2: This chapter will be directed towards the theoretical backdrop to this thesis. The theory part will span from the historical background of PM, to more specific skills and competences a project manager should posses. This will include a detailed distinction between management and leadership and how these dimensions are combined. In the last section of this chapter the reader will get an introduction into PM education and what is needed to develop an effective PMEP. This section will cover important factors to establish an effective PMEP, different educational approaches and its benefits as well as the required scope of PM education.

Chapter 3: Here we will present the methodology and procedures we use to secure a proper scientific research. We aim to illustrate our research model, and what kind of information we want to gather through this qualitative study.

Chapter 4: This chapter focuses solely on the objective data of the organizations. We will present the empirical findings and analyze the received information. Thus we will start by presenting the investigated organizations and their education program structure. Afterwards we will analyze both education programs in terms of their educational approaches, time consumption and educational content. This chapter will end with a brief discussion.

Chapter 5: In this chapter we will present the qualitative data based on the interviews with the EPDs and previous participants of the respective PMEP. The information from the interviews will be used to make a more accurate statement about the effects of each PMEP. This chapter will also end with a brief discussion.

Chapter 6: The point of reference for the discussion is the RQs. We will here attempt to sew the theory and the empirical findings together to answer the RQs most accurately. To achieve this, we will build upon the previous discussions from Chapter 4 and 5. The discussions is then intended to give a fuller picture of how the PMEPs are fairing.

Chapter 7 and 8: These chapters are directed towards the investigated organizations. Here we will share our recommendations based on the information collected in the previous chapters. Thus, we will identify possibilities for both organizations to improve their current PMEP.

1.2.1 Intended Readers

The intended readers of this thesis are people with knowledge, either theoretical or practical, about PM. We group the different intended readers into five categories:

(i) The sensors:

The sensors are the ones responsible for grading this work, and are thus our main stakeholder. The two main sensors are unknown to us, but are expected to be scholars with significant knowledge in the field of this study. The third sensor is our supervisor from the university. He is the only sensor known to us. Thus, the goal should be to use his expertise as much as possible, to guide this study in the right direction. It is expected that the sensors will read the whole thesis.

(ii) The organizations investigated:

The two companies investigated will be interested in knowing how they are fairing compared to each other and how they might improve. It is therefore recommended that they read the data analysis in Chapter 4 and 5, and the following discussion, conclusion and recommendations. If they would like to know more about the theoretical background, and the basis of the discussion and conclusion, we advise them to read the theoretical background in Chapter 2.

(iii) Other PM students:

PM students interested in project management and leadership, and how to develop these skills are encouraged to read the Chapter 2. If they want to understand how the two organizations develop their project managers, Chapter 4-6 and 9 might be of interest. Students with the intention to replicate our research, or continue our study, are advised to read the methodology in Chapter 3 and our proposed further work, in Chapter 10.

(iv) Peers in the field of PM:

Peer in the field of PM will mainly be interested in the empirical results of this research. Thus, we recommend to read through Chapter 4-6 and 9. If they would like to know more about the theoretical background, and the basis of the discussion and conclusion, we advise them to read the theoretical background in Chapter 2.

(v) Other organizations with the interest to create or develop an education program for PM:

Organizations with the interest to develop their own PMEP, we recommend to read Chapter 2 first. This will provide the organizations with a comprehensive introduction into PM and what is needed to develop an effective PMEP. To get an impression of how the investigated organizations conduct their PM education, we advise to read through Chapter 4 and 5. The recommendations in Chapters 7 and 8 could furthermore be useful for organizations with the interest to develop their own PMEP.

Chapter 2

Theory

This chapter will provide a backdrop to this research, introducing previous work on the matter of project manager development in an organizational context. We will explain different aspects of project manager development and go deeper into what competences they should possess. We differentiate between the hard and soft skills of management and express the differences with respect to their development approaches.

2.1 Background

Nowadays Project Management (PM) is a widely recognized and accepted profession (Thomas and Mengel, 2008). Over the last 30 years several standards have emerged which provide a common framework for PM practice. The Global Alliance for the Project Professions (GAPPS) has identified and compared 9 different standards related to PM (Global Alliance for the Project Professions, 2018). These standards serve as a term of reference to evaluate and instruct PM staff. Hundreds of different PM certification programs have developed over the years with the goal to apply these standards and certify PM practice all around the world. But apart from how PM is applied today, when did it start and how has it developed over time?

2.1.1 A Retrospect in the Genesis of Project Management

To understand when and why the need for PM has increased over the years, we will need to look back to the mid 20th century. At this time most projects, "*in which the US Air Force (Atlas), Navy (Polaris), and NASA (Apollo) pioneered*", (Morris et al., 2006) were considered as large and contractual. These organizations were operating in very innovative environments with a high degree of complexity and uncertainty (Johansen et al., 2015). The main driver for those organizations was to understand and manage the total project scope. Due to several limitations of the former operating systems, the need for more comprehensive PM tools increased. Hence, the PM professional associations started to develop in the early 1970s (Morris et al., 2006). This procedure was followed by a large standardization process of numerous PM techniques. Nevertheless, the movement did not only receive support. Especially in the start, large parts of the private sector considered the attempt as *over-management* and did not understand the value of extensive project planning and control (Johansen et al., 2015). This view drastically changed in the 70s and 80s since projects became increasingly more complex. Organizations that have previously been against the movement, now experience the benefits of streamlining their PM approach. This is also seen as the due date for different PM standards, with the first publication of the Project Management

Body of Knowledge (PMBoK) from the Project Management Institute (PMI) in 1983 (Morris et al., 2006). The upcoming years were dominated by a continuous growth of Project Management Education Programs (PMEPs). The need for credentials that can verify the competence level of project managers has continuously increased during the 80s and 90s (Johansen et al., 2015). Today, PM is more popular than ever before. Many organizations either require PM certifications as a validation for employment (Farashah et al., 2019) or have developed their own, internal PMEP that suits their requirements and needs.

2.1.2 The Need for Standards and Certifications

The booming formalization of PM processes in the 70s and 80s required a rethinking of the current approach. Rather than formalizing PM processes for each profession individually, the idea was to establish a generalized standard that suits "*most projects most of the time*" (Project Management Institute, 2007). The PMI was the first institution that developed and published a *Guide for project managers* (PMBoK) (Morris et al., 2006).

The PMBoK contains "*a required standard of* (PM) *knowledge*" (Morris et al., 2006) that project managers should meet to successfully manage projects. The standardization of PM processes is generally seen as a way to create common procedures, tools, knowledge as well as a common language across the profession. This was done to establish a more professional view on PM and to introduce a generic *'driver's license'* of PM. The development of numerous certification programs in the upcoming years were a logical consequence, since the need to control the quality of the PM education increased noticeable (Johansen et al., 2015). With the development of multiple standards, various PM associations opened their platforms to exchange experience and to circulate ideas. According to Farashah et al. (2019), the possibility to share professional knowledge in a much wider setting can be seen as a support to the traditional certifications. Hence, the project managers were able to develop their personal knowledge and skills through an extensive network.

Today, PM certifications are more demanded than ever before. According to Farashah et al. (2019), certifications are increasingly used in the recruitment process of project managers. A research conducted within this study found that Human Resource (HR) professionals generally believe in the value of certifications as an indicator for PM competences. By selecting project managers with a valid certification the HR staff reduces the need to assess the technical competences of the candidate. Morris et al. (2006) goes even one step further by challenging the reliability of non-certified project managers. Especially in complex projects with a high degree of uncertainty, the organization requires some kind of evidence, verifying the competence of the project manager. "*Certification thus becomes an attempt to create barriers to entry and to promote the value of project management practitioners*" (Morris et al., 2006).

2.2 The Road to Effective Project Management Education

The education and certification of project managers has increased significantly over the years (Thomas and Mengel, 2008). This "*can be seen not only in the increasing number of members or certified practitioners but also in the increasing number of academics, gurus, consultants, trainers, etc.*" (Morris et al., 2006). As a result, a variety of different education programs were developed. According to Crawford et al. (2006), Ramazani and Jergeas (2015) and Thomas and Mengel (2008) these education programs fail to prepare project managers to deal with the high complexity and uncertainty of today's projects. Their approaches are often too shallow to cope with the challenges and difficulties of the modern world. Morris et al. (2006) claims that PM requires a rethinking to guarantee that PM will still be seen as a profession in the future. This section will thus focus on the requirements to establish an effective education

program and develop the right competences. To start, we have analyzed the different options to educate and certify project managers.

2.2.1 The Approaches to Project Management Education

Based on our research about the current PM education, we have identified three approaches to educate and certify project managers in practice. Within the given time horizon we could not find any literature investigating or supporting our thoughts, therefore we established our own characterization. The three approaches to educate and certify project managers are thus defined as: the credential approach, the academic approach and the organizational approach.

Based on our research about the current PM education, we have identified three approaches to ensure PM competence: (*i*) the credential, (*ii*) the academic and (*iii*) the organizational approach.

(i) The *credential approach* is commonly applied by independent PM associations (e.i. PMI, International Project Management Association (IPMA), PRINCE2 and Association for Project Management (APM)). Over the past years, these associations have developed a large variety of different programs to certify their participants. Nowadays, almost all activities that can be related to project management are certified by these associations (e.g. program management, portfolio management, risk management etc.). What all these certifications have in common is, that they require self-study from their participants (Giammalvo, 2016). They do not focus on traditional classroom education. After a certain amount of preparation the participants are requested to take an exam to verify their knowledge and receive their certification. According to Farashah et al. (2019), these certifications are considered as "*an important criterion when making decisions regarding recruiting, promoting and payment*".

(ii) The *academic approach* is applied by universities to educate PM students in a more scientific way. The course participants will experience a combination of classroom education and self-study during their education. The classroom education is commonly based on confrontational teaching and might include smaller discussions or group activities. This approach provides their participants with a wide and more theoretical perspective on the different PM traits. This is generally done to increase the possibilities for the participants after they have finished their academic education.

(iii) As the name implies, the *organizational approach* is applied by organizations to internally educate and certify project managers. This is often conducted as a combination of classroom education and self-study. By focusing the education program on the organizational needs and requirements, this approach will become more streamlined. As a result, the participants will be specialized to manage and control projects internally. Common practice shows that the organizational approach is often combined with the credential approach. Meaning, the participants are requested to first take the internal courses of the PM education program before they are invited for an independent external certification.

2.2.2 Establishing an Effective Education Program

To develop an effective PMEP, that targets the right audience and transmits the right knowledge, some important prerequisites should be considered (Goff, 2013). These prerequisites will draw the baseline for the development of the education program and should therefore be evaluated in advance. A continuous assessment can furthermore help to frequently adapt and improve the program. Based on IPMA (2015), the following prerequisites have been defined:

(i) *Understand the competence level of the average participant.*
These information might include the educational background of the participant, prior work experience or other related skills. By understanding the competence level of the participants, the Education Program Director (EPD) will gain a better understanding about the required extent of the education program.

(ii) *Understand the organizational needs and requirements.*
The effectiveness of the PMEP highly depends on the potential of the EPD to understand the needs, interests and expectations of the organization towards the education program. This implies that the project model is understood and considered in the development of the education program. The project model might affect the topics that should be cover by the education program as well as the prioritisation of the courses.

(iii) *Develop a structured approach to deliver PM competences.*
The development of PM competences should be done in a logical sequence. This can be done by dividing the PMEP into different educational levels. The participant will be requested to fulfill specific requirements to enter the next level. The start and the end of each level, will be defined by the competence level of the participants, as well as the needs and requirements given by the organization. This prerequisite furthermore implies that the EPD constantly seeks for possibilities to improve the delivery of PM competences.

(iv) *Ensure that the PMEP receives the required resources.*
To ensure and sustain the quality of the education program, the EPD requires adequate resources. This includes sufficient funding, time and knowledgeable staff.

(v) *Ensure that the PMEP receives the required support.*
Develop a culture in which the values of the education program are understood and perceived as essential to assure the continuous improvement of the organizational performance.

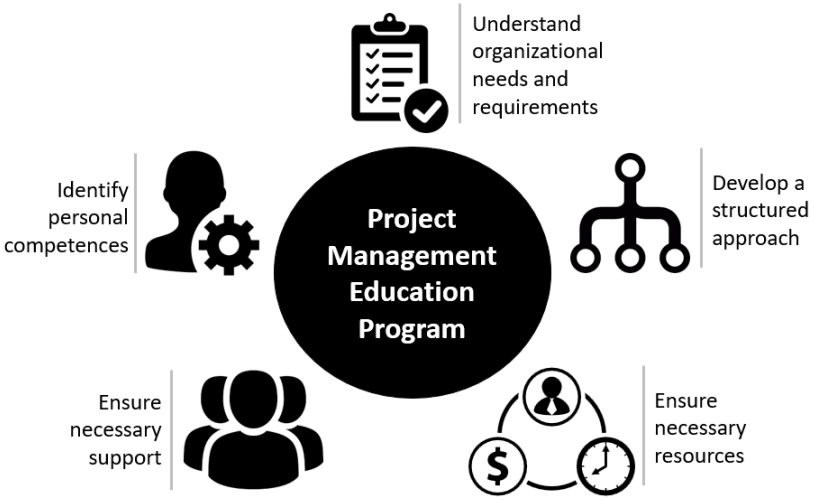

Figure 2.1 Prerequisites to establish an effective education program, inspired by IPMA (2015)

All prerequisites are summarized in Figure 2.1. These prerequisites should be used to frequently evaluate the validity of the current education program and to implement necessary changes if needed. This will help to keep the education program up to date.

2.2.3 The Required Scope of Project Management Education

Educating PM requires an understanding of what is needed to successfully manage projects. In the past years, PM education purely relied on the development of technical skills of their participants, since an engineering degree was considered as sufficient to be a project manager (Ramazani and Jergeas, 2015). In contrast, more recent research demands a rethinking of the current educational practice. They claim that the current PM education does not prepare their participants to deal with the increased complexity and uncertainty of today's projects (Thomas and Mengel, 2008; Ramazani and Jergeas, 2015). This is commonly justified by the consistent high failure rate and the differences between project plan and execution (Ramazani and Jergeas, 2015; Koskela and Howell, 2002; Thomas and Mengel, 2008). Ramazani and Jergeas (2015) have investigated the deficiencies of today's PM education and what is needed to develop competent project managers. Based on their findings, Figure 2.2 was established. The development of project managers starts with the selection of the right individuals. This is important, since not every individual is suited or capable to be a competent project manager. Müller and Turner (2010) and Dulewicz and Higgs (2003) on the other hand, emphasize the challenge of becoming a competent project leader, as this is more influenced by their personality.

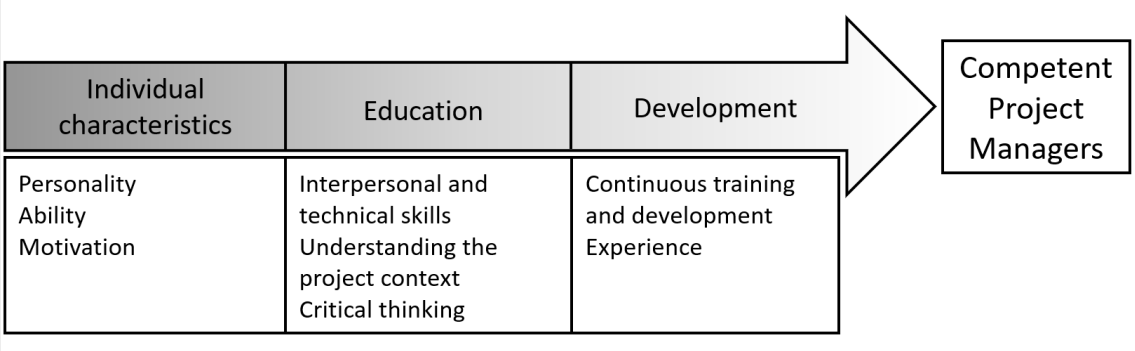

Figure 2.2 Requirements for developing competent project managers, adapted from Ramazani and Jergeas (2015)

Interpersonal and Technical Skills

Ramazani and Jergeas (2015) have identified that PM education should not exclusively focus on the technical skill set of their participants. According to the Project Management Institute (2007), "*project management is a people-oriented profession*" and therefore demands leadership skills to the same extent as technical skills. This is in line with what is required by IPMA (2015) to develop competent project managers. The challenge should therefore be to balance technical and leadership skills in a more meaningful way (Thomas and Mengel, 2008). One reason for why PM education has primarily focused on developing technical skills in the past is due to the challenges of teaching soft skills (Ramazani and Jergeas, 2015). However, the criticism of the current PM education requires a rethinking and suggests to incorporate the interpersonal development of the candidate into the educational system (Thomas and Mengel, 2008).

Understand Project Context

Ramazani and Jergeas (2015) Ramazani and Jergeas (2015) have discovered that current PM education lacks in engaging the participants with the project context. They argue that "*the traditional approach to educating project managers has relied substantially on throwing a lot of data at the human mind and hoping it will generate the right programs and processed data*". By engaging the participants with the

context and the environment of the project they will not just learn about the different PM tools but rather how to apply those tools in practice (Ramazani and Jergeas, 2015). This requires a close collaboration with the industry to develop practical examples that can be used for educating project managers. Another, practical reason for engaging the participants with the context of the project was identified by Jarvis (2010). He claims that adults are very rational learners. To deepen and apply the learned theory, they need to understand the practical application and direct benefits of the knowledge.

Critical Thinking

For a long time, PM has relied on one singular approach to handle and thus deliver projects. Thomas and Mengel (2008), Morris et al. (2006) and Ramazani and Jergeas (2015) criticize, that a one-size-fits-all approach can not deal with the increased complexity and uncertainty of today's projects. They claim that PM education needs to develop critical and reflective thinkers rather than uninspiring operators. The goal is to develop project managers which are "*capable of managing and changing organizations rather than simply being managed*" (Thomas and Mengel, 2008). This requires going beyond the current educational practice. By involving the participants in role- and simulation games, they learn to work in a real case environment. This increases their awareness to identify variations and develop appropriated solutions on the fly (Thomas and Mengel, 2008).

Continuous Development

In their study Ramazani and Jergeas (2015) realized that some project managers consider the PM certification as the finish line of their professional education. They identified two reasons for why the PM certification should rather be viewed as the start of their personal development. *First*, because today's projects are embedded in a fast changing environment. It is unlikely that the education program will prepare their participants for all possible circumstances of the future. Thus, the participants are obligated to continuously develop and update their knowledge as part of their education. *Second*, there is just a small tendency that recently graduated PM students will directly work within their educated profession. They will most likely start in a lower position and work themselves up to become a project manager. This development might take several years until the participants work in their desired profession. During this time some PM traits might already have changed and the projects are embedded in a complete new environment. To counteract this, project managers are requested to continue their education.

Practical Experience

Giammalvo (2016) stresses the importance of practical work experience to become a trustworthy and reliable project manager. From his point of view, PM certifications should at least require a minimum amount of practical experience to validate the competences of the project managers. He underlines his statement by asking if you would walk into an airplane, knowing that the pilot in command has no practical experience and received his licence by passing a multiple-choice exam? The importance of practical experience in PM is furthermore mentioned in IPMA (2015). They consider personal experience as a key success factor to develop individual competences. Based on the former work of Morris (2014), Farashah et al. (2019) state that "*project management is a practice oriented profession*" and can not exclusively rely on theoretical knowledge. Practical experience thus separates the professional practitioner from the freshman (Morris et al., 2006).

To develop an effective education program it is important to take the content of Figure 2.2 into account. By implementing those measures the participants of the education program will be much better equipped to deal with the high complexity and uncertainty of today's projects. However, this requires

that the methods applied in the education program are designed to develop the desired competences. Based on the former work of Mintzberg (1975), Carbone and Gholston (2004) state that, "*just as you cannot teach a person to swim in a classroom, the manager cannot be developed in one*" . The following section will thus elaborate more on the different possibilities to educate PM competences.

2.2.4 Educational Approaches to Develop Project Management Competences

There are different approaches to develop PM competences. IPMA (2015) provides a generic overview about the approaches that are most commonly applied in practice. These approaches vary in their method of teaching (direct vs. indirect), their flexibility for the participants (when and where), their delivery of content (theoretical vs. practical) and their degree of collaboration (self-development vs. group tasks). Which approach to choose, highly depends on the situation. This includes the needs and requirements of the organization, but also the preferences of each student (IPMA, 2015). The different educational approaches can be explained as followed:

- *Classroom education* is the traditional way of teaching students (Thomas and Mengel, 2008). The participant is commonly obligated to join the classroom lessons. The lesson can be conducted as conventional lectures or seminars. Instead of pure confrontational teaching, the instructor can choose from a great variety of alternative teaching methods. This might include group discussions, to exchange valuable information and experience; case-studies, to provide the participant with insides and examples of their daily work life or group tasks, to experience the personal interaction in the team environment.

- *Self-study* is commonly expected by most of the educational institutes (Giammalvo, 2016). Either as a singular teaching method, where the participant is exclusively requested to conduct self-study to develop their competences or in combination with other teaching methods e.g. classroom education. Self-study typically includes tasks such as: Reading books, writing reports or gaining individual work experience. The main advantage of this teaching method is the increased flexibility for the participant, to decide when and where the self-study is performed. Thomas and Mengel (2008) describe it as the "*opportunities for distance based learning*". They furthermore stress the potential of web-based learning tools as independent education methods.

- *Interpersonal learning* is a way to develop personal competences through meetings or gatherings by exchanging valuable information and experience. This might include personal feedback or reflection on previous tasks. The value of a continuous knowledge exchange, to develop the individual way of thinking, is also emphasized by Thomas and Mengel (2008). According to IPMA (2015), the exchange of information among different disciplines can furthermore disclose new perspectives.

- *Mentoring* is a way to develop personal competences through feedback and advices, given by a mentor or coach. The mentor can be any person who has more experience than the person receiving the feedback. Rather than providing pre-defined answers, the mentor should challenge the participant by asking questions (IPMA, 2015). The questions have the purpose to make the participant reflect on their way of thinking and acting.

- *Simulation-based learning* is a method to develop practical knowledge and personal competences through case-based activities. These activities are commonly conducted in teams and might include simulation games or other group-based activities. If applied right, this method combines the learning outcomes of the latter three approaches. Hence, the participant can develop personal experience during the activity (Self-study) and discuss individual thoughts in the team (Interpersonal learning). In addition, the coach or mentor can challenge the individual or team by asking

reflective questions (Mentoring). Therefore, this approach can be very effective, but might require sufficient time and patience of the participants.

Knowledge Creation and Sharing

In their book Nonaka and Takeuchi (1995) explain that there are two main types of knowledge, tacit and explicit. Where *tacit knowledge* is personal and subjective, often fixed to a context, making it hard to transfer (Nonaka and Takeuchi, 1995). The *explicit knowledge* are by Nonaka and Takeuchi (1995) called "*codified knowledge*", which is easy to transfer by a "*formal, systematic language*". They created a model to illustrate some of the challenges related to knowledge creation and sharing, as illustrated in Figure 2.3. In this figure, the typical forms of knowledge creation are evident, showing the different steps in the spiral, going from *socialization*, to *externalization*, *combination* and *internalization*, before starting again.

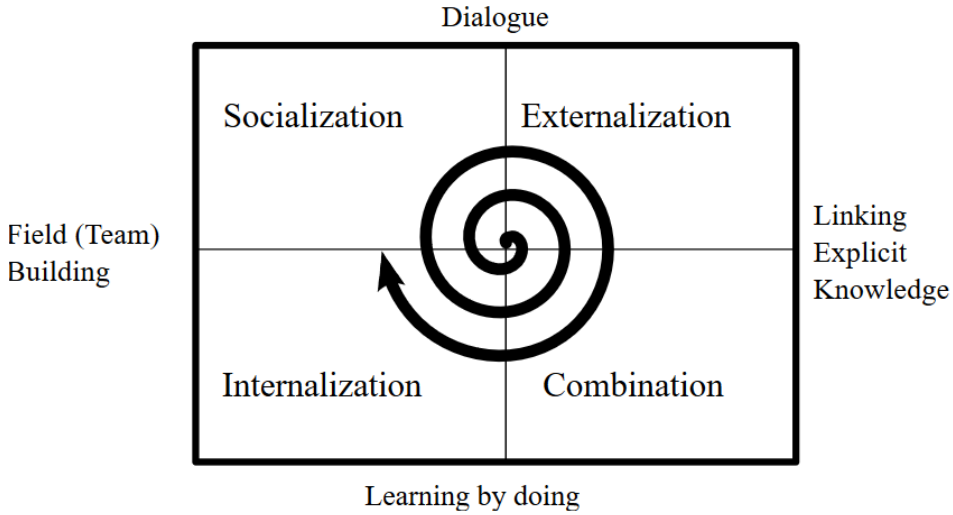

Figure 2.3 The knowledge spiral (Nonaka and Takeuchi, 1995) [1]

Nonaka and Takeuchi (1995) explain how *socialization* is the transference of tacit knowledge to tacit knowledge. This could be done, not only through a conversation, but also through observation. *Externalization* is the second step, Nonaka and Takeuchi (1995) describe this as "*a quintessential knowledge-creation process in that tacit knowledge becomes explicit, taking the shape of metaphors, analogies, concepts, hypotheses, or models*". The *combination* is how knowledge is cataloged and systematized into knowledge systems, transferring explicit to explicit knowledge. In the digital world, this knowledge is easily accessible through databases. *Internalization* is the translation of explicit to tacit knowledge. Nonaka and Takeuchi (1995) relate this to "*learning by doing*". They further explain how the experiences gained through the first three steps of the knowledge spiral could make the individual a valuable asset through their knowledge. When the knowledge has been internalized by the individual, mixed with some personal experience, the individual could then be able to contribute to the field, taking part in the socialization to share the knowledge.

