Lisa Enge Hauås

Project Managers in Software Development Projects

A case study of project managers with technical and non-technical background from one IT company

Master’s thesis in Project Management
June 2019
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Norwegian University of Science and Technology
Faculty of Economics and Management
Department of Industrial Economics and Technology Management
Preface

This master thesis is the final part of the course TIØ4920 – Project Management, Master Thesis, at the Department of Industrial Economics and Technology Management (IØT), at Norwegian University of Science and Technology (NTNU) in Trondheim. The study answers the question of to what extent do project managers experience that their technical or non-technical background affects their performance as project managers in software development projects. Some of the theory in Chapter 2 is based on my own project thesis in the course TIØ5230 - Project Management, Specialization Project.

I would like to thank my supervisor Ola Edvin Vie, Associate Professor at NTNU, and Parinaz Farid, PhD Candidate at NTNU, for help and guidance throughout the thesis. I would also like to thank Tim Torvatn and Michael Enge Haukås for reading my thesis and give comments. In addition, I would like to thank my fellow students for good discussions at the social room, and of course the project managers that used their time to being interviewed by me.

Lisa Enge Haukås

11.06.2019 Trondheim
Abstract

Project management can be defined as the application of resources to activities to meet the project requirements. The resources includes tools, techniques, skills and knowledge. Software development projects are complex, and today it is common to use agile methods when doing such projects. Agile methods focus on having a close collaboration with the customer, as well as appreciating individuals and interaction within the group. The project manager is the link between the customer and the developers. Although there is relatively much research on project management within IT, there is little research related to the technical or non-technical background of the project managers. In this study, a technical project manager is defined as a project manager who has a background as a developer.

The purpose of this masters’ thesis is therefore to examine to what extent project managers experience that their technical or non-technical background affects their performance as project managers in software development projects. The case study has an qualitative research strategy, in which four project managers have been interviewed through a semi-structured interview. These project managers are working in a case company that is engaged in software development. In order to maintain credibility, the interviewees have read the study and approved that they are properly presented. The interviews have been analyzed using coding, looking for potential similarities and putting them into categories. This was done to emphasize the similarities and differences of the technical and non-technical project
managers.

The results show that having a technical background is the most beneficial when you are a project manager for software development projects. It is important to have technical knowledge as a project manager on such projects, as it gives you an overview of how things are connected, in addition to notice early warning signs earlier. On the other hand, non-technical project managers can learn enough technology that it is sufficient.
Sammendrag

Prosjektledelse kan bli definert som anvendelse av kunnskap, ferdigheter, verktøy og teknikker for å utarbeide aktiviteter for å møte prosjekt-kravene. Programvareutviklingsprosjekter er komplekse, og i dag er det vanlig å bruke agile metoder når en utfører slike prosjekter. Agile metoder fokuserer på å ha et tett samarbeid med kunden, i tillegg til å verdsette enkeltpersoner og samspill i gruppen. Prosjektlederen er leddet mellom kunden og utviklerne. Selv om det finnes relativt mye forskning på prosjektledelse innen IT, er det lite forskning knyttet til teknisk og ikke-tekniske prosjektledere. I denne oppgaven defineres en teknisk prosjektleder som en prosjektleder som har bakgrunn som utvikler.

Resultatene viser at det er flest fordeler ved å ha en teknisk bakgrunn når en er prosjektleder for programvareutviklingsprosjekter. Det er viktig å ha teknisk kunnskap som prosjektleder på slike prosjekt, da det gjør at en har oversikt over hvordan ting henger sammen. I tillegg til at en enklere ser problemer og utfordringer som oppstår tidligere. På en annen side, kan ikke-tekniske prosjektledere lære seg nok teknologi til at det er tilstrekkelig.
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Chapter 1

Introduction

Project management has been practiced for thousands of years and has developed a lot since then (Kwak, 2005; Bentley, 2012). In the 1950s, systematic tools and techniques were applied to project management (Kwak, 2005). For 60 years ago, the companies could choose if they wanted to use project management. Today, the question is not whether it should be implemented, but rather when it should be implemented. Kerzner (2017) explains project management as the planning, organizing, directing, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives. Project management is about completing a project within time, cost and scope. The PMBOK Guide defines project management as “the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (Guide, 2001).

The beginning of software engineering was in the early 1960s. Only a short time before this, large computers became available to universities and research institutions (Wirth, 2008). Software engineering has developed a lot since then and are continuously developing. The development of software engineering has after this been based on the development of tools and programs. The need for software engineering is increasing, and there is a lot of predictions about software engineering in the future (Brooks, 2008; Boehm, 2006). The main goal of
the software engineering is to create a suitable work to develop programs of high quality (Alshamrani & Bahattab, 2015).

Software development projects are complex, and it is therefore harder to achieve project success in these kinds of projects. Some of the failures that happens in these projects is that the project managers do not understand the customer’s needs, or the scope of the project is not defined well enough. Most of the software development projects that do not achieve project success have failures in the beginning of the project, even before a single line of code is written (Al-Ahmad et al., 2009). For software projects to achieve project success, project management must be implemented. The projects need to be completed within both time, cost and scope to achieve project success.

An approach to project management that is mostly used in software development projects is agile software development. Agile development focus on making the relationship between the customer and developers closer, and it is about creating and responding to change (Highsmith & Cockburn, 2001). An agile approach plans the project in short iterations with some features attached to them, and the customer can get feedback and change the priority of the features at the end of each iteration (Cho, 2008). This is different from the waterfall method, which has a linear sequential design process, where the output of each phase is the input for the next one (Bassil, 2012).

The characteristics for a leader and a manager are different. Nevertheless, a project manager should have both skills for achieving project success, because the skills are complementary to each other. Management is about managing the project, the planning and controlling of the project and team members, while leadership are more about motivating and inspiring the team members (Burke & Barron, 2014; Kotter, 1990).

During an internship in a software development company I came in talk with a project manager with background in mechanical engineering, who was a project manager in this company now. When she heard my background with both computer science and project
management, she reacted by saying “It must be a huge advantage to have a background in computer science when becoming a project manager in software development companies!”

The aim of my master thesis is to investigate project managers in a company that provide software development projects, with a focus on their background and how they experience their background affecting their performance as project managers.

In this master’s thesis project management in general, project management in software development, agile software development and leadership will be explained further. The study gives a better insight of project management in software development, and agile software development as the response to reduce the number of project failures. The study also gives better insight into what some project managers think about the extent to which the project managers’ performance is affected by their technical or non-technical background. In this study, a technical background is defined as background as a developer. The research questions that I would like to investigate in this paper, is:

To what extent do project managers experience that their technical or non-technical background affects their performance as project managers in software development projects?

To help building the theoretical background needed to answer this research question, four sub-question will be asked:

1. What are project management and what skills should a project manager have?
2. How is the process of software development projects and which failures are relevant?
3. Which characteristics are important for agile development? And why agile?
4. What is the difference between management and leadership? Is leadership important in software development projects?

Within each section in Chapter 2, some propositions will be developed, which will be summarized in Section 2.5. These propositions will later be used to analyze the empirical
1.1 Structure of the paper

The paper is structured in 6 sections:

Chapter 1 introduces the research study, the problem statement and the research question.

Chapter 2 is the literature of the research study. The literature chapter is divided into four sections, project management, project management in software development projects, agile software development and leadership. As shown in Figure 1.1, the section with project management and leadership is for general projects, while the section of software development and agile development are for IT projects. At the end, the theoretical framework that will be used in the analysis is presented.

![Figure 1.1: Overview of the theoretical building blocks](image.png)
1.1. STRUCTURE OF THE PAPER

Chapter 3 is the methodology used in this research.

Chapter 4 is the empirical data, which explore the findings from the four interviews.

Chapter 5 is the analysis and discussion of the empirical data from Chapter 4, based on the literature from theoretical framework developed in Chapter 2.

Chapter 6 is the conclusion, where there will be a brief overview of what my findings are, and finally the research question will be answered. At the end, future research that can be done will be discussed, and limitation of this research will be explained.
1.1. STRUCTURE OF THE PAPER
Chapter 2

Literature

The research question in this thesis is: To what extent do project managers experience that their technical or non-technical background affects their performance as project managers in software development projects? Project managers with technical background, are managers with background as developers in software development projects. These project managers can use their knowledge from their time as developers to understand problems and the process of the software development projects. Project managers with non-technical background on the other hand, are managers that have experience as project managers from another industry before becoming a project manager for software development projects. They have both project management experience and -certifications that they can use in their work.

The chapter of project management in general and the PRINCE2 methodology will help understand the non-technical project managers better, and the chapters about software development projects and agile software development will help understand both the technical project managers better, but also the industry they are working in. The leadership chapter will help understanding important aspects of being a project manager today. This chapter will provide the essential theoretical base necessary to answer my research question, by answering the four sub-questions. At the end of the chapter, the theoretical framework
developed during the literature are presented. This will later be used in the analysis and discussion of my empirical data. As mentioned in the preface, some of the literature in this chapter is based on the paper I wrote in TIØ5230 Project Management, Specialization Project.

### 2.1 Project Management

In this section, project management in general will be explained. This will help to understand what project management is, in addition to which background the non-technical project managers had before they started working in the software development company. The first sub-research question will be answered in this section: What are traditional project management and what skills should a project manager have?

To understand what project management is, one must understand what a project is. A project can be defined as any series of activities and tasks that have a defined start and end date, are multifunctional and with funding limits (Savolainen, Ahonen, & Richardson, 2012; Kerzner, 2017). The project has a specific objective to be completed within certain specifications, and consume human and non-human resources as money, people, equipment, etc. (Kerzner, 2017). A project is a temporary effort undertaken to create a unique product, service, or result (Guide, 2001). That a project is temporary does not necessarily mean that the project has a short duration, it means that the project is not forever, but the outcome is. The project has a given start and end time, but the deliverables and activities in between vary extensively from project to project. Each project creates unique products, services, or results, which results in each project being different from one another. The project team has new task on every project and therefore each project needs more devoted planning than most other routine work.

Time, cost and performance are the constraints of a project, while management is more
about time, cost and scope (Kerzner, 2017). The PMBOK Guide defines project management as “the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (Guide, 2001). Maxwell (2013) explains that management is at its best when things stay the same. To achieve project management success, the project should be completed within time and cost, at the desired technology level while utilizing the resources effectively and efficiently, and of course, that the project is accepted by the customer as shown in Figure 2.1 (Kerzner, 2017; Savolainen et al., 2012). There are many definitions and explanations on project management, Kerzner (2017) explains project management as a way of making better use of existing resources, by getting work to flow within the company, both horizontally and vertically. This requires project managers to communicate, so the work will be accomplished more smoothly throughout the company. Project management can be defined as “… the planning, organizing, directing, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives” (Kerzner, 2017; Watson & Harris, 1999; Gulick, 1937).

![Figure 2.1: Overview of Project Management (Kerzner, 2017, p. 6)](image)

Traditional project management is divided in five process groups, project initiation, project
2.1. PROJECT MANAGEMENT

planning, project execution, project monitoring and control, and project closure (Guide, 2001). These five process groups are further explained in Table 2.1. The first step is the project initiation where the project starts. Project planning is the next step, and at this step the plan of the project is made. This plan consists of details of what the scope and objectives of the project are and how these objectives will be achieved. The requirements from the customers are planned here. After this step is done, the project will move on to the project execution step, where the work that were planned in the step before gets done. Then the project moves on to the project monitoring and control step. Here the processes and performance of the project are reviewed and regulated. At the end, the project goes over in the project closure step, where all the steps are concluded, and project managers can formally close the project.

Table 2.1: The Five Process Groups (Guide, 2001)

<table>
<thead>
<tr>
<th>Process Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Initiation</td>
<td>The start of the project</td>
</tr>
<tr>
<td>Project Planning</td>
<td>Plan the scope and the objectives of the project and how this will be achieved</td>
</tr>
<tr>
<td>Project Execution</td>
<td>Doing the work planned in the previous group</td>
</tr>
<tr>
<td>Project Monitoring</td>
<td>Reviewing and regulating the process</td>
</tr>
<tr>
<td>Project Control</td>
<td>Concluding all the groups and formally close the project</td>
</tr>
</tbody>
</table>

Different variables can have much impact on the project along the way, and how much impact depends on how far the project has come, as shown in Figure 2.2. At the beginning of the project, the stakeholders have much influence, and the risk and uncertainty of the project is high. The further into the project, the more it costs to make changes. Therefore, the stakeholders have less influence later in the project. The better management in the beginning, the less cost at the end.
2.1.1 Project Manager

To understand management better, Watson and Harris (1999) differentiate between management as a function, managers as people occupationally involved in fulfilling this function and managing as the activities engaged in by people to fulfil the function of directing the organization. Management is the planning, coordination, control etc. that is needed for achieving the outcome and to fulfil the functional requirement of the organisation. Managers are the people who are responsible for carrying out the functions of management. There is a possibility for all the members doing the managing, or only one person doing it. Either way, management is needed and according to Watson and Harris (1999) the question is not weather or not management needs to occur, it is what kind of management there will be. Managing is the set of activities which bring about management, the directing and steering of the organization as a whole (Watson & Harris, 1999). Managing is something one does every day when for example managing the household, plans they have etc. But man-
2.1. PROJECT MANAGEMENT

aging is still a skilled activity, where some people are better at it than others. The reason why managing is challenging, is because the manager needs to influence others thinking and behaviour.

Becoming a manager is not a straightforward process and all new managers agree that the managerial role is complex and demanding (Hill, 2003). According to Watson and Harris (1999) this process, along with a lot of other occupations, can be seen as a process of continuous emergence in which people are continuously making sense of what they are doing.

There are no clear line between being a manager and not being a manager (Watson & Harris, 1999), and there is no sudden transformation before and after people becomes managers. They are still the same person, but an transformation is needed. To ease this transformation, the project managers need to make psychological adjustments. According to Hill (2003), these adjustments are learning what it means to be a manager, developing interpersonal judgment, gaining self-knowledge and coping with stress and emotions. Another important aspect of the process of becoming a manager, is that this process is mainly based on learning by doing. A project manager learn by experience. The project manager is learning by doing mistakes when facing real problems and consequences (Hill, 2003).

Being a project manager has different aspects to it, both a task and a personal dimension (Watson & Harris, 1999). The task dimension is the main part of project management that people think of when they hear the word ”managing”, with all the task that follows being a manager. This includes the initiating and organising tasks that produces the services and goods. On the other hand, it is important to not forget the personal dimension of it. The personal dimension is the respect the managers need to have, and is therefore an adjustment on personal level. Both the project manager and his employees needs to see him as a manager. According to Hill (2003), the primary responsibilities of a manager include supervising others rather than directly performing technical tasks (Hill, 2003).
2.1.2 Skills of a Project Manager

The project manager is an important resource for achieving project success. Some important skills of a project manager are human-, technical- and conceptual and organizational skills, which are called the three-skills approach (Katz, 2009/1955). El-Sabaa (2001) showed in his research that human skills was the most important skill of a project manager. Communication, delegation of authority, coping with situations, mobilization, high self-esteem, political sensitivity and enthusiasm were characteristics that were included in the category of human skill. Human skills concern mostly about working with people, the project manager must accept the existence of different views, perceptions and faiths that differ from himself. The project manager must be people-oriented and have good communication skills, both verbally and non-verbally (Katz, 2009/1955). Human skills are the non-technical skills that a project manager has, concerning the managing and working with people and ensuring customer satisfaction (Jalil & Shahid, 2008). These skills also include team building skills and the ability to manage stress and conflicts.

