AN AGILE WAY OF WORKING IN A GREATER CONTEXT

A case study at an IT organization within a manufacturing industrial organization

Victor Grane & Jesper Wåhlstedt
Master thesis LIU-IEI-TEK-A--14/01902--SE

Institute of technology – Linköping University
IEI - Department of Management and Engineering
Division of PIE - Project, Innovation and Entrepreneurship
AN AGILE WAY OF WORKING IN A GREATER CONTEXT

A case study at an IT organization within a manufacturing industrial organization

Victor Grane & Jesper Wåhlstedt

Mentor at LiU: Jörgen Sandin
Examiner at LiU: Nicolette Lakemond
Mentor at the case company: Anna Östh

Master thesis LIU-IEI-TEK-A--14/01902--SE
IEI - Department of Management and Engineering
Division of PIE - Project, Innovation and Entrepreneurship
Abstract

The purpose of this study is to gain an understanding of an agile way of working at an IT organization in a context of a surrounding and otherwise manufacturing industrial organization, when it comes to software development projects. Thus the study aims to answer whether to what extent agile methodologies are manifested at an IT organization, what is demanded of the IT organization in order to follow agile values and principles, and whether it is possible to develop software according to agile values and principles in an IT organization in the above mentioned context.

The study has been carried out as a case study at a case company where an IT organization, within a larger organization, was investigated. The study consisted of a pre-study, a literature review and an empirical study followed by analysis of the gathered data.

The pre-study aimed to give the authors relevant insights into the case company as well as to the available academic literature. During the pre-study eight initial interviews were conducted, at the case company, among project managers, methodology experts and group managers. The pre-study was used in order to define and refine the scope of this study. From this the authors investigated literature relevant to their findings in the pre-study and to the scope. The literature review was used to formulate the theoretical framework of this study. The theoretical framework is mainly based on academic journals complemented by various publications and books. The empirical study was conducted by investigations of four software development projects, at the case company. Here nine interviews were conducted among the project managers, customers of the projects, and with managers of the IT organization. The empirical study have then been analyzed using the theoretical framework in order to form the conclusions of this report.

The theory presents benefits, drawbacks and demands when it comes to agile methodologies in software development. The importance of support from the IT department, and from the customer, to a project is especially highlighted in literature.

The empirical study presents findings of both agile and non-agile projects operating in the above mentioned organization. Several advantages and drawbacks have been identified regarding agile projects in the organization. Also hinders for an agile way of working, in the form or organizational demands, extensive processes, limited support and customer commitment have also been seen.

While benefits regarding agile projects can be identified, in the context of an IT organization functioning within a larger industrial manufacturing organization, several drawbacks and hinders are also prominent. The analysis show agile values and principles manifested in the IT organization agile practices are harder to identify. It is also seen that an organization should strive for agility on several organizational levels in order to support an agile way of working. Regarding the surrounding organization an agile way of working is seen to be possible. Furthermore several benefits are identified, for a customer, when it comes to agile projects. However agile methodologies are also seen to be demanding when it comes to time, commitment and external support. Putting this in the context of an IT organization developing business support systems for a surrounding organization the benefits, while still prominent, can be further discussed.
Acknowledgements

The making of this study would not have been possible without the help and support of the following people.

From Linköping’s University we would like to extend our gratitude to the examiner of this report Nicolette Lakemond, our supervisor and mentor Jörgen Sandin and also the opponents of this report, Tomas Bauer and Jens Bergman.

The authors would also like to sincerely thank Scania IT, especially our interviewees and our supervisor Anna Östh.

Finally the authors would like to thank our families and friends for supporting us through the process of writing this report.
# Table of contents

Abstract ............................................................................................................................................... 3

Acknowledgements .......................................................................................................................... 4

1 Introduction ................................................................................................................................... 1

  1.1 Background .............................................................................................................................. 1

  1.2 Putting agile methodologies in a greater context ..................................................................... 2

  1.2 Scope ....................................................................................................................................... 4

    1.2.1 Research questions ............................................................................................................. 4

    1.2.2 Limitations of research ....................................................................................................... 4

  1.3 Case study ................................................................................................................................ 5

  1.4 Report disposition ..................................................................................................................... 5

2 Method .......................................................................................................................................... 7

  2.1 Research design ....................................................................................................................... 7

    2.1.1 Pre-study .............................................................................................................................. 7

    2.1.2 Theory ................................................................................................................................ 8

    2.1.3 Empirical studies ............................................................................................................... 10