When organizations seek to develop a certain type of competence (i.e. project management) with a new set of candidates, the knowledge spiral could serve as a guidance. The candidates should be placed in a surrounding that allows them to socialize with the experts, giving them meaningful dialogues that help them reflect and systematize the hidden knowledge (Nonaka and Takeuchi, 1995). This should be supplemented by formal tutoring on the practices, through lectures, self-study or a combination of both.

[1] Picture found at: https://en.wikipedia.org/wiki/Knowledge_management, (06.06.2019)

This will enable the candidates to combine the hidden tacit knowledge, with the formalized explicit knowledge. When the candidates apply their knowledge, the internalization is triggered and the explicit knowledge gained turns into tacit knowledge.

2.2.5 Educational Approaches to Project Leadership Development

According to Söderlund and Maylor (2012) the hard side and the soft side of management is not bridged through PM. They continue describing that these sides do not support each other, but rather are "*two separated paradigms that do not communicate with each other*". This underlines the challenge of project managers, combining the two worlds of management and leadership. Historically, there has been a small focus on how to develop leadership skills. Lord and Hall (2005) point at the previous way of thinking about leadership qualities and skills (i.e. trait school), and say this has served as an inhibitor to leadership development models.

According to Thoms and Pinto (1999), much of the research found "*that successful project managers are those individuals who are able to master the various, sometime competing, demands their jobs make of them*". Therefore, it is imperative that the project managers are taught the skills the job requires, both as a manager and a leader. In their research, Mumford et al. (2000) reveal that all "*leaders, no matter how gifted, initially enter organizations as novices*". As all leaders start as novices, it seems even more reasonable to teach leadership skills before they actually take on a leadership role.

But how to teach leadership, when not all leaders learn in the same way or at the same rate (Day et al., 2014; Hirst et al., 2004)? Hirst et al. (2004) also found that the inexperienced leaders are more susceptible to leadership development. They state that the experienced leaders "*must work harder to integrate new knowledge into their established cognitive frameworks*" (Day et al., 2014). This indicates that the leadership development must be adapted not only to the personal characteristics of each individual, but also to their leadership experience and gender. Eagly (2005) specifically mentions how leadership development must be fitted to the gender. Additionally, Hirst et al. (2004) mention how it takes time to grasp and understand how the newly acquired knowledge can be translated into leadership behaviour.

In their article, Day et al. (2014), summarize different theories on developing leadership skills. They found that Russell and Kuhnert (1992) created a framework for leadership development, where three different models were incorporated. According to Day et al. (2014), the framework contains elements of the leadership development, that will vary in terms of the skills. Where they used the skill acquisition model of Kanfer and Ackerman (1989), the adult-development (based on constructive-developmental theory (Day et al., 2014)) of Kegan (1982), and combine it with the theory of transactional and transformational leadership development (Day et al., 2014). Later on, Russell and Kuhnert (1992) included feedback systems to explain the longitudinal development of the leader. McCauley et al. (2006) analyzed the previous research on the constructive-developmental theory, and explains how people develop through qualitative process-like stages. This theory separates development into two main aspects (McCauley et al., 2006):

1. **Order of development**: "*the organizing principles that regulate how people make sense of themselves and the world*"
2. **Developmental movement**: "*how these regulative principles are constructed and re-constructed over time*"

The constructive-developmental theory thus explains the process of learning. The question at hand is how to create a leadership development program for project managers? According to Pinto and Trailer (1998), the best way for project managers to acquire leadership skills is through experimental training. In the past few years, it has been more common to use the method known as 360-degree feedback (Day

et al., 2014). This is a method that allows the participants to experiment with leadership in a controlled environment. It has been shown empirically, that feedback is an effective way to develop leadership skills, as it provide self-awareness and self-understanding (Day et al., 2014). Furthermore, this will enable the participants to become *reflective practitioners*, as Crawford et al. (2006) emphasize in their article. This is also supported by our own experience as students within PM.

Day et al. (2014) also point out that developing leadership skills is not done over night, and that a longitudinal perspective should be kept in mind. They refers to the special edition of *Leadership Quarterly* in 2011, on the longitudinal approach to leadership. In this special edition, Day et al. (2014) found that the "*leaders are a product of their life experiences, beginning at an early age*". They further indicates that leadership development should have a longer time horizon, and be carefully tailored to the current competences of each leader. As one of his concluding remarks, Day et al. (2014) state:

> "*Leadership is something that all organizations care about. But what most interests them is not which leadership theory or model is "right" (which may never be settled definitively), but how to develop leaders and leadership as effectively and efficiently as possible. As such, this is an important area of scholarly research and application with myriad unanswered (and even undiscovered) questions to pursue.*" (page 79)

2.3 Project Management - Skills and Competences

This section provides the reader with more insights into management and leadership, as well as the skills and competencies a project manager should possess. Readers with sufficient enough background in PM may consider to skip or skim this section.

The skills required of a project manager will vary between each project and the project's phases. The role of a manager, in general, could be divided into two sub-parts: management and leadership. This also applies for project management. Kotter (2001) states that management and leadership are very different, but "*complementary systems*". According to Kotter (2008), *management* refers to a set of processes that is intended to provide "*consistency and order*". He further states that management will help the organization to stay within their given cost and time objectives. According to Kotter (2001), management is a means to handle complexity. As projects are short-lived and highly complex, the management of an organization becomes highly important to guarantee the project success. *Leadership* on the other hand is the ability to create a vision and influencing other to follow that vision (Müller and Turner, 2010; Daft and Lane, 2011). Leadership is more abstract and complex than management. Kotter (2001) argues that "*leadership (...) is about coping with change*". He illustrates the difference of management and leadership with a military analogy:

> "*A peacetime army can usually survive with good administration and management up and down the hierarchy, coupled with good leadership concentrated at the very top. A wartime army, however, needs competent leadership at all levels. No one yet has figured out how to manage people effectively into battle; they must be led.*" (page 4)

This analogy highlights the difference of "*coping with complexity and coping with change*" (Kotter, 2001). It furthermore emphasises the importance of effective management and leadership. Both Mumford et al. (2007) and Müller and Turner (2010) also state the duality of PM skills. Thus, it is evident that being a project manager requires a wider variety of skills.

2.3.1 Project Management

PM has evolved since its beginning in the 1950's (Burke and Barron, 2014). Management is by Kotter (2001) described as a means of "*coping with complexity*". Bennis and Nanus (1985) have a more philosophical view on the meaning of management. They state that management is about doing things right. Nevertheless, both studies consider management as a means to maintain control over the projects and to execute the project in the right way.

Figure 2.4 illustrates a general representation of the project life cycle. Each of these phases are characterized by different attributes, and are fundamentally different to each other. A project manager working in all the phases, therefore needs to acquire adequate managerial knowledge. The knowledge areas for project managers have been defined by several different institutions within the field of PM.

Figure 2.4 Common description of the project life cycle, inspired by Project Management Institute (2013) and Samset (2014)

Projects could easily arise to be complicated, as the size and complexity of projects increase. As a result, the need for good management skills rises. Szentes and Eriksson (2016) describe the correlation between complexity and uncertainty. In their research, Klatt and Moksness (2019) describe how management can be use to control the epistemic uncertainty in projects.

In the last decades project management has become more associated with defined skills, often labeled as hard skills. This has been accompanied by the emergence of several Body of Knowledges (BoKs) related to PM. These BoKs build on the best practice of PM, and provide a common language for all practitioners. Many institutions have published their own interpretation of what knowledge a project manager should possess. These knowledge areas range from scope and time management to stakeholder management. The Global Alliance for the Project Professions (2018) made a comparison between the most known BoKs and their content. A brief version of their findings is summarized in Figure A.1 in Appendix A. This version covers the most known BoKs as the IPMA (ICB4), the International Organization for Standardization (ISO), the Japanese standard (P2M), the PMBoK from the PMI, PRINCE2 and the BoK of the APM. Table 2.1 illustrates the total coverage of each BoK, according to the knowledge areas described by the Global Alliance for the Project Professions (2018), is illustrated. The differences between G1 and G2 can be found in Table A.1 and A.2 in Appendix A. While G1 covers all knowledge areas from 1-5, G2 also includes the last point (6) which is related to the evaluation and improvement of the project performance. This illustrates that the different BoKs have a varied focus on what is essential for a project manager to know.

Table 2.1 Percentage coverage of the competence areas for the different BoKs as shown in Appendix A (Global Alliance for the Project Professions, 2018).

	ICB4	ISO 21500	P2M	PMBoK Version 5	PRINCE2 2009	APM BoK 6th Version
G1 Percentage coverage	88%	58%	81%	76%	93%	51%
G2 Percentage coverage	90%	54%	73%	74%	92%	45%

2.3.2 Leadership

What is leadership? This is the prevailing question we want to answer in this section. Leadership has been defined in many different ways throughout history. The essentials of leadership, defined by Kotter (2008), can be described by three sub-processes: (i) establishing direction, (ii) aligning people and (iii) motivating and inspiring.

Table 2.2 Leadership school of thoughts, a brief summary (Müller et al., 2012)

School of thought	Description
Trait	Successful leaders are born and show similar traits.
Behavioral	Parts of leadership traits can be developed.
Contingency	Leadership styles should be adapted to the specific context.
Relational	The leader will affect the members.
Visionary/ charismatic	The leader's vision and charisma will affect its success. Transactional and transformational leadership styles has its roots in this school.
Emotional intelligence	Leadership is not about being seen, but about the relations and interactions with others.
Competency	Views leadership as an integrativepart of management and leadership. Therefore, the manager requires competence in EQ, IQ and MQ

The views on leadership have changed gradually over time. This is also reflected by the increased research and theory on leadership since the 1950's. To distinct the different theories of leadership they have been categorized into schools of thoughts. A brief summary of the school of thoughts is illustrated in Table 2.2. Where the oldest schools of thought dates back centuries (trait), the more recent ones were developed in the turn of the 20^{th} and 21^{st} century (emotional intelligence and competency).

The *emotional intelligence* is related to peoples immediate response. According to Goleman (1995), this is "*driven by the amygdala, which 'thinks' holistically, in pictures and feelings*" (Müller and Turner, 2010). The rational part, in contrast, has a slower processing, using logic and thinking analytically. Therefore, the emotional intelligence of a leader is their ability to have an appropriate immediate response to situations.

Dulewicz and Higgs (2003) developed the emotional intelligence school of Goleman (1995) to cover leadership skills in organizations. They saw emotional intelligence of a leader as one of three competence clusters important to successful leadership. This is known as the competency school. They named the three clusters: (i) *Emotional leadership competences (EQ)*, (ii) *Intellectual leadership competences (IQ)* and (iii) *Mangerial leadership competences (MQ)*. These are again divided into fifteen distinct leadership competences, as illustrated in Table 2.3. For a full description of the fifteen leadership competencies, compare Müller and Turner (2010) and Dulewicz and Higgs (2003).

Project Leadership

In contradiction to leadership in hierarchical organization, where the leaders have a direct mandate of specific resources, project managers do not have the same privileges. They just have little direct control over the project team members, and must therefore work harder to aspire their loyalty, assure their

Table 2.3 Fifteen leadership competencies (Müller and Turner (2010) and Dulewicz and Higgs (2003))

Group	Competency
Managerial (MQ)	Managing resources
	Engaging communication
	Empowering
	Developing
	Achieving
Intellectual (IQ)	Critical analysis and judgement
	Vision and imagination
	Strategic perspective
Emotional (EQ)	Self-awareness
	Emotional resilience
	Intuitiveness
	Sensitivity
	Influence
	Motivation
	Conscientiousness

alignment and commitment to the project (Anantatmula, 2010; Kerzner and Kerzner, 2017).

Müller and Turner (2006) found that fourteen out of the fifteen leadership competencies described in Table 2.2, were significantly stronger for successful project managers (Müller and Turner, 2010). *Intuitiveness*, as the only leadership competency, was not significantly higher for successful project managers.

Project Characteristics and its Influence on Leadership

Every project, regardless of the similarities, are unique, either by external or internal factors. Projects can thus be divided into several phases and be characterized by their complexity. According to Müller et al. (2012), it is important to match the competences of the project manager with the complexity of the project. They separate complexity into three types:

(i) *Complexity of faith*: This is related to the uncertainty of projects, and especially relates to new developments.

(ii) *Complexity of fact*: The structural complexity, where it is challenging keeping an holistic view.

(iii) *Complexity of interaction*: Here, the human interfaces is the key factor for generating complexity.

In their research, Müller et al. (2012), discovered that project success and its relationship with EQ and MQ are moderated by complexity of faith, and complexity of facts and faith, respectfully. They further found that the IQ did not significantly impact the project success, even though it was moderated by complexity. In the conclusion, they point out that the correlation between EQ's and MQ's impact on project success and the interaction with complexity was negative (Müller et al., 2012). This implies that a higher level of complexity, will require a corresponding increase in EQ and MQ skills, to maintain the leadership level. Simultaneously the complexity of interaction is strongly related to the project manager's abilities with regards to EQ and MQ. Müller et al. (2012) state that these managers have the highest potential to "*influence project results (...) through their leadership style*".

Müller and Turner (2006) investigated three different kinds of projects, with regards to the competency school. In particular organizational change, IT and engineering projects. They found that a successful manager usually possesses the set of skills illustrated in Figure 2.5. The skills are ranked from 0-3, with 3 being the highest skill requirement level. If we combine this with the complexity dimension in Müller et al. (2012) we see that, projects related to *organizational change* have a higher complexity of interactions than the *IT* and *engineering* projects, which is expected (Müller and Turner, 2010).

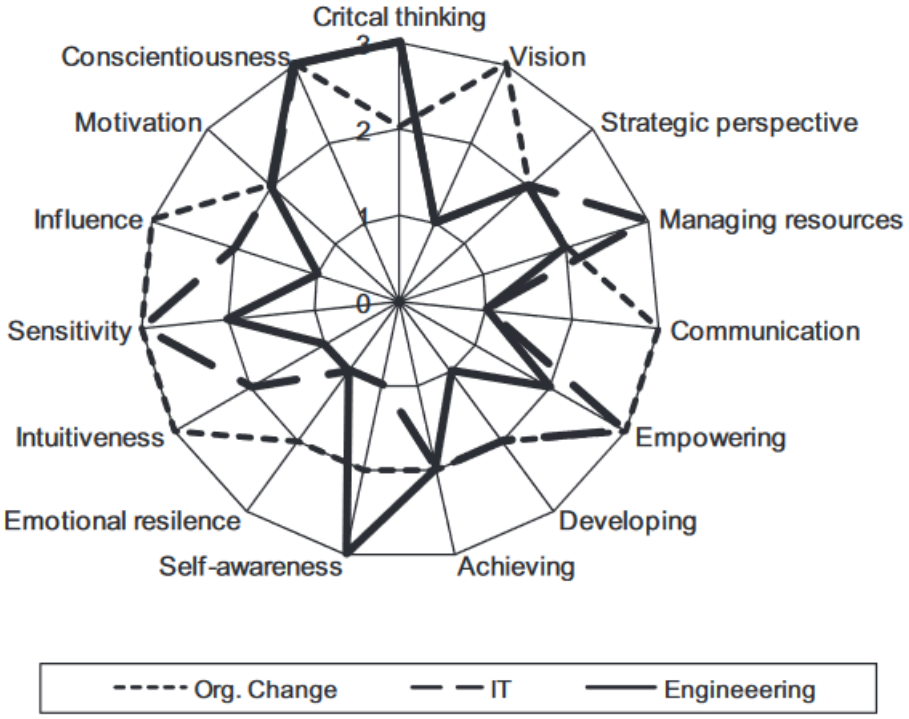

Figure 2.5 The personality profiles for successful managers in three types of projects (Müller and Turner, 2006)

Turner and Müller (2005) underline that the phases of a project will be so different that the project manager should change the leadership style from one to another. This is due to the changing demands of each phase. Leadership styles will, however, not be further covered in this report.

2.3.3 Combining the Two Dimensions

Müller and Turner (2010) describe two "*prevailing believes*" of project management, where the first disregards the project manager as a project success factor and the other ignores leadership as a project success factor. Both believes have the common feature of paying little attention to leadership within projects. On one side, a project manager should be able to handle the tools and techniques of PM, but also be able to convey them through leadership (Müller and Turner, 2010).

Barber and Warn (2005) argue that a project manager should not only be capable as a manager and a leader, but also have technical insight and be able to see market opportunities. This gives extra dimensions to project management, and highlights that the project manager must be a "jack of all trades". Müller and Turner (2010) emphasize that the project manager should master both the managerial and the leadership part, this is further illustrated in Table 2.4. Müller and Turner (2010) further argue that possessing skills in just one of the competence areas will lead to less success. Bennis and Nanus (1985) describe the distinction between managers and leaders in the following way: "*..Managers are people who do things right, and leaders are people who do the right things*".

Table 2.4 Combining management and leadership for success, adapted from Müller and Turner (2010) and Parry (2004)

		Leadership	
		Poor	**Good**
Management	**Poor**	Fail	Dysfunctional: short-term appearance of success; long-term failure
	Good	Sustained but only moderate success	Sustained and high success

Kotter (2008) utilized Table 2.4 to investigate managers in organizational hierarchies. He identified that almost all organizations had *"too few"* managers that excel in leadership and management. Most organizations surveyed often consist of good managers with poor leadership skills.

Klatt and Moksness (2019) linked the relationship between managerial and leadership skills to the different approaches of uncertainty handling, control and flexibility. They argued that the approaches towards uncertainty handling are related to the project manager's hard and soft skills. Whereas the hard skills could be seen as the managerial skills, and the soft skills are related to the leadership skills. The competence of the project manager with regards to the hard and soft skills seem to be imperative to how the project manager handles and steers the project uncertainty. A manager with strong managerial skills, but poor leadership skills, is good at executing the project according to the triple constraint (time, cost and quality), but not well equipped to handle unwanted events. Klatt and Moksness (2019) argue that leadership is essential for a successful handling of uncertainty in projects.

In their final remarks, Müller et al. (2012), state that the complexity of the project should be considered carefully before appointing a project manager. This is done to ensure that the project manager possesses the correct balance of EQ, MQ and sufficient knowledge with regards to the managerial skills.

Chapter 3

Methodology

In this chapter, the available research options should be discovered, which and why we chose them. The research design, should fit around the Research Questions (RQs) that we will present in this chapter. We will explain our chain of thoughts, how we designed the research, how the data gathering was performed and the reliability and validity of the results. This will elaborate on the strength of the research.

3.1 Research's Purpose and Objective

The purpose of this research is to compare the two organizations with regards to their respective Project Management Education Program (PMEP). The initial research proposal from Forsvarsmateriell (FMA) was limited to the investigation of the easy obtainable 'hard' facts of their PMEP, by only considering its content and duration. The main objective was to determine the effectiveness of their PMEPs. We evaluated this approach as a too shallow as it provides no feedback on the direct effects of the PMEP. We therefore extended the scope to include the opinions of the Education Program Directors (EPDs) and the project managers. By including their feedback we were, to a large extent, capable to determine the effectiveness and success of the PMEPs, seen from the practitioner's point of view.

The research objective is therefore to determine how effective the PMEPs are, and discover how the benchmarking partners might learn from each other. Based on our findings, we should be able to make recommendations for further development of the PMEPs, where we point out their strengths and weaknesses.

3.1.1 Stakeholder Analysis of the Education Program

The PMEPs are of strategic value for the organizations. We found it relevant to do a brief analysis of the two main stakeholders of this research. The stakeholders group that is most direct influenced by the PMEP are the participants. We anticipate, that the participants will provide the most valuable feedback on the PMEP's relevance and quality. Further, the EPD has the highest potential to impact the PMEP's structure and content. These two stakeholder groups are considered the most important for our research.

There are also other stakeholders that should be considered, as they have the potential to impact the PMEP. Those stakeholders are the Norwegian government and their respective ministries, educational knowledge providers, and the internal management of the organization (both horizontal and vertical).

3.2 Available Research Approaches

There are several research approaches available. Therefore this section will provide the reader with a short introduction into the different research approaches and their purposes.

The research approaches can be divided with regards to the research strategy, reasoning and method, as shown in Table 3.1. These elements should be carefully considered when conducting a research. The combination of elements chosen for a study is often labeled the research design. This is a tedious process, and the strategy, reasoning and method should be decided in a step-wise manner.

Table 3.1 Elements of a research design, inspired by Langlo (2010), Jacobsen (2015), Bryman (2016) and Gray (2004)

Strategy	**Reasoning**	**Method**
Exploratory	Inductive	Qualitative
Descriptive	Deductive	Quantitative
Explanatory	Abductive	

1. **Deciding the strategy**: This section is labeled strategy as it is closely related to determining the purpose of the research (Gray, 2004). To a large extent, this section is based on the work of Gray (2004) and inspired by Langlo (2010). The *exploratory* strategy is used to explore, often an undescribed, phenomenon. This strategy is suitable for a pre-study of a phenomenon, but could also be used for literature search, expert consulting and for focus group interviews. The *descriptive* strategy is, as the name implies, a strategy meant to give a detailed account of a phenomenon, often one that naturally occurs. This strategy could be applied to be purely descriptive, but also normative, "*comparing data against some standard*" (Gray, 2004) The *explenatory* strategy is used to explain the "*causal relationship between variables*" (Gray, 2004). This approach is often used when investigating the relationship between a phenomenon and certain variables.

2. **How to structure the reasoning**: According to Jacobsen (2015), there are three main approaches to scientific reasoning: Inductive, Deductive and Abductive. The difference can be seen in the way the hypotheses are developed, as illustrated by Figure 3.1. The deductive and inductive reasoning approaches are the most common ones. These two reasoning models are each others opposites, where deduction finds a hypothesis from theory and uses empirical data, inductive reasoning finds a hypothesis from the data and supports it with theory. Jacobsen (2015) describes a third reasoning approach, abduction. This way of reasoning was developed by the philosopher Charles Sanders Pierce, and is based on the thought that no research is completely deductive or inductive in nature (Jacobsen, 2015). In Figure 3.1 the abductive reasoning is illustrated. The figure shows how the abductive approach is more pragmatic, applying the ability to re-fit, and continuous learning (Jacobsen, 2015). When applying the abductive approach, the most senisble is to consider "*how open or closed the data collection should be*" (Jacobsen, 2015). Gray (2004) and Holme and Solvang (1996) also describe an approach similar to the abduction, they call it a combination of deductive and inductive theory.