The second most important skill of a project manager were according to this research, the conceptual and organizational skill (El-Sabaa, 2001). Important characteristics in this category were being able to plan and organize the project, being goal oriented, strong problem orientation and see the project as a whole. Success of any decision depends on the conceptual skill of those who do the decision and those who put it in motion (Katz, 2009/1955). Both of these two skills scored over 79% of the 126 respondents in El-Sabaa (2001) research, while the technical skill only scored 50%.

The technical skill included characteristics as knowledge about the project, methods, processes, procedures and techniques. The project manager has specialized understanding, and proficiency in how to use the tools and techniques. The skill in use of computer and technology required are important (El-Sabaa, 2001; Katz, 2009/1955; Jalil & Shahid, 2008). According to El-Sabaa (2001), managers should have relevant experience or knowledge of
2.1. PROJECT MANAGEMENT

the technology required in the project they manage, to be successful. In order for a project manager to be able to create effective solutions for the use of technology, the project manager must understand the technology being used well enough to know which technology is appropriate and how to take advantage of this technology to meet business objectives (Keil, Lee, & Deng, 2013).

The role of project management has changed over time. Years ago, project managers had the full responsibility for project success, that the project should be delivered within time, cost and performance/technology. Today, projects success is more advanced than that. Today project managers need to have an understanding of technology rather than a command of technology (Kerzner, 2017). Project managers are expected to focus more on managing the project delivery rather than providing technical direction to the project team, and the accountability for the success of the project is not only the project managers task (Kerzner, 2017).

The question is how project managers contribute for achieving project success. The answer is that, in addition to having both human, conceptual and organizational, and technical skills, they learn from other people’s experiences as much as their own experiences. Therefore, I will move on to examine a methodology for project management that is based on experiences of project managers.

2.1.3 Methodology for Project Management

Project Management have been practised for centuries (Bentley, 2012; Kwak, 2005), so why should people start from scratch each time? To avoid this, some methodologies and standards for project management has been developed, where people can learn from other people’s experiences. There are a lot of different methodologies for project management, some more used and known than others. Some examples of methodologies can be PRINCE2, Critical Chain Project Management, Critical Path Method, Integrated Project Management, etc. In
this section I will mention PRINCE2, as an example for showing how traditional project management works. The reason why I chose to examine PRINCE2, is because it is a well-known certification for effective project management, which is widely used by most industries and organizations.

PRINCE2

PRINCE2 is a structured project management method and are based on experiences of other project managers. ‘Don’t use a sledgehammer to crack a walnut” is a saying from PRINCE2, which means that the method needs to be adjusted to suit the size, importance and environment of the project (Bentley, 2012). PRINCE2 can be adjusted to be used in all organizations, independent of industry, size, geography or culture.

PRINCE2 are fitted to meet the customers’ needs, by being designed to be both flexible and scalable. Bentley (2012) explains that PRINCE2 gives more efficient control of the resources, and it has a controlled management of change that the business gets in terms of investments and return on investments. For ensuring that the product will meet the functional, environmental, service and management requirements that the customers has, PRINCE2 actively involve the customers throughout the development of the product (Bentley, 2012).

Some of the benefits with PRINCE2 is that it is both repeatable, teachable, people know what to expect and it builds on experiences (Bentley, 2012). PRINCE2 consists of good documentation which makes it easier for another project manager to take over the project in the middle of it. The method also provides early warning of projects and it is proactive, not reactive.

Two key principles of PRINCE2 is that it is product based, and that a project should be driven by its business case. PRINCE2 are based on several components, eight processes and a few techniques to achieve the project (Bentley, 2012), which are shown in Table 2.2. Bentley (2012) explains that the components examine the philosophy about why the various
2.1. PROJECT MANAGEMENT

project aspects are needed and how they can be used. This philosophy is implemented to
any project through a set of processes that provides a controlled start, progress and closing
of the project. The techniques that PRINCE2 provides are mostly optional, except the
product-based planning technique. This technique is important for PRINCE2 because it
bring major benefits to the project. These components, processes and techniques are tested
by project managers all over the world and are based on their experiences (Bentley, 2012).

Table 2.2: Components, processes and techniques that PRINCE2 are based on

<table>
<thead>
<tr>
<th>The Components</th>
<th>The Processes</th>
<th>The Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Case</td>
<td>Directing a Project (DP)</td>
<td>Quality Review</td>
</tr>
<tr>
<td>Organisation</td>
<td>Starting Up a Project (SU)</td>
<td>Product-based Planning</td>
</tr>
<tr>
<td>Plans</td>
<td>Initiating a Project (IP)</td>
<td>Change Control</td>
</tr>
<tr>
<td>Controls</td>
<td>Controlling a Stage (CS)</td>
<td></td>
</tr>
<tr>
<td>Risk</td>
<td>Managing Product Delivery (MP)</td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td>Managing Stage Boundaries (SB)</td>
<td></td>
</tr>
<tr>
<td>Configuration Manage-</td>
<td>Closing a Project (CP)</td>
<td></td>
</tr>
<tr>
<td>Change Control</td>
<td>Planning (PL)</td>
<td></td>
</tr>
</tbody>
</table>

2.1.4 Discussion and Summary

As a summary of Section 2.1, I can say that project management is the application of
knowledge, skills, tools, and techniques to project activities to meet the project requirements
of time, cost and scope of the project. Project management are in general divided in five
process groups, initiation, planning, execution, monitoring and control, and closure. It is a
lot of different standards and methods of project management and these must be fitted to
each project, as each project are different. The project management method PRINCE2 are
based on these five process groups. This method use good documentation which makes it
easier for another project manager to take over the project while it is ongoing. The standards
and methods are based on other people’s experiences, their failure and success.

For achieving project management success, the project manager must have the right skills
for the project. The three-skills approach are a good explanation of what skills a project
manager should have. The most important skills are human- and conceptual and organi-
zational skills. However, in this research I imagine that conceptual skills are something
all project managers have, and look more closely at the human- and technical skills in the
software development industry, as shown in Table 2.3

Table 2.3: Skills from the three-skills approach by (Katz, 2009/1955), related to the study

<table>
<thead>
<tr>
<th>Three-skills approach</th>
<th>Keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human skills</td>
<td>People-oriented, good communication skills, delegation of authority, coping with situations, accepting different views</td>
</tr>
<tr>
<td>Technical skills</td>
<td>Knowledge about the project, methods, processes, procedures and techniques</td>
</tr>
</tbody>
</table>

Project management are the planning, organizing, directing and controlling of the process
that leads to project success, by completing specific goals and objectives by using the re-
sources they have. I will conclude this chapter by saying that the human skills are the most
important one for project managers in general today. In other words, project managers must
be people-oriented, and communication is important for good project management. Without
communication, they will not achieve the conceptual and organizational skill, that are the
second most important skill of a project manager. Another thing to have in mind later in
this study is that the further into the project in traditional project management, the less
degree of influence the stakeholders gets because the cost of the changes increase.

The main research question in this study is To what extent do project managers experience
2.2 SOFTWARE DEVELOPMENT PROJECTS

that their technical or non-technical background affects their performance as project managers in software development projects. This chapter answers sub-question one: What are traditional project management and what skills should a project manager have?

Based on this, the following propositions will be used to analyse the empirical data I have collected, in Chapter 5:

P1: Project managers are never fully trained, they are constantly learning.

P2: Project management tools and methodologies must be fitted to each project.

P3: Human skills are the most important skill of a project manager, while technical skill are the least important.

Now, I will move on to examine how to do project management in software development projects, as this are the topic of this research.

2.2 Software Development Projects

As mentioned, some of the constraints for achieving project success is finishing the project within time, cost and scope. In software development projects, a successful project is delivered upon time and within budget, with agreed functionality/quality (Procaccino & Verner, 2006; Savolainen et al., 2012). Software development projects are complex, and that is a big obstacle to achieve project success in these kinds of projects.

The challenge with software projects is to estimate the time it will take and to stay within the scope throughout the whole project. The customers will often have more, and the developers often want to do something extra. Many people agree that “the basic problem of computing is the mastery of complexity” (Reel, 1999). Reel (1999) explains that most of the project failures happens before the design is made and even before there is written one
2.2. SOFTWARE DEVELOPMENT PROJECTS

Field (1997) established 10 signs of IT project failure, which Al-Ahmad et al. (2009) later revised. These 10 signs are shown in Table 2.4, and they are failures that mainly happen before the project even have started. These failures can be avoided with better management.

How are a software development projects managed? A traditional software development methodology is divided into four phases. According to Leau, Loo, Tham, and Tan (2012), these four phases are the requirement planning phase, the design and architectural planning phase, the development phase and the testing and feedback phase. The requirement planning phase are the beginning of the process, where the requirements of the project is planned together with the customer. The planning includes the length of the project and predicting problems that may occur during the project. When this is in order, the project goes to the next phase, the design and architectural phase. In this phase, the design and architectural behind the project are planned. The developers make models and diagrams of the technical infrastructure of the project. After this, the developers start to develop the project and actually code is written to solve the specific goal. While this is done, the developers are

<table>
<thead>
<tr>
<th>Ten Signs of IT Failure:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Project managers don’t understand users’ needs</td>
<td></td>
</tr>
<tr>
<td>2. The project’s scope is ill-defined</td>
<td></td>
</tr>
<tr>
<td>3. Project changes are managed poorly</td>
<td></td>
</tr>
<tr>
<td>4. The chosen technology changes</td>
<td></td>
</tr>
<tr>
<td>5. Business needs change</td>
<td></td>
</tr>
<tr>
<td>6. Deadlines are unrealistic</td>
<td></td>
</tr>
<tr>
<td>7. Users are resistant</td>
<td></td>
</tr>
<tr>
<td>8. Sponsorship is lost</td>
<td></td>
</tr>
<tr>
<td>9. The project lacks people with appropriate skills</td>
<td></td>
</tr>
<tr>
<td>10. Managers ignore best practices and lessons learned</td>
<td></td>
</tr>
</tbody>
</table>
2.2. SOFTWARE DEVELOPMENT PROJECTS

testing the code. At the end of the development phase, the fourth phase begins. The
customers get involved in the testing and gives feedback to the developers to ensure customer
satisfaction.

The methodologies require predetermined requirements and documentation at the begin-
ning, and on-going documentation during the entire project to ensure further development
(Leau et al., 2012). This also allows the developers to give a more exact estimate of the
costs of the project, accurate schedule and they can easier allocate the resources they have
before the beginning of the project.

2.2.1 Traditional Software Development Methods

Waterfall-, spiral-, iteration- and V-shaped-model are some of the many different models of
traditional software development methods that exists. In this section, I will focus on two of
them, which are the waterfall model and the spiral model. The reason why I chose these
two models, is because they were the most interesting ones in relation to this research. The
waterfall model was first introduced in the manufacturing and construction industries, and
were adopted to software development because there were no other alternatives. The spiral
model on the other hand, are a model that has adopted elements from different models.

The Waterfall Model

The waterfall model is the oldest software development model and the most well-known
(Alshamrani & Bahattab, 2015; Balaji & Murugaiyan, 2012). Imagine water flowing down
a river, this is how the progress in a waterfall model is going through its phases. The model
has a linear sequential design process where the output of each phase is the input for the
next one. One phase must be executed before going on to the next phase, in order to build
a computer software (Bassil, 2012). This makes it an easy model to implement, and few
resources are needed. The phases are differently defined depending on who is talking about them, in Figure 2.3 a model based on Balaji and Murugaiyan (2012) is shown.

![The Waterfall Model](image)

**Figure 2.3:** The Waterfall Model

This model consists of the phases: analysis, design, implementation, testing, and maintenance. The main message of the waterfall model is similar to everyone, independent of how they define the phases. Each project begins with an analysis phase where all the requirements of the project are collected, before moving on to the next phase. Requirements as all the information about software specifications and features are gathered and analysed. Proper documentation that will help further in the development process are prepared (Alshamrani & Bahattab, 2015). Moving on to the design phase, algorithm design, software architecture design, database design, logical diagram design, and data structure definition are chosen (Alshamrani & Bahattab, 2015). After the design phase is done, the developers start to write the code and implementing it to the project. When the developers are finished with developing the project, the testing phase starts, and then the maintenance of the projects begins (Balaji & Murugaiyan, 2012). Maintenance of the project includes modifications, improvements, errors correction, etc. (Alshamrani & Bahattab, 2015).
2.2. SOFTWARE DEVELOPMENT PROJECTS

In waterfall models, one phase of the project is ended before the next phase starts (Balaji & Murugaiyan, 2012; Alshamrani & Bahattab, 2015). The phases are not overlapping, and each phase are scheduled to be completed within a specific time period. Projects where quality control is a major concern will use this model. This is because the model has intensive documentation and planning throughout the project (Alshamrani & Bahattab, 2015).

The Spiral Model

![Figure 2.4: The Spiral Model](image)

The spiral model tries to combine the advantages of the top-down and bottom up concepts, by combining elements of both design and prototyping in the stages of the model (Alshamrani & Bahattab, 2015). The four main steps in this model are: planning, risk analysis, development and evaluation. The approach goes through these steps’ multiple times, as illustrated in Figure 2.4, until the project is completed. First, the developers need to understand the requirements of the project by communicating with the customers and making plans for the project should contain. Second, they must look at the risks and make alternative solutions. At the end of this phase, a prototype is produced. In the next phase, the development phase, the software is produced and tested according to the plan. After the software is produced, the
2.2. SOFTWARE DEVELOPMENT PROJECTS

customers evaluate the output and approve it before the project continues to the next round in the spiral (Alshamrani & Bahattab, 2015). This model emphasizes more on risk analysis than other models, which is one of the biggest advantages with this approach (Munassar & Govardhan, 2010).

By using this model, the developers get a small set of requirements and begins with these in each planning phase and can learn new lessons through each round. After each round in the spiral, the version of the project that is produced is called a prototype of the application (Alshamrani & Bahattab, 2015). One of the advantages with the spiral model is that software is produced early in the project and customers can see progression during the project, and they can evaluate and give feedback. Munassar and Govardhan (2010) explains that the angular component in the spiral model represents progress, while the radius of the spiral represents costs. The costs of this approach can be higher than other approaches and the model does not work well for smaller projects.

2.2.2 Discussion and Summary

The waterfall and the spiral model are the two methods of software development that are well-known, where the waterfall model is the oldest one of them. The waterfall model has four or five phases and goes through the phases one time, then the entire project is finished. It does not move on to the next phase, before the previous one is finished. This way, the customers do not see the product before the entire project is finished and therefore the requirements must be well-documented before project start. The spiral model on the other hand, has four steps and goes through these steps many times. After going through these steps one time, they have a prototype of the project and the customer can evaluate this before the developers continues with the project.