3. **Choosing the method**: The last step is to choose an appropriate method. Jacobsen (2015) states that "*after deciding what to research, and how to design it, the method to gather data should be decided*". He further explains how the strategy and reasoning structure should be determinant for deciding the method. The two most common methods are known as qualitative and quantitative method. In a practical point of view, the methods distinguish themselves with how they collect data. The qualitative method often uses few subjects for collecting the data, and explore them in a more detailed manner. This method usually "*emphasizes words rather than the quantification in the collection and analysis of data*" (Bryman, 2016). Whereas the quantitative explore larger

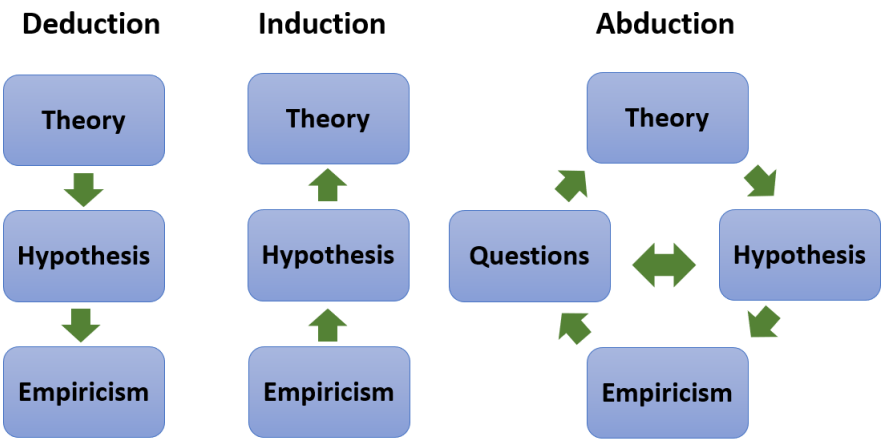

Figure 3.1 Differences of the reasoning approaches (Jacobsen, 2015)

data sets, but do not go in-dept. Bryman (2016) explains how quantitative research "*emphasizes quantification in the collection and analysis of data*".

The research approach is an important aspect of every study, to make certain that the results are valid and can be verified by other researchers. The research approach for this study, is based on the research phases presented by Jacobsen (2015), as illustrated in Figure 3.2. Jacobsen (2015) explains the different phases of a research process, and thoroughly goes through how it should be structured dependent on what method to be used.

3.3 Research Design

The research design could be described as a plan and framework for how to conduct the research. We have designed the research to fit to the purpose of this study. Furthermore, it should be in accordance with the RQs. The research approaches chosen for this study are carefully considered before the study was initiated. The strategy has to be twofold, on the one side it is important to be exploratory and on the other side we see the need to work descriptive. In the initiation we thought that the deductive reasoning approach was the most suitable. However, after a short period of time, we found this reasoning approach to be insufficient, as we were continuously learning. Therefore we emigrated towards the abductive reasoning. Based on the nature of this research, and how we could retrieve data, we found the qualitative method to be most suitable.

3.3.1 Research Questions

Formulating the right RQs has been a challenging task. We have used the procedures desribed in Jacobsen (2015) and Bryman (2016) to develop our RQs. The RQs are developed to create a sense of direction to what we want to investigate (Bryman, 2016). Jacobsen (2015) argues that the RQs should cover the following central questions: "what are we interested in?", "who are we interested in?", "where should the study be conducted?", "when should the study be conducted?".

Our process of developing the RQs has been an ongoing process. We started out with a notion of what direction we wanted to go, and how we wanted to proceed, but were quickly set back after starting the initial literature review. Therefore, we had to review the RQs, but only until we met the same issue in

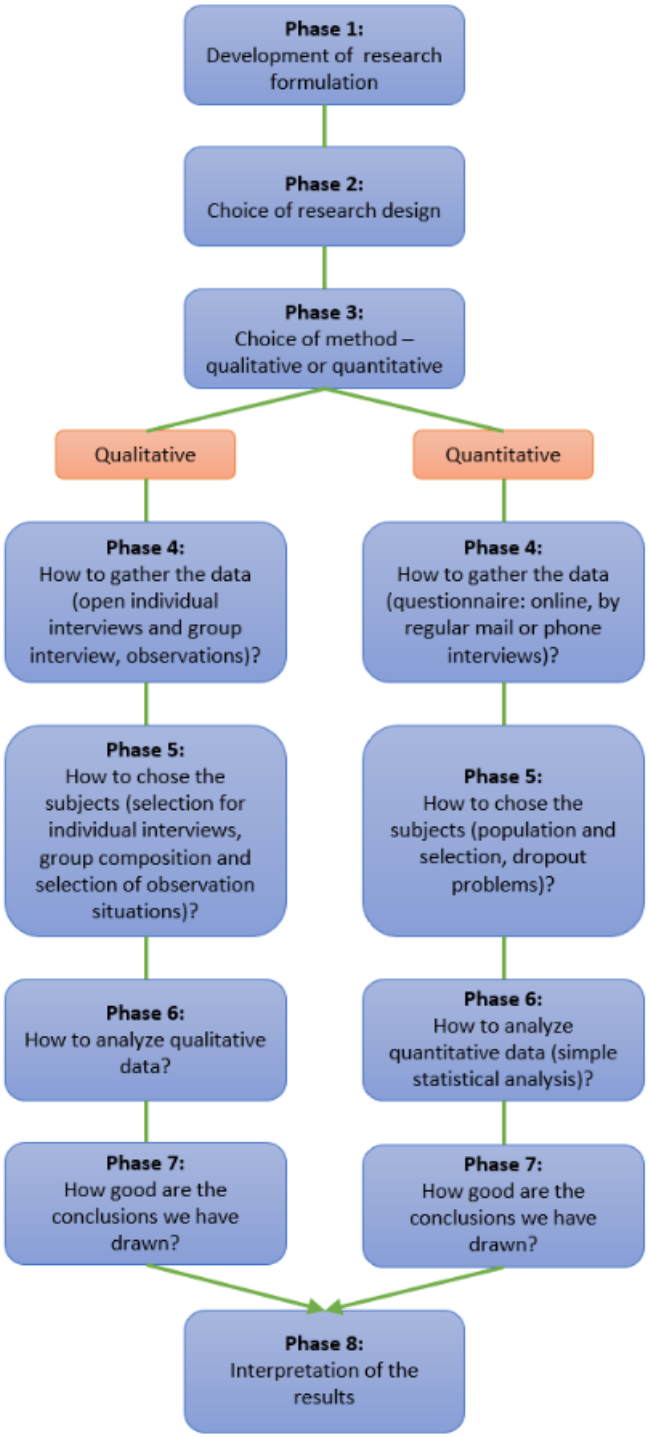

Figure 3.2 The phases of a research process, adapted from Jacobsen (2015)

the initial part of our data gathering. The RQs are therefore a product of continuous development. This is a process Holme and Solvang (1996) label the "*problem formulation grinder*".

When we initiated this research we were asked to measure the effectiveness of the PMEP of FMA, with regards to duration and content. We quickly realized that the scope of a PMEP can not be limited to the duration and content. Therefore, we decided to expand the scope. The project managers were, naturally, the core of this study and we thus wanted to revolve the research around them. Questions like "what is a good project manager?", "what should a project manager know?", "how can you learn to become a project manager?", and "is it even possible to learn to become a good project manager?" became important for us to answer. We decided to pursue this approach. Since we are analysing the the PMEP's effectiveness, we found it imperative to know the basics of what is expected of a project manager and how to develop these skills. This lead us to our first RQ and its Sub-Research Questions (SRQs):

RQ 1: What does it take to be a competent project manager?

- RQ 1.1: What knowledge and skills should a competent project manager possess?
  - What skills should a project manager possess?
  - To what extent should a project manager also be a leader?
  - Is there an optimal balance between management and leadership skills?
- RQ 1.2: Are there different ideals of project managers?
  - Do different cultures have their own ideals of project managers?
  - If so, is this applicable to the organizational culture?
  - Is the ideal of a project manager affected by the conducted projects of an organization?

After we established the ideals of competent project managers, we are able to move forward, investigating the PMEPs. We should analyze their effectiveness and their concept of success in order to promote competent project managers. The approach to RQ2 was to start wide and narrowing the topic down by its SRQs.

RQ 2: Are the Project Management Education Programs (PMEPs) successful at developing competent project managers?

- SRQ 2.1: Are the Project Management Education Programs (PMEPs) transferring the appropriate knowledge to their participants?
  - What knowledge is transferred?
- SRQ 2.2: Are the Project Management Education Programs (PMEPs) conveying the knowledge in an appropriate manner?
  - How do they transfer it?
- SRQ 2.3: Do the Project Management Education Programs (PMEPs) increase the competence and quality of their project managers?
  - To what extent is it increased?

3.3.2 Data Collection, Methods and Process

Information gathering is a crucial part of any research, and mastering methodology is important to provide the possibility that the results may be tested. This report focuses on a qualitative information gathering, based in three consecutive stages: (i) literature review, (ii) a study of the PMEPs structure, and (ii)

a series of semi-structured interviews. Where the last two provide a basis for understanding the context of how the organizations run their projects, and additionally an insight to their culture.

(i) Literature Review

The RQs require, to a large extent, a thorough literature research, to gather information about the subject and prepare for the interviews. The literature review is designed with a dual purpose. It should investigate previous work within the field and serve as a reference for the upcoming data analysis.

For us, it has been important to use valid and reliable sources that are relevant. To ensure that there is a high quality of the sources used, we have created a set of guiding requirements:

- Standards and institutions should be well established
- Articles are published in well established journals
- There is a general consensus among scholars about the conclusion(s)
- Articles show that the researches has used a reasonable methodology

(ii) Structure and Content of the Education Programs

The second part of our research revolves around the structure of the PMEP. This is an important part, as it will provide a foundation to the rest of the study. By investigating the PMEP's structure we are able to understand more about how the organizations are structured and function. The PMEP's content will give an indication to what parts of their projects the organization deem to be most important. Additionally, this provides a basis to understand the context of the PMEP.

(iii) The Semi-Structured Interview

There are many methods to gather quantitative data, one of which is the individual interview. This is a method suitable when there are just a few subjects, when there is an interest of the individual's opinion, or when there is an interest of knowing how the individual interpret a specific phenomenon (Jacobsen, 2015).

Jacobsen (2015) describes how an interview could be structured, with the two extremes: completely open and completely closed. Figure 3.3 shows that there are several degrees of how the interviews can be structured. The completely open interview has a weak structure, meaning that it will be more like a conversation, and does not utilize the benefits of an interview guide. A completely closed interview, on the other hand, has a strong structure. There will be a set of questions with fixed options for the candidate to answer. In between these extremes are the semi-structured approaches. Utilizing a semi-structured approach will allow to have a conversation with a set of topics to cover during the interview.

We decide to divide the interviews into two groups, which requires different approaches: (i) Interviews with the EPDs, and (ii) interviews with previous participants of the PMEP:

1. **Interviews with the education program directors**

   The EPDs are responsible for the content, structure and execution of the Project Management (PM) development in the given organization. Those responsible should have an historical connection to how the program has developed over time and an impression of how the current education program

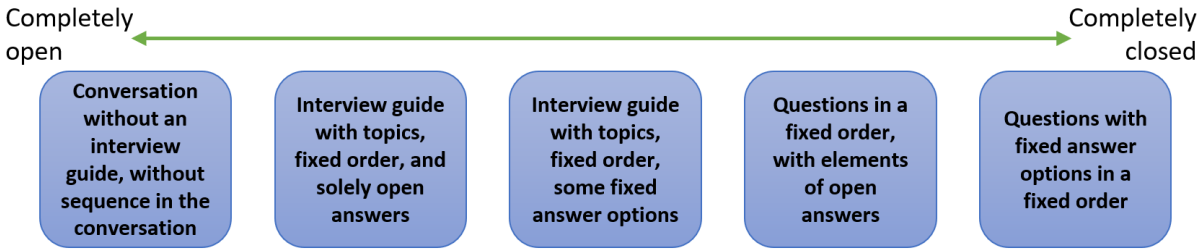

Figure 3.3 The different degrees of an interview structure, adapted from Jacobsen (2015)

performs. The interview process with the EPDs was supported by a short questionnaire, which we intended to answer in advance. This approach was chosen to enhance the discussions during the interview session. The interview guide and the questionnaire can be found in Appendix B. The goal of these interviews is to determine the sense of success seen from the EPDs point of view.

2. **Interviews with previous participants of the education program**

   The investigated PMEPs are divided into different levels. These levels contain different learning outcomes, and are thus structured differently. To maximize the value of the interviews candidates from different educational levels should be elected. As the participation in the education program is not limited to people working in project environments, as a project manager or member, we have to limit the interviewees to those with a project background.

Brinkmann and Kvale (2015) describe the strengths and weaknesses of conducting different kinds of interviews (face-to-face, telephone, chat, e-mail). They suggests that the researchers must be cautious about the type of interview chosen. This should in fact be customized to each interviewee. The face-to-face interviews is good at establishing trust and openness with the interviewee and will provide a continuous flow in the conversation and good control for the interviewers (Jacobsen, 2015). On the other hand, a face-to-face interview might require high expenditures, and might also prove difficult with regards to geographical distances or a busy working schedule of the interviewee (Jacobsen, 2015). A telephone conference will, according to Jacobsen (2015), also provide a continuous flow of the conversation, be less resource demanding than the face-to-face interview and give an easier access to the interviewees. He further explains that a telephone interview will be weak with regards to establishing trust and openness, and cause the interviewer to loose control of the interview situation. However, the control aspect will be significantly improved using video conference.

We preferred to use a video conference tool to be more flexible with regards to the interviews, as most of the interviewees were located in Oslo. All of the interviews were scheduled to take one hour, and be conducted through video conference. The video conference allowed us to be more flexible with regards to the date and the time of the interview. This proved to be crucial, as many of the project managers had a tight schedule. Some of the interviewees were unable to use cameras, due to work restrictions. We see this as an insignificant drawback.

Contextual Observations

Through the information gathering of the organizations (PMEP) structure and content and interviews, we will gain an insight on how the organizations run their projects. We will also try to understand how the organizational culture influences their way of conducting projects and eventually how the structure of the PMEP is affected by this. Due to the complexity of the organizations and time limitations of this thesis, we will base our observations strictly on the qualitative data collected, as explained earlier.

3.3.3 Research Models

The benchmarking study of PMEPs is challenging, as it contains many variables. Our job as researchers is to identify the variables, investigate their causality and eventually delimit the system to a controllable set of variables. Due to the exploratory nature of this research it is challenging to delimit the system. We have therefore used the pentagon model, illustrated in Figure 3.4, as a guidance to restrict our system boundaries. Based on this, we will investigate the PMEPs performance (with regards to the effectiveness of it) and we will look into the surrounding technologies, the internal interactions, its structure, the social relations and networks as well as the surrounding culture. It is furthermore intended that both PMEPs are analyzed by the same framework.

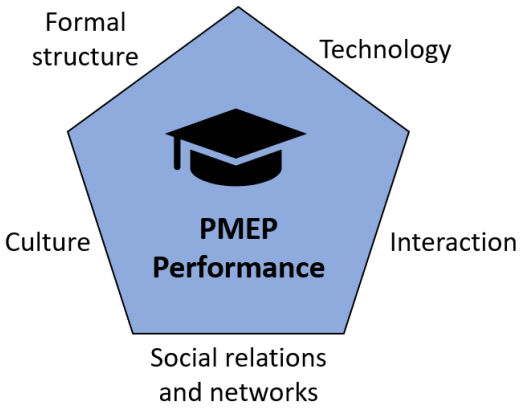

Figure 3.4 The pentagon model, described by (Schiefloe, 2011)

Investigating the success of the PMEP is challenging. There are many variables that could give an indication on the success of the education program. Figure 3.5 illustrate how the PMEP fits into the organization. The black arrows indicate how the different elements influence each other, while the red arrows shows the feedback loop. The dotted lines represent the noncontinuous flow of feedback or influence. The figure contains two clouds, which represent the different environmental, contextual and cultural influence on the PMEP and projects. Since both have fundamental different objectives, methods and exists in different organizational environments, it is expected that they are distinguishable from each other. The upcoming paragraph will briefly explain the background of Figure 3.5.

As many organizations have converted their value creating business to become project driven, an increased need for developing PM skills has emerged. Many larger project-based organizations have therefore developed their own education program for project managers (PMEP). These programs are often open for project members that aspires to become project managers. The PMEP will be under the direct control of the EPD, who is responsible for the educational content and the overall organization of the PMEP. The EPD will further be influenced by the top management. To what extent the top management is engaged to the PMEP is expected to vary and also depends on success of it.

For this research study, we are investigating the effectiveness of the PMEP, which is deemed a challenging task. We identified two loops on how to measure the success of the PMEP. *Firstly*, by measuring the success of projects, and compare them to the outcomes of projects that were finished prior to the implementation of the PMEP. This method requires information about the project performance. As projects are highly unique with different influencing factors, this method has proven difficult to receive reliable information. On the other hand, we expect that the project director will provide the EPD with feedback on the overall project performance. The *second* feedback loop is given by the former participants of the PMEP. They can provide feedback on the relevance of the PMEP based on their daily work as project managers. It is assumed that these two feedback loops can provide and indirect indication about the relevance and the success of the PMEP.

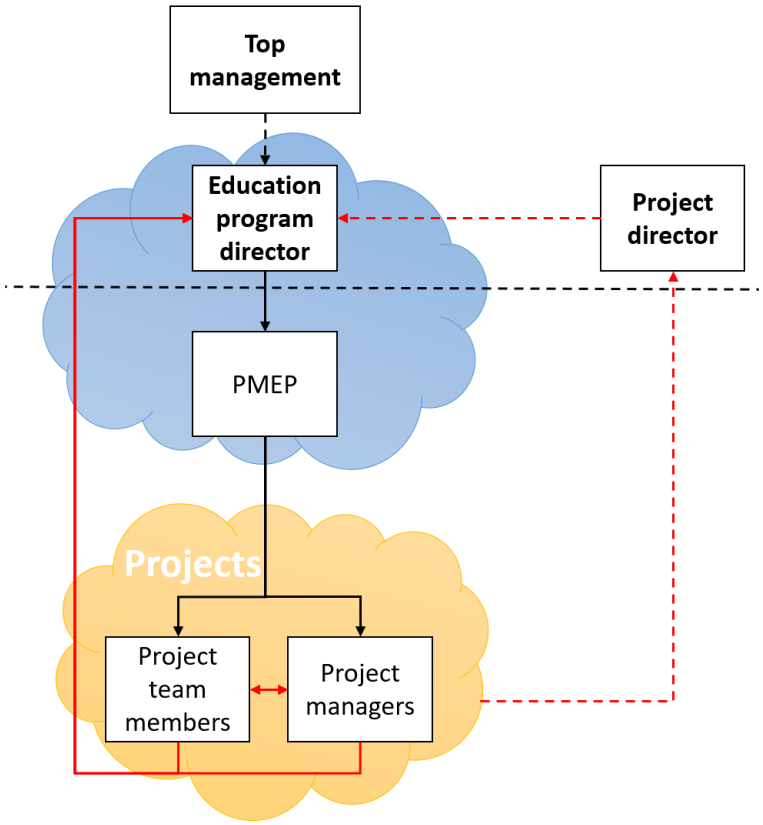

Figure 3.5 Research model and rationale of this study

As a result our research approach is to conduct two sets of interviews. First, with the EPD of the respective PMEP and second, with former participants of the PMEP. For the second round of interviews, it is desired to select candidates who are currently working within a project environment.

3.3.4 Data Analysis

The data analysis is one of the most crucial part of every research. It is used to describe the results of the research and put them in a larger picture. This is done to present the nuances of the gathered information (Jacobsen, 2015). In his book, Jacobsen (2015) explains qualitative analysis as reducing the information to smaller parts, and put them together to shed light on the totality. Dey (1993) supports this by stating that the qualitative analysis is a threefold process, illustrated in Figure 3.6. According to Dey (1993), this approach may "*provide the basis for new descriptions*" of the phenomenon. In this research we will analyze information gathered through 'hard' and 'soft' facts. Whereas the hard facts relate to materialistic data provided by the organizations, the soft facts reflect the data collected through the conducted interviews.

Upon analyzing the data we strive to understand each result in the light of a larger picture. Jacobsen (2015) describes the result analysis as a two factor model. A categorization and connection of the results. The content analysis is a way to find the causalities. This method is closely connected to the *thematic analysis*, as described by Bryman (2016).

The qualitative data gathered through the investigation of the PMEP's structure is only comprised of hard facts. Therefore, the analysis becomes simpler. We will break down the structure of the PMEP into its content and duration. Afterwards we will compare both programs against each other and a reference point. Further, we will analyze the parts with a thematic approach.

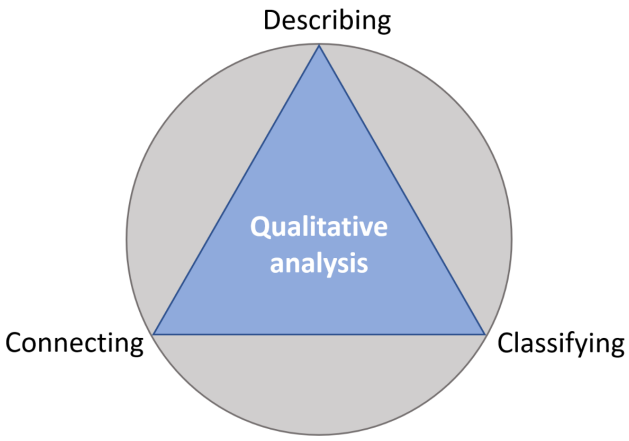

Figure 3.6 A circular representation of the qualitative analysis (Dey, 1993)

Brinkmann and Kvale (2015) present two approaches to analyze data gathered from interviews. Either by focusing on meaning or on the language. By focusing on the meaning Brinkmann and Kvale (2015) aspire researchers to dismantle the interview in such a way that only its core is left. Typical tools are meaning condensation, meaning interpretation and the hermeneutic method (Brinkmann and Kvale, 2015). Focusing on the language, on the other hand, is used to analyze details in how the interviewees choose to verbalize themselves in the interview (Brinkmann and Kvale, 2015). Tools like linguistic, conversation, narrative and discourse analysis could be used for this approach.

There are two reasons for why it would be challenging to conduct an interview analysis which focuses on the language. First, because the interviews were conducted in English, which is not the mother tongue of the interviewees and second, due to the time constraints of the interviews. We will, however, focus on the meaning. Thus, we will condense the interviews down to their meaning, before we use a hermeneutic approach. Jacobsen (2015) explains the thinking method known as the hermeneutic spiral, Figure 3.7, which we are utilizing in our research.

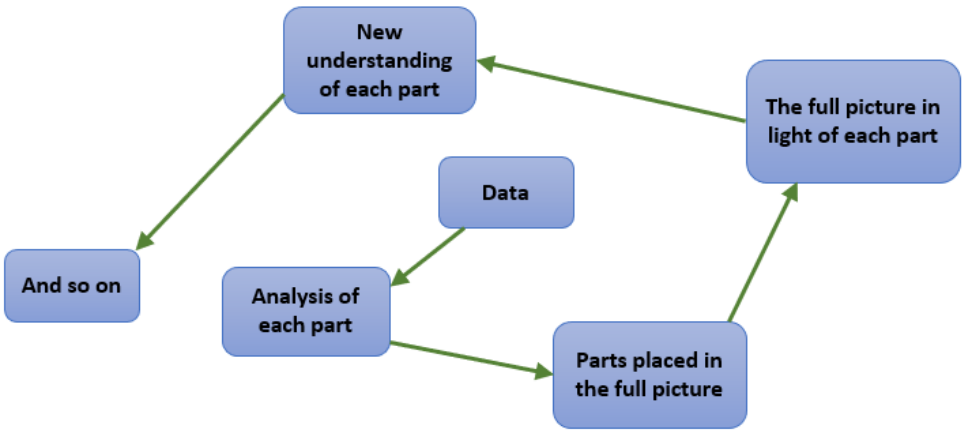

Figure 3.7 The hermeneutic spiral (Jacobsen, 2015)

3.4 Quality of Information

The validity and reliability of the results is imperative to give value to the research. Therefore, researchers put a lot of effort into known and tested methods in social science.

Validity

In general, validity is the research's ability to be accurate. This is often measured in the replicability of the study. However, there is more to a research's validity. Validity is often separated into two factors:

1. **Internal validity**: The internal validity is a measure on whether the observations and the presented theory, developed by the researchers, correspond (Bryman, 2016). When exploring internal validity, we find that its sphere of influence is more extensive, than mentioned at the beginning of this section. Jacobsen (2015) presented three questions that should be answered: "*Does the study object provide an accurate representation of the reality?*", "*Are the researchers presenting the data accurately?*", and "*Does the results represent the reality?*".

   Answering the first question; we have several different study objects in this research. We believe that the study objects we use are able to provide us with correct and relevant information to this study. Then the question is whether the learning objects are willing to share truthful information with us. At this point we have to trust each individual. At least, we strive to create a setting where the interviewees feel safe to share the truth. In the interviews we have asked open questions to allow the subject to reflect and give their answers without us stimulating them (asking a direct question). Answers given without stimulation will provide a higher validity (Jacobsen, 2015).

   To the second question, due to time constraints, we did not validate the respondents. We have rather focused on the validation of the results through discussion and there categorization. We further discuss the correlations and causalities found. As this research is a benchmark of two PMEPs, it is important that the results mirror the reality. We are confident that our research model, presented in Figure 3.5, is sufficient to reflect the reality. Since this is an exploratory research, it is difficult to verify our findings through previous research.