The main difference between the waterfall model and the spiral model, is that the spiral model goes through the steps in the waterfall model, multiple times as shown in Figure 2.5,
2.2. SOFTWARE DEVELOPMENT PROJECTS

that are based on one of Beck (1999) models. The spiral model is more suitable for more complex and long-term projects than the waterfall model, but the waterfall model is easier to implement, and it is easier to estimate the costs of the projects. Because the spiral model is more flexible, and the customer can change the requirements during the project, it is more costly than the waterfall model, where all the requirements should be specified at the beginning of the project (Alshamrani & Bahattab, 2015).

![Figure 2.5: Difference between the waterfall model and the spiral model](image)

Of the ten signs of project failures mentioned in this chapter, five of them can be avoided depending on which model the developer team follows in their software development process, as shown in Table 2.5. It is important for the project manager to understand the customers’ needs in both models (a), but there are more opportunities for letting the developers know if they misunderstood them in the spiral model. If the project managers misunderstand the needs before the project starts in the waterfall model, they will not know before the product are finished. If the scope of the project is ill-defined (b), the developers must make own assumptions during the project in the waterfall model, while they can ask the customers at the end of each round in the spiral model. If there are some changes in the project, they can
be managed poorly (c) in the spiral model. The waterfall model at the other hand, are not open for any changes. The same goes for change of technology (d) in the waterfall model, since it is used in small projects that are not that complex. For each round in the spiral model, the developers can learn new skills while the project are ongoing. On the other hand, the waterfall model does not have this opportunity and the project will fail if they do not have the people with the appropriate skills (e).

Table 2.5: Causes of project failures in IT projects which are relevant for the waterfall (VM)- and the spiral (SM) model

<table>
<thead>
<tr>
<th>Project Failures</th>
<th>WM</th>
<th>SM</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Project managers don’t understand users’ needs</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>b) The project’s scope is ill-defined</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>c) Project changes are managed poorly</td>
<td>O</td>
<td>X</td>
</tr>
<tr>
<td>d) The chosen technology changes</td>
<td>O</td>
<td>X</td>
</tr>
<tr>
<td>e) The project lacks people with appropriate skills</td>
<td>X</td>
<td>O</td>
</tr>
</tbody>
</table>

As mentioned, the main research question in this study is: To what extent do project managers experience that their technical or non-technical background affects their performance as project managers in software development projects. This chapter answers sub-question two: How is the process of software development projects, and which failures are relevant?

Based on this, the following propositions will be used to analyse the empirical data I have collected, in Chapter 5:

S1: Project managers who do not understand the customers needs and an ill-defined scope is the biggest reasons for project failure in software development projects.

S2: Project managers in software development projects must ensure that the project stay within the planned time, cost and quality to achieve project success.
2.3. AGILE SOFTWARE DEVELOPMENT

Considering project management framework, the response to these methods has been to introduce agile software development to recover some of the project failures in IT. Today, agile software development is the most used approach to project management in software development projects.

2.3 Agile Software Development

Agile software development has evolved since early 1990s (Cho, 2008) and is an approach to project management that is mostly used in software development. This approach was developed to embrace change and uncertainties in software development projects (Sheffield & Lemétayer, 2013). Not all processes match all projects and the processes needs to be fitted each project individually. The agile approach takes this into account. An agile style of development addresses the problems of rapid change directly. Unlike traditional project management, agile development focuses on the individually skills and talents of the developers and forms the process to them (Cockburn & Highsmith, 2001). These companies focus more on collaboration in leadership rather than commanding the employees. Communication and discussions with the team often make better ideas and results than one manager in charge of decisions. Who makes the decisions is not important in agile companies.

Table 2.6: The Manifesto for Agile Software Development (Beck et al., 2001)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>NOT VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals and interactions</td>
<td>Processes and tools</td>
</tr>
<tr>
<td>Working software</td>
<td>Comprehensive documentation</td>
</tr>
<tr>
<td>Customer collaboration</td>
<td>Contract negotiation</td>
</tr>
<tr>
<td>Responding to change</td>
<td>Following a plan</td>
</tr>
</tbody>
</table>

The Manifesto for Agile Software Development, which were published in 2001, revels items
that are considered valuable for agile methods. This was the beginning of the “Agile Move-
ment” (Abrahamsson, Salo, Ronkainen, & Warsta, 2002). The manifesto argues that agile
development values individuals and interactions over processes and tools, working software
over comprehensive documentation, customer collaboration over contract negotiation, and
responding to change over following a plan (Beck et al., 2001), as shown in Table 2.6.

Processes, tools, documentation, contract negotiation and following a plan are all im-
portant aspects and useful in a project. But valuing individuals and interactions allows
the developers to interact and share information, making them better developers when it
is needed. Quick feedback and measurements of how fast results get produced comes from
using working software. Both of these compensates for comprehensive documentation. Con-
tract negotiation are important, but the contract is unsatisfactory for the customers without
collaboration. The customers have to collaborate with the developers, sponsors and everyone
else involved to get the best results. While the process is ongoing, the customers can get
new needs, and therefore it is important for the developers to respond to their changes and
not just following an outdated plan.

Agile is about creating and responding to change (Highsmith & Cockburn, 2001). Agile
approach focusses on making the relationship between the customers and the developers
closer. Project managers focus on setting up a collaborative relationship with the customers.
While the project managers are the link between the customers and the developers, the tasks
are coordinated by the developers who carries out the work (Moe, Dingsøyr, & Dybå, 2010).
This approach has a potential for higher customer satisfaction, but also a potential for
shorter development cycles, quicker adaption to change and a lower bug rate (Cho, 2008).
The customer usually does not understand the task that needs to be done, therefore an agile
approach plans the features instead of task. These features are planned in short iterations
on two to six weeks, an iteration that are several months long are not agile (Highsmith &
Cockburn, 2001). This makes it easier for the customers to know the status of their product
at all time. The customer has the opportunity to give feedback and make changes while the
2.3. AGILE SOFTWARE DEVELOPMENT

A project is ongoing, and they can change the order of the prioritized features at the end of each iteration.

**Table 2.7:** Characteristics of Agile Processes by Miller (2001)

<table>
<thead>
<tr>
<th>Characteristics of Agile Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modularity</td>
</tr>
<tr>
<td>Process broken into activities transforming vision into reality</td>
</tr>
<tr>
<td>Iterative</td>
</tr>
<tr>
<td>Short cycles</td>
</tr>
<tr>
<td>Time-Bound</td>
</tr>
<tr>
<td>From two to six weeks</td>
</tr>
<tr>
<td>Parsimony</td>
</tr>
<tr>
<td>Require a minimal number of activities to mitigate risk and achieve the goal</td>
</tr>
<tr>
<td>Adaptive</td>
</tr>
<tr>
<td>Open for change</td>
</tr>
<tr>
<td>Incremental</td>
</tr>
<tr>
<td>Development approach</td>
</tr>
<tr>
<td>Convergent</td>
</tr>
<tr>
<td>Proactively attacking risks in each iteration</td>
</tr>
<tr>
<td>People-Oriented</td>
</tr>
<tr>
<td>Not favoring process and technology</td>
</tr>
<tr>
<td>Collaborative</td>
</tr>
<tr>
<td>Fostering communication among team members</td>
</tr>
</tbody>
</table>

Miller (2001) have developed nine characteristics to agile software processes, and these are shown in Table 2.7. These characteristics are good examples of what an agile process is about and how it works. As mentioned, an agile process consists of short cycles, called iterations, over approximately two to six weeks. The method focuses on people instead of favoring process and technology, which makes it a people-oriented method. The goal of the project is divided into small features, which the developers have the responsibility of managing. The customer makes a priority list of the features and the developers chooses which tasks (that the features are divided into) they think they will manage to complete within each iteration. Good collaboration through communication get fostered among team members and with the customers at all time. At the end of each iteration, the customer can change the priority list and give feedback, which shows that the developers are open for change. All of these, and more, are important facts that exists in an agile process (Miller, 2001).
2.3. AGILE SOFTWARE DEVELOPMENT

2.3.1 Agile Software Development Methods

There are different methods of agile software development, where the most well-known method is Scrum. Extreme Programming (also called XP) and Lean software development is also popular methods for agile software development, followed by crystal methodologies, dynamic software development method and feature-driven development. In this section, I will explain the most used and well-known one, which is Scrum.

Scrum

Scrum is a project-management-oriented agile development method and presents an approach for planning and managing software projects (Moe et al., 2010). It is based on a series of short development phases or iteration, also called sprints, which are maximum 30 days long, usually shorter. By using Scrum, the developers have a review with a customer focus group at the end of each iteration. At this review-sessions, the customers can both give feedback to the developers and change the priority of the features (Highsmith & Cockburn, 2001). A Scrum team has the full responsibility and authority of making decisions for achieving the goal. They are responsible for planning, scheduling, and assigning tasks to the different team members themselves (Moe et al., 2010).

Scrum exists of different roles, meeting and tools that help the process become so effective. A scrum team has a product owner, a team and a scrum master (Cho, 2008). The product owner is responsible for making the plan, with the project’s requirements and return on investment (ROI) objectives and for getting initial and on-going funding (Schwaber, 2004). The team are responsible for the process of the project. As mentioned, the team has the full responsibility and authority of making decisions for achieving the goal. They are responsible for implementing functionality to the project and should be self-managing, self-organizing and cross-functional to maximize team performance (Schwaber, 2004). According to Schwaber (2004) the scrum master has the responsibility for ensuring that scrum
2.3. **AGILE SOFTWARE DEVELOPMENT**

values, practices and rules are enacted and enforced.

The scrum team have different meetings during the process, that will help them communicating both in the team and with customers. This way they can always be aware of what is going on in the project. These meetings are the Daily Scrum Meeting, the Daily Scrum of Scrums Meeting, the Sprint Review Meeting and the Spring Planning Meeting (Cho, 2008). A Daily Scrum Meeting is a meeting every morning where the team gives an update on what they have done and what they are going to do. The same format is used on the Daily Scrum of Scrums Meeting, the purpose of this meeting is to synchronize work between multiple scrum teams. A Sprint Review Meeting is a meeting at the end of each iteration, where the iteration is discussed. The team shows the product owner and the stakeholders what have been done in the iteration that is completed. After this, the product owner, scrum master and the team have a meeting to discuss what should be done in the next iteration. The team breaks the features down to manageable tasks, that they think will be completed in one iteration.

Scrum also provides three tools, which are the Product Backlog, the Sprint Backlog, and the Burndown Chart (Cho, 2008). The Product Backlog is made at the beginning of a project and are a list of features which are going to be implemented in the project. Before the projects starts, the customers and project managers discuss what the results of the project should be, and which features the customers want in the end-result. These features should be in a prioritized list, so that the team knows which one is more important. After the backlog is ready, the team adds the features into different iterations, and this list is called the Sprint Backlog. In the Sprint Backlog, the features are divided into different iterations, or sprints. As mentioned, in a sprint, there is just enough features and tasks that the team think will be completed in one sprint. The Burndown Chart is a chart which shows how much of the tasks in one sprint are completed. The scrum team can use this chart to see how they are doing, if they have done a lot or if they have much to do before the sprint is done.
2.3.2 Discussion and Summary

The nine characteristics of the agile software development approach developed by Miller (2001) are somewhat similar to each other, and therefore I merged them into four main characteristics, as seen in Table 2.8. The first one is iterative and time-bounded, meaning that an agile process are divided into short iterations of two to six weeks. Within each iteration, a set of tasks is completed and shown to the customers for getting feedback. The second characteristic is people-oriented and collaborative. The team members are responsible for the project and how to manage it, which means they must be collaborative for achieving their goal. Good communication by the project manager and among the team members makes the collaboration easier. Modularity and parsimony are another important characteristic, where the project is divided into features, which are again divided into such small tasks that the developers manage to achieve their goal in each iteration. The last characteristic is adaptive, incremental and convergent. The project is delivered in increments and when this increment is tested and completed, it is implemented into the system. New risks can be discovered through an iteration and it is therefore important to adapt to the situation by making new tasks.

Table 2.8: A summary of the characteristics of an agile process

<table>
<thead>
<tr>
<th>Summary of Characteristics of an Agile Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iterative and time-bound</td>
</tr>
<tr>
<td>People-oriented and collaborative</td>
</tr>
<tr>
<td>Modularity and parsimony</td>
</tr>
<tr>
<td>Adaptive, incremental and convergent</td>
</tr>
</tbody>
</table>

As mentioned in Section 2.2.2, most project failures that often happens in software development projects could be solved by the agile methodology Scrum. This are shown in Table 2.9. The project manager and the developer team communicate with the customers at the end of each iteration and if the needs are misunderstood, they can easily be explained one
2.3. AGILE SOFTWARE DEVELOPMENT

more time. The same applies to not defining the scope correctly. The agile methodology has been made to manage changes and reduce costs of making changes.

<table>
<thead>
<tr>
<th>Project Failures</th>
<th>Scrum</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Project managers don’t understand users’ needs</td>
<td>O</td>
</tr>
<tr>
<td>b) The project’s scope is ill-defined</td>
<td>O</td>
</tr>
<tr>
<td>c) Project changes are managed poorly</td>
<td>O</td>
</tr>
<tr>
<td>d) The chosen technology Changes</td>
<td>O</td>
</tr>
<tr>
<td>e) The project lacks people with appropriate skills</td>
<td>O</td>
</tr>
</tbody>
</table>

Table 2.9: Causes of project failures in IT projects which are relevant for scrum

As mentioned, the main research question in this study is: *To what extent do project managers experience that their technical or non-technical background affects their performance as project managers in software development projects?* This chapter answers sub-question three: Which characteristics are important for agile development? And why agile? Now, I will move on to look at the differences between management and leadership.

Based on this, the following propositions will be used to analyse the empirical data I have collected, in Chapter 5:

A1: Agile development solves all project failures within IT.

A2: A project manager must have good communication skills to achieve good collaboration with and within project team.

A3: In agile software development it is not important who makes the decisions.
2.4 Leadership

Characteristics for a leader and a manager are different. The leader are known as a people-oriented person who inspires his employees to achieve, while the managers are more concerned with planning and controlling the team members (Burke & Barron, 2014). Nevertheless, a project manager should have both skills for achieving project success. In this section, I will examine the differences between management and leadership. Then, I will explain transformational leadership, as it is a theory that emphasises on making relationships through communication, motivation and influence (Burke & Barron, 2014).

A lot of people have tried making a definition of what leadership is, and they are all different. The difference between leadership and management is the way of making people to work. According to Kotter (1990), management controls the people by pushing them in the right direction, while leadership motivates people by satisfying their basic needs. As mentioned in Section 2.1, management is at its best when things stay the same. Leadership on the other hand, is different. Leadership is influence. By that, I mean that leadership deals with people and their continually changing dynamics (Maxwell, 2013). Leadership are more a process rather than a position. According to Burke and Barron (2014), leadership is more about motivating, influencing and working with people, rather than organizing, planning, directing and controlling as management is about. A good leader advances his team, not himself, and develops people to become leaders themselves.

According to Burke and Barron (2014), project managers need both management- and leadership skills, because the skills are complementary to each other. Without management there is no plan for the project, and without leadership the team are unmotivated to do what is expected of them. Different leadership theories can affect the leaders behaviour. Li, Tan, and Teo (2012) explain in their study that the leaders transformational leadership is related to the developers intrinsic motivation in a positive way. Therefore, transformational leadership will be examined in the next section.
2.4. LEADERSHIP

2.4.1 Transformational Leadership

Transformational leadership is a theory that emphasises on making relationships through communication, motivation and influence (Burke & Barron, 2014; Li et al., 2012). This leadership theory can be adopted in most situations, because the leaders inspires the employees to work with them (Yukl, 2002; Burke & Barron, 2014; Bass, 1996, 1997). Transformational leaders creates an environment where people can develop and grow, which benefits both themselves and the organization (Burke & Barron, 2014). They motivate the employees and help them succeed themselves. By motivating the employees, they often do more than they originally are expected to do. This makes the employees feel trust, admiration, loyalty, and respect toward the leader (Yukl, 2002).

Table 2.10: Guidelines for transformational leadership (Yukl, 2002)

<table>
<thead>
<tr>
<th>Guidelines for transformational leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Articulate a clear and appealing vision</td>
</tr>
<tr>
<td>2  Explain how the vision can be attained</td>
</tr>
<tr>
<td>3  Act confidently and optimistically</td>
</tr>
<tr>
<td>4  Express confidence in followers</td>
</tr>
<tr>
<td>5  Use dramatic, symbolic actions to emphasize key values</td>
</tr>
<tr>
<td>6  Lead by example</td>
</tr>
<tr>
<td>7  Empower people to achieve the vision</td>
</tr>
</tbody>
</table>

Yukl (2002) have developed some guidelines for transformational leadership, as shown in Table 2.10. These guidelines can be used by leaders who want to inspire and motivate his employees. The first guideline (1) is that the leader should articulate a clear and appealing vision. By this, it means that the leader should strengthen the existing vision or build commitment to a new vision (Yukl, 2002). As a result, it gives the work meaning and the employees action and decisions are guided by the vision. The second guideline (2) is that
the leader must convince the employees that the vision is appropriate and achievable. There should be a link between the vision and the strategy, which makes the employees the value of the vision. The leader should not pretend to know how to achieve the vision, but rather inform the employees that they can contribute to what actions are needed to achieve the vision. To succeed in getting the employees to believe in the vision, the leaders need to be confident and optimistic, and convince (3) them that it is important for achieving success. In addition, the leaders need to be trustful for their employees (4). The leaders should make the employees confidence and optimistic over themselves. The fifth guideline (5) explains that the leaders should use dramatic, symbolic actions to emphasize key values. According to Yukl (2002), a vision is reinforced by leadership behaviour that is consistent with it. Lead by example (6), and actions speak louder than words, are the sixth guideline. The leader should be an example for the employees, and if the employees have to do something unpleasant, the leader should also do it. The employees are watching the leaders at all time to look for hidden meanings that may not be intended by the leader. Therefore, the leaders must consider how comments and actions are likely to be understood by the employees. The last guideline (7) is for the leaders to delegate responsibilities to subordinates. Subordinates should get the responsibility for solving a problem by making own solutions, and they should get adequate resources from the leader to do so.

2.4.2 Discussion and Summary

A project manager should have both management and leadership skills for achieving project management success in a project. These skills are different from each other, as the leader are suppose to motivate and influence the team to achieve the project, while a manager are concerned with the planning and controlling of the team in the project. The transformational leadership theory emphasises on making relationships through communication, motivation and influence.

As mentioned in Section 2.3.2, one of the characteristics of an agile process is being people-
2.4. LEADERSHIP

oriented and collaborative. Transformational leaders are people-oriented leaders who creates an environment where people can develop and grow. For example, the last guideline for transformational leadership are ”Empower people to achieve the vision”, which means that the leaders should delegate responsibilities to the project team. By delegating responsibilities and task to the team, the team need to be collaborative to achieve the goal. For an agile approach to work, a motivated project team is needed. Therefore, transformational leadership is important in software development projects today.

The main research question in this study is: To what extent do project managers experience that their technical or non-technical background affects their performance as project managers in software development projects? This chapter answers sub-question four: What is the difference between management and leadership? Is leadership important in software development projects?

The following propositions will be used to analyse the empirical data I have collected, in Chapter 5:

L1: Project managers should use communication, motivation and influence when making relationship with the team.

L2: Project managers should be role models for their project team.

L3: Project managers should delegate responsibility to the team members to show confidence in them.
2.5 Theoretical Framework

In this section, the theoretical framework developed in this chapter are summarized. In Table 2.11 a summary of the propositions are shown.

<table>
<thead>
<tr>
<th>Chapter</th>
<th>No.</th>
<th>Propositions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Management</strong></td>
<td>P1</td>
<td>Project managers are never fully trained, they are constantly learning.</td>
</tr>
<tr>
<td></td>
<td>P2</td>
<td>Project management tools and methodologies must be fitted to each project.</td>
</tr>
<tr>
<td></td>
<td>P3</td>
<td>Human skills are the most important skill of a project manager, while technical skill are the least important.</td>
</tr>
<tr>
<td><strong>Software Development Projects</strong></td>
<td>S1</td>
<td>Project managers who do not understand the customers needs and an ill-defined scope is the biggest reasons for project failure in software development projects.</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>Project managers in software development projects must ensure that the project stay within the planned time, cost and quality to achieve project success.</td>
</tr>
<tr>
<td><strong>Agile Software Development</strong></td>
<td>A1</td>
<td>Agile development solves all project failures within IT.</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>A project manager must have good communication skills to achieve good collaboration with and within project team.</td>
</tr>
<tr>
<td></td>
<td>A3</td>
<td>In agile software development it is not important who makes the decisions.</td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>L1</td>
<td>Project managers should use communication, motivation and influence when making relationship with the team.</td>
</tr>
<tr>
<td></td>
<td>L2</td>
<td>Project managers should be role models for their project team.</td>
</tr>
<tr>
<td></td>
<td>L3</td>
<td>Project managers should delegate responsibility to the team members to show confidence in them.</td>
</tr>
</tbody>
</table>
2.5. THEORETICAL FRAMEWORK
Methodology

Within a research project like this, the choice in relation to which direction in form of research strategy, -design and -method one should use to reach the goal are questioned. In this section this choice of strategy, design and method will be explained and discussed. The case company and the interview-objects will be presented, and also the process of collecting the data. At the end of this chapter, I will establish the quality of the thesis, ethical considerations, as well as my own personal remarks.

3.1 Research Strategy

Research strategy is the general orientation of how to execute social research. Choosing between a quantitative and qualitative research strategy is helpful to classify different methods of social research. The main difference between quantitative and qualitative research strategy is that quantitative researchers employ measurements, while qualitative researches do not (Bryman, 2016, Ch. 3). Qualitative refers to characteristics of phenomena, while quantitative refers to quantity or numbers (Larsen, 2007). There are several factors that affect which of these two strategies one should choose, such as the approach, the problem
In this master thesis, the most suitable research strategy is qualitative. The benefit of using qualitative research, is that I can go in depth on some project managers within one software development company. These project managers need to have different backgrounds, some with technical background and others with another background (technical background in this case means background as a developer). With this in mind, I will move on to my choice of research design.

3.2 Research design

There are mainly five different research designs according to Bryman (2016, Ch. 3): experimental-, cross-sectional-, longitudinal-, case study- and comparative design. This thesis is a case study and in this section the case study design will be explained. Strengths and weaknesses with the research design will also be discussed.

A case study involves a detailed and intensive analysis of a single case (Bryman, 2016, Ch. 3), which is concerned with the complexity and particular nature of the case in question (Stake, 1995). There are five types of cases according to Yin (2009): the critical-, the extreme-, the representative-, the revelatory- and the longitudinal case. According to Bryman (2016, Ch. 3), a case study is associated with a location, such as a community or an organization.

This thesis is a case study of the community for project managers in a software development company. To have as much as the same surroundings and a limited number of variables, the thesis only look at project managers in one corporation. This allows me to go in depth into the differences and gives a more detailed analysis of a single case.
Of the five types of cases that Yin (2009) mentions, this thesis is a representative case study. According to Yin (2009, p. 48), the object in a representative study is “to capture the circumstances and conditions of an everyday or commonplace situation”. This can also be called an exemplifying case, because it epitomize a broader category of cases. The case study looks at one organization that is engaged in software development projects, and this organization is representative for other organizations that does the same. The thesis investigates what the project managers in this organization are doing at a normal day at work and how they are behaving.

Whether the case study is inductive or deductive tends to be affected by whether a quantitative or qualitative research strategy is employed (Bryman, 2016, Ch. 2). The research strategy in this case is as mentioned qualitative, and the case study has a deductive approach. According to Wilson (2014, p. 13), a deductive approach is concerned with developing a hypothesis based on existing theory, and then designing a research strategy to test the hypothesis. The reason why this research has a deductive approach is because I started with having a question that I found compelling, and then collected data and analysed it to find the answer to the question.

The disadvantage of case study like this is that one can end up getting too much data, which will be time consuming and unnecessary (Bryman, 2016, Ch. 3). Another drawback is the question of external validity, if a single case study is valid for other contexts than the industry I am studying, if the result can be generalized. This will be discussed further in Section 3.5.

### 3.3 Research Method

Bryman (2016, Ch. 3) explains that research method is simply a technique for collecting data. As mentioned, the research strategy in this thesis is a qualitative strategy. The re-
3.3. RESEARCH METHOD

search method for this thesis will be qualitative interviewing. Qualitative interviewing is much less structured than quantitative, and in qualitative interviewing the weight is on the respondent’s perspectives which are the goal of this thesis (Bryman, 2016, Ch. 3). In qualitative interviewing there is greater focus on the interviewee’s point of view and reflections on the subject. It is wanted that the interviewee talks about what he thinks is important and relevant and the interviewer can ask questions to follow up what the interviewee is talking about. There are two major types of qualitative interviews, unstructured interview and semi-structured interview (Bryman, 2016, Ch. 20). In this research, a semi-structured interview is appropriate. In a semi-structured interview, the interviewer has an interview guide with some main question to ask. These questions are asked but may not be outlined as scheduled. The interviewer can ask follow-up questions to the respondent (Bryman, 2016, Ch. 20).

The research question in this research is: To what extent do project managers experience that their technical or non-technical background affects their performance as project managers in software development projects? A semi-structured interview is suitable for this research because it looks at the project managers feelings and experiences of the topic. The interview-guide let the project managers talk freely around the highlighted topics. It also allows the interviewer to ask the question in the order that is most suitable, based on how the interview develops.

There are several benefits by using this method. One of the biggest benefits are that the respondents are asked the same questions, but follow-up-questions can be added if the respondents have something to add that can help the interviewer to understand the situation better. The project managers that are interviewed in this thesis work in different projects and different situations, therefore, they may need different questions to give good answers. Another benefit with a semi-structured interview is that it is more flexible than a structured interview, even if the interviewer has a clear focus on the study. A semi-structured interview allows more specific issues to be addressed.
However, the interview needs to have some structure. Without structure, the respondent may talk about completely different things, which makes it hard for the interviewer to see similarities and differences between the project managers in the case company. The drawbacks with a semi-structured interview is that it is time-consuming, both in terms of data-collection and data-analyses. Compared to a structured interview, a semi-structured interview takes longer to perform and analyse.

3.4 Data Collection

In this section, I will explain how I collected the data of this research. First, the case company will be presented, followed by the process of selecting candidates. In addition, I will discuss the problems I met during the thesis in relation to data collection.

3.4.1 Case Company

The case company used in this research are a consulting firm within IT. They offer a lot of different IT-services, but the main focus in this research is the software development services that they offer.

The case company are collected through convenience sampling. Convenience sampling is a sampling that is selected because of its availability to the researcher (Bryman, 2016, Ch. 8). The reason why I chose this company, is mainly because of my contacts in the firm from when I was a summer intern there myself. In Section 4.1 there will be more information about the case company.
3.4. DATA COLLECTION

3.4.2 Selection and Collection of Candidates

As mentioned, I made a choice to interview project managers in one consulting company within software development, that I have previously worked for. When I was going to find candidates for this thesis that could answer my problem statement, I had to find two different types of project managers. I needed project managers with both background as developers, and with background from another industry.

In the case company mentioned in Section 3.4.1, I came in contact with the leader for the community of engagement management. This community covers project management, service management and project management office (PMO). This person is the team-leader for the project managers at his main office. On the email-list for the community of engagement management, there are more than 100 people. I sent an email to the leader for this community, who forwarded it to everyone on the list, asking them to participate in this research study. This email can be found in both an English and Norwegian version in Appendix A-1 and A-2.

One of them responded that she wanted to be a part of this research study. She had a background as project manager in another industry before becoming a project manager in this consultant company. This was the only respond I got, because project managers are busy, and especially at this time of the year. After a while, I sent a new email to the leader of this community and asked if he could get me in contact with a project manager with background as a developer in this company too because I needed at least one of each. This gave me two project managers to interview. One girl with non-technical background and one guy with technical background.

Two project managers was less than I hoped. Because the project managers were too busy to engage in my thesis at their own through a mail, I started to contact the project managers in person. I searched for project managers in the case company on LinkedIn, and looked for both managers with both technical or non-technical background. Because I had one of each
background and gender from before, I looked for people with the opposite background and
gender on Linkedin. After a couple of days, two of the six project managers that I sent a
message to answered that they wanted to participate. One girl with technical background
and one guy with non-technical background.

The process from getting in touch with the company till I got the interviews took a long
time. But in the end, I reach my goal of getting at least four interviews and getting the
interviews done and transcribed within the deadline I had set for myself.

3.4.3 The Candidates

In this section, the four project managers who were interviewed are presented. Of these
four, two have technical background and two have non-technical background, as shown in
Table 3.1. Andrea and Bill have background as project managers from another industry.
They have experience from project management and certifications as for example PRINCE2,
which contributed to their being employed by the case company. Even if they did not have
knowledge of the industry. Chris and Donna on the other hand, has background as software
developers and then developed to become project managers.

<table>
<thead>
<tr>
<th>Name</th>
<th>Background</th>
<th>Age</th>
<th>Experience</th>
<th>Time on Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrea</td>
<td>Non-technical</td>
<td>30-35</td>
<td>2-4 years</td>
<td>45 minutes</td>
</tr>
<tr>
<td>Bill</td>
<td>Non-Technical</td>
<td>30-35</td>
<td>5-7 years</td>
<td>40 minutes</td>
</tr>
<tr>
<td>Chris</td>
<td>Technical</td>
<td>35-40</td>
<td>8-10 years</td>
<td>60 minutes</td>
</tr>
<tr>
<td>Donna</td>
<td>Technical</td>
<td>50-55</td>
<td>11-13 years</td>
<td>50 minutes</td>
</tr>
</tbody>
</table>

What these four people have in common is that everyone works in the same company
now, the case company that was mentioned in Section 3.4.1 (and later on in Section 4.1). In
addition, they have in common that none of them started their career in this company.