2. **External validity**

   The external validity is also called transferability and is related to the research's ability to be replicated.

   The external validity of this research is considered to be low, as we use a few organizations, and a low number of interviewees. We also have little control over the selection of candidates who take part in the interviews. We only demanded that respondents work in a project environment. The dispersion of the respondents was correspondingly weak, since we only used a few subjects and could not control which subjects were to be used. Since the interviewees were selected by the EPD, it may not be a true scatter of former PMEP participants. This is a weakness of the study, however, we believe that the EPDs acted honestly to generate an optimal platform to evaluate the PMEP.

Reliability

The reliability is related to the consistency between measures of the same phenomenon. This could either be study replications, or method replications on other subjects (Gray, 2004). The practical implications for assessing the reliability of a research relate to how it affects the subject(s) and errors in the recording and analysis of the data (Jacobsen, 2015).

When the researchers engage in direct contact with the research subjects, through interviews (among others), there will be some sort of interactions between them. This is a common interaction, that might force a change of behaviour on the interview subject. This is known as the interviewer effect (Jacobsen, 2015). With regard to this study, the project managers are not expected to have a direct influence on the PMEP and will therefore not interfere with the results. The EPDs on the other hand, have the possibility to change the PMEP. Therefore, it is reasonable to assume that they might change their behaviour. With regards to the PMEP, this has a high inertia, and cannot be changed or adapted instantly. Secondly, there will always be a chance of mistakes and misinterpretations by the researchers. Especially as we do not intend to record the interviews. During the interviews, we will strive to consistently pursue any kind of confusion. As a quality control to avoid these mistakes, we will both participate in the interviews and write a handwritten transcription afterwards.

3.5 Compliance with the General Data Protection Regulation (GDPR)

On June 20th 2018, the GDPR regulations commenced. This regulation directly restricts the gathering and storing of information, and requires a safe system to keep the sources anonymous. According to the Norwegian data protection authority (Datatilsynet), the GDPR especially revolves around personal data and how this is handled. If personal data is gathered, an application must be sent to the Norwegian center for research data (NSD), describing what data that should be collected and how it is stored.

According to the guidelines of NTNU (NTNU, 2018), it is assumed that this research does not require any special application in NSD. However, research studies involving interviews and collection of personal data are required to be submitted to the Norwegian data protection authority, this was done accordingly.

In this study, we worked hard to comply with the GDPR regulations and to maintain the trust that we gained from the interview respondents. Therefore, the project managers remain anonymous. However, in order to present the results correctly, we consider it necessary to create codenames for the interviewed PMEP participants. This code allows the EPDs to identify the respondents. However, these information are considered less confidential. Regarding the interviews with the EPDs, it seems fairly impossible to keep them anonymous. The information gathered through the EPDs are considered less sensitive and are therefore within our acceptance range.

3.6 Critique of Research Design

In general there are many points of critique to qualitative research. Bryman (2016) summarizes some of the critique of the qualitative research as being: too subjective, difficult to replicate the results, challenging to generalize the findings and a lack of transparency. These critical points substantiate some of the challenges related to qualitative research.

The research design of this thesis is, a qualitative research in general, not without its flaws. We perform a cross-sectional investigation of two PMEPs with regards to their efficiency (content and duration). This approach will give an indication on how the previous participants of the PMEP subjectively consider its performance. It will, however, not present empirical evidence on the direct effects of the PMEPs. In addition, it does not provide any empirical evidence for the increased competencies of the project managers. This requires a different approach, using a longitudinal perspective. The number of variables that can impact the analysis also increases the difficulty of measuring the effectiveness of the PMEPs. Delimiting this study to a system that can provide trustworthy empirical evidence is challenging with regards to the small number of interviewees and organizations.

Although the validity as well as the reliability are affected by the time restrictions of this study, we believe that they are within an acceptable range for an exploratory study.

3.6.1 Desired Optimizations

Our biggest regret is that we did not expand the research to include PMEPs from other industries and organizations. By doing so it would have been possible to identify trends and opportunities across other sectors. This could allow for a broader generalization of what a good PMEP should focus on, in terms of its duration and content. The findings of such a research design would further be strengthen if a combination of qualitative and quantitative methods were to be used, utilizing the power of big data.

Chapter 4

Structure of the Education Programs

In this chapter we will introduce the research subjects and focus on their methods for developing project managers. The main focus is to appraise the *hard* facts of their respective education programs. We will look deeper into their educational structure and the specialities of each Project Management Education Program (PMEP). In addition, we will compare both programs with regards to their time consumption and educational content. Based on the collected information, we will evaluate the efficiency of PMEPs for the development of project managers.

4.1 Research Subjects

This section is dedicated to describe the organizations in this comparison study. We will explain their basis of operation, their differences, what makes them special and how they are structured. Here, we will focus especially on their projects and their PMEP. The two investigated organizations are similar in many ways. They are both public organizations and must therefore comply with the strict procurement regulations in Norway. The projects they conduct, are done on behalf of the Norwegian State, which in many cases are extensive and complex projects. For this report, the most interesting similarity is that both organizations have a well-established approach to their internal Project Management (PM) education.

4.1.1 Forsvarsmateriell

Forsvarsmateriell (FMA) is responsible for equipping the Norwegian armed forces with all the material required to be sufficiently operational. Their projects range from soldiers clothing to fighter planes, from armored vehicles to submarines. These materials should be state of the art and of a high quality. They are also responsible for immaterial products such as software and IT-systems. The projects conducted at FMA are commonly transferred to the armed forces upon completion.

FMA is separated from the Norwegian armed forces and belongs to the Ministry of Defence. They are a fairly new organization, established as an agency in 2016. However, FMA remains closely associated with the rest of the armed forces, as both fall under the Ministry of Defense[1].

The projects conducted at FMA are to a large extent procurement projects. Where the primary responsibility for the project managers lies in the initiation, planning, monitoring and controlling, and closing of the project (see Figure 2.4). This is typical for an organization that does not execute their projects themselves. Therefore, much of the work for the project manager is to source and monitor

[1] https://forsvaret.no/forsvarsmateriell/en/about-ndma (Viewed: 04.06.2019)

the suppliers. Additionally, the project managers are responsible for sufficient documentation of the products, prior to the delivery of the product to the operators.

4.1.2 Statsbygg

Statsbygg is a public enterprise falling under the Ministry of Local Government and Modernization. They serve as "*Norwegian government's key advisor in construction and property affairs, building commissioner, property manager and property developer*"[2].

Statsbygg can therefore be considered as the project owner, by proxy, for the Norwegian state. Thus, they are responsible for many of the public construction and property development project in Norway. Upon completion, the projects could be transferred to the property management department in Statsbygg or to the governmental institution, ordering the project. As Statsbygg, like FMA, does not possess the internal capability to execute the projects, they are increasingly focused on procurement. Therefore, Statsbygg focuses less on the execution phase of their projects. However, they still monitor their suppliers during the project execution to guarantee the project success.

Statsbygg's PMEP is owned by the Project Owner Department, but managed by the Human Resource (HR) department. The PMEP is coordinated by two persons. While the first person serves as a liaison officer on behalf of the PMEP owner, the second person is the director of the PMEP. In the following, we will refer to them as the Education Program Directors (EPDs) of Statsbygg.

4.2 Education Program Structure

FMA and Statsbygg, have developed their own internal program to educate and certify project managers. According to Section 2.2.1, both organizations thus follow the *organizational approach* to develop the PM competences of their employees. This enables FMA and Statsbygg to focus their PMEP on the organizational needs and requirements. The program at FMA is called *PRINSIX* whereas Statsbygg's is named *Prosjektakademiet*.

4.2.1 PRINSIX - Forsvarsmateriell

The idea to internally educate and certify project managers started in the early 90s. At that time, FMA was operating under a different organizational name but with the same objectives. In the early days, each division was responsible for developing the competences of its personnel. An overarching competence center coordinated the education system. During the early 21st century the need for transparency and standards increased. As a result, FMA in cooperation with a PM consultancy firm, develop a more centralized education program. Instead of having each division themselves responsible for teaching PM traits, the goal was to develop a central program that would make it easier to overlook and influence the education system. In 2004, FMA finally introduced today's PRINSIX standards. Figure 4.1 illustrates the current PRINSIX education program.

The program is divided into two levels. During the first level (*Nivå 1*) the candidate receives a general introduction into PM, to become a certified PRINSIX project employee in the defense sector. The second level (*Nivå 2*) consists of six courses that provide the candidate with advanced knowledge in PM. Upon completion of Nivå 2 the candidate is entitled to be a certified project manager at FMA. As described in the underline of Figure 4.1, some courses of the education program are developed by FMA themselves,

[2] https://www.statsbygg.no/Om-Statsbygg/About-Statsbygg/ (Viewed: 04.06.2019)

while others are developed in collaboration with the PM consultancy firm. During the education each candidate is requested to submit one individual assignment per level of education (*Innlevering nr 1 and nr 2*). To complete Nivå 2, each candidate is additionally requested to submit a written paper of 4000-6000 words (*Prosjektoppgave*). Upon completion of each educational levels, the candidate may take a volunteer exam. The exam provides the candidate with a formal confirmation about the obtained study credits (*studiepoeng*). For Nivå 1, a maximum of ten credits are possible. The termination of Nivå 2 will give the candidate another twenty credits. Thus, the candidate can receive a maximum of thirty credits for completing both levels of the PMEP.

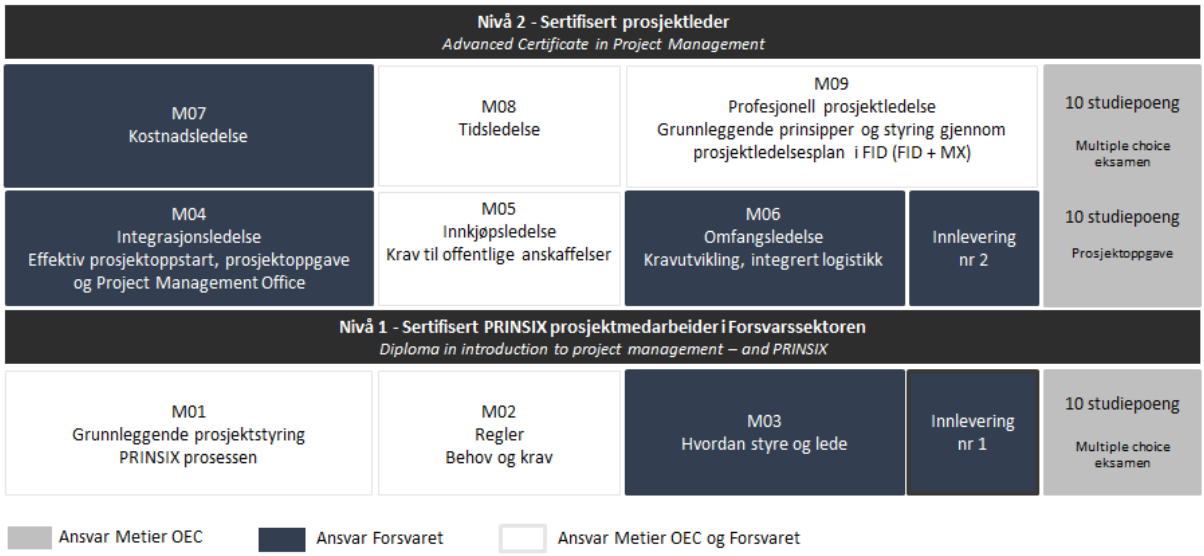

Figure 4.1 The formal structure of the internal project management education program at FMA (PRINSIX) [3]

4.2.2 Prosjektakademiet - Statsbygg

Statsbygg's Prosjektakademiet was established between 2010 and 2011. The program was designed to develop and strengthen the PM competences of Statsbygg's internal personnel. To a large extent, the program was developed by the experienced project managers from Statsbygg. Only three courses were developed in close collaboration with a PM consultancy firm. Today, the program is powered by the HR department (*Statsbyggskolen*) in close collaboration with the coordinator for the construction department and the management group inside this department.

Figure 4.2 illustrates the structure of the current PMEP at Statsbygg. The program is divided into four Hay Grade (HG) levels, whereas HG14 is the lowest and HG18 the highest achievable level. The HG model functions as a career ladder to define competence, experience, tasks and responsibilities within the company. It is furthermore used to control salary levels between different levels of employment and the external market. Appendix C provides a holistic overview about the different educational levels and their characteristics. As illustrated in Figure 4.2, the courses of Prosjektakademiet focus on the development of management (*Prosjektledelse*) and leadership (*Lederutvikling*) competences. To participate in lowest level of the education program (*HG14*), the candidate must hold a bachelor's degree in engineering or economics. With the completion of HG14, the candidate confirms to possess the basic knowledge in project management. It furthermore entitles the candidate to serve as an assistant project managers at Statsbygg. To participate in the second level (*HG15*) of the educational program the candidate is requested to demonstrate at least two years of practical work experience and a master's degree in civil engineering or business. At the end of HG15, the candidate is invited to attend a six-day course

[3] https://forsvaret.metierportal.no/utdanningslop/, (Viewed: 10.05.2019)

dedicated exclusively to leadership development (*Ledelse og kommunikasjon*). Through a combination of theory and practical training the candidate gains knowledge about how to create greater commitment and motivation, as well as how to better solve difficult communication situations in an appropriate and positive way. This level enables the candidate to handle projects up to 150 million NOK. Upon completion of HG14 and HG15, the candidate may take a certification exam through PRINCE2. For HG16 a mentoring program (*Mentorordning*) is intended. This involves a monthly gathering of approximately thirty project managers over a one and a half year period. The goal is to share knowledge and experience across different projects and thus improve the competences of the project managers. After HG16, the project manager can handle projects between 150 and 500 million NOK. To complete the last level of the education program (*HG18*), the candidate is required to demonstrate at least ten years of practical work experience. Upon completion of HG18, the project manager may execute the largest projects at Statsbygg.

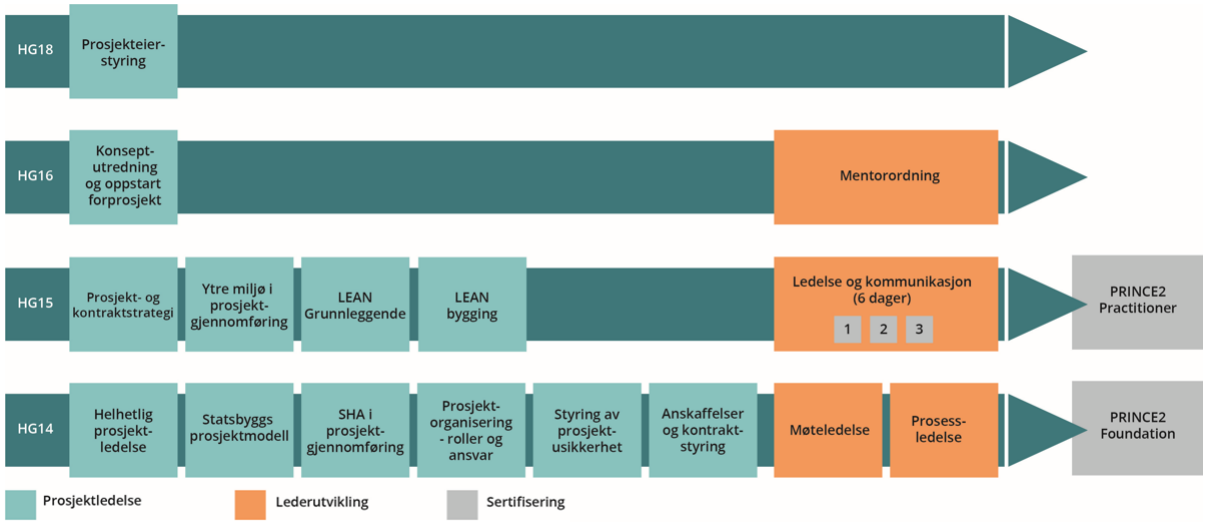

Figure 4.2 The formal structure of the internal project management education program at Statsbygg (Prosjektakademiet)[4]

4.3 The Comparison of the Educational Performance

In this section we will compare the educational performance of PRINSIX and Prosjektakademiet based on the data provided by the organizations. We will thus analyze both PMEPs in terms of their educational approaches, coverage of the necessary prerequisites to establish an effective education program, time consumption and educational content.

4.3.1 Educational Approaches at PRINSIX and Prosjektakademiet

Table 4.1 presents an overview of the educational approaches applied in PRINSIX and Prosjektakademiet. It becomes evident that both PMEPs focus on a combination of *self-study* and *classroom education*. The participant is commonly encouraged to read through a web-based learning application or book before attending the classroom session. The self-study will prepare the candidate for the subsequent classroom session. In addition, PRINSIX demands individual submissions from its participants. These contributions are intended to improve long-term learning. The classroom courses can be held by either external or internal course holders. The latter are often experienced project managers within the organization. Both

[4]Retrieved as a separate presentation from Statsbygg, "*Prosjektakademiet - Informasjon, mars 2019*"

PMEPs work in close collaboration with a PM consultancy firm, which provides web-based courses through its platform and instructors who hold courses in the organization's premises. During the classroom session, the instructor can provide further insights into the topic, answer questions or encourage discussions to share experience. A high focus is also placed on case-based learning. The instructors are encouraged to use cases to engage the candidate to the context of the project. In this way, the candidate will gain a better understanding of the different PM tools and how they are applied in practice. It could also be argued that this will improve the candidate's critical thinking. The importance of critical thinking and engagement with the project context for the PM education is described in Section 2.2.3.

Table 4.1 The applied educational approaches in PRINSIX and Prosjektakademiet, according to Section 2.2.4

Education program	Classroom education	Self-study	Interpersonal learning	Mentoring	Simulation-based learning
PRINSIX	✓	✓	Partly during classroom session	✗	✗
Prosjektakademiet	✓	✓	✓	✓	✗

Based on the program structure and available information, no clear indication was found that PRINSIX specifically focuses on the *interpersonal learning* and *mentoring* of its students. To some extent, the interpersonal learning might be considered as part of the classroom education. However, there are no courses or tools that focus on a direct knowledge exchange to develop the competences of the candidate. By contrast, Statsbygg's Prosjektakademiet offers its candidates the opportunity for interpersonal learning and mentoring within the course *Mentorordning* in HG16. The course lasts for one and a half years. Each candidate is invited to a monthly group meeting with workshops on relevant topics, discussions and knowledge sharing. The course is led by an experienced project manager from Statsbygg who acts as a mentor.

No direct indication was found that both PMEPs use *simulation-based learning* to educate their students. According to Section 2.2.4, simulation-based learning is a method to develop practical knowledge and personal competences through case-based simulations or games. Thus, the candidates are challenged to apply the theory from the classroom session in a real-case simulation. The advantage of this method is that it combines the learning objectives of self-study, interpersonal learning and mentoring. In addition, the candidate will gain a better understanding of the project context and develop its abilities in critical thinking as required in the Section 2.2.3. This is how the PM education will improve by "*moving from analysis to synthesis, from breaking down to integrating, from knowing to understanding, from asking "how to" to "when, where, why" and integrating emotional and spiritual intelligence into our cognitive approaches*" (Thomas and Mengel, 2008).

4.3.2 Identification of the Necessary Prerequisites at PRINSIX and Prosjektakademiet

In Section 2.2.2 we have identified five prerequisites that should be considered to develop an effective education program. These prerequisites are furthermore illustrated in Figure 2.1. To determine if PRINSIX and Prosjektakademiet meet these prerequisites, Table 4.2 has been created. It becomes apparent that with the exception of the first all prerequisites are fully met. In the following the results for each prerequisite are briefly explained.

Understand the competence level of the average participant:
Both PMEPs do not evaluate the individual competences of its participants. However, it might be argued that Prosjektakademiet is better equipped to anticipate the competencies of its participants than PRINSIX. This is because Prosjektakademiet has clear expectations regarding the entry-requirements of their participants. Therefore, only those candidates who meet the requirements will be accepted.

Table 4.2 The considered prerequisites at PRINSIX and Prosjektakademiet, according to Section 2.2.2

Education program	Understand the competence level of the average participant	Understand the organizational needs and requirements.	Develop a structured approach to deliver PM competences.	Ensure that the PMEP receives the required resources.	Ensure that the PMEP receives the required support.
PRINSIX	✗	✓	✓	✓	✓
Prosjektakademiet	Partly	✓	✓	✓	✓

The entry-requirements for each HG level are listed in Appendix C. In contrast, FMA's PRINSIX only requires a high-school education of their participants. Due to the stricter requirements at Statsbygg's Prosjektakademiet, we assume that the EPDs have more advantages in anticipating the competences of its participants. However, during the interviews with project managers from Statsbygg, one respondent stated that the content of several courses were related to his prior education in PM. Thus, the interviewee did not gain any added value from the basic introductory courses in the education program. If the competences of the candidate were better understood, the candidate could have skipped some courses or even started at a higher educational level. This benefits both, the organization and the candidates.

Understand the organizational needs and requirements:
Both organizations follow the *organizational approach* to develop the PM competences of their employee. In this way PRINSIX and Prosjektakademiet can focus their PMEPs much more on the organizational needs and requirements. This claim is supported by the participants of our interviews. Almost all interviewees stated the importance of the PMEP to learn the organization-internal approach to PM. Even those interviewees with prior PM experience appreciated the organization-specific knowledge they had received during their education.

Develop a structured approach to deliver PM competences:
As explained in Section 4.2.1 and 4.2.2, both organizations provide a structured approach to their PM education. Given the information available, FMA uses the PMEP more as an supplement to strengthen the competences of their internal project managers. Statsbygg on the other hand, uses the PMEP to define the competences and responsibilities of their employee. A detailed description of the educational levels, their expected competences and responsibilities is provided in Appendix C. Thus, both programs follow a different educational background. While FMA considers the program more as an "additional education", Statsbygg's education program is considered a prerequisite to become a project manager within the organization. Another important part, as described in Section 2.2.2, is the ability and willingness to continuously improve the delivery of PM competences. The participation in this study itself could be considered as a great attempt to seek for improvements. Both programs also use questionnaires after each course to collect the feedback from the participants. According to the information of the EPDs of FMA and Statsbygg, both PMEPs are very flexible. Therefore, they are able to change courses rapidly if required or requested.

Ensure that the PMEP receives the required resources & support:
Based on the information from the interview with the EPDs, both programs receive the necessary support and resources. FMA's PRINSIX as well as Statsbygg's Prosjektakademiet have a high reputation within their own organizations. Both EPDs also try to involve top management to develop a culture in which the values of the education program are understood. This was confirmed during our interviews with the project managers.

4.3.3 The Comparison of the Educational Effort Hours

The model in Table 4.3 was developed to compare the effort hours needed to receive the PM certification at FMA and Statsbygg. Most of the information needed to benchmark the two PMEPs were gathered from the official web page of their organization and collected in an extensive data sheet in Excel. In the unlikely event that data was missing or obsolete, the EPDs was contacted to request the desired information. Based on the collected data the model in Table 4.3 was created. A summary of all information needed to understand and analyze Table 4.3 is provided in Appendix D. For more clarity, both PMEPs were divided into their educational levels. Subsequently, the total hours of work to complete each level were accumulated. To read the model correctly, it is important to understand that the next higher level already includes the effort hours of the previous level. For example, *FMA Nivå 2* already contain the effort hours required for *FMA Nivå 1*. This gives the reader a quick overview of the total effort hours required to complete both PMEPs.

The model in Table 4.3 is based on the work of Dr. Paul D. Giammalvo (Giammalvo, 2016), who developed a method to compare the different PM credentialing programs. He compared the different programs by accumulating the required effort hours "*to qualify for, prepare for, apply and become certified*" (Giammalvo, 2016). Table 4.3 follows the same theoretical approach as Giammalvo. However, several modifications were done to adapt the model to the requirements of this study. Since the original model was based on the American education standard, one major change was the adaption to the European Credit Transfer and Accumulation System (ECTS) (Education and Culture DG, 2015). As a result, the model became more accurate with regards to the application in Europe. Another change was the separation of the model into two categories: "*Entry-Requirements*" and "*Project Management Education/ Certification*". The *first category* describes the necessary preconditions to be accredited for the education program. These conditions can either be practical work experience or a academic bachelor's or a master's degree. According to Giammalvo (2016), a high-school degree is considered too basic to be part of the entry-requirements. Therefore, a high-school degree does not count towards the total accumulated level of effort. The *second category* is divided into the three educational approaches identified in Section 2.2.1: The *Academic approach*, the *Organizational approach* and the *Credential approach*. We implemented the international masters degree in PM from the Norwegian University of Science and Technology (NTNU) as an example for the academic approach. To be admitted for the master's program at NTNU, the candidate is requested to hold at least one valid bachelor degree in the field of engineering. The other columns in Table 4.3 are focused on the different educational levels of PRINSIX and Prosjektakademiet. A closer look at the model shows that PRINSIX follows a purely organizational approach whereas Prosjektakademiet seeks for a combination between organizational and credential approach. Thus, Statsbygg offers their participants the opportunity to become certified by PRINCE2. Upon completion of the first HG level (HG14) the candidate may take PRINCE2 Foundation (P2F) and PRINCE2 Practitioner (P2P) after completing the second HG level (HG15). Both certifications require a multiple-choice exam. With completion of both certifications, the participant gains 108.5 extra effort hours.