### 3.4.4 Interviewing Process

During the interview, I was aware that the way I asked the questions would be important. The goal was to get the candidates to be open and tell in their own words their experiences. Before doing the interviews I acquired knowledge of their careers to be maximally prepared. The interviews were recorded using audio tapes. The reason why I chose to use an audio tape was because I wanted to be present during the interview. I am only one person on this project and therefore it would be hard for me to get everything the candidates said without missing a lot of important aspects or waste time writing during and between each question. In this section I will explain how the interviewing process was.

**Skype Interview**

The interviews were over Skype. The main reason for this was because the project managers who were interviewed belonged to different offices in Norway, and none of them in the same city as me. The advantage of using Skype instead of a simple phone call is that one can see each other which makes the interview more like an in-person interview. Some of the benefits with interviewing over Skype is that the interview is more flexible to last-minute changes of the schedule, which was a great chance that could happened in this case, because project managers are in general busy people. This benefit turned out to be needed when one interviewee canceled the interview when it was supposed to start, because the project manager had to attend another emergency meeting. The benefit was also needed on two of the other interviews, when the project managers said they had time for the interview right now. Fortunately, as a student you are very flexible, so this was no problem for me, and the interviews were carried out without any problem.
Another benefit with Skype interviews, is that I saved both time and costs by not traveling to the project managers. According to Bryman (2016, Ch. 20), people who usually would declined being interviewed in-person, may be encourage to agree after all being interviewed by Skype. One of the biggest drawbacks with Skype interviews, is if potential technical problems arise during the interview (Bryman, 2016, Ch. 20). Fortunately, this problem did not arise.

Pilot Interview

Thomas, Nelson, and Silverman (2005) emphasize the importance of pilot work, claiming that many methodologies errors can be corrected by conducting a pilot test before the original study. As this was a qualitative research interview, it was important to conduct a test interview to test the interview guide if it has the right flow. I planned a pilot interview with my brother, five days before my first planned interview. The reason why I chose him, was because he has a lot of experience with these kinds of interviews. But as mentioned before, project managers are busy people. Therefore, when one of the project managers I reached out to on LinkedIn, answered me and said that he had time to do the interview right now, I did the interview with him before I had completed the pilot interview with my brother. The interview went well and the candidate gave me good feedback. He was prepared that it was my first interview, and I asked him about feedback afterwards. He told me it was a good flow in the interview and it lasted as long as I told him before the interview. It was just a question that I had to formulate better, otherwise it was good. Therefore, I chose to cancel the pilot interview with my brother and completed the next interviews.

Transcribing the Interviews

When the interview were finished, the next step was to transcribe the interviews. This helped me get a holistic overview of it all. I was careful to transcribe the interview as fast
3.5. CRITERIA FOR ESTABLISHING THE QUALITY OF THE RESEARCH

as possible after it was done, while it was still fresh in my memory. The reason why I did
the transcribing myself, was because it brought me closer to the data which encourage me
to become aware of similarities and differences between the project managers. With this in
mind, I move on to the processing and analysing of the data.

3.4.5 Processing and Analysing the Data

As mentioned, the transcribing was a good way to get to know the data better and start seeing
similarities and differences between the project managers in the case company. I gathered
these similarities and differences into different categories, to get a better overview of what
they said on the same topic. According to Bryman (2016, Ch. 24), this type of categorizing is
called coding. Coding involves reviewing the transcription and seeing potential similarities,
and putting them into categories. Coding tends to be in a constant state of potential revision
and fluidity (Bryman, 2016, Ch. 24). The topics were compared constantly to see which topic
fit best in which category.

3.5 Criteria for Establishing the Quality of the Research

In establishing and assessing the quality of quantitative research, reliability and validity
are important criteria. In qualitative research on the other hand, the meaning of those
terms need to be altered (Bryman, 2016, Ch. 17). Lincoln and Guba (1985) and Guba and
Lincoln (1994) proposed two alternative criteria for assessing a qualitative study, which are
trustworthiness and authenticity. These criteria is an alternative to reliability and validity
(Bryman, 2016, Ch. 17). Trustworthiness is divided into four criteria, where each of them
are equivalent criterion in quantitative research as seen in Table 3.2. In this section, I will
use these four criteria to assess the quality of my research study.
### 3.5. CRITERIA FOR ESTABLISHING THE QUALITY OF THE RESEARCH

#### Table 3.2: Four quality criteria within qualitative research

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Parallel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Credibility</td>
<td>Internal Validity</td>
</tr>
<tr>
<td>2. Transferability</td>
<td>External Validity</td>
</tr>
<tr>
<td>3. Dependability</td>
<td>Reliability</td>
</tr>
<tr>
<td>4. Confirmability</td>
<td>Objectivity</td>
</tr>
</tbody>
</table>

#### 3.5.1 Credibility

Credibility of the study refers to how believable the findings are (Bryman, 2016, Ch. 3). As mentioned, audio tapes were used during the interviews to ensure that the project managers’ words would be correct. After the interviews, I transcribed them as soon as I could. The transcriptions were done precise and in Norwegian. I have been careful when processing the data and especially careful when translating the quotes from Norwegian to English. In addition, Chapter 4 Empirical Data, has been sent out to the four project managers, to see if they think there is a good correspondence between my findings and their perspectives and experiences. Bryman (2016, p. 17) refers to this technique as respondent validation. After getting feedback from the project managers, I made some minimal changes that made their opinions appear better.

#### 3.5.2 Transferability

Transferability of the study refers to if the findings apply to other contexts (Bryman, 2016, Ch. 3). A factor that affects the transferability in this study is that the participants are all from one company, and therefore one industry. The theory and research methodology of the
3.6. ETHICAL CONSIDERATIONS

study can be transferable to other companies within the same industry. Lack of response from the project managers led me to not being able to collect as much data as I wanted to. Anyway, I think the findings are transferable to other context within the same industry.

3.5.3 Dependability

Dependability of the study refers to if the findings are likely to apply at other times (Bryman, 2016, Ch. 3). Meaning that if other researchers wanted to replicate this study, they will have enough information and thereby get the same results. The process of this research are well documented in this chapter of methodology, which makes it easier for another social researcher to carry out the same study. The results will probably be close to mine, if the researcher choose to interview project managers with the same amount of experience in the case company as in this study. However, the results may be different if interviewing more experienced non-technical managers.

3.5.4 Confirmability

Confirmability of the study refers to if the researcher allowed her values to intrude to a high degree (Bryman, 2016, Ch. 3). I made sure that I did not allow personal values to be visible, both in the interviews but also in the presentation of the empirical data I found. The study is structured so that the empirical findings are in a separate chapter. In the analysis, it is easy to distinguish between my empirical findings and own discussions from the interviews.

3.6 Ethical Considerations

As mentioned, during the actual interview process I used audio tapes. These audio tapes were taken according to NSD, which is short for ”Norsk senter for forskningsdata”, terms
3.7. PERSONAL REMARKS

and conditions. NSD approved my application with the following comment:

After reviewing the information in the message form with attachments, we consider that the project has low personal protection because it does not process specific categories or personal information about criminal convictions and offenses, or includes vulnerable groups. The project is of reasonable duration and is based on consent. We therefore give the project a simplified assessment with terms.

Before the interview I sent out an information letter where I wrote the purpose of the project, how the interview would take shape and most importantly, what rights the interviewee have. This included, among other things, that the interview was going to be recorded and that the interviewee could withdraw from the research at any time. I repeated this information at the beginning of the interview, in case they had not read the information letter, to be sure they got the information. This information letter are shown in Appendix A-3 and A-4, in Norwegian and English. The information letter also explained the interviewees that they will be anonymous both in the transcriptions and in the research.

After transcribing the interviews, I deleted the audio recordings, which was one of the requirements from NSD. After these were deleted, the only data I had left of the interviewees, were anonymous. I have used fiction names in this research, to more easily refer to the different project managers in relation to keep the anonymity.

3.7 Personal Remarks

In this section, the personal remarks I have experienced these six months of writing my master thesis will be described.

One thing that I have noticed, was that the project managers was as busy as I thought.
3.7. PERSONAL REMARKS

Only one of the four project managers could arrange an interview one day and carry out the interview as planned. This probably had something to do with being away from work during the period I interviewed people. The three other project managers I had to be flexible to get an interview with them. One of the interviews had a scheduled time, which was canceled at the last minute when she received an urgent meeting with a customer. When I asked to schedule a new date for this interview, the project manager replied that she had time in two hours. The other two project managers replied that they had the opportunity now, or tonight, the same day they were spotted.

Another thing that I would like to emphasize on is that using a semi-structured interview made it a lot harder and time-consuming analysing the data afterwards. Given that the different project managers interpreted the questions different according to each other, in addition to having different personalities, there were differences between the data I received from the different interviewers. These differences made it more difficult to categorize the data and analyse them.

The fact that both the technical project managers has more experience than the non-technical project managers was something I discovered when going through, categorizing and analysing the data. It showed in what they said during the interviews, that they had more experience as a project manager, which can be a reason why they appear more confident than the two non-technical project managers. This may have affected their answers according to each other.
Empirical Data

In this chapter the empirical data collected through four interviews will be presented. The first section will explain the case company these four interviewees works in. After this, I will go in depth on what the project managers in this company answered on the interviews. According to the fact that I chose to have a semi-structured interview, the interviewees have focused on slightly different things that they think are important. In addition, there were differences in how much each of them spoke, both in terms of their interests but also because of their personalities. Therefore, there are some topics where some had more to say than others.

The results in this chapter will be further discussed and analyzed in Chapter 5, based on the theoretical framework developed in Section 2.5. As a reminder, the purpose of this research is to answer the following research question: *To what extent do project managers experience that their technical or non-technical background affects their performance as project managers in software development projects?*

To keep the interviewees anonymity, they are called Andrea, Bill, Chris and Donna. As mentioned in Section 3.4.3, Andrea and Bill have a non-technical background, and Chris and Donna have a technical background before they started as project managers. As a reminder
from Chapter 2, the project managers with technical background in this study, are managers with background as developers in software development projects.

4.1 Case Company

The case company in this research are a consulting firm within IT. They offer a lot of different IT-services, but the main focus in this research is their software development services that they offer. The company has over 100 000 members within over 20 countries all over the world working for them, where around 0.5 % of them are working in Norway. The company was created in the middle of the 1900s and is now over 50 years old.

The case company has its own community for project managers in the company. This community looks at both projects and services, and which skills you need in both of them. Even if projects has a start- and finish-date while services runs continuously, the skills needed are somehow overlapping. In this community, the project managers can share experiences and learn from each other. All four of the interviewee’s are a member of this community.

The main reason why I chose this company, is because I had an summer internship there where I got to know the company well. I worked on a software development project, and has therefore some experience as a project team member myself. It was during this internship the research question of this research study came to my mind and I wanted to look further into it.

4.1.1 Projects

An agile approach are often used in the projects in the case company, in the form of the company’s own agile framework. They use something similar to Scrum, where they have small sprints and meetings with the customer at the end of each sprint. The project teams
4.2. INTERVIEWEE’S BACKGROUND

can have between two to twenty members, and the tasks of the project managers are different according to how big the project team are. Normally, a project team consists of five to seven members.

A typical working day for project managers in the case company, consists of a lot of meetings. These are meetings where you take in the project team to figure out what status is, what remains and where the road goes next in the project. Status of the project must be constantly updated to know what remains and what is finished. At the end of each sprint, the project manager will have a status meeting with the customer, where the economy is reviewed along with other issues. Here the customer will know what was in the previous sprint and what comes in the next. In addition to this, the days consist of some documentation, to keep control of the project, that everything goes as planned.

4.2 Interviewee’s Background

<table>
<thead>
<tr>
<th>Name</th>
<th>Background</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrea</td>
<td>Non-technical</td>
</tr>
<tr>
<td>Bill</td>
<td>Non-Technical</td>
</tr>
<tr>
<td>Chris</td>
<td>Technical</td>
</tr>
<tr>
<td>Donna</td>
<td>Technical</td>
</tr>
</tbody>
</table>

Table 4.1: Reminder of the background of the four interviewees

In this section, the four people who were interviewed are presented further. As mentioned in Section 3.4.3, the four project managers interviewed in this research is now working for the case company mentioned in the previous section. Two of them, Andrea and Bill, are non-technical, meaning that they have a background as project managers from another industry. The other two project managers, Chris and Donna, are technical, meaning that they started
4.2. INTERVIEWEE’S BACKGROUND

their career as developers and then became project managers. As a reminder from Section 3.4.3, the background of the interviewees are shown in Table 4.1.

4.2.1 Choice of Career

Among the four project managers, all of them knew early on that they wanted to become project managers at some point. They all liked to have the overview and control over what is going on, and are not detail-oriented people. For example, Chris mentioned that he was good at technology, but not as good as what others were. He thought it was more fun to work in teams, lead the team and see the effect of the choices he made.

"Early on I realized that my leadership and organizational abilities would be more useful than my technological abilities" - Chris

"... I like to organize and control people. Keep track of things happening and all checklists that is needed to get to the finish line" - Donna

All the project managers think that becoming a project manager was a natural way for them to go. How they got there were different for the project managers with technical and non-technical background. Andrea and Bill, who have a non-technical background, started their career in another industry as engineers. Then they became project managers in that industry, before they moved on to the IT industry. The main reason why they got the job in the case company was because of their experience as project managers and because of their PRINCE2 certifications, etc.

"I’m interested in leadership and think it’s a very exciting area that I want to develop in" - Andrea

"There has always been a leader in me" - Bill
The technical project managers, Chris and Donna on the other hand, started their careers as developers. The transition to becoming a project manager for them, came naturally both for the project managers and for the company, as they developed. Donna started in a project as a developer and by the time the project ended she was a project manager, because the case company saw that she had the potential to be a project manager. Chris started the path to becoming a project manager as early as during his studies. He liked managing people, and took the managing roles when he could. In school projects, he easily took the role as a project manager, and saw early that he likes to lead people.

"I started in a project as a developer-resource. In that project they saw that I had the capabilities to lead and coordinate too, and was therefore set to be a technical project manager. Then I became a team leader in the same project, before I finally got the role of project manager as that role suddenly needed to be filled by a new person” - Donna

"I've always had a leadership position, and I enjoy it” - Chris

4.3 Project Management

Chris explains that being a project manager in a project is mainly about being a leader. The main tasks a project manager has are everything from supporting, coaching and motivating people. In addition to this, there is the delivery-part of the project, which is more about the product itself or the solution to be delivered. In this section, I will explore the interviewees thoughts about human skills of the project manager and the three big measurement parameters within project management, which was subjects they brought up when explaining a good project manager.
4.3. PROJECT MANAGEMENT

4.3.1 Human Skills

The interviewees started talking mainly about human skills when they were asked to explain a good project manager. All the interviewees agreed that communication skills are the most important skill of a good project manager. The non-technical project managers focused a lot more on this skill than the technical project managers. A good project manager communicates well with both his team and the customer, and have a good tone with all the parties in the project. A project manager should be able to communicate with the customer to figure out what the needs are, and communicate this to the team members so that they know what is expected of them at all time. In addition, they said that a good project manager ensure that the team members communicates well with each other too. Communication skills are important for a project to succeed in many ways. According to Andrea, a project without good communication should be terminated. As mentioned, Andrea and Bill, which has a non-technical background, focused a lot more on the importance of communication than the technical project managers.