The penultimate row in Table 4.3 (*Level of Effort for Project Management Education/ Certification*) shows the total effort hours needed to complete the internal PM education at FMA and Statsbygg. It becomes apparent that PRINSIX is scoring slightly lower than Statsbygg's Prosjektakademiet. This was partly predictable since the PMEP at FMA is less complex than the one at Statsbygg. This statement is supported by the average hours each participant spends in the regular classroom session. Whereas the participant in Prosjektakademiet spends about 227.5 hours in the classroom session, the participant of FMA's PRINSIX spends only 126 hours. If we only compare the number of courses each participant has to take to complete Prosjektakademiet (16) with the number of courses in PRINSIX (9), we would expect Prosjektakademiet to score significantly higher than PRINSIX. This is not the case, as PRINSIX requires two extra individual submissions from its participants (*Innlevering nr 1 and nr 2*). According to the information of the EPD at FMA, these assignments are designed to enhance the long-term learning

Table 4.3 Comparison of the effort hours needed to receive the project management certification for the different educational levels at FMA and Statsbygg, adapted from Giammalvo (2016)

Order Number	1	2	3	4	5	6	7
Organization: / PM Education Program: / Educational level:	NTNU Master degree	FMA - PRINSIX Nivå 1	FMA - PRINSIX Nivå 2	Statsbygg - Prosjektaka. HG14	Statsbygg - Prosjektaka. HG15	Statsbygg - Prosjektaka. HG16	Statsbygg - Prosjektaka. HG18
Entry-Requirements							
Required Experience Hours AFTER Bachelors	0	0	0	0	3000	7500	15000
Standardized ECTS for BDEG	180	0	0	180	180	180	180
Level of Effort per ECTS by student for BDEG	27.5	0	0	27.5	27.5	27.5	27.5
Bachelors (BDEG) Level of Effort	4950	0	0	4950	4950	4950	4950
Standardized ECTS for MDEG	0	0	0	0	120	120	120
Level of Effort per ECTS by student for MDEG	0	0	0	0	27.5	27.5	27.5
Masters (MDEG) Level of Effort	0	0	0	0	3300	3300	3300
Project Management Education/ Certification							
Academic approach:	PM NTNU	-	-	-	-	-	-
Standardized ECTS for ADEG	120	0	0	0	0	0	0
Level of Effort per ECTS by student for ADEG	27.5	0	0	0	0	0	0
Academic Degree (ADEG) Level of Effort	3300	0	0	0	0	0	0
Organizational approach:	-	PRINSIX	PRINSIX	Prosjektaka.	Prosjektaka.	Prosjektaka.	Prosjektaka.
Standardized ECTS for ODEG	0	10	30	15	30	-	-
Level of Effort per ECTS by student for ODEG	0	27.5	27.5	27.5	27.5	-	-
Organizational Degree (ODEG) Level of Effort	0	275	825	413	825	873	895
PAPR Level of Effort	0	0	100	0	0	0	0
Credential approach:	-	-	-	P2F	P2F + P2P	P2F + P2P	P2F + P2P
Exam Duration in Hours	0	0	0	1	3.5	3.5	3.5
Level of Effort To Prepare for Exam	0	0	0	30	105	105	105
EXAM Level of Effort	0	0	0	31	108.5	108.5	108.5
Level of Effort for Project Management Education/ Certification	3300	275	925	444	934	982	1004
Total Accumulated Level of Effort (Entry-Requirements & Project Management Education/ Certification	8250	275	925	5394	12184	16732	24254

of their participants. To complete Nivå 2 at PRINSIX, each participant is furthermore requested to deliver one compulsory paper of approximately 5000 words (*Prosjektoppgave*). In Table 4.3, this paper is termed *PARP* and provides each participant with 100 extra effort hours (Giammalvo, 2016). In direct comparison, *Statsbygg-Prosjektaka. HG18* requires 79 more effort hours than *FMA-PRINSIX Nivå 2*. Nevertheless, both programs are less time demanding than the PM master's degree at NTNU. This is understandable, as the master's degree at the NTNU is considered full-time, while the participants of PRINSIX and Prosjektakademiet attend their courses next to their daily work.

However, in the total sum (*Total Accumulated Level of Effort*), Statsbygg's Prosjektakademiet is scoring much higher than PRINSIX and the PM master's degree at NTNU. The main reason for this is that Statsbygg puts more emphasis on entry-requirements for each level of their educational program. While PRINSIX just requires a high-school degree to enter both levels of their education program, Statsbygg requires at least a bachelor's degree to participate in the lowest HG level (HG14) of their education program. To enter the second HG level (HG15) at Statsbygg a combination of practical work experience and a corresponding master's degree is required. The entry-requirements increase as higher the HG level becomes. Appendix C provides a detailed description about the requirements for each level. In this way, Statsbygg ensures that their project managers not only have the necessary theoretical knowledge

but also the practical work experience as requested in Section 2.2.3. Due to the practical experience the participants will have a better understanding of when to use and how to apply the theory of their formal education. Based on the information from the interviews with former attendees of the PMEP at Statsbygg we concluded that the increased focus on practical experience will improve the discussions and information exchange during the classroom sessions.

Restrictions of the Described Model

The model described in Table 4.3 contains some restrictions which are considered in this section. The first restriction is related to the ECTS of the bachelor's (BDEG) and master's (MDEG) degree. According to NTNU (2016), the illustrated model assumes 180 ECTS credits for all bachelor- and 120 ECTS credits for all master students. On the other hand, the Education and Culture DG (2015) describes the amount of ECTS credits in a range between 180-240 ECTS for the first academic education and 90-120 for the second academic education. To be more accurate, this model needs to be applied for each participant individually. However, the goal was to provide a generic comparison between the two PMEPs. The same applies to the second restriction. Rather than having a range for the level of effort hours per ECTS, as described in Education and Culture DG (2015) and NTNU (2016), this model assumes an average of 27.5 hours. Since we had no further information, this number was also used to calculate the effort hours for PRINSIX and Prosjektakademiet.

The third restriction of Table 4.3 is related to the accumulation of effort hours for the last two HG levels at Prosjektakademiet. Since these levels are not based on ECTS credits (studiepoeng), we accumulated the total level of effort hours, based on the anticipated level of effort hours for each course. This also includes the hours expected for the web-based learning applications. Most anticipated effort hours for the classroom sessions and the web-based learning applications were described in a range. Hence, we decided to use the average to calculate the total level of effort hours for both HG levels. Another restriction of Table 4.3 is, that it assumes that all participants take the desired exams of their PMEP. However, PRINSIX and Prosjektakademiet leave it to their participants to decide whether to take the exam or not. If the participant decides not to take the exam, the total amount of effort hours to complete the PMEP will be reduced by the effort hours needed to take the final exam. At Prosjektakademiet the total sum must be reduced by the effort hours needed to complete both PRINCE2 exams (P2F and P2P). For PRINSIX, this requires a more detailed recalculation because the exams are included in the ECTS credits of the PMEP.

The last, major restriction of the model in Table 4.3 is that it focuses exclusively on the hours needed to obtain the PM certification. It does not take the content or learning outcomes of the courses into account. Thus, this model can not make any direct statements about the quality of education within the program. Therefore a more detailed analyses about the courses and their desired learning outcomes is needed.

4.3.4 The Comparison of the Educational Content

This section aims to investigate and compare the content of both PMEPs. Therefore, PRINSIX and Prosjektakademiet were analyzed with regards to the expected learning outcomes of their education program. First, we searched for useful information on the official web page of FMA and Statsbygg. For both organizations we found a detailed description about their PMEPs, the individual courses and the expected learning outcomes for the participant. The collected data was gathered in an extensive Excel sheet. To compare both programs a third, independent model from the Project Management Institute (2013) was used. This model was found in Morris et al. (2006) and contains the fundamental knowledge areas in PM. Each knowledge area is subdivided into smaller topics that allow each knowledge area to be analyzed in

more detail. The model is illustrated in Appendix E. Some smaller adjustments were done to adapt the model to the requirements of our investigation. Subsequently, the content of the courses in PRINSIX and Prosjektakademiet was checked for each topic of the knowledge areas. To identify whether the topic is included or not, we applied the approach used by the Global Alliance for the Project Professions (2018). Thus, we distinguished between: *fully considered*, *partly considered* and *not considered*.

- Fully considered: Requires that two or more learning outcomes of the courses conform with the searched term. Minor deviations of the searched term were also considered.
- Partly considered: If only one reference to the searched term was found.
- Not considered: If no single reference to the searched term was found.

The results of our first investigation are presented in Appendix F. In a second step, the EPDs at both organizations had the opportunity to overlook the results and correct them if necessary. We chose this approach to increase the accuracy of the analysis, as we identified two issues related to the formal course description on the homepage of FMA and Statsbygg. The first problem we found was that some courses provided a better description about the expected learning outcomes than others. Several courses mentioned the need for we-based learning applications without specifying the desired learning outcomes for the user. The second problem was that some courses were described in such detail that it is questionable whether the expected learning outcomes can actually be achieved within the course duration. One example for the latter was the course *M04* at FMA. Therefore, we decided to include the EPDs of both PMEPs in the evaluation. If there was evidence that the information of the EPD was valid, we implemented the change in the analysis. The results, including the feedback of the EPDs, are illustrated in Table 4.4.

It becomes evident that Prosjektakademiet covers the studied knowledge areas more closely. While FMA's PRINSIX achieves a *Total Coverage* of sixty-five percent, Statsbygg's Prosjektakademiet scores at sixty-nine percent. PRINSIX considers almost all topics of the nine knowledge areas. Only one topic (*Manage meetings*) is not considered. However, it appears that most of the studied knowledge areas are only partly taken into account. Comparing Table F.1 from Appendix F with Table 4.4 reveals that, based on the formal course description PRINSIX possess a higher coverage of the educational content than Statsbygg's Prosjektakademiet. Several of the investigated knowledge areas were reclassified based on the individual evaluation of the EPD at FMA. Thus, PRINSIX scores fifteen percent lower than first anticipated.

On the other hand, Statsbygg's Prosjektakademiet has more knowledge areas that are fully considered (e.g. *Project Human Resource Management* and *Project Procurement Management*). Nevertheless, a recurring problem was found related to the control of cost, quality and risk response. No evidence was found that these topics are considered in the current PMEP at Statsbygg. According to the information of the EPDs, the cost controlling is performed by a separate department (Prosjektøkonom) Statsbygg. Therefore, the cost controlling is considered less important for the PMEP. Since Statsbygg requires all project managers to take independent planning courses that are not part of Prosjektakademiet, the topic *Schedule control* has been updated from not considered to partly considered. Another update was accredited for *Project plan development* and *Project plan execution*. Both topics are fully considered in the courses *Styring av prosjektusikkerhet* and *Statsbyggs prosjektmodell* of Statsbygg's Prosjektakademiet.

Table 4.4 furthermore contains the educational balance between management and leadership development. Whereas PRINSIX solely relies on the development of management skills, Prosjektakademiet strives for a combination of management and leadership development. Thus, thirty-two percent of the total effort hours to complete Statsbygg's Prosjektakademiet are spend to develop the leadership competences of the candidate. The importance of an balanced approach to develop effective PM competences is mentioned in Section 2.2.3 and 2.3.3.

Table 4.4 Comparison of the educational content in PRINSIX and Prosjektakademiet based on the course description and the feedback from the education program directors, inspired by Project Management Institute (2013) and Global Alliance for the Project Professions (2018)

PM Knowledge Areas	*PRINSIX*	*Prosjektaka.*
Project Integration Management		
Project plan development		
Project plan execution		
Overall change control		
Project Cost Management		
Resource management		
Cost estimation		
Cost budgeting		
Cost control		
Project Human Resource Management		
Organizational planning		
Individual development		
Team development		
Project Scope Management		
Initiation		
Scope planning		
Scope change control		
Project Quality Management		
Quality management		
Quality assurance		
Quality control		

PM Knowledge Areas	*PRINSIX*	*Prosjektaka.*
Project Risk Management		
Risk identification		
Risk response developement		
Risk response control		
Project Communication Management		
Communication planning		
Information distribution		
Managing meetings		
Performance reporting		
Project Time Management		
Schedule developement		
Schedule control		
Project Procurement Management		
Procurement planning		
Contract strategy		
TOTAL COVERAGE [%]:	65	69
Management vs. Leadership Development		
Hours spend on managment development [%]	100	68
Hours spend on leadership development [%]	0	32

	Fully considered
	Partly considered
	Not considered

4.4 Discussion

In this chapter, we have identified various challenges related to educational development and program structure in PRINSIX and Prosjektakademiet. These challenges are discussed in the following section. We will furthermore introduce new intellectual approaches that can help to overcome these challenges.

4.4.1 The Challenges of Defining the Right Entry-Requirements

The model in Table 4.3 shows that the candidates of Statsbygg's Prosjektakademiet spend about twenty-six times more effort hours to complete the highest level of their education program than the candidates of FMA's PRINSIX. The main difference lies not in the different workloads within the education program, but rather in the different entry-requirements. To reach the final stage of Prosjektakademiet (HG18), the candidate must demonstrate at least ten years of practical work experience, which equates to 15,000 effort hours. Based on the information of the EPDs at Statsbygg, this approach was chosen to retain

the project managers in the long term. The project managers are encourage to stay in the company and complete the PMEP to execute the largest projects at Statsbygg. PRINSIX follows a different educational approach. During our research and interviews with prior attendees of the PMEP we identified three potential reasons for why PRINSIX requires no entry-requirements according to Giammalvo (2016). The *first* reason is related to the background of the people working at FMA. Many people have been working in the armed forces since their high-school education. The armed forces offers their employee several opportunities to develop their personal competences. Although the employee has participated in various internal or external courses, these courses often lack standard ECTS credentials that could be equated with an academic bachelor's or master's degree. By tightening the entry-requirements to a bachelor's or master's degree, these employees may not be able to participate in PRINSIX, even though they may possess the right competences. The *second* reason is that not every candidate participates in PRINSIX with the goal to become a project manager. Many candidates participate in the program to better understand the internal structures and processes. This became particularly clear during one of the interviews with a previous PMEP attendee at FMA, who encourages its employees to participate at least in the first level (Nivå 1) of PRINSIX. The last, and probably most tangible reason is related to the internal payment system at FMA. Based on the information of the EPD, there is a correlation between entry-requirements and profit. If PRINSIX's entry requirements were increased, fewer people would attend the courses, which would reduce the total income of the PMEP.

The EPDs of PRINSIX and Prosjektakademiet may consider to evaluate the competences of each candidate before entering the PMEP. According to Ramazani and Jergeas (2015), not every individual is suited or capable to be a competent project manager or project leader (Müller and Turner, 2010; Dulewicz and Higgs, 2003). This depends to a large extent on the individuals personality, ability and motivation (as mentioned in Figure 2.2). By carrying out a preliminary evaluation the competent candidates can be selected at an early stage. This will benefit both, the organization as well as the candidate

4.4.2 Educational Backlog

According to Giammalvo (2016), it is questionable if a purely theoretical approach to PM education, as applied by FMA, is sufficient. This thought is supported by Farashah et al. (2019). They describe PM as a "*practice oriented profession*" which can not exclusively rely on theoretical knowledge. It could be that FMA internally controls the selection of suitable students for the PMEP. However, to ensure that all candidates, who wish to become project managers, possess a basic level of work experience, it is recommended to implement a minimum set of requirements that all candidates must meet. Since not all PRINSIX candidates are interested in becoming project managers, it could be argued that these requirements are most applicable for Nivå 2 of the PMEP. In this way, Nivå 1 is used as a basic introduction to the structure and processes of FMA, while Nivå 2 focuses more on developing the required PM competencies. Nivå 2 will thus be exclusively designated for the project managers at FMA.

Another interesting observation is the different focus on management and leadership development in both PMEPs, as shown in Table 4.4. While PRINSIX solely relies on the development of management competences, Prosjektakademiet strives for a balance between both management and leadership. According to the theory in Section 2.2.3 and 2.3.3, effective PM requires a combination of both dimensions. This is supported by Ramazani and Jergeas (2015) who state that the education of project managers can not only rely on the tools and techniques of PM, but also focus on the ability to convey them through leadership (Müller and Turner, 2010). Müller and Turner (2010) furthermore argue that having skills in only one of the competence areas will lead to less success. This is also illustrated in Table 2.4. Thus, focusing purely on management will create project managers who are capable to handle projects in a structured manner. However, they will lack the ability of a project leader, to encourage, motivate, and share the vision. FMA may not focus on the development of leadership competences during their PM

education as several employees are coming from the armed forces, which have a high focus on leadership development. However, not all people who work at FMA automatically have a military background. Thus, it is recommended by the authors to include leadership development in the current educational approach at PRINSIX.

4.4.3 The Weakness of Comparing the Educational Content

The model used to compare the content of both PMEPs is taken from the Project Management Institute (2013). Since PRINSIX is to a large extent based on the Project Management Institute (PMI) standard, this investigation slightly benefits the education program at FMA. This could be the reason why PRINSIX scored higher in the first comparison based on the formal course description, illustrated in Table F.1. On the other hand, the PMI standard is very generic. It is designed to suit "*most projects most of the time*" (Project Management Institute, 2007). Therefore, it could be argued that the PMI standard also applies for Prosjektakademiet. However, just as the organizational approach to PM often varies from one organization to another, the educational content may not always be the same. This leads us to a major limitation of our analysis on the educational content. PM practice has more variety than just the formal standard from PMI. FMA and Statsbygg may have different organizational needs and requirements on PM which are not considered in the Project Management Institute (2013). Therefore, it is difficult to tell which organization performs better, based on the analysis of the educational content in Table 4.4. This requires a more detailed understanding of the organizational background. However, Table 4.4 can be used as a point of reference for the EPDs to identify possible backlogs in the current education system. We leave this decision to the EPDs of each organization.

Chapter 5

Organizational View on the Education Programs

This chapter will present the qualitative data collected through interviews at both organizations. We distinguish the results obtained into two groups, according to the research model presented in Figure 3.5. First, we present the views of the Education Program Directors (EPDs) on the Project Management Education Programs (PMEPs) and afterwards the opinion of the previous participants of the education program on the respective PMEP.

5.1 The Education Program Directors

The EPDs of PRINSIX and Prosjektakademiet have extensive experience in running the PMEP in their respective organizations, clocking in at no less than six years. In the hierarchical structure of the organizations the PMEPs are structured differently. While PRINSIX from Forsvarsmateriell (FMA) is located underneath the department of acquisition management, Statsbygg's Prosjektakademiet is placed in the care of the Human Resource (HR) department.

The EPDs are directly responsible for the development of project managers across the organization. The PMEPs therefore have a vital position in project based organizations, and could indirectly affect the success of projects. Nevertheless, the effectiveness of the PMEP is affected by many things including its environment.

5.1.1 Organizational Support towards the Education Programs

The EPDs expressed in the interviews that they, in general, were happy about the support they receive from the top management. How the top management is involved, or show their support differentiates between the organizations. Another commonality is how the PMEP is well known throughout the organizations, meaning that they are well established in their environment.

After completion of Nivå 2 at FMA, a graduation ceremony is held where the top management is invited. In this way, the position of the PMEP is cemented in the top management and the future project managers in the organization are presented.

Statsbygg has another approach to secure the involvement of the top management. The PMEP gives an annual presentation to the top management, where they could come with input and suggestions. Additionally, the leader group of the project owner department (Byggherreavdelingen) is meeting 2-3 times

per annum. The leader group is invited to propose improvements to the PMEP to reflect changes in practice, methodology or regulations. In the leader group meeting, the strategy for the PMEP is decided.

Figure 5.1 illustrates how the EPDs perceive the organizational attitude towards the PMEP. This Figure illustrates that the answers of the EPDs vary just slightly from each other. Both programs are very well rated and are between four to five for all questions. The main differences are the extent to which the PMEP receives sufficient funding and how the different organizations understand the value of the PMEP. The former can be explained by the organizational placement of the PMEP and the internal payment structure. Whereas FMA has an internal pricing system, Statsbygg does not (at least for Prosjektakademiet). Theses findings support the claim that the PMEPs have a solid foundation in the organization. The interest of top management towards the internal education program is ranked at four, where both describe that the top management involve themselves as far as much as their schedule allows. The EPDs at Statsbygg stated:

> "*The top management finds it very important, and support the strategic competency planning and development that Prosjektakademiet is responsible for.*"

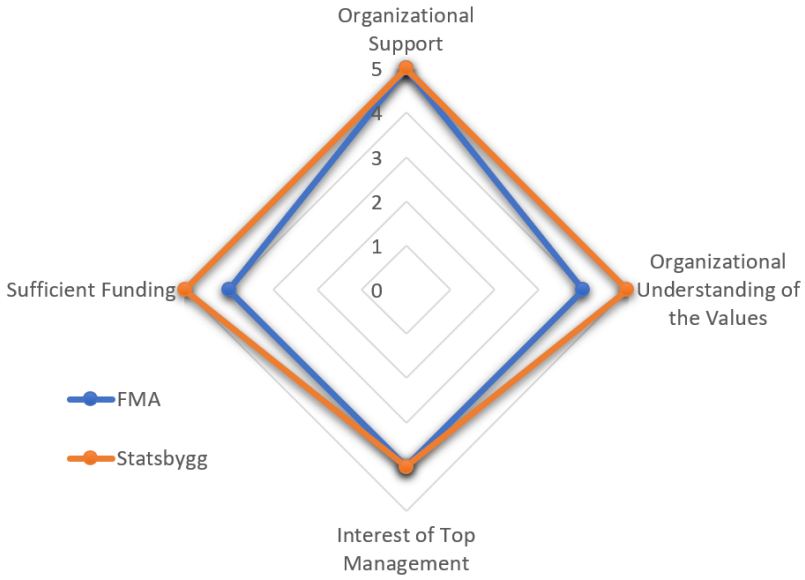

Figure 5.1 Organizational attitude towards the education program according to the education program directors

5.1.2 Education Program Directors Opinion on their Education Programs

The EPDs of both organization underline that their PMEP is constantly under development. It is also no problem to re-evaluate the educational program at any time and implement necessary changes as needed. During our interviews we got the impression that the EPDs are satisfied with their current state of the PMEP.

Both PMEPs have similar approaches to educate their participants. They use web-based learning applications, classic sessions, group discussions and case studies. Based on their feedback it seems that both EPDs are happy with their educational approaches. However, both also mentioned the need for more flexibility within their education program. They put special emphasis on educational solutions that increase the flexibility for the candidate (i.e. web-based learning). For conducting the courses the PMEPs try to utilize their internal resources as much as possible. However, some courses require external competences. The EPDs at Statsbygg stated that they had initially tried to "*buy courses from the shelves*".

This was not very successful, as the candidates were more interested in learning the internal approach to Project Management (PM). Thus the program became much more customized.

According to the EPD of FMA, the pedagogic model is good. It provides the participants with background knowledge, cases and discussions. The web-based learning is meant to prepare the participants to actively contribute in the lectures. In addition, the individual assignments will enhance the long-term learning of the candidates. Elements the EPD would like to improve: more on digital PM, more real-life cases and enhance the web-based learning. During the interview the EPD reflected on the position of the PMEP, and stated:

> "*I could give you a certificate for driving a car, but it does not imply that you are a good driver.*"

By this the EPD suggests that even though the PMEP provides a good foundation for the participants, it does not guarantee that they are competent project managers.

Statsbygg's EPDs stated much of the same as their FMA counterpart. However, they especially highlighted the need to make it more flexible, and pointed out web-based learning as a solution to it. They also expressed a desire to change their lectures so that they would be seen more as a workshop, rather than pure confrontational teaching. In this way they considered to increase the focus on cases.