"A project without communication can be terminated right away" - Andrea

Another skill a good project manager should have according to the interviewees, is the ability to motivate the team to do what is expected of them. Both Bill and Chris, regardless of their background, spoke specifically about this topic. At the start of a project, it is important with team-building activities to build up a motivated team. These activities makes the team get to know each other, which again makes them feel more safe and thereby rely on each other. A team that relies on each other, communicates better. Chris is also concerned that the team should have fun at work, as he believes this leads to better motivation and thereby better performance. A good project manager should also show interest in what the team is working on.

"If you have motivated people you will experience progress, then people will take
responsibility and do a real job” - Bill

In addition to motivating the project team, Bill talked about motivating and engaging the whole organization to be interested in the project. A project that he achieved good project management success in, was a project where he engaged the whole organization to understand that this project had value for their company.

"I think that what I did right in this project was that I was able to engage the whole organization, to understand the importance of delivering the project. Get them to understand that this created value for the business.” - Bill

Chris mention decision-making as an important skill that a good project manager should have. A project manager have to take a lot of decisions. Decisions like which tools to use, how many resources needed and how to use them, which technology to use, if the project actually gives value to the customer, if the project should be terminated before it is finished, etc. Chris are concerned that consultants are expensive, especially for the customers, and that it is therefore important for the project manager to make decisions quickly rather than to dwell on it.

"You are not always making the right decisions, but often it is better to make a decision than to dwell on it and burn time” - Chris

Chris and Bill, regardless of their backgrounds, both talked about a good project manager as a project manager that has the ability to question the customer when the customer wants more functionality than described in the original project mandate. The reason for that is that they stay within the contract and are avoiding scope creep, which is a huge factor for not achieving project management success. They mentioned that a good project manager understands the contract well enough that they understand both what the customer wants
and needs, and communicates this to the project team. The project manager always knows what is in the contract, and if the customer comes with more wishes along the way, the project manager explains that is not a part of the contract. If they then want to change it, they need to change the contract according to estimated time and cost.

"I think one of the most important skills of the project manager is to read and understand the contract, what the customer wants, and have that understanding for it and then be able to convey it to the project team" - Chris

Chris mentioned that a good project manager sees the people, the individuals, in the project, not only the resources. He is able to make use of the capabilities of the individual people in the team. The project manager must be structured to keep the control of what is to be delivered and what is definitely not going to be delivered. If not, the project will have a scope-creep which gives economic problems.

".. that you see the people, see the individuals, not just the resources" - Chris

### 4.3.2 Measurement Parameters

In addition to the human skills, the interviewees explains that a good project manager must have control over the traditional project management aspect as well. By means of this is the financial control of the project. They explains that the project manager must have the ability to plan, estimate, follow, measure and report the project, which is more on the financial part of the project. Measuring the progress of the technological solution to be delivered, and knowing when it is to be delivered. The project manager must also see that what is produced has both a technical value but also a business value. One must also understand how to use project management tools, which methods and tools to use when.
"To understand what elements are playing a role in the project, comes with experience" - Chris

As mentioned in Section 2.1, the three major measurement parameters within project management are time, cost and scope. The non-technical interviewees focused on the fact that a good project manager is a manager that delivers a project within the agreed time, cost and quality. They come to turns with the fact that delivering a project within these measurement parameters do not make a good project manager alone, but it is an important factor. In addition to this, the project managers must deliver something that the customer benefits from, something that gives value to the customer.

"It is important to steer the project from A to Z according to the different aspects of the project management triangle, with time, cost and quality" - Andrea

In the industry of software development, the measurement parameter of quality is much more important than in the other industries that the non-technical project managers in this research came from. They explain that the customer now wants a product that gives them value, both technical value and also business value. The non-technical interviewees talks about the differences between their last job compared to now. Both of them explains that the financial responsibility is greater in this industry as well as the focus on quality.

"It wasn’t about quality in the same way as now" - Andrea

"It was more difficult to get the same financial framework and the resources needed to deliver the project compared to now" - Bill
4.3. PROJECT MANAGEMENT

4.3.3 The Use of Project Management Methods

Among the interviewees, all of them has either the PRINCE2 certification or something similar to it. The case company uses agile methods on their projects, by using something similar to Scrum. Sometimes customers demand the case company to use the same project management methods as them. Many of these customers are using a variant of PRINCE2, and the case company must adopt to them. The non-technical interviewees, that started their career as project managers in another industry, has the PRINCE2 certification from working in that industry. Both of them said that they have more use of this certification now, than before. Bill mentioned that he got more structured as a project manager after getting the PRINCE2 certification.

"I have used it [PRINCE2] most clearly here" - Andrea

"I’ve used PRINCE2 at least [to guide some of the choices I’ve made], a methodology to control some choices" - Bill

When asked which tools and methodologies the project managers used, the scope was big. As mentioned, the non-technical project managers focus a lot on PRINCE2 and that they use that a lot to guide the choices they take as project managers. Beside this, all of them said that they have a lot of options. However, the technical project managers focused more on these options than the non-technical project managers. The case company has a lot of tools they use as standards, but the project managers are freely to use other tools if they want. Chris mentioned that younger project managers often chose to use the good old waterfall method or the agile method because they are well known. Knowing which tools and methodologies to use comes with experience, when you know which elements who plays a role in the project.

"It’s up to you which tools and methods you want to use, you use what works
4.4 Knowledge

In this section, the knowledge of the project managers and their thoughts around it will be examined. Where their knowledge comes from and whether or not they experienced good knowledge transfer when they started as project managers in the case company, etc. In addition, I will explore the project managers thoughts about the importance of the technical knowledge/skills of the project managers.

4.4.1 Learning

"Project management was a difficult subject when I started with it many years ago, and it definitely has not become easier" - Chris

Sharing knowledge seemed to be important for the interviewees when start working in the case company, as well as at the beginning of a new project. Both the technical and non-technical project managers in this research have started their career in another company than the case company, either as a project manager or as a developer. They all agreed that the transfer of knowledge when they started in the case company was better than previous companies they worked in. The reason for this is that the case company is a company that focus a lot on the expertise of its employees, which the employees highly appreciate. Even if the transfer of knowledge are good in the case company, they agree that project management is a difficult subject. Project management is not something that you can learn in theory alone, it need to be done in practice. As mentioned, all the interviewees agreed on that.

"You can’t learn project management by theory, it’s based on experience" - Andrea
Chris has been a project manager within IT for between 8 to 10 years, and he is still learning. Bill and Donna agrees that good project management is based on experience. Andrea explains that you learn along the way, that you have to ask a lot to learn from others and that you never have to stop asking questions if there is something you are wondering about. All of them have learned more when they started working. All four of them, regardless of their background, agree that they have a long way to go and much more to learn.

"It’s simply learning by doing” - Andrea

"I’ve learned more by working than at school” - Bill

Project managers learns a lot in their first project as a project manager, especially if you are a non-technical project manager in a technical project for the first time. The non-technical project managers knew the theory of project management when they started, but not the technology. Suddenly they had the responsibility of the project themselves. Both of them got the whole responsibility for the project alone the first time, which they thought was scary at first. This made them learn faster, because they were forced to learn fast. Among the interviewees, all of them learned a lot on their first projects. Regardless of their background, they learned how to organize projects better, set the right expectations for the right kind of people, how to prioritize properly to not get scope creep. They also learned to understand their role in relation to both the customer and their own organization. But most importantly, they learned the importance of communicating early and clearly. Among all the interviewees, they all achieved project success in their first projects, even if they went over planned time and budget of the projects. The reason for this was that the projects achieved good quality, which was the most important aspect of these projects. The time in these projects were not critical.

"I felt I had no idea what I was doing” - Bill
"It was scary at first, I didn’t know what was going on at all, it was simply like fake it to you make it" - Andrea

4.4.2 Technical Knowledge

According to the interviewees, project managers in software development companies traditionally have a technical background. This tradition is starting to fade out. The case company in this research have started to hire project managers without technical knowledge, as long as they have knowledge within project management. One of the reasons for this, is because the human skills of the project manager are as important as the technical skills, as in this research is the developing skills of the project managers.

The two interviewees with technical background were those who mentioned technical skills when they were asked to explain the tasks and skills of a project manager. When Donna were asked how she thinks her project team would explain her as a project manager, she replied that she have a technical understanding that she thinks they appreciate.

"I think they feel that I have a good technical bearing and take hold of things when there are problems" - Donna

Chris talked about the benefits that comes from his technical background. By having a technical background, he understand issues and challenges along the way and can solve them early. With his technical knowledge, he can easier notice early warning signs. On the other hand, he explains that according to his view, non-technical project managers are able to be good project managers in software development projects as well, because they can learn enough technology that it is adequate.

"My technical background contributes so that I quickly understand issues and challenges that arise along the way" - Chris
4.4. KNOWLEDGE

The technical project managers interviewed also explained other benefits they think the non-technical project managers have. They think that the non-technical project managers can use their experience from the industry they were previously working for as a benefit in the case company. It can be a benefit when working towards an organization within their previous industry in a way that they may better understand the organization’s needs. It can also be a benefit for the case company because they get a more interdisciplinary project team within the organization. This interdisciplinary project team can be beneficial when they share experiences and opinions with each other. On the other hand, they mention that some projects are so complex in the technology that it actually requires a technical project manager.

"... one can see that it is an important knowledge to have, knowing the industry one is working with before the project starts" - Donna

"It is not easy to say what is right and wrong" - Chris

Andrea explains that it is a huge advantage by having technical knowledge, but that it is not a problem without it, because you can learn everything. Therefore, she thinks that it is not a problem for her being a project manager in software development projects. As Donna mentioned, it can be a benefit knowing the industry one is working against. Neither of the non-technical interviewees has worked towards their previous industry yet. Bill explains that he believes that having a technical knowledge would be helpful when being a manager for software development projects. The reason for that is because they get a deeper understanding of how things are connected. Those with technical knowledge understand what the project entails and what one has to do to set up a solution that looks a certain way.

"It’s a big advantage [with technical background], but it’s far from a must, because you can learn everything" - Andrea
"You get a deeper view of how things are connected [with technical background]"
- Bill

A point that Chris made is the importance of keeping up to date with technology. The technology is developing at a crazy speed and it does not help with 10 years of experience with development, if you have not developed anything for the past 10 years. He compare it to if you worked out a lot when you were between 18 and 20 years old, but have not worked out since then and now you are 30. That does not help you now, because you have to keep it up to date. But on the other hand, as mentioned in Section 4.3.1, he talked about the importance of understanding how it works is enough to help see early warning signs that arise earlier, before it is too late.

"It’s important to stay up to date" - Chris

4.5  Project Managers as Leaders

In this section I will examine how the interviewees see themselves as leaders and what they focus on when it comes to characteristics a manager should have.

Project managers has the same main tasks, but they have different ways of achieving project success. Different project managers have different leadership styles. Of the four interviewees, for example Andrea and Chris have quite different leadership styles. Andrea, which has a non-technical background, talked about including the team on a different level than Chris. While Chris were talking about how he got his team with him, to do what he wants, Andrea talked about giving the responsibility to the team. She want to help the team members to develop themselves by delegating responsibility to them. By doing this she shows her employees that she trusts them and has the belief that they are doing well on their own.
"I like to give people responsibility, I don’t need to always be the one who fronts the customer" - Andrea

Chris on the other hand, talked more about being a role model for the project team. When talking about this, he brought up The Golden Rule: ”One should treat others as one would like others to treat oneself”. He explains that he does not sit late nights in the office, if he does not want his team to do so, and if the team has to work late, he joins them. He is enthusiastic and shows interest and engagement in the work the team works with. In this way he manage to affect the team to work with him.

"It’s about being a leader, lead by example” - Chris
Analysis and Discussion

In this section the empirical data presented in Chapter 4 will be analyzed and discussed using the theoretical framework developed during Chapter 2, shown in Section 2.5. The purpose is to create a basis for answering the research question, which will be answered in the next chapter, Chapter 6. As a reminder, the research question to be answered in this research study is: *To what extent do project managers experience that their technical or non-technical background affects their performance as project managers in software development projects?*

This chapter is divided into six sections, the first five sections are: learning, challenges, tools and methodologies, skills of a project manager and transformational leadership. The last section shows an updated version of the propositions that were not consistent with my empirical data. These sections are most relevant for answering the research question, based on what the interviewees talked about.
Among the interviewees, no matter if they are technical or non-technical, new or experienced, they all said that they still have a lot to learn. As Chris mentioned, project management was a difficult field of study when he started with it, and it still is. Andrea agrees with this, by saying that she did not know what she were doing when she started but that she learns along the way, learning by doing as she said. This is consistent with proposition P1: Project managers are never fully trained, they are constantly learning.

What Andrea says here is clearly consistent with what the theory says about the process of becoming a manager is mainly based on learning by doing (Hill, 2003). Hill (2003) explains that a project manager is learning by experience and by doing mistakes when facing real problems and consequences. According to Watson and Harris (1999) the process of becoming a project manager can be seen as a process of continuous emergence which people are continuously making sense of what they are doing. This states what Chris mentioned about the fact that he is still learning and going to do so for many years to come.

As mentioned in the empirical data, Andrea talked about the importance of asking questions. When she started in the case company, she asked a lot of questions and sometimes she was afraid that she asked to much. The other project managers did not mention this, and that may be because Andrea is the one with less experience as a project manager of the interviewees, with only 2-4 years of experience in the business. In addition the industry is new to Andrea, as she has a non-technical background, which may be a reason as well. She is both new to the industry and new to the role of being a project manager in this kind of industry.

Another interesting topic that seemed to be important for the project managers, was the transfer of knowledge in the case company. They explained that the case company is a company that focus a lot on the expertise of its employees, and gives them many courses and certifications when it is needed. This is something that the project managers highly
appreciate, and that I did not include in my theory. Even if the transfer of knowledge in the company is good, they all agree that project management is a difficult subject that can not be learned alone. It must be learned practically, by doing mistakes and learn by them.

To conclude, my empirical data are consistent with the theory according to how to learn to be a project manager. Learning to become a project manager is a process of continuously emergence.

5.2 Challenges

Among the four interviewees, they all agreed that one of their biggest challenges during a project is scope creep or misunderstanding the customers. They talked about a good project manager as a project manager who question the customer when the customer wants more functionality than described in the original project contract, so that they will not go out of scope on the project. This is consistent with proposition S1: Project managers who do not understand the customers needs and an ill-defined scope is the biggest reasons for project failures in software development projects.

Reel (1999) explains that most project failure in IT is made even before there is written a single line of code. Software development projects are complex and according to Field (1997) and Al-Ahmad et al. (2009) the biggest failure is that the project manager do not understand the users needs or that the scope is ill-defined.

I think one of the reasons many software development projects are still failing is because the agile processes used today are open for change during the project. Even if the agile processes solve a lot of project failures, the fact that the process value customer collaboration over contract negotiation makes it harder to stay within scope (Beck et al., 2001). If the customer get new needs along the way or somethings changes, the project team must respond. These new needs easily makes the scope creep, which is, as mentioned, one of the biggest challenges
5.2. CHALLENGES

within software development projects. On the other hand, the agile method contributes to customers being more satisfied now, as they get what they really want and need. Often, customers do not know exactly what they need before the project have started. It is often a cooperation between the customer and the software development project manager in the beginning of a project, to figure out what the customer actually wants and needs. How to avoid scope creep completely is therefore difficult to say.

Bearing the above in mind, this is not consistent with proposition A1: *Agile development solves all project failures within IT*. Even if agile methods solves a lot of project failures within IT, scope creep is still one of the biggest challenges within IT. Indeed, this challenge may be a result of the agile methodology. On the other hand, a lot of the common project failures within IT will be solved using the agile methodology.

For a project manager it is important to keep control of the contract so that the scope do not get too big, while doing the needed changes during the project. As Chris mentioned, his technical background contributes so that he understand issues and challenges that arises along the way. In connection with this, an assumption is that his technical background makes him understand both the contract better at the beginning of the project, but also which needs that arises along the way one should take into account or ignore.

When the project managers talked about their first projects as a project manager, it usually ended with a project success even if the project went out of scope and over time. The reason for the project success in these situations was because time and cost was not that important in these projects, and the quality of the product was good. This is probably because they used agile methodology, which is open for change. Then the customer got a product they wanted, with good quality which gave them both customer value and business value.

This shows that my empirical data is not directly consistent with the proposition S2: *Project managers in software development projects must ensure that the project stay within*
the planned time, cost and quality to achieve project success. Indeed, a project can be successful even if it goes out of scope and finished later with higher cost. It is not in all projects that time is critical for example. Then the project can be successful, as long as the quality of the product is good and the customer is satisfied.

To conclude, my empirical data are consistent with the theory when it comes to the biggest project failures within IT. However, the theory says that agile methodology solves these failures. My findings shows that agile methodologies solves a lot of the common project failures within IT, but not all of them. Scope creep are still a challenge within software development projects. In addition, my empirical data shows that a project can achieve project success even if it does not stay within the planned time, cost and quality, as the theory says. In some projects, some of these factors are more important than the others. That is, if time is not critical, it is more important to deliver a project of good quality.

5.3 Tools and Methodologies

As shown in the literature, project management is evolving. Project management in software development projects has evolved from the waterfall method, to the spiral method and towards agile. Most software development companies today are using agile methods or agile based methods. As mentioned in the previous section, project failure in software development projects are high due to the project going over time or budget. The agile methodology are making it easier for the project manager to achieve project success. While most software development companies uses agile methods today, it is popular to use something similar to the waterfall method in other industries. Which tools and methodologies the project managers in software development projects uses depends on what the customer requires. Some customers requires certain tools and methodologies, while others do not require anything.

The non-technical project managers, had PRINCE2 certification before they started in the
case company. Both of them said that this certification made them more structured in their work. They agreed on the fact that they have used PRINCE2 more in the case company, than in the industry they was working in before. The technical project managers on the other hand, do not mention PRINCE2 when asked about which tools or methodologies they use. They focus on the fact that there are a lot of different tools they could use in the case company, and that it is based on experience which one project managers choose to use. This is somehow consistent with proposition P2: *Project management tools and methodologies must be fitted to each project.* Which tools and methods to should use, depends on which project is to be implemented.

I think this has something to do with their technical background. The non-technical interviewees are talking about PRINCE2 because it is the basis they had when they started in the case company. The technical interviewees on the other hand, have more control over the technical aspects of the project. They have used the tools themselves, and therefore have more knowledge about these. This I believe is the reason that they focus more on these when they are asked about the tools and methodologies they use in projects.

Chris mention that understanding which elements play a role, comes with experience. Another reason why the two interviewees with technical background focus more on this, may be because they, in addition to having experience as developers in the industry, have more experience as project managers than those with non-technical background.

To conclude, my empirical data are consistent with the theory according which tools to use differs from each project. Which tools to use may differ depending on the project.
5.4 Skills of a Project Manager

5.4.1 Human Skills

As mentioned in Section 4.3.1, when the project managers were asked to explain a good project manager, they focused on human and technical skills. Among the four interviewees, the first skill that came to mind for the non-technical project managers, was the importance of communication. As Andrea mentioned, a project without communication can be terminated right away, because it will not be a success. All the interviewees mentioned communication, but the technical project managers mentioned it only barely compared to the non-technical project managers, who focused a lot on it. Anyway, this is consistent with proposition A2: A project manager must have good communication skills to achieve good collaboration with and within the project team.

I think this also has something to do with the non-technical project managers being more dependent on communication than the technical project managers are. The reason for this is because the non-technical project managers do not have the technical understanding like the other two interviewees. Due to lack of technical knowledge, they will later see the early warning signs themselves. The developers may see these signs early, but think that the project manager has control over it and therefore continues without mentioning anything. But with a non-technical project manager who may not see these signs, it is more important that the developers communicate if they see something to help the project manager. The technical project managers see the early warning signs easier and earlier by themselves. The early warning signs may, for example, be that a way they develop a function means that they will later have problems with creating another function, etc.

The interviewees started answering the question of explaining a good project manager by mention different human skills, which shows that these skills are the most important for them. This is consistent with the first part of proposition P3: Human skills are the most
5.4. SKILLS OF A PROJECT MANAGER

important skill of a project manager, while technical skill are the least important. El-Sabaa (2001)s are concluding his article with the fact that human skills are the most important skill of a project manager. As mentioned, these project managers are working with agile processes, unless the customer requires something else. According to (Miller, 2001), one of the characteristics for agile processes are the importance of being collaborative, meaning that the process is fostering communication among the team members. This characteristic are consistent with the importance of communication, that the interviewees agrees on. Another characteristic of agile processes is that it is people-oriented. The process is not favoring process and technology (Miller, 2001). My experience of the four project managers in this research, is that they all were people-oriented project managers. The manifesto for agile software development also shows this, by the fact that it value individuals and interactions over processes and tools (Beck et al., 2001). This is confirming what Chris mentioned, that it is important to see the individuals and not only the resources in the project.

According to Cockburn and Highsmith (2001), agile development focus more on the individually skills and talents of the developers and forms the process to them, unlike traditional project management. As mentioned in the empirical data, Chris focused on the importance of decision-making as a project manager. He explained that it is more important to make a decision than to dwell on it, as the consultants are expensive both for the organization and the customer. It is hard to say if this is consistent or not to proposition A3: In agile software development it is not important who makes the decisions. The difference between the proposition and what Chris explains, is who makes the decisions. Cockburn and Highsmith (2001) explains that who makes the decisions using the agile methodology is not important, while Chris focus on the importance of decision-making from the project managers. The fact that Chris says this does not necessarily mean that he makes all decisions alone, he can also sometimes include the team for everything I know.

On the hand, an assumption regards this, is that the technical project managers are making more decisions alone. The non-technical project managers knows that they do not possess
5.4. SKILLS OF A PROJECT MANAGER

the technical knowledge and therefore must include the project team in the decision-making. Another assumption based on this, is that it may be easier to be a non-technical project manager in software development projects than the other way around. The team is more involved in decision-making in agile software development companies, which makes it easier to be a non-technical project manager. This can be seen in the way Andrea chooses to give responsibility to people in her project team. Andrea mention that she delegate authority to the project team, by letting someone else talk to the customer instead of always doing that herself. This is an example of an human skill that a project manager should have, but it has also something to do with her leadership style. Therefore, this will be further explained in Chapter 5.5 Transformational Leadership.

El-Sabaa (2001) mentions high self-esteem when explaining the characteristics of the category of human skills. An assumption is that since the technical project managers knows the technology better than the non-technical project managers, they have higher self-esteem when they talk to the customer about the technical part of the project. As mentioned, Chris believes that his technical background makes him understand the problems and challenges both faster and better than the non-technical project managers. Which thereby brings us in to the technical skills of a project manager.

To conclude, my empirical data are consistent with the theory of human skills. Human skills are the most important skill of a project manager. This skill includes having good communication skills and delegating both authority and responsibility to the team. My findings are kind of consistent with the theory of who makes the decisions in agile are not important. Who makes the decisions are not important, but the technical project managers makes more decisions alone than the non-technical project managers. The important thing is to actually make decisions fast, and not dwell on them.
5.4.2 Technical skills

The technical skills are important according to the two interviewees with technical background. As they mentioned, their technical background help them understand issues and challenges earlier. This is not consistent with last part of proposition P3: *Human skills are the most important skill of a project manager, while technical skill are the least important.* Indeed, my empirical data shows that the technical skills are necessary within software development projects.

The technical project managers agrees that having knowledge about the industry they are working towards may be a benefit, but non of the non-technical interviewees have done that yet. The non-technical project managers agree that it is a big advantage to have technical background, as you get a deeper view of how things are connected. But on the other hand, they mention that you can learn everything so it is not a must. Chris, who are a technical project manager, thinks that the non-technical project managers can learn enough technology that it is sufficient.

Overall, my findings reveal that the project managers do not know themselves exactly what is right or wrong, or at least they wont tell. A feeling I got when talking to the technical project managers is that they feel that technical background is best and most beneficial when being a project manager in a software development company. On the other hand, they were trying to be open for the non-technical project managers and searching for benefits for them. The non-technical project managers also agrees that it is beneficial and a huge advantage with technical background, but that they can learn the technology themselves, at least enough technology that it is sufficient.

Kerzner (2017) explains that today’s project managers are expected to focus more on managing the project deliverable rather than providing technical direction to the team. This explains why more companies working with software development projects hire project managers with non-technical background now. They look at the project managers background...
as project managers, not their technical background. The case company in this research hire project managers with certifications in project management, as for example PRINCE2, and looks at their experience as a project manager.

On the other hand, the fact that project managers today are expected to focus more on managing the project deliverable rather than providing technical direction to the team is maybe a reason why companies hire non-technical project managers. But the fact that technical project managers often notice the early warnings signs much earlier than the non-technical project managers, as mentioned in the previous section, will still exist. Therefore, non-technical project managers will still be dependent on good communication.

Watson and Harris (1999) are talking about two different aspects of being a manager, that there is a task and a personal dimension of it. The task dimension includes the initiating and organising tasks, and everything else you think about when you hear the word ”managing”. The personal dimension on the other hand, is the respect the managers need to have. As mentioned in Section 2.1.1, both the project manager and the employees needs to see a person as a manager. I think the employees of a non-technical project manager will struggle more with respecting their project manager than they will if they have a technical project manager. The non-technical project managers probably must earn their respect. The technical project managers in this research study have developed themselves and been in the project teams position before, and have therefore a lot of knowledge in the field. Therefore, I think it is easier for them to earn the respect of their project teams.

To conclude, my empirical data are not consistent with the theory according the importance of technical skills. In software development projects, technical skills are necessary and therefore important.
5.5 Transformational Leadership

When asked to explain how the interviewees see themselves as project managers and how they think their employees see them as project managers, three of them described the concept of transformational leadership. As mentioned in Section 2.4.1, transformational leadership is a leadership theory that emphasizes on making relationships through communication, motivation and influence (Burke & Barron, 2014). Two of the four interviewees, regardless of their background, agreed that motivating the project team are an important skill of a project manager. They mentioned team-building activities and letting the team have fun at work as things that will give the project team better motivation. Chris explained that he think a project member that is motivated, are also performing better in the team. This is consistent with proposition L1: *Project managers should use communication, motivation and influence when making relationship with the team.*

The interviews shows that the project managers uses several of the seven guidelines, developed by Yukl (2002), in their mindset of how they should act as project managers.

Indeed, Chris used the sixth guideline: *"Lead by example"* directly when explaining how he is as a leader. He talks about doing himself what he wants his employees to do, and being a role model. If he does not want his team to sit late nights at the office working, then he does not do it himself either. This is consistent with proposition L2: *Project managers should be role models for their project team.* The guideline *"Lead by example"* explains that actions speak louder than words (Yukl, 2002) and the leader always have to think about how he acts. This is because his employees are always watching him.

Bill talked about a project he achieved project management success on. The reason why they achieved success in this project was because he was able to motivate the entire organization with the importance of completing the project. He engaged the entire organization by being self-confident and optimistic that this created value for the organization and was therefore an important project. This is consistent with the third guideline by Yukl (2002): *"Act
confidently and optimistic”. It is important to act confidently and optimistic to convince the organization the importance of achieving success.

Another of Yukl (2002)’s guidelines to remark, is the fourth guideline: ”Express confidence in followers”. As mentioned in Chapter 5.2.1, Andrea do not need to always be the one fronting the customers, she like to give responsibility to her team members to get them to develop and grow. By doing this she shows that she trusts them, which most likely makes them more confident about themselves. This is consistent with proposition L3: Project managers should delegate responsibility to the team members to show confidence in them.

All of these examples are some of Yukl (2002)s guidelines to leaders who wants to create an environment were their employees are inspired and motivated. I think that one of the reasons Andrea likes to give responsibility to someone in the project team has something to do with the fact that she has a non-technical background. That is, the people in the project team understand better what the customers need is, for them to get what they want. It does not necessarily mean that there is something negative about giving responsibility to others. She shows trust in her employees, and is aware that they have a better technical understanding than she has. As she says, she helps the team members to develop and grow by giving them more responsibility. This is somehow compatible with what Hill (2003) says about the primary responsibility of a manager include supervising others rather than directly performing technical tasks.

To conclude, my empirical data are consistent according to the theory of leadership. The project managers are trying to be good examples for the team, and delegate responsibility to them to help them develop. They are focusing on good communication and motivation when making relationships with them. My findings reveal that the project managers have a transformational leadership.
5.6 Updated Theoretical Framework

An updated version of the propositions that were not consistent with my empirical data are shown in Table 5.1. These propositions are changed based on what my findings are.

**Table 5.1: Updated propositions based on my empirical data**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>No.</th>
<th>Propositions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Management</td>
<td>P3</td>
<td>Human skills are the most important skill of a project manager. Technical skill are also an important skill within software development projects.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software Development Projects</td>
<td>S2</td>
<td>Project managers in software development projects has the main responsibility to ensure that the project stay within the planned time, cost and quality, or at least the most critical factor of them, to achieve project success.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agile Software Development</td>
<td>A1</td>
<td>By using an agile method, a lot of the common project failures within IT will be solved.</td>
</tr>
</tbody>
</table>
Conclusion

In the previous chapter, my empirical data was analysed and discussed in relation to the propositions developed in the literature. Based on that, the research question will be answered in the first section of this chapter. Then the value of the research will be established, in addition to limitations and further work.

6.1 Answering the Research Question

The research question of this research are: “To what extent do project managers experience that their technical or non-technical background affects their performance as project managers in software development projects?” Through the analysis and discussion of the propositions, I gathered insight that help answering this research question.

Project management are the application of resources on an effective and efficient way to meet the project requirements. These resources consists of knowledge, skills, tools and techniques needed to achieve project success. Project managers have the responsibility for carrying out the project within the planned time, cost and the desired technology. Which
tools and methodologies to use differ depending on the project, and must be fitted to each project separately. In most software development project, an agile methodology are used. Agile methodologies takes that into account. Agile development focus on embracing change and uncertainties. The project manager in these projects are the link between the customer and the developer team.