In Figure 5.2 the EPDs impression about the current state of their PMEP is illustrated. We asked them six questions to be answered according to the five point Likert scale. The answers provided were used to paint a picture of the current performance of the PMEPs, seen from the EPDs point of view. We asked whether their education program is up to date, its extensiveness, quality, success and if they have measured the effect and satisfaction of their PMEP. The answers are reflected in the spider chart, and show that there mostly is a coherence between the answers. The exceptions are the perceived extensiveness of the PMEP and to what extent they measure the effects of it. Where the EPD of FMA stated clearly the difficulties of measuring the effect of the PMEP, the EPDs of Statsbygg were more positive on their ability to measure this effect. We were not able to identify how Statsbygg measure the effect of the PMEP.

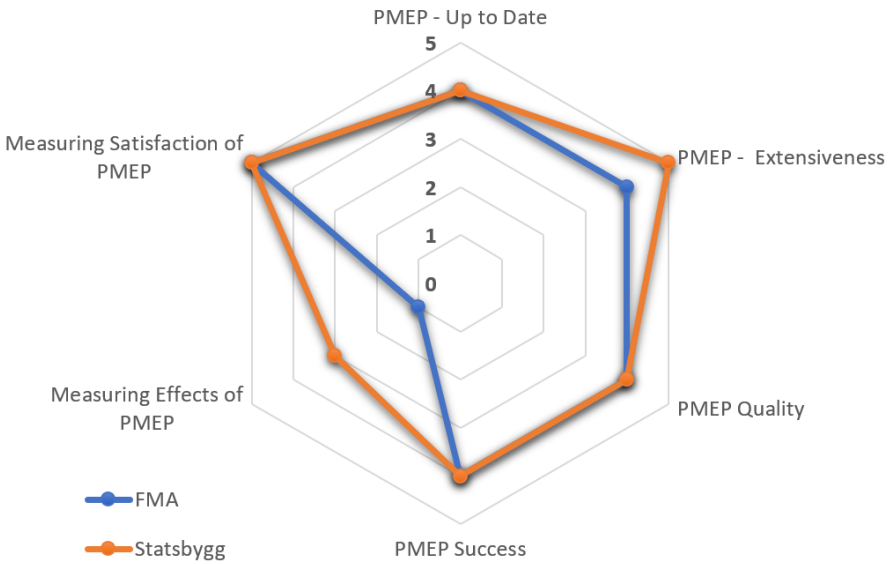

Figure 5.2 The education program directors opinion on the education program

5.2 The Participants of the Education Programs

To conduct our interviews, we have selected people with different educational background and experience in PM. Table 5.1 gives a general overview about the candidates selected for this research. We interviewed four employees of each organization. At Statsbygg, all interviewees were holding a masters degree, and were diversified in their level of experience in PM. By contrast, the respondents from FMA had different levels of education. Of the four respondents, three had a civilian master's degree, two of which also had a military bachelors in engineering. The interviewees from FMA have a broad age distribution. The same implies to the experience level in PM. However, only one of the interviewed subjects currently works as a project manager within the organization.

	Age [years]			**Education Level**		**Previous PM training or courses**	**PM experience [years]**			**Currently work as a project manager**
	<35	**36-50**	**>51**	**Military Bachelor**	**Civilian Master**		**0**	**<5**	**>5**	
FMA	1	1	2	3	3	3	1	2	1	1
Statsbygg	2	-	2	-	4	2	1	1	2	3

Table 5.1 Profiles of the education program participants interviewed in this research

It should also be mentioned that three of the interviewees from FMA work within the same field, Information and communications technology (ICT). Due to time constraints and difficulties in establishing the right contacts, we were unable to attract other interviewees from other parts of the organization.

We started by asking the interviewees about their opinion on the PMEP they participated in. We wanted the respondents to elaborate on the extensiveness of the education program, with regards to the content and duration. The intent of these questions are to expose the participants attitude towards the PMEP, and reveal positive and negative features. These questions should spark a reflection on their perceived quality of the PMEP.

5.2.1 The Quality of PRINSIX

As we scrutinized the surface of PRINSIX and its content, the respondents were more or less in agreement. They generally argued that the content, structure, flexibility (in terms of web-based learning) and the use of internal resources, as well as their own experiences with the education program, are good. One candidate explicitly mentioned how the experienced project managers holding the courses were able to "*..spice up the theory with practical FMA experience*". This statement was indirectly supported by the other interviewed candidates. Further, the content of the PMEP was also considered to be satisfying for the interviewees. However, it was also pointed out that the course content in some cases was "*to generic and challenging to apply (in their work)*". One of the respondents asked; "*how does the company want me to do things?*". In addition, the content of the web-based learning applications was considered too generic and is thus not geared to the application at FMA. However, when the respondents were asked whether their PMEP was up to date, they all ranked it at four, according to the five-point Likert scale. This is illustrated in Figure 5.3. The interviewees did not agree on the extensiveness of the education program. Here we can see a negative correlation with the age and experience of the candidate. It is furthermore influenced by the personal impression about the comprehensiveness of the education program. One of the interviewees specifically mentioned the deficits in scope, time and cost management. The subject did not felt prepared enough to handle the tasks at hand.

When we asked them about the different learning methods they experienced in their education, they

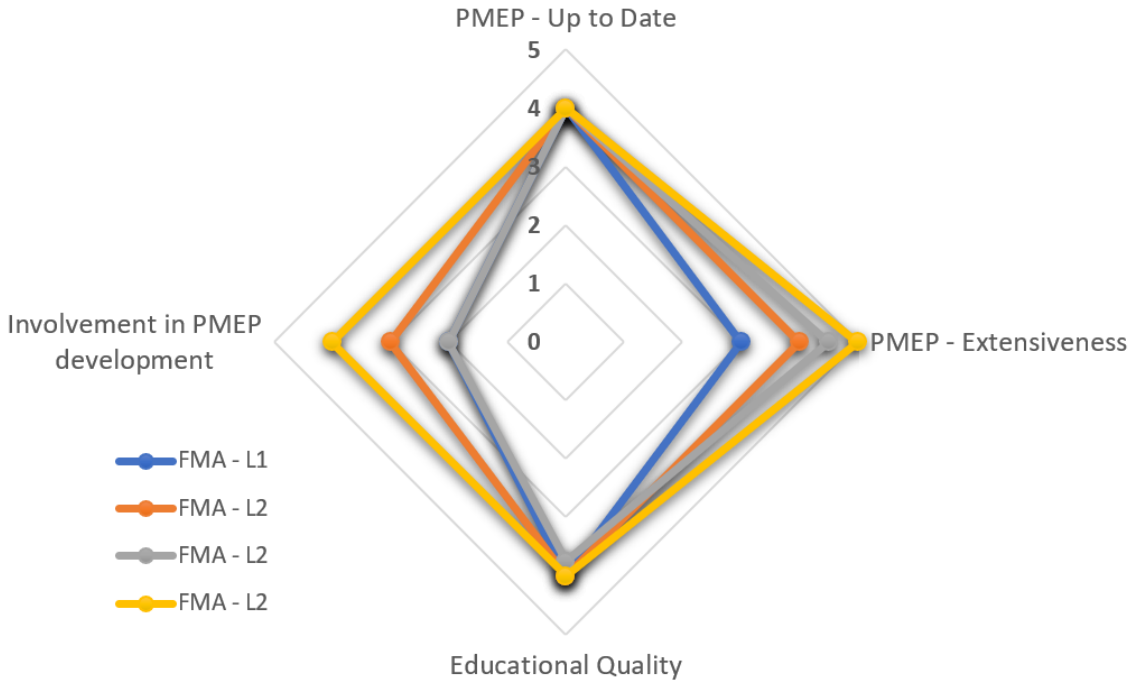

Figure 5.3 PRINSIX - The participants attitude towards the education program

replied in a positive manner. Specifying how the web-based learning gave them a great deal of freedom and flexibility in acquiring knowledge in their own interest. The web-based learning also gave them the possibility to go more thoroughly through unfamiliar topics and skim through familiar topics. Further, they expressed how they appreciate the lectures, cases and discussions in the classes.

PRINSIX scores rather low in the involvement of the candidate in developing the PMEP, as illustrated in Figure 5.3. Even though each candidate is requested to evaluate each course module after its completion one interviewee referred the weak rating to the lack of responses on whether or not the changes were implemented. The participants of PRINSIX are furthermore requested to assess the performance of the total education program at their graduation ceremony. To encourage the continuous improvement of the PMEP one interviewee suggested that the EPD should take part in the annual PM gathering at FMA. Here, the EPD will find fertile ground for discussions and possible suggestions for improvements.

Finally, their opinion on the quality of the PMEP was queried. According to the answers in Figure 5.3 all respondents answered roughly the same for the quality of the PMEP, four. This is also reflected throughout the interviews.

At a side note, the interviews revealed that the PMEP has a high focus on larger projects. The interviewees working within ICT felt that their projects were not completely covered by the PMEP. They expressed the need to teach the application of PRINSIX for smaller projects. Pointing out especially the multitude of documentations required for the projects at FMA. They ask if it is possible to include shortcuts for smaller projects, and compared it to alpine skiing:

> "*There are two extremes of getting down a hill, you could either run slalom, getting through all the gates. Or you could run downhill through the course, not hitting as many gates as for slalom, thus making it a faster process.*"

5.2.2 The Quality of Prosjektakademiet

The interviews with the candidates from Prosjektakademiet were conducted in a similar way as the ones from PRINSIX. Our general impression is that the candidates were quite satisfy with their PM education. When we asked them more specifically about the educational content and the duration of the education program, two of the interviewees mentioned that some of the lectures were a bit basic, and they would like to focus more on the PM practice at Statsbygg. These two candidates have taken courses within PM before joining Statsbygg. They furthermore requested to have more advanced discussions during the classroom sessions. One of them stated that "*..the program* (PMEP) *aims wide, and sometimes it hits*". By this, the candidate wanted to highlight the various backgrounds of the participants and that for some cases the courses were a bit too basic. It was further questioned if the PMEP should take the background knowledge of the participant into account. When we asked respondents if they were missing topics in the PMEP, everyone came up with suggestions. Some of them are listed below:

1. Progress Management (Fremdriftsstyring)
2. Schedule and Planning
3. More detailed courses like:
   (a) Agile Methods
   (b) Procurement (Anskaffelse)
4. Digitalization in PM
5. Systematic completion (Systematisk Ferdigstillelse)
6. Operational Management (Operativ Ledelse)
7. A course addressing the problems a project manager could face on the construction site.

When we asked the respondents about the scope of the PMEP, the answers showed that, in contrast to FMA, it was the most experienced candidates who found it to be most extensive. This is illustrated in Figure 5.4.

The teaching methods applied at Prosjektakademiet are typically web-based learning prior to the classroom gatherings, where they go through cases and encourage discussions. This is to a large extent appreciated by the interviewees. However, it was also mentioned that the web-based learning for some of the course modules were to extensive. Three interviewees appeared to be very busy during their daily work days, and thus struggled to find time to conduct the web-based learning applications. This was further emphasized because they were grateful for the full-day gatherings as they had the time to focus fully on the courses. It was also mentioned that the lecturers were competent and good at conveying the essence of the courses. This is reflected in the question about the quality of the PMEP, as it was rated four on average.

Also for the PMEP participants at Statsbygg, the feeling of involvement in the development of the PMEP was relatively low. This is depicted in Figure 5.4. The participants were given a survey, per e-mail, upon completion of the education program. In the opinion of two respondents, this was not an ideal method, as the e-mail can easily be forgotten among the other working tasks. However, one of the interviewees stated that it is possible to provide the EPDs with direct feedback if desired. It was also noted that two respondents had specific feedback but not the right forum to address it.

Of those who participated in the course module *Leadership and communication* we have heard nothing but praise. Although, they have described it as a challenging and demanding course. They were put

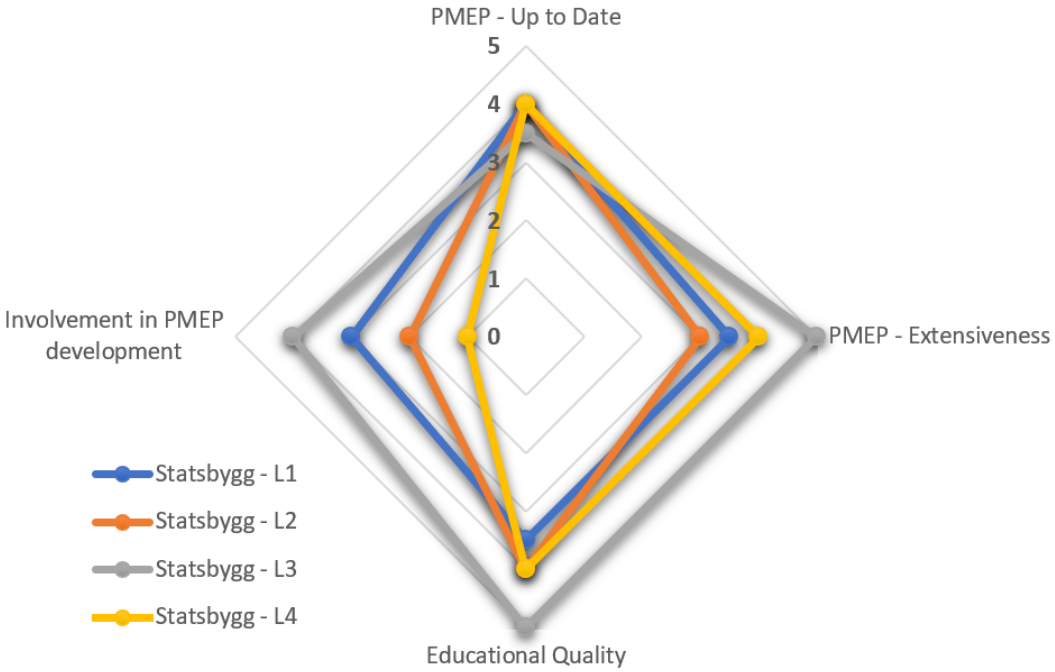

Figure 5.4 Prosjektakademiet - The participants attitude towards the education program

to the test, and had to step out of their comfort zone. One of the interviewees said it to be one of the most important courses of *Prosjektakademiet*. This is supported by another interviewee who stated that:

> "*Taking this course will make you more qualified to be a good communicator and project leader. There are not many employer competing with Statsbygg on the same level.*"

By this the interviewee explained satisfaction with the balance of management and leadership qualities in the development of project managers at Statsbygg.

5.3 Discussion

There are several points that should be discussed. First of all we feel the need to criticize the research design. Where the results obtained could be considered more valid if we were able to include more interview subjects. Additionally, how the interview subjects were chosen by the EPDs is a weakness of the report. Nonetheless, the results obtained showed that the interview subjects were not positively biased in any way, and provided us with valuable information about the PMEPs. As the interview is exploratory in nature, the number of subjects is not considered a big problem. We still believe a larger focus group would provide us with a broader perspective on the PMEPs. With regards to the distribution of the participants background, they were fairly good. To criticize our research, we would have liked to included more people who are currently working as a project manager.

Second, we need to discuss what the EPDs said during the interviews and what information is trustworthy. The EPDs have been responsible for their PMEPs for a substantial period of time. This has made them highly capable of their job. Even though the EPDs are from two different organizations, they both seem to be equally happy about their education program. They feel that their PMEP is generally good, but also see the possibility to improve it even further. The fact that they have participated in this study

is probably one of the best examples for this. In the interviews they seemed to be positively biased, but still realistic about the PMEPs.

The third point of discussion is the opinion of the PMEP participants on the education program and their suggestions for improvements. The interviewees were distributed in such a way that some of them were not recent graduated, but had gained experience in projects. Thus, the recent graduated candidates would have a different reference point with regard to the structure and the courses of the PMEP than the more experienced candidates. This was confirmed during our interview as some of the more experienced candidates proposed to introduce topics that had already been covered by the PMEP. Therefore, some of the comments and answers about the current status of the PMEP of the more experienced candidates may be invalid. At the same time we have seen that their experience is important to pinpoint which parts of the PMEP can be improved. This is therefore a two-edged sword, where those with long experience could give the most accurate feedback on what is missing, but they would also have the most distant to its resent development. Figure 5.3 and 5.4 show that there are some similarities between the answers of the interviewees at FMA and Statsbygg. The average score is more or less the same for all the questions.

Chapter 6

Discussion

This chapter will discuss the Research Questions (RQs) and connect them to both the theory and empirical findings. The first RQ is exploring what it takes to be a competent project manager, while the second will look into how they are developed. This discussion is, unlike the previous ones, an attempt to sew each part into a bigger picture. This is done in accordance with the philosophical thinking behind qualitative triangulation and the hermeneutic spiral.

6.1 RQ 1: What does it take to be a competent project manager?

This RQ is a difficult and philosophical question, that we aimed to answer by the theoretical part of this study. We asked ourselves what a competent project manager should know, and if the ideal of a project manager could vary between different cultures and organizations. By answering these Sub-Research Questions (SRQs) we believed that the notion of what it takes to be a project manager could be answered. This was purely based on the literature study, the empirical findings from the comparison of both organizations is not used.

- **SRQ 1.1: What knowledge and skills should a competent project manager possess?**

  We started venturing into this topic asking what it takes to be a competent project manager. From our previous experience, both academic and professional, we knew that there is several different actors who has defined what skills and knowledge a project manager should possess. They are typically associations that have a ventured interest in this topic, as they in many cases are providers of PM certifications. We investigated how they are distinguishable from each other, and what topics they consider. These are referred to as Body of Knowledges (BoKs). Global Alliance for the Project Professions (GAPPS) defined a set of knowledge areas that they believe a project manager should be familiar with. The knowledge areas are shown in Tables A.1 and A.2. Based on this work, it is obvious that there are some knowledge areas in which a project manager should be competent. However, we argue that the project manager does not necessarily need to be an expert in all of them. As there are several different project types. Some projects might be more front-heavy than others, outsourcing much of the execution phase.

  Section 2.3 explains how the project manager should not only possess knowledge in management, but also skills in leadership. Kotter (2001) explicitly stated how "*management and leadership is two distinctive and complementary systems of action*". He further expresses how they "*both are necessary for success in an increasingly complex and volatile business environment*". But what is leadership, and how should it be exerted? And is it possible for all to become good leaders? Firstly,

we argued that the leadership school of competency is the best model to develop and evaluate the skills of a leader. Here it is possible to expose weaknesses in the 15 different competencies and develop the individual skills. But, it is also argued a lot that becoming a good leader is not as simple as developing a few competencies. Mintzberg (1975) expresses how leadership skills cannot be taught in a classroom, they require practical experience.

If we recall Figure 2.4, it illustrate that a combination of both leadership and management is appropriate. This is also supported by Thoms and Pinto (1999) and Thomas and Mengel (2008). Klatt and Moksness (2019) argues that leadership is truly a necessity when the project uncertainty is high, or the project faces a crisis. Until then, they express how management is the preferred tool.

- **SRQ 1.2: Are there different ideals of a competent project manager?** Like others, the project manager is also a product of its environment. When considering the environment it is useful to separate it into external and internal. The external environment is often determined by the societal structure, signified by the culture and the hierarchical system. In this way we could determine how the management structure is defined in the societal structure, i.e. flat or strong hierarchical. The external environment could give an indication of what the society expect from the project managers. In this study, the external environment is more or less the same for Statsbygg and FMA. Therefor, it has to a large extent been neglected. However, we recognize its significant on project management and leadership.

  The internal structure on the other hand, is considered to be the organizational structure, signified by the culture. More specifically, a project manager is influenced by the project organization, the mother organization, their different cultures and eventually the projects itself. The projects may differ in their novelty, complexity and composition of staff, which will influence the behavior of the project manager. In Section 2.3.2 we elaborate, based on the former work of Müller and Turner (2010), how leadership should be adapted to the project. By this, they mean that the features of the project and the project members will require different leadership approaches, emphasized by Figure 2.5.

  The answer to this SRQ is not based on empirical findings, but on literature reviews on the topic of project management. We have seen that different societies have their own opinion on how a manager and a leader should be. This is easy to observe as the hierarchical structure of projects, often reflects the hierarchical structure of the society. Thus, there are different ideals of a competent project manager. Both in terms of how management and leadership is executed in the hierarchical structure, and how the manager should behave for the different types of projects.

Are we then any closer defining what it takes to be a competent project manager? We have seen that there is generic management knowledge that should be recognized. Still, not all of the defined knowledge areas are equally important for each project manager. We know that leadership is an important factor for the success of projects. This is also emphasized by Müller et al. (2012). Where they found Emotional leadership competences (EQ) and Mangerial leadership competences (MQ) as important factors to contribute to the success of projects with high complexity (of interaction). Crawford et al. (2006) explain it slightly different, explaining that a competent project manager is not the master of processes. They further explained that a competent project manager must go beyond the theoretical knowledge and be able to reflect on the practices and actions taken (Crawford et al., 2006).

6.2 RQ 2: Are the Project Management Education Programs (PMEPs) successful at developing competent project managers?

To determine whether the PMEPs are successful in their approach of developing project managers is a challenging task, as there are many variables determining its successfulness. Additionally, many of these variables are longitudinal in nature, making them even more challenging to measure. To answer whether the PMEPs are successful with their approach or not, we have interviewed both the Education Program Directors (EPDs) and the prior participants of the PMEP. The interviewees presented their subjective opinion on how good and effective the PMEPs are. In order to answer this RQ we included three SRQs that we identified as fundamental to receive a larger picture on the RQ. To answer these questions, it was important for us to consider if the PMEPs are able to make better project managers. From a PMEP point of view, this is determined by two factors. Firstly, if the PMEP is successful or not, depends on how they are able to focus and teach the right elements. Secondly, it should be investigated if the PMEP is good at conveying the desired knowledge.

- **SRQ 2.1: Are the Project Management Education Programs (PMEPs) transferring the appropriate knowledge to their participants?**

  There are many ways of considering if the PMEPs are able to transfer the appropriate knowledge to their participants. We could view the course content and compare it to a standard, as done in Section 4.3.4. However, this approach may not reflect the nuances of knowledge that each program conveys. Nevertheless, Table 4.4 show that the PRINSIX and Prosjektakademiet has a coverage of 65% and 69%, respectfully. However, this analysis is based solely on the formal knowledge areas recited by Project Management Institute (PMI). These knowledge areas may not reflect the individual needs and requirements of the investigated organizations. They may focus on knowledge areas that differ from those presented by PMI. We therefore conclude that this approach is not the most appropriate to make a direct distinction on the scope of educational content. Considering that both FMA and Statsbygg are focused on procurement projects, it seams reasonable that the PMEP has a lower focus on the less relevant topics. In addition, the purpose of the PMEPs is not only to develop Project Management (PM) skills to the participants, but also to learn them the organizational framework for projects (i.e. their project model and regulations) and best practices.

  The PMEP participants were asked to what extent the education program was up to date. For both FMA and Statsbygg, this score was around 4, suggesting that all the participants are rather satisfied with what they learned throughout the program (Figure 5.3 and 5.4). This opinion is also reflected by the EPDs, as illustrated in Figure 5.2. They rank the PMEP from up to date (4) to very extensive (5).

  Considering the SRQ at hand, are the PMEPs transferring the right knowledge to its participants? It seems like the PMEPs have given the covered topics a lot of consideration. As both the EPDs and the participants are fairly satisfied with the covered topics. Through the interviews, we asked if they felt the need to acquire knowledge elsewhere, and based on that we got suggestions to new courses. However interesting it would be to include more courses, the PMEPs are limited by time and the EPDs thus cannot include every suggested topic. Although the EPDs are constricted by how much they are able to include, we see that many of the PMEP participants would like to have more specialized modules, relevant for the projects they conduct. As a few of the interviewees uttered that some of the course were not able to reflect their job appropriately, we wonder if another approach could be viable. Where the PMEPs could divide some of the courses into mandatory and optional parts, allowing the participant to choose more work related courses.

- **SRQ 2.2: Are the Project Management Education Programs (PMEPs) conveying the knowledge in an appropriate manner?**

  This SRQ is tricky to answer, as we have not been present in the courses, and thus need to rely on secondhand information. In Chapter 4 we have presented the collected information about the PMEPs structure and content. Here, we furthermore determined the educational approaches applied in the PMEPs. We found out that both education programs commonly use web-based learning applications (or books) and traditional classroom teaching to convey their knowledge. During the classroom sessions, the candidates are encouraged to actively participate in the discussions and cases. This is confirmed by the EPDs and the participants themselves. The described method is also in line with the *spiral of knowledge* presented in Section 2.2.4, focusing on the tacit and explicit knowledge, and their transitions. Of all the knowledge transfer methods described in the Section 2.2.4, both PMEPs do not address simulation-based learning. As already mentioned in Section 4.3.1, this is a major deficit as this approach combines the learning objectives of self-study, interpersonal learning and mentoring. Due to the high effectiveness, we encourage both EPDs to consider implementing simulation-based learning into the current educational approach.

  According to the EPDs, both the quality and the success of the PMEPs are ranked good (4) in Figure 5.2. This could serve as an indication that at least the EPDs have a good feeling about the knowledge transfer within their PMEP. The participants of the PMEP also ranked the quality of the PMEP rather high. Figure 5.3 and Figure 5.4 shows that the average score of the participants towards the quality of the PMEP is 4. We also asked the participants about their educational preferences and what they feel is most valuable for them. To a large extent the participants highlighted the classroom sessions as the most beneficial form of education. It provides them with the opportunity to ask questions, discuss practical examples and exchange knowledge. However, they also emphasized that the quality of the course highly depends on the willingness of the students, as well as the experience and skills of the lecturer. Based on their experience, participants with different backgrounds within the organization will stimulate and enhance the classroom discussions. Therefore, the EPDs should consider the composition of candidates when preparing the courses.

  Lastly, it should also be considered that project management consists of two parts: management and leadership. These are almost opposites, representing the *hard* and the *soft* sides of management. They should therefore be approached differently with respect to their development. Through our literature review, we have encountered many authors who point out that leadership can not be taught in the classic classroom sessions, but must be practiced. It is therefore necessary to address management and leadership in two different ways to ensure an effective PM education. Statsbygg's Prosjektakademie provides a good example of how this can be implemented in practice. They have divided their approach to PM education in the development of management and leadership skills.

- **SRQ 2.3: Do the Project Management Education Programs (PMEPs) increase the competence and quality of the project managers?**

  We have no empirical data to support this research question, but will answer it based on our subjective opinion. Crawford et al. (2006) state that "*there is no empirical evidence that project management training of any sort actually improves a practitioner's capacity to manage projects*". Then what is the point of having a PMEP to develop project managers? Unfortunately, many of the previous studies have not taken the longitudinal approach to investigate PMEPs. Therefore, little empirical data is presented about their effects. Besides, it should also be considered that the PMEPs are influenced by many variables. Each of these variables have the possibility to impact both the PMEP output, and the output of the projects. Therefore, measuring its effectiveness proves challenging.

  As the EPD of the PMEP at FMA stated in the interview, "*I could give you a certificate for driving a car, but it does not imply that you are a good driver*". This statement illustrate the dilemma of

PMEPs. Even though we would seek to design "the best PMEP" we will still be dependent on the participants. Farashah et al. (2019) claim that the development of project managers starts with the selection of the right individuals. Thus, the personality, ability and motivation of the candidate are from great importance. If these personal characteristics are not given, even the best PMEPs will not be considered successful. This makes it challenging to answer this SRQ. To be more precise, this question should be answered for each participant individually.

The overall impression gathered throughout the interviews was, that the PMEPs are able to satisfy the expectations of its participants. We therefore believe that the PMEPs, at least partially, manage to increase the competence of their participants.

It is challenging to answer this RQ within the limited time of this master's thesis. Through our interviews, we have identified some markers that could indicate that the PMEPs are on the right track. The PMEPs are well-structured to transfer the desired knowledge, and are seemingly capable of doing so. However, this research just scratches the surface of this topic, and a more in-depth analysis is needed to fully answer this RQ. Nevertheless, the results of our interviews in Section 5.2 indicate a high satisfaction level of the participants. The content of the PMEPs also seems to be reasonable, as they cover, at least partially, most of the knowledge areas described in Table 4.4.

Chapter 7

Recommendations for Forsvarsmateriell

The recommendations for PRINSIX are illustrated in Table 7.1 and Table 7.2 below.

Table 7.1 Recommendations for PRINSIX (Part 1)

No.	Topic	Recommendation	Identified in	Discussed in Section	Theory in Section
1	Teaching methods	Introduce simulation-based learning and mentoring into to current educational approach.	Table 4.1	4.3.1	2.2.4
2	Teaching methods	Increase the focus on interpersonal learning.	Table 4.1	4.3.1	2.2.4
3	Educational content	Increase the relevance of basic introductory courses and web-based learning applications.	Table 4.4	4.3.4	2.2.3
4	Educational content	Increase the focus on cost, time and scope management (requested by interviewee).	(Table 4.4)*	5.2.1	-
5	Educational content	Introduce leadership development as part of the project management education.	Table 4.4	4.4.2	2.2.3, 2.2.5, 2.3.2
6	Educational content	Adjust PRINSIX to be also suitable for smaller projects. Currently, PRINSIX focuses exclusively on larger projects with an increased need for documentation.	-	5.2.1	-
7	Entry-requirements	Introduce entry-requirements for candidates willing to become project managers (especially for Nivå 2).	Table 4.3	4.3.3, 4.4.2	(2.2.2)*
8	Entry-requirements	Evaluate the competences of potential candidates before they enter the educational program.	(Table 4.2)*	(4.3.2)* 4.4.1	(2.2.2)* 2.2.3

Based on our research we want to highlight two of our recommendations. Whereas the first recom-

*Partly considered
**Discussed in Sub-Research Question 2.2

Table 7.2 Recommendations for PRINSIX (Part 2)

No.	Topic	Recommendation	Identified in	Discussed in Section	Theory in Section
9	PMEP participants	Create educational groups with different organizational backgrounds.	-	(6.2)**	-
10	PMEP development	The education program director should attend the annual gathering for project managers as a possibility to improve the education program.	-	5.2.1	-

mendation is already mentioned in Table 7.1, the second one will be discussed in the following section. The *first* recommendation is related to the entry-requirements of PRINSIX. We argue that a greater focus on entry-requirements is beneficial for understanding and assessing the competences of the candidates. However, as the internal Project Management Education Program (PMEP) is not just used by people who are interested in becoming project managers, we recommend a slightly different approach to the one that is applied today. Thus, Nivå 1 could be used as a general introduction into the structure and processes at Forsvarsmateriell (FMA). This level will be open to anyone wishing to expand their knowledge and learn about the internal approaches of handling projects. We would not recommend limiting this level to specific entry-requirements, as this hinders the knowledge development inside FMA. Some people might feel excluded due to their educational background. Nivå 2, on the other hand, should be restricted to candidates who have a direct interest in becoming project managers. Since Project Management (PM) requires more than just a formal education, this level should include some entry-requirements. We do not provide detailed suggestions to the requirements, but it should be mentioned that a minimum amount of practical work experience could be requested. This is also proposed by Farashah et al. (2019) who state that "*project management is a practice oriented profession*" and can not exclusively rely on theoretical knowledge (Morris, 2014).

The *second* recommendation we would like to highlight is the idea of subdividing the PMEP into compulsory and optional courses. By offering each candidate the opportunity to choose between different courses, the PMEP will become more focused on the individual needs. This will benefit both the candidates, as they gain more background-specific knowledge, as well as the organization, as the project managers will be better prepared for their individual tasks. To get this idea even one step further, the Education Program Director (EPD) might consider to divide each course module into specific knowledge areas. While some knowledge areas are required for all candidates, others can be selected individually. Thus, the candidates will spend some days of their PM education together, while other days may focus more on the development of individual competences.

We hope that the listed recommendations will benefit the PMEP in the future development of their project managers. Thank you very much for your collaboration.

Chapter 8

Recommendations for Statsbygg

The recommendations for Prosjektakademiet are illustrated in Table 8.1 below.

Table 8.1 Recommendations for Prosjektakademiet

No.	Topic	Recommendation	Identified in	Discussed in Section	Theory in Section
1	Teaching methods	Introduce simulation-based learning into to current educational approach.	Table 4.1	4.3.1	2.2.4
2	Educational content	Increase the focus on control of cost, quality and risk response.	Table 4.4	4.3.4	-
3	Educational content	Include individual assignments, as applied by FMA, to enhance the long term learning of the candidates.	Figure 4.1	4.2.1 5.1.2	-
4	Educational content	Increase the relevance of basic introductory courses (requested by interviewee).	-	5.2.2	(2.2.3)*
5	Educational content	Increase relevance of the project management education by including the topics listed in Section 5.2.2 (requested by interviewees).	-	5.2.2	(2.2.3)*
6	Educational content	Reduce or divide the learning objectives of web-based learning applications that are too comprehensive. (requested by interviewees).	-	5.2.2	-
7	Entry-requirements	Evaluate the competences of potential candidates before entering the educational program.	(Table 4.2)**	(4.3.2)** 4.4.1	(2.2.2)** 2.2.3
8	PMEP participants	Create educational groups with different organizational backgrounds.	-	(6.2)***	-

Based on our research, we would like to highlight another recommendation that is not listed in the Table 8.1. Thus, the Education Program Director (EPD) should consider subdividing the Project Management Education Program (PMEP) into compulsory and optional courses. By offering each candidate

*Increase the relevance of the Project Management Education Program
**Partly considered
***Discussed in Sub-Research Question 2.2

the opportunity to choose between different courses, the PMEP will become more focused on the individual needs. This will benefit both the candidates, as they gain more background-specific knowledge, as well as the organization, as the project managers will be better prepared for their individual tasks. To get this idea even one step further, the EPD might consider to divide each course module into specific knowledge areas. While some knowledge areas are required for all candidates, others can be selected individually. Thus, the candidates will spend some days of their Project Management (PM) education together with the other participants, while the other days may focus more on the development of individual competences.

We hope that the listed recommendations will benefit the PMEP in the future development of their project managers. Thank you very much for your collaboration.

Chapter 9

Conclusion

This thesis was both an descriptive and exploratory study with the aim to dissect and describe the core of Project Management (PM) and its competence development. The description of PM should help in the exploration of two research subjects, and their internal project manager development. This chapter presents the main conclusions, and is the extension of the discussions and recommendations.

The competent project manager

We have thoroughly described what competences a project manager should master, and referred to the various Body of Knowledges (BoKs). It has been emphasized that the project manager should be both skillful within *management* and *leadership*. We further identified that the ideals of a competent project manager are related to the project's context. This is due to the expectations of the project manager, which are not only dependent on project-related factors, but are also influenced by the organizational and external environment. The empirical findings were inconclusive on identifying the ideals of project managers in the different organizations. However, it revealed that the two organizations view the role and responsibilities of the project manager slightly different. This is reflected by their Project Management Education Programs (PMEPs), which do not cover the same range of topics.

Developing the competent project manager

To answer this Research Question (RQ) we created three supporting Sub-Research Questions (SRQs). The results suggest that the participants of the PMEPs are overall satisfied with its content. Although some participants made recommendations for possible improvements of the PMEPs. We found that both PMEPs provided a good platform to convey the managerial skills of their participants, to a large extent in line with the presented theory in Section 2.2.4. The development of leadership competences, however, is only covered by Prosjektakademiet. This marks the major shortage of the PRINSIX education program. The interview respondents conveyed their satisfaction about the learning outputs of the PMEPs. This indicates that the PMEPs are successful at delivering relevant and high-quality courses. We are unable to conclude if the PMEPs are able to increase the competences of the project managers, and to what extent they are successful.

We conclude that the qualifications required to be a competent project manager must be evaluated by each organization themselves. They have the expertise to decide whether the competencies of a project manager meet their expectations or not. Based on these findings, we furthermore conclude that

an organization-internal approach to PM education will be beneficial as it increases the relevance of the conveyed knowledge. With this approach, the organization can directly influence its project managers to focus on the specialties of their future profession. Throughout the analysis of the available data and the conducted interviews, we found that both organizations have a well-structured approach to their internal PM education. This statement is supported by the generally high satisfaction of its participants. The respondents from both organizations stated that they particularly valued the insights on the best practices within their respective organization.

Both PMEPs have a sophisticated foundation to develop competent project managers. Even though they do not always hit the target, they satisfy most of the theoretical requirements for effective PM education. It should also be mentioned that the development of PM competences is an ongoing process. Therefore, the PMEPs are constantly challenged to keep their courses up to date and at the same time ensure the relevance and quality of their course content. The results show that both PMEPs are aware of the changing landscape in PM, and continuously seek to improve themselves. With this in mind we conclude that both PMEPs are on the right track. The on-going challenge for the Education Program Directors (EPDs) is to reflect on how a change of today's PMEP might affect tomorrows project managers.

Chapter 10

Further Work

This master thesis was, to a large extent, exploratory. Seeking information in a field not well covered by the literature. As a result, we revealed many questions along the way that we could not answer. We can therefore make several suggestions for further research. Our suggestions are summarized below.

- Investigate the effects of good leadership, not only from the project manager's point of view, but also take into account the project members.
- Analyze how organizations appoint project managers to their projects. Determine if they take the complexity of the project into account, and apply it to the competencies of the project manager. If they do, a logical consequence would be to analyze if this will have an impact on the project performance. An interesting question could be: Are those projects more successful?
- Analyze the effects of the Project Management Education Program (PMEP). Use wide-scale testing to identify the performance of the PMEP participants before they enter the education program, after they finished the education program, and with some years of experience. It is suggested to measure the managerial skills of the participants as well as the Emotional leadership competences (EQ), the Intellectual leadership competences (IQ) and the Mangerial leadership competences (MQ). Furthermore we recommend to collect qualitative data from the project managers and their surrounding team members. This will provide the organization with a better understanding of the effects of their PMEP, and identifies opportunities for improvement.
- Investigate the possibility to categorize the project managers skill set and the project characteristics. Find a way to match the project manager with suitable projects.
- Investigate other organizations, preferably within different sectors, and look at the structure of their PMEP. Investigate the differences with regards to their educational content. Try to identify similarities and differences within those PMEPs.
- According to the theory, the organizational culture is of great importance for the implementation of projects and thus for the structuring of the PMEP. It should be investigated to what extent the organizational culture impacts the performance of the PMEP. This is highly influenced by the industry in which the organization is located and the conducted projects.
- A more detailed analysis about the courses in the PMEPs and their desired learning outcomes with regards to the organization and its work environment should be performed. It should be investigated if the courses reflect the organizational needs and requirements.

- The two organizations are organized slightly different with regards to where the PMEP is placed. It should be investigated how this affects the structure of the PMEP and its quality. Are there any benefits or drawbacks related to their approaches?

Bibliography

Anantatmula, V. S. (2010). Project manager leadership role in improving project performance. *Engineering Management Journal*, 22(1):13–22.

Barber, E. and Warn, J. (2005). Leadership in project management: from firefighter to firelighter. *Management Decision*, 43(7/8):1032–1039.

Bennis, W. G. and Nanus, B. (1985). *Leaders : the strategies for taking charge*, volume PL 1336 of *Perennial library*. Harper Row, New York.

Brinkmann, S. and Kvale, S. (2015). *InterViews : learning the craft of qualitative research interviewing*. Sage, Thousand Oaks, Calif, 3rd ed. edition. Bibliografi: s. 369-383.

Bryman, A. (2016). *Social research methods*. Oxford University Press, Oxford, 5th ed. edition.

Burke, R. and Barron, S. (2014). *Project management leadership : building creative teams*. Wiley, Chichester, 2nd ed. edition.

Carbone, T. A. and Gholston, S. (2004). Project manager skill development: A survey of programs and practitioners. *Engineering Management Journal*, 16(3):10–16.

Crawford, L., Morris, P., Thomas, J., and Winter, M. (2006). Practitioner development: From trained technicians to reflective practitioners. *International Journal of Project Management*, 24(8):722–733.

Daft, R. L. and Lane, P. G. (2011). *Leadership*. South-Western Cengage Learning, Mason, Ohio, 5th ed. edition.

Day, D. V., Fleenor, J. W., Atwater, L. E., Sturm, R. E., and McKee, R. A. (2014). Advances in leader and leadership development: A review of 25years of research and theory. *The Leadership Quarterly*, 25(1):63–82.

Dey, I. (1993). *Qualitative data analysis : a user-friendly guide for social scientists*. Routledge, London.

Dulewicz, V. and Higgs, M. (2003). Leadership at the top: The need for emotional intelligence in organizations. *International Journal of Organizational Analysis*, 11(3):193–210.

Eagly, A. H. (2005). Achieving relational authenticity in leadership: Does gender matter? *The Leadership Quarterly*, 16(3):459–474.

Education and Culture DG, E. U. (2015). Ects users' guide.
URL:https://ec.europa.eu/education/ects/users-guide/docs/ects-users-guide_en.pdf,
(Visited 25.03.2019).

Farashah, A. D., Thomas, J., and Blomquist, T. (2019). Exploring the value of project management certification in selection and recruiting. *International Journal of Project Management*, 37(1):14–26.

Giammalvo, P. (2016). Project management certification benchmarking research: 2016 update. *PM World Journal*, V(XII - December 2016):23.

Global Alliance for the Project Professions, . (2018). Project manager standards mapping overview. **URL:**https://globalpmstandards.org/wp-content/uploads/2014/12/Mappings_27.2.14-1.xls (Visited 05.02.2019).

Goff, S. (2013). Comparing pm certifications: Which is best for you?

Goleman, D. (1995). *Emotional intelligence*. Bantam Books, New York. Bibliografi: s. 311-339.

Gray, D. E. (2004). *Doing research in the real world*. Sage, London.

Hirst, G., Mann, L., Bain, P., Pirola-Merlo, A., and Richver, A. (2004). Learning to lead: the development and testing of a model of leadership learning. *The Leadership Quarterly*, 15(3):311–327.

Holme, I. M. and Solvang, B. K. (1996). *Metodevalg og metodebruk*. TANO, Oslo, 3. utg. edition.

IPMA (2015). *Individual Competence Baseline for Project, Programme Portfolio Management*. IPMA, IPMA.

Jacobsen, D. I. (2015). *Hvordan gjennomføre undersøkelser? : innføring i samfunnsvitenskapelig metode*. Cappelen Damm akademisk, Oslo, 3. utg. edition.

Jarvis, P. (2010). *Adult education and lifelong learning : theory and practice*. Routledge, London, 4th ed. edition.

Johansen, A., Hald, L. C., Ekambaram, A., and Klakegg, O. J. (2015). The development of the project management as an academic dicipline.

Kanfer, R. and Ackerman, P. L. (1989). Motivation and cognitive abilities: An integrative/aptitude-treatment interaction approach to skill acquisition. *Journal of Applied Psychology*, 74(4):657–690.

Kegan, R. (1982). The evolving self: Problem and process in human development [kindle ed.].

Kerzner, H. and Kerzner, H. R. (2017). *Project management: a systems approach to planning, scheduling, and controlling*. John Wiley Sons.

Klatt, A. and Moksness, M.-J. N. (2019). The art of balancing control and flexibility in projects.

Koskela, L. and Howell, G. (2002). The underlying theory of project management is obsolete. In *Proceedings of the PMI Research Conference*, pages 293–302. PMI.

Kotter, J. P. (2001). What leaders really do. *Harvard Business Review*, 79(11):85.

Kotter, J. P. (2008). *Force for change: How leadership differs from management*. Simon and Schuster.

Langlo, J. A. (2010). *Where is the knowledge we have lost in information? : a study on communication and information quality in interorganisational project processes*. Thesis.

Lord, R. G. and Hall, R. J. (2005). Identity, deep structure and the development of leadership skill. *The Leadership Quarterly*, 16(4):591–615.

McCauley, C. D., Drath, W. H., Palus, C. J., O'Connor, P. M. G., and Baker, B. A. (2006). The use of constructive-developmental theory to advance the understanding of leadership. *The Leadership Quarterly*, 17(6):634–653.

Mintzberg, H. (1975). The manager's job - folklore and fact. *Harvard Business Review*, 53(4):49.

Morris, P. W. (2014). Project management: a profession with a hole in its head or, why a change in the culture of academic support is needed for the profession. *Engineering Project Organization Journal*, 4(2-3):147–151.

Morris, P. W., Crawford, L., Hodgson, D., Shepherd, M. M., and Thomas, J. (2006). Exploring the role of formal bodies of knowledge in defining a profession–the case of project management. *International journal of project management*, 24(8):710–721.

Müller, R., Geraldi, J., and Turner, J. R. (2012). Relationships between leadership and success in different types of project complexities. *IEEE Transactions on Engineering Management*, 59(1):77–90.

Müller, R. and Turner, J. R. (2010). *Project-oriented leadership*. Advances in project management. Gower, Farnham.

Müller, R. and Turner, R. (2006). *Choosing appropriate project managers: Matching their leadership style to the type of project*. Project Management Institute.

Mumford, M. D., Marks, M. A., Connelly, M. S., Zaccaro, S. J., and Reiter-Palmon, R. (2000). Development of leadership skills: Experience and timing. *The Leadership Quarterly*, 11(1):87–114.

Mumford, T. V., Campion, M. A., and Morgeson, F. P. (2007). The leadership skills strataplex: Leadership skill requirements across organizational levels. *The Leadership Quarterly*, 18(2):154–166.

Nonaka, I. and Takeuchi, H. (1995). *The knowledge-creating company : how Japanese companies create the dynamics of innovation*. Oxford University Press, New York.

NTNU (2016). Veiledning for utvikling av studieplaner og emnebeskrivelser ved ntnu. **URL:**https://innsida.ntnu.no/documents/portlet_file_entry/10157/Veiledning+for+utforming+av+studieplaner+og+emnebeskriverlser+ved+NTNT.pdf/cbe14438-41c8-4f08-a074-7ff96080de70?status=0 (Visited 25.03.2019).

NTNU (2018). Behandle personopplysninger i student- og forskningsprosjekt. **URL:**https://innsida.ntnu.no/wiki/-/wiki/Norsk/Behandle+personopplysninger+i+forskningsprosjekt (Visited 16.05.2019).

Parry, K. (2004). The seven sins and the seven virtues of leadership: Which path do we follow? In *The Leading Matters Symposium Series). Centre for Leadership Management in Education, Graduate School of Management, Griffith University, Australia, Griffith University EcoCentre*.

Pinto, J. K. and Trailer, J. W. (1998). *Leadership skills for project managers*. Project Management Inst.

Project Management Institute, . (2007). *Project manager competency development (PMCD) framework*. Global standard. Project Management Institute, Newtown, Pa, 2nd ed. edition.

Project Management Institute, . (2013). *A guide to the project management body of knowledge (PMBOK guide)*. Project Management Institute, Newtown Square, Pennsylvania, 5th ed. edition.

Ramazani, J. and Jergeas, G. (2015). Project managers and the journey from good to great: The benefits of investment in project management training and education. *International Journal of Project Management*, 33(1):41–52.

Russell, C. J. and Kuhnert, K. W. (1992). New frontiers in management selection systems: Where measurement technologies and theory collide. *The Leadership Quarterly*, 3(2):109–135.

Samset, K. (2014). *Prosjekt i tidligfasen : valg av konsept*. Fagbokforl., Bergen, 2. utg. edition.

Schiefloe, P. M. (2011). *Mennesker og samfunn : innføring i sosiologisk forståelse*. Fagbokforl., Bergen, 2. utg. edition.

Söderlund, J. and Maylor, H. (2012). Project management scholarship: Relevance, impact and five integrative challenges for business and management schools. *International Journal of Project Management*, 30(6):686–696.

Szentes, H. and Eriksson, P. E. (2016). Paradoxical organizational tensions between control and flexibility when managing large infrastructure projects. *Journal of Construction Engineering and Management*, 142(4):05015017.

Thomas, J. and Mengel, T. (2008). Preparing project managers to deal with complexity – advanced project management education. *International Journal of Project Management*, 26(3):304–315.

Thoms, P. and Pinto, J. K. (1999). Project leadership: A question of timing. *Project Management Journal*, 30(1):19–26.

Turner, J. and Müller, R. (2005). The project manager's leadership style as a success factor on projects: A literature review. *Project Management Journal*, 36(2):49–61.