One of the propositions was that the human skills was the most important skill, and technical skills the least important one. My findings agree with the fact that human skill are the most important, and that is why the case company has started to hire non-technical project managers. Project managers with a non-technical background, has experience within project management and have already developed their human skills. In addition, they can contribute to the project team with other knowledge so that you get a interdisciplinary project manager team. If the case company get projects from the industry these project managers have worked in before, it will be an advantage because they will easier understand what these customers need.

According to the theory of transformational leadership, my findings reveal that project managers within software development projects, regardless of their background, have a transformational leadership style. They focus on communication, motivation and influence when establishing relationship within the team. The project managers are trying to be role models for their project team, and delegate responsibility to them to show confidence in them.

On the other hand, as mentioned, the theory states that the technical skill are the least important skill. According to my findings, the project managers technical skill in software development projects are necessary and therefore important. Project managers with technical background notice early warning signs faster than non-technical project managers. Their technical knowledge helps them get a better overview of how things are connected, and understand issues and challenges faster.

However, because the case company usually uses agile methods in their projects, unless the
customer require something else, it may be easier for non-technical project managers. Agile methodology focus on collaboration in leadership rather than commanding the employees. In addition, who makes the decisions in agile development are not important. Therefore, project managers with non-technical background can learn enough technology that it is sufficient. The theory states that becoming a manager are based on learning by doing, which the project managers agrees with.

6.2 Value of the Research

This research have a value for companies that offer software development projects. Companies can read about the advantages and disadvantages of hiring technical or non-technical project managers, and use this as a starting point in their choice of who to hire. In addition, the research can be interesting for young people who want to become project managers within IT, as they can read about the background they should get when starting their path of becoming a project manager. Furthermore, the study can also be interesting for others who are already working as developers, to see the benefits and drawbacks of having a technical or non-technical project manager on their team.

6.3 Limitation and Further research

In this section, I will explain topics that would be interesting to look at in further research.

My research study focuses on what the project managers think and experience themselves, of the extent the performance is affected by the project managers technical or non-technical background. However, it would also be interesting to talk to team members that have worked for both an technical and an non-technical project manager. The reason for this is to get their view of how the project managers background are affecting their work as project managers.
6.3. LIMITATION AND FURTHER RESEARCH

In software development projects. In addition to team members, it would be interesting to talk to a common leader for the project managers. This leader probably has something to say, both on the hiring process but also of their performance as project managers.

Another interesting topic to do further research on, would be to make a quantitative research among project managers (or team members) on to what extent the different benefits and drawbacks found in this research, matters. For example, how important is it for the project manager to understand the technical part of the project, compared to having the understand for the organization (industry) they are working towards? Is it more important to have soft skills, compared to understanding the issues and challenges early?

Time was definitely the most significant limitation in this master thesis. Project managers are generally very busy, especially at this time of the year, and it was therefore difficult to find project managers who had time to participate in an interview. I had little experience with conducting these kinds of studies, which delimited how advanced and comprehensive this study could be within the given time frame. It was originally planned to interview six informants, which was downgraded to four, as these four were the ones who had the time and wanted to participate of the 115 project managers I reached out to on mail, plus the six I reached out to on LinkedIn.
References


References


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Appendix A-1
Forskningsprosjekt: Prosjektledere innen IT

Kjære prosjektleder i X!

Bakgrunnen for at du er kontaktet er at jeg ønsker din deltagelse i et forskningsprosjekt om hvordan veien din til å bli prosjektleder i X var. Formålet med forskningsprosjektet er å få mer kunnskap om IT prosjektledelse og hvilken vei som er den beste å gå for å bli prosjektleder i slike prosjekter.

Det er masterstudent, Lisa Enge Haukås, ved NTNU som er ansvarlig for denne undersøkelsen, ved hjelp av førsteamanuensis Ola Edvin Vie ved NTNU. Denne undersøkelsen vil danne utgangspunkt for Lisa’s mastergrad innen prosjektledelse.

Selvte intervjuprosessen er kvalitativ, som vil si at vi har en samtale hvor jeg er interessert i å høre om din bakgrunn og hvordan du taklet overgangen til å bli prosjektleder innen IT. Jeg er interessert i å snakke med både prosjektledere som begynte som utvikler, de som begynte direkte som IT prosjektledere og de som begynte som prosjektleder i en annen bransje. Intervjuet vil bli en samtale mellom oss to, hvor samtalen vil bli tatt opp via en lydopptaker. Du vil forbli anonym i undersøkelsen. Det finnes ingen rette eller gale svar, da det er din oppfatning jeg er ute etter. Jeg regner med at selske intervjuet tar ca en halv time, alt etter det hvordan samtalen utarter seg.

Hvis dette er av interesse for deg, vil jeg kontakte deg på telefon/mail for å avtale tid og sted for et eventuelt intervju. Jeg er fleksibel på tidspunkt, og vi kan godt ta intervjuet på skype hvis dette er av interesse. Jeg håper dette er noe du finner interessant å kunne tenke deg å stille opp på, det hadde vært til stor hjelp! Gi meg en lyd på lisahaukas@outlook.com hvis du vil stille opp.

- Lisa Enge Haukås
Appendix A-2
Master Thesis: Project Managers within IT!

Dear project manager in X!

The reason why you are contacted is that I want your participation in a research study on how your road to becoming a project manager in X was. The purpose of the research study is to gain more knowledge about project managers within IT and which background that is best to have when becoming a project manager in such projects.

It is master student, Lisa Enge Haukås, at NTNU who is responsible for this study, with the help of associate professor Ola Edvin Vie at NTNU. This study will form the basis for Lisa’s master’s degree in Project Management.

The interview process itself is qualitative, which means that we have a conversation where I am interested in hearing about your background and how you handled the transition to becoming a project manager in IT. I am interested in talking to both project managers who started out as developers, those who started directly as IT project managers and those who started as a project manager in another industry. The interview will be a conversation between us two, where the conversation will be recorded via an audio recorder. You will remain anonymous in the study. There are no right or wrong answers, as that is your opinion I am looking for. I expect that the interview itself will take about half an hour to an hour, depending on how the conversation goes.

If this is of interest to you, I will contact you by phone / mail to arrange time and place for an interview. I’m flexible on when, and we can take the interview on skype if this is of interest. I hope this is something you will find interesting to imagine, it would have been a great help! Give me a sound at lisahaukas@outlook.com if you want to set up.

- Lisa Enge Haukås
Appendix A-3
Deltagelse i intervju ifm. forskningsprosjekt

Hensikt
Dette intervjuet blir gjennomført for å hente inn data til min masteroppgave, som omhandler prosessen for å bli prosjektleder i IT-bransjen. Hensikten med intervjuet er å hente inn dine erfaringer fra når du ble ansatt som prosjektleder i X, til i dag. Målet med intervjuet er å kartlegge styrker og utfordringer med veien du gikk, og hvordan du kom dit du er i dag.

Nøkkelinformasjon
● Intervjuet gjøres på skype, å vil vare rundt 30 - maks 60 minutt, alt etter hvordan samtalen utarter seg.
● Det vil bli tatt opptak underveis i intervjuet, da det blir vanskelig for meg å notere underveis når jeg er alene. Disse opptakene vil bli slettet med en gang intervjuet er transkribert. Informasjon og personopplysninger av deg vil bli anonymisert, og vil ikke bli nevnt i transkriberingen.
● Hvis det er av interesse kan du få se transkriberingen i etterkant, og dermed gjøre endringer hvis du mener noe er feil.
● Det er frivillig å delta og du kan trekke deg når som helst uten å oppgi noen grunn.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:
● NTNU ved enten meg: Lisa Enge Haukås, lisahaukas@outlook.com eller veileder: Ola Edvin Vie, ola.edvin.vie@iot.ntnu.no
● Vårt personvernombud: Thomas Helgesen, thomas.helgesen@ntnu.no
● NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller telefon: 55 58 21 17.

Format på intervjuet
Intervjuet er et semistrukturert intervju, der jeg vil komme med oppfølgingspørsmål underveis. Temaene du vil bli spurt i er:
1. Intervjuobjektets bakgrunn
2. Overgang til å bli prosjektleder
3. Hva er god prosjektledelse?

Med vennlig hilsen

Lisa Enge Haukås
lisahaukas@outlook.com | lisaeha@stud.ntnu.no | +47 993 77 656
Mastergrad i prosjektledelse | Bachelor i datateknikk ved UiA
Appendix A-4
Participation in an interview in connection with my master thesis

Purpose
This interview is conducted to retrieve data for my Master's thesis, which is about the process of becoming a project manager in the IT industry. The purpose of the interview is to bring in your experiences from when you were hired as a project manager in X, till today. The goal of the interview is to identify the strengths and challenges of the way you went to become a project manager and how you got to where you are today.

Key Information
- The interview is done through skype, and will last around 30 to maximum 60 minutes, depending on how the conversation goes.
- There will be recordings of the interview, as it will be difficult for me to make notes while I am alone. These recordings will be deleted as soon as the interview is transcribed. Information and personal information of you will be anonymised and will not be mentioned in the transcription.
- If it is of interest you can see the transcription afterwards, and making changes if you think something is wrong.
- Participation is voluntary and you can withdraw at any time without giving any reason.

Where can I find out more?
If you have questions about the study, or would like to exercise your rights, please contact:
- NTNU by either me: Lisa Enge Haukås, lisahaukas@outlook.com or supervisor: Ola Edvin Vie, ola.edvin.vie@iot.ntnu.no
- Our Privacy Officer: Thomas Helgesen, thomas.helgesen@ntnu.no
- NSD - Norwegian Center for Research Data AS, by email (personverntjenester@nsd.no) or telephone: 55 58 21 17.

Format of the interview
The interview is a semi-structured interview, where I will give follow-up questions along the way. The topics you will be asked in are:
1. The background of the interview object
2. Transition to become a project manager
3. What is good project management?

Best regards,
Lisa Enge Haukås
lisahaukas@outlook.com | lisaeha@stud.ntnu.no | +47 993 77 656
MSc in Project Management | Bachelor Degree in Computer Science
Appendix A-5
Intervjuguide

Jeg vil gjerne stille noen bakgrunnsspørsmål før vi begynner selve intervjuet:

---

Alder:

Kjønn:

Utdanning:

Stillingstittel:

Tidligere stillingstitler:

Antall år i virksomheten:

Antall år som prosjektleder:

---

Introduksjon til intervjuet

.... Formålet med forskningsprosjektet er å få mer kunnskap om IT-prosjektledelse og hvilken vei som er den beste å gå for å bli prosjektleder i slike prosjekter.

Vi skal i hovedsak snakke om 3 temaer:

1. Intervjuobjektets bakgrunn
2. Hva er god prosjektledelse?
3. Overgang til å bli prosjektleder

Deretter settes lydopptaker på:

---

Tema 1: Intervjuobjektets bakgrunn

1. Har du noen sertifiseringer innen prosjektledelse?
   a. Hvor fikk du disse fra? Fra X?
2. Hvilke typer prosjekter har du vært prosjektleder for?
3. Hva er dine hovedoppgaver som leder for et team gjennom et prosjekt?
4. Hvor små/store grupper har du vært prosjektleder for, og hva var hoved forskjellene mellom disse?

Tema 2: Hva er god prosjektledelse?

5. Hvordan vil du definere en god prosjektleder generelt?
   a. Har du et konkret eksempel på god prosjektledelse?
   b. Hvordan vil du definere en god prosjektleder innenfor IT?
6. Merker du forskjell på prosjektledere i X?
   a. Hvilke forskjeller merker du?
   b. Hva tror du har betydning/er grunnen for disse forskjellene?
   c. Tenker du det har noe å si med bakgrunn forskjellene?
7. Har du erfaringer med en god prosjektleder?
   a. Hva gjorde den som var bra? Hvor hører denne prosjektlederen til?
8. Hva må du være mest oppmerksom på når du skal lede et team gjennom et prosjekt?
   a. Føler du at du klarer disse utfordringene greit? Hvordan?
9. Hvordan tror du dine medarbeidere opplever deg som prosjektleder?
10. Hvilke systemer til prosjektledelse bruker X?
   a. Hvor stort er handlingsrommet her, har X en veldefinert prosjektledelse-modell?
   b. Hvor stor er frihetsgraden i forhold til dette systemet?
11. Har du brukt noen standardiserte prosjektledelse metoder eller prosesser for å guide noen av valgene dine eller hvordan du har gjort ting i X?
   a. Brukte du disse i starten eller bruker du de endå?

**Tema 3: Overgangen til å bli prosjektleder**

12. Hvorfor ville du bli prosjektleder?
13. Kan du beskrive det første prosjektet du var prosjektleder på?
   b. Var du redd? Da du plutselig satt alene med så mye ansvar.
14. Vil du si du fikk god erfaringsoverføring da du begynte som prosjektleder i virksomheten?
15. Hvor lærte du deg å bli prosjektleder? Og hvor kommer det fra?
   a. Internkurs? Studie i prosjektledelse? Erfaring fra prosjektledelse i annen bransje?
   b. Hvilken opplæring har du fått for å bli en god prosjektleder (ikke bruke ordet opplæring)

Avslutningsspørsmål: Vil du forklare hvordan en typisk arbeidsdag er for deg?
Appendix A-6
Interview Guide

I would like to ask some background questions before we begin the actual interview:

Age:
Gender:
Education:
Job Title:
Previous job titles:
Number of years in the company:
Number of years as project manager:

Introduction to the interview

.... The purpose of the research project is to gain more knowledge about project managers within IT and which path is the best to go to become a project manager in such projects.

We will mainly talk about 3 themes:
1. The background of the interview object
2. What is good project management?
3. Transition to become a project manager

Then, sound recorder is set to:

Theme 1: Interviewees background

1. Do you have any project management certifications?
   a. Where did you get these from? From X?
2. What types of projects have you been the project manager for?
3. What are your main tasks as a team leader through a project?
4. How small / large groups have you been the project manager for, and what were the main differences between these?

Theme 2: What is good project management?

5. How would you define a good project manager in general?
   a. Do you have a concrete example of good project management?
   b. How would you define a good project manager within IT?
6. Do you notice the difference between project managers in X?
What differences do you notice?

What do you think is the reason for these differences?

Do you think it has anything to say with the background differences?

Do you have experience with a good project manager?

a. What did it do that was good? Where does this project manager work?

What should you pay most attention to when managing a team through a project?

a. Do you feel that you can handle these challenges smoothly? How?

How do you think your employees experience you as a project manager?

Which project management systems does X use?

a. How big is the scope of action here, does X have a well-defined project management model?

b. How big is the degree of freedom in this system?

Have you used any standardized project management methods or processes to guide some of your choices or how you have done things in X?

a. Did you use these at first or do you use them anyway?

Theme 3: The transition to becoming a project manager

12. Why did you want to be a project manager?

13. Can you describe the first project you were a project manager at?

a. How did you experience that? What were the challenges? Were you scared?

b. What did you learn from it? Would you say you got out of it ok? Was it successful?

14. Would you say you got a good transfer of knowledge when you started as a project manager in the business?

15. Where did you learn to become a project manager? And where does it come from?

a. Courses within the organization? Studying project management? Experience from project management in another industry?

b. What training have you been given to become a good project manager (not using the word training)

Closing Questions: Can you explain how a typical working day is for you?