Appendices

Appendix A

Comparing Different Bodies of Knowledge

Table A.1 Explanation of the GAPPS framework (Part 1) (Global Alliance for the Project Professions, 2018)

GAPPS Framework for Project Managers - Nov 2006 (Unit and Element Level)		
1 Manage Stakeholder Relationships	*1.1 Ensure that stakeholder interests are identified and addressed.*	1.1.1 Relevant stakeholders are determined.
		1.1.2 Stakeholder interests are investigated and documented.
		1.1.3 Stakeholder interests are considered when making project decisions.
		1.1.4 Actions to address differing interests are implemented.
	1.2 Promote effective individual and team performance.	1.2.1 Interpersonal skills are applied to encourage individuals and teams to perform effectively.
		1.2.2 Individual project roles are defined, documented, communicated, assigned, and agreed to.
		1.2.3 Individual and team behavioral expectations are established.
		1.2.4 Individual and team performance is monitored, and feedback provided.
		1.2.5 Individual development needs and opportunities are recognized and addressed.
	1.3 Manage stakeholder communications.	1.3.1 Communication needs of stakeholders are identified and documented.
		1.3.2 Communication method, content, and timing is agreed to by relevant stakeholders.
		1.3.3 Information is communicated as planned, and variances are identified and addressed.
	1.4 Facilitate external stakeholder participation.	1.4.1 External stakeholder participation is planned, documented, and communicated.
		1.4.2 External stakeholder participation is supported as planned, and variances are addressed.
2 Manage Development of the Plan for the Project	*2.1 Define the work of the project.*	2.1.1 A shared understanding of desired project outcomes is agreed to with relevant stakeholders.
		2.1.2 Processes and procedures to support the management of the project are identified, documented, and communicated to relevant stakeholders.
		2.1.3 Work-items required to accomplish the product of the project are determined.
		2.1.4 The work-items and completion criteria are agreed to by relevant stakeholders.
		2.1.5 Assumptions, constraints, and exclusions are identified and documented.
		2.1.6 Relevant knowledge gained from prior projects is incorporated into the plan for the project where feasible.
	2.2 Ensure the plan for the project reflects relevant legal requirements.	2.2.1 Relevant legal requirements are identified, documented, and communicated to relevant stakeholders.
		2.2.2 Potential for conflicts caused by legal requirements are identified and addressed in the plan for the project.
	2.3 Document risks and risk responses for the project.	2.3.1 Risks are identified in consultation with relevant stakeholders.
		2.3.2 Risk analysis techniques are used to evaluate risks and then prioritize them for further analysis and response planning.
		2.3.3 Responses to risks are identified and agreed to by relevant stakeholders.
	2.4 Confirm project success criteria.	2.4.1 Measurable project success criteria are identified and documented.
		2.4.2 Project success criteria are agreed to by relevant stakeholders.
	2.5 Develop and integrate project baselines.	2.5.1 Resource requirements are determined.
		2.5.2 Schedule is developed based on resource requirements, resource availability, and required sequence of work-items.
		2.5.3 Budget is developed based on resource requirements.
		2.5.4 Conflicts and inconsistencies in the plan for the project are addressed.
		2.5.5 The plan for the project is approved by authorized stakeholders and communicated to relevant stakeholders.

Table A.2 Explanation of the GAPPS framework (Part 2) (Global Alliance for the Project Professions, 2018)

3 Manage Project Progress	*3.1 Monitor, evaluate, and control project performance.*	3.1.1 Performance of the project is measured, recorded, evaluated, and reported against the project baselines.
		3.1.2 Processes and procedures are monitored, and variances addressed.
		3.1.3 Completed work-items are reviewed to ensure that agreed completion criteria were met.
		3.1.4 Corrective action is taken as needed in support of meeting project success criteria.
	3.2 Monitor risks to the project.	3.2.1 Identified risks are monitored.
		3.2.2 Changes to the external environment are observed for impact to the project.
		3.2.3 Applicable legal requirements are monitored for breaches and conflicts.
		3.2.4 Actions are taken as needed.
	3.3 Reflect on practice.	3.3.1 Feedback on personal performance is sought from relevant stakeholders and addressed.
		3.3.2 Lessons learned are identified and documented.
4 Manage Product Acceptance	*4.1 Ensure that the product of the project is defined.*	4.1.1 Desired characteristics of the product of the project are identified in consultation with relevant stakeholders.
		4.1.2 Characteristics of the product of the project are documented and agreed to by relevant stakeholders.
	4.2 Ensure that changes to the product of the project are monitored and controlled.	4.2.1 Variances from agreed product characteristics are identified and addressed.
		4.2.2 Requests for changes to the product of the project are documented, evaluated, and addressed in accordance with the change control processes for the project.
		4.2.3 Approved product changes are implemented.
	4.3 Secure acceptance of the product of the project.	4.3.1 The product of the project is evaluated against the latest agreed characteristics and variances addressed where necessary.
		4.3.2 The product of the project is transferred to identified stakeholders and accepted.
5 Manage Project Transitions	*5.1 Manage project start-up.*	5.1.1 Authorization to expend resources is obtained from the appropriate stakeholders.
		5.1.2 Start-up activities are planned and conducted.
	5.2 Manage transition between project phases.	5.2.1 Acceptance of the outputs of a prior phase is obtained from the relevant stakeholders.
		5.2.2 Authorization to begin work on a subsequent phase is obtained from the appropriate stakeholders.
		5.2.3 Transition activities are planned and conducted.
	5.3 Manage project closure.	5.3.1 Closure activities are planned and conducted.
		5.3.2 Project records are finalized, signed off, and stored in compliance with processes and procedures.
6 Evaluate and Improve Project Performance	*6.1 Develop a plan for project evaluation.*	6.1.1 Purpose, focus, and criteria of evaluation are determined.
		6.1.2 Relevant evaluation techniques are determined.
	6.2 Evaluate the project in accordance with plan.	6.2.1 Performance data is collected and analyzed in accordance with the evaluation plan.
		6.2.2 Evaluation process engages relevant stakeholders.
	6.3 Capture and apply learning.	6.3.1 Knowledge sharing and skill transfer is encouraged among relevant stakeholders.
		6.3.2 Results of evaluations are documented and made available for organizational learning.
		6.3.3 Potential improvements are identified, documented and communicated to relevant stakeholders.
		6.3.4 Improvements agreed for this project are applied.

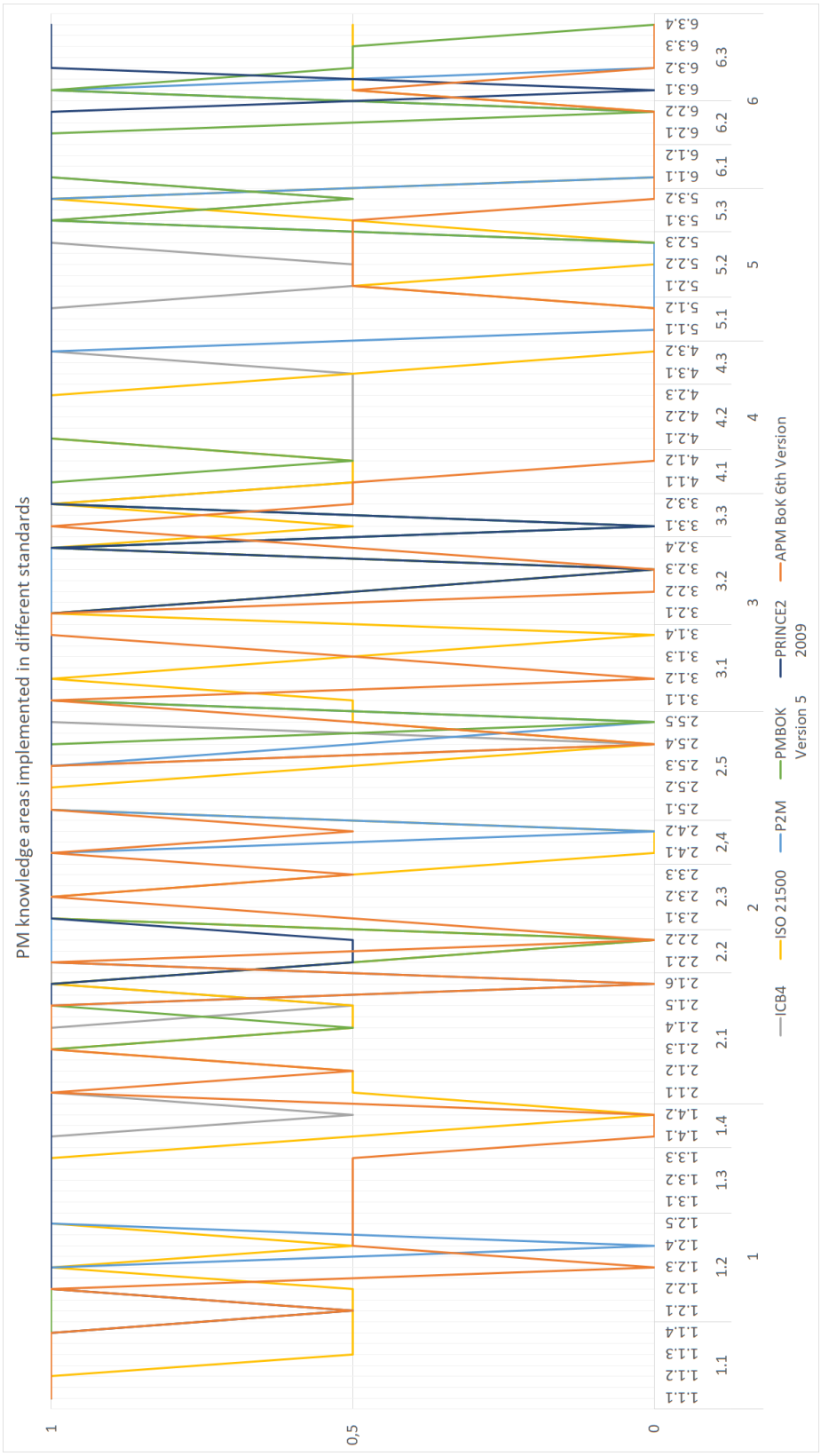

Figure A.1 Knowledge areas of project management applied on different project management standards (Global Alliance for the Project Professions, 2018). A score of 1 means a full coverage of the topic, while a score of 0 means that the topic is not covered at all. The score of 0.5 indicates that the topic is briefly covered.

Appendix B

Interview Guides

B.1 Education Program Directors

Prior to the interview we sent out a brief questionnaire where we wanted the program directors to answer a few statements according to the Likert five point scale. Where 5 was the highest score, and 1 the lowest. The answer of the following statements were used as a basis for further questions during the interviews:

- Does the education program have support from the top management? To what degree? 1-5, where 5 is the highest possible support
- To what extent do you feel that the organization sees the value of the project management education program? To what degree? 1-5, where 5 is the highest possible score
- To what extent do you feel that top management takes an interest into the project management education program? To what degree? 1-5, where 5 is the highest possible interest
- To what extent would you say that the project management education program receives the necessary funding? To what degree? 1-5, where 5 is the most appropriate funding
- To what degree do you feel that your current education program is up to date? To what degree? 1-5, where 5 is fully up to date
- Do you feel that the education program is extensive enough (with regards to time and content [all relevant knowledge areas and skills according to IPMA/PMI])? To what degree? 1-5, where 5 is extensive enough
- What do you feel about the quality of the education program? To what degree? 1-5, where 5 is very high quality
- To what extent do you feel that the education program is successful? To what degree? 1-5, where 5 is the most successful
- To what degree have you been able to measure the effects of the education program? To what degree? 1-5, where 5 is the highest possible score
- To what extent do you measure the satisfaction of the education program participants? To what degree? 1-5, where 5 is the highest possible score

The following questions were used for the interview session with the education program directors:

- How long have you been involved with the project management education program?
  - How has it changed over time?
- How is your impression about the organizational attitude towards the PM education program?
  - This should cover:
    * Supportive vs. Non-supportive
    * High interest vs. Low interest
  - Does the organization understand the value of the education program?
  - How would you say the organizational environment affect the PM education program?
- As the education program director, what is your feelings about the education program?
  - Topics this should cover:
    * The build-up of the program. Static or dynamic? Changing?
  - Does it give the desired output?
  - Have you seen any positive effects of the education program? How?
  - What about the length of the study program?
  - Is there something you would like to change with the study program? What is good, and what is bad?
  - Have you based your education program on other well-known education programs/institutes?
- Project management is often viewed upon as a practical (people oriented) profession, how would you say your program is focused on developing soft-skills (I.e. leadership skills, and interpersonal skills)?
  - How do you feel about this? Would you like to implement more, or less?
  - Have you seen any positive effects of this?
- What is the reason why you have set the entry requirements for your education program at the current level?
  - Have you had any good or bad experience with this?
  - How would you say that this education program is influenced by the acceptance level of the education program?

B.2 Education Program Participants

- Background, who are you:
  - What is your current position in the company?
  - What was your position in the organization prior to the entering the education program (EP)?
  - Do you have an academic background?
  - Do you have previous knowledge/experience within PM?
    - Education
    - Certification
    - Experience
  - Why did you participate in the EP?
  - When did you finish your current level in the EP?
- EP content:
  - What is your opinion on the EP?
    - Content
    - Duration
    - Relevance
    - Effectiveness
  - Do you feel that the EP has prepared you to be a project manager?
  - Have you felt the need to learn PM trait by yourself?
  - Based on your experience as a project manager, are there any subject you think is missing, is obsolete or should have had a higher focus?
  - Is there something you would like to change with the EP?
  - Would you recommend this EP to your co-workers?
- EP development:
  - Do you feel involved in the development of the EP?
    - Is there a feedback system (internal questionnaires, interviews, form etc.) to address recommendations?
      - Do you feel that the feedback system is appropriate/sufficient?
    - From your point of view, what should be improved?
    - How could the EP learn from the project managers to increase the relevance of their courses?
  - What kind of learning methods did you encounter during your time at the EP?
    - E-learning
    - Traditional classroom teaching
    - Interactive
    - Case-based
    - Discussion
    - Self-studies
  - What is your opinion on the learning methods of the EP?

    - Would you like to change it any other way?

- Please rank the following statements according to the Likert five point scale, where 5 being the highest and 1 being the lowest.
  - To what degree do you feel that your current education program is up to date?
  - Do you feel that the education program is extensive enough (with regards to duration, content and relevance)?
  - What do you feel about the quality of the education program?
  - To what degree do you feel involved in the development of the education program?

Appendix C

Prosjektakademiet - Supplement

Hay level	Score	Minimum educational level and experience	Administrative and managerial competence, and interpersonal competence	Framework conditions and freedom of action	Management Framework	Career Program	Programs regardless of level
14	Assistant Project Manager	Bachelor: engineer/ economist. Graduates.	• Execution and / or control of one or more clearly specified and limited activities. • Good knowledge of SB's main strategy. • Ability to collaborate and communicate with PL and other key personnel.	• Limited by standardized procedures and general routines (the in-house / project model). • Subject to periodic monitoring and follow-up of progress and results.		Mandatory one year 2: • Overall project management • Statsbygg's project model (formerly practical project management) • SHA in project execution • Project organization, roles and responsibilities • Project uncertainty management • Acquisitions and contract • Management chairing • Process management	Mandatory within 1st year: • ISY PØ • ISY PP • Project organization, roles and responsibilities • Statsbygg's project model (practical project management)
15	Project manager/ assistant project manager Level 1	Master: Civil Engineer/ Master of Business Administration. Min. 2 years of practical experience.	• Planning, management, execution and control of project-related activities (especially contract and financial management). • Focus on goal achievement in the project in accordance with SB's main strategy. • Ability to collaborate and communicate with PE and other key people in the project organization internally and externally.	• Ability to identify uncertainties and prioritized choices, but within current routines and guidelines (the in-house / project model). • Subject to general performance control and follow-up.	Management framework up to NOK 150 million (Project classes 1 and 2)	Mandatory one year 2: • Project and contract strategy • Management and communication • Lean basics • External environment in project implementation	
16	Project Manager Level 2	Master: Civil Engineer / Master of Business Administration. Min. 5 years of practical experience.	• Planning, management, execution and control of project-related activities (especially contract and financial management). • Goal achievement in the project according to SB's main strategy. • Ability to create good grounding with superior and customer contact. Cooperation and communication with PE and other key people in the project organization internally and externally.	• Ability to identify uncertainties and prioritized choices, but within current routines and guidelines (the in-house / project model). • Subject to general performance control and follow-up.	Management framework up to 150-500 mill. (Project classes 2 and 4)	Mandatory one year 2: • Concept evaluation and alternative assessment • Mentor program • Contribute to internal development projects when needed • Internal certification for course holder, and hold courses	
18	Project Manager Level 3	Master: Civil Engineer / Master of Business Administration. Min. 10 years of practical experience	• Expertise in organizing, managing and leading large, complex project organizations (especially contract and financial management). • High degree of goal achievement in the project according to SB's main strategy. • Ability to develop a good working climate and anchoring with superiors, customer contacts and management groups. • Ability to develop, convince and motivate other people to achieve results.	• Ability to identify uncertainties and to prioritize choices, but within clear operational goals, clearly defined policies and principles (the in-house / project model). • Subject to general performance control and follow-up.	Management frame larger than 500 mill. (Project classes 3 and 4)	Mandatory for the first 2 years: • Project Governance • If necessary, run an internal development project • Be a course holder Possibility of: • Management development through Statsbyggskolen	

Figure C.1 Description of the different requirements, competences, experience and responsibilities for Prosjektakademiet

Appendix D

Legend for Table 4.3

Table D.1 Legend for Table 4.3 (Part1)

Description	Short Form	Additional Information
European Credit Transfer and Accumulation System	ECTS	*"Quantified means of expressing the volume of learning based on the workload students need in order to achieve the expected outcomes of a learning process at a specified level" (European Union and DG, 2009).*
Standardized value of a 4 years bachelor's degree	BDEG	According to the European Union and DG (2009), the bachelor degree requires a minimum of 180 ECTS and 25-30 hours of work effort per ECTS. NTNU (2016) requires 26-29 hours of work per ECTS. As a result, we choose 27.5 to calculate the the hours of work per
Standardized value of a 2 years master's degree	MDEG	According to the European Union and DG (2009) and NTNU (2016), the masters degree was rated with 120 ECTS. The number of hours per ECTS remains unchanged to the bachelor's degree (27.5 hours).
Standardized value for an academic degree in project management	ADEG	The academic degree in project management can be equated with the score of a Bachelor (BDEG) or Master (MDEG) degree.
Standardized value for an organizational degree in project management	ODEG	For FMA's PRINSIX we calculated the "ODEG Level of Effort" by accumulating all ECTS credits (studiepoeng) that the participant can receive after each completed level. The number of effort hours per ECTS (27.5 hours) was taken from the bachelor's degree (BDEG). For Statsbygg's Prosjektakademiet we used a combination of ECTS credits and direct effort hours needed to complete a course. For the first two HG levels (HG14 and HG15) we have found the corresponding ECTS credits (studiepoeng) in a previous model. This model is no longer used by Statsbygg. However, as the course content is still the same and only the exam owners have changed, we believe that this assumption can be made. For the last two HG levels (HG16 and HG18) we accumulated the average hours of effort for each course (E-learning in combination with group gatherings).

Table D.2 Legend for Table 4.3 (Part 2)

Total level of effort to create a quality paper	PAPR	According to Giammalvo (2016), for a quality paper with at least 2500 words the participant can receive 50 effort hours extra. Since FMA requests a quality paper of 4000-6000 words (average = 5000 words) as part of their Level 2 exam, each participant receives 100 effort hours extra.
Level of effort to prepare for exam	No short form	According to Giammalvo (2016), for each hour of exam the participant receives 30 hours of preparation.
Project management degree at NTNU	PM NTNU	Masters degree in project management at the Norwegian university of science and technology (NTNU).
Project management education at FMA	PRINSIX	PRINSIX is the internal education programfor PM at Forsvarsmateriell.
Project management education at Statsbygg	Projectaka.	Prosjektakademiet is the internal education program for PM at Statsbygg.
Prince2 Foundation	P2F	Basic PM certification from PRINCE2.
Prince2 Practitioner	P2P	Advanced PM certification from PRINCE2.

Appendix E

Scope of the PMBoK *Guide*

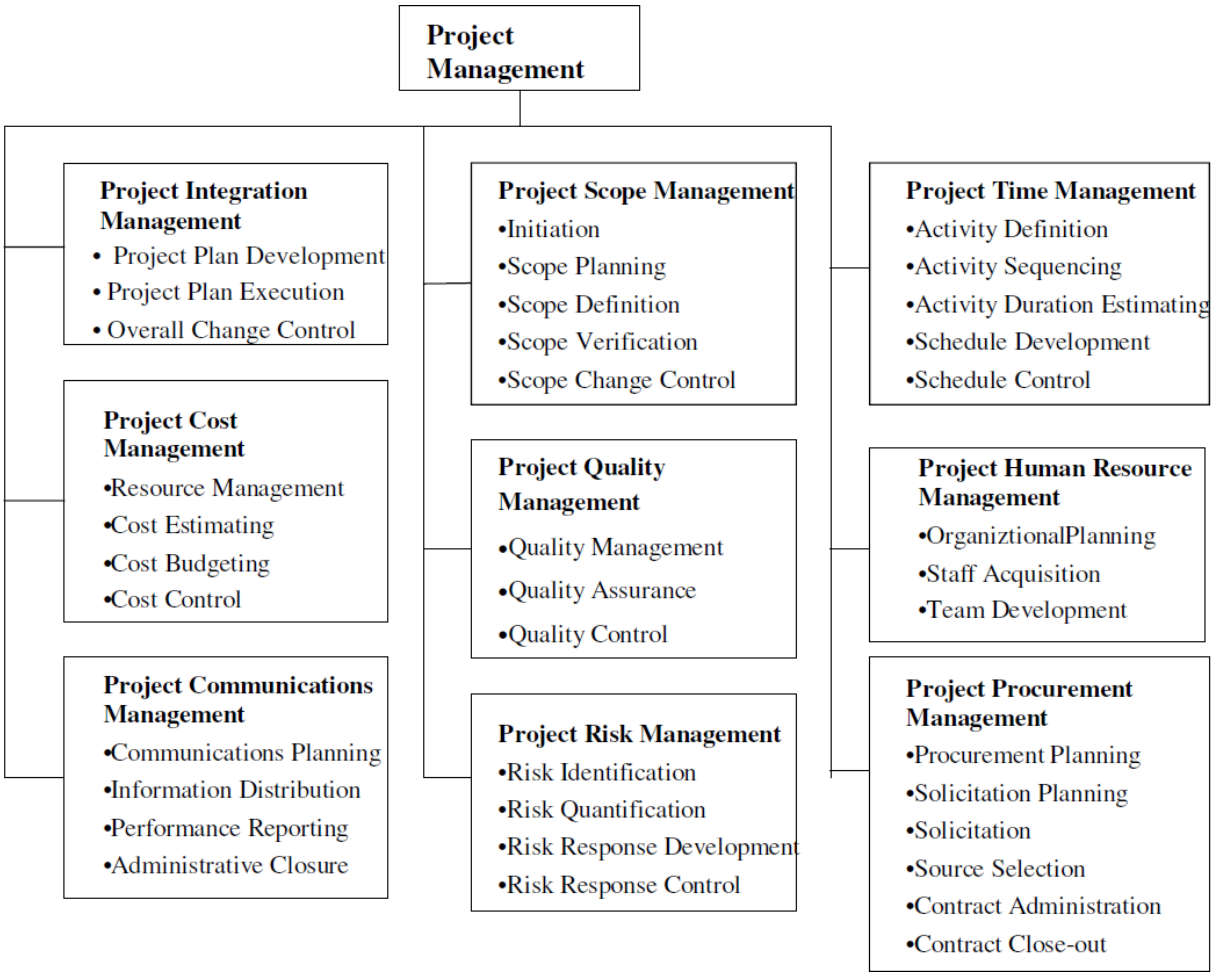

Figure E.1 The fundamental knowledge areas in PMI's *PMBoK* Guide (taken from Morris et al. (2006))

Appendix F

Comparison of the Educational Content

Table F.1 Comparison of the educational content in PRINSIX and Prosjektakademie based on the course description, inspired by Project Management Institute (2013) and Global Alliance for the Project Professions (2018)

PM Knowledge Areas	*PRINSIX*	*Prosjektaka.*
Project Integration Management		
Project plan development		
Project plan execution		
Overall change control		
Project Cost Management		
Resource management		
Cost estimation		
Cost budgeting		
Cost control		
Project Human Resource Management		
Organizational planning		
Individual development		
Team development		
Project Scope Management		
Initiation		
Scope planning		
Scope change control		
Project Quality Management		
Quality management		
Quality assurance		
Quality control		

PM Knowledge Areas	*PRINSIX*	*Prosjektaka.*
Project Risk Management		
Risk identification		
Risk response developement		
Risk response control		
Project Communication Management		
Communication planning		
Information distribution		
Managing meetings		
Performance reporting		
Project Time Management		
Schedule developement		
Schedule control		
Project Procurement Management		
Procurement planning		
Contract strategy		
TOTAL COVERAGE [%]:	**80**	**63**
Management vs. Leadership Development		
Hours spend on managment development [%]	100	68
Hours spend on leadership development [%]	0	32

	Fully considered
	Partly considered
	Not considered

Andre Klatt, Mats-Julian Nilsen Moksness

Molding the Competent Project Manager

NTNU
Kunnskap for en bedre verden