    2.1.4 Analysis and Conclusions .................................................................................................. 12

  2.2 Credibility of the study ............................................................................................................. 13

    2.2.1 Validity ................................................................................................................................ 14

    2.2.2 Reliability ........................................................................................................................... 14

3 Theoretical framework .................................................................................................................. 16

  3.1 Overview of traditional methodologies and the project parameters ......................................... 16

    3.1.1 The plan-driven approach ................................................................................................... 16

    3.1.2 Stage-gate models .............................................................................................................. 18
4.3.2 Summary of issues identified regarding agile practices at Scania and Scania IT during the Pre-study ................................................................. 42
4.4 The Case study ............................................................................................................. 43
  4.4.1 Introduction to the case study ............................................................................. 43
  4.4.2 Overview of used methodologies, the stage-gate model, and the project parameters ... 44
  4.4.3 The impact of agile values and principles on the organization ............................ 52
  4.4.4 The impact of agile values and principles on the customer ................................. 60
5 Analysis .......................................................................................................................... 66
  5.1 Methodologies, stage-gate models, and the project parameters ......................... 66
    5.1.1 Methodologies ............................................................................................... 66
    5.1.2 Stage gate models .......................................................................................... 69
    5.1.3 The project parameters .................................................................................. 70
  5.2 The agile values and principles in the organization ................................................. 71
    5.2.1 The organizational structure ......................................................................... 71
    5.2.2 Agile values and principles in the organization .............................................. 72
    5.2.3 Management support .................................................................................... 76
    5.2.4 Measurements of progress ............................................................................ 77
  5.3 The impact of agile values and principles on the customer ..................................... 78
    5.3.1 The essential customer .................................................................................. 78
    5.3.2 Reasons for lack of customer involvement ...................................................... 80
    5.3.3 Customer practices in the agile project .......................................................... 80
6 Conclusion ...................................................................................................................... 84
  6.1 To what extent are agile values, principles, and methodologies manifested at an IT organization? ........................................................................ 84
  6.2 What is demanded of an IT organization in order for a project to be able to follow agile values and principles? ..................................................................... 85
6.3 To what extent is it possible, and what is demanded, to develop software according to agile values and principles in an IT organization, while the surrounding organization, i.e. customer, is not focused on software development?

6.4 Theoretical contribution and further research

7 References

7.1 Literature

7.2 Online resources

7.3 Oral resources

7.4 Scania Internal Documentation

8.1 Appendix 1: Interview questions Project Managers

8.2 Appendix 2: Interview questions Managers

8.3 Appendix 3: Interview questions Customers
Table of figures

Figure 1: An illustration of the background of the study ................................................................. 3
Figure 2: Illustration of validity and reliability by Björklund & Pålsson (2010) ........................................ 13
Figure 3: Linear Project Management Life Cycle (Wysocki, 2014) ................................................. 16
Figure 4: Waterfall model (Wysocki, 2014) ................................................................................. 17
Figure 5: The stage-gate system. Cooper (1990) ............................................................................. 18
Figure 6: The project management triangle by Tonnquist (2008) .................................................... 19
Figure 7: Adaptive project management life cycle (Wysocki, 2014) .................................................. 19
Figure 8: Wasted requirements (i.e. requirements that have been elicited, documented and reviewed but not implemented) in plan-driven (left) versus agile and incremental practices. (Petersen & Wohlin, 2010) ................................................................................................................. 23
Figure 9: Waterfall and agile view on time, cost and scope by Opelt et al (2013) ......................... 27
Figure 10: The agile triangle (Highsmith, 2010) ................................................................................ 28
Figure 11: Four of Hobday’s (2000) described organizational forms. Positioning the project-based organization, Hobday (2000) ................................................................................................................. 29
Figure 12: The Scania IT House. Scania CV AB, 2012 ....................................................................... 37
Figure 13: White arrow-, yellow arrow-, and green arrow-stages (Scania CV AB, 2013) .......... 38
Figure 14: The project steering model at Scania IT (Scania IT, 2014C) ............................................. 38
Figure 15: The organization chart of Scania IT (Scania CV AB, 2014A) ........................................... 52

Table of tables

Table 1: Overview of the interviewees in the pre-study .................................................................... 8
Table 2: Key words used in search for literature ............................................................................... 9
Table 3: Overview of the interviewees in the case study .................................................................. 10
Table 4: The values in the Agile Manifesto (Beck et al. 2001) and description (Barlow et al., 2011, p 27) 21
Table 5: Measurements in agile organizations. Brown et al., 2013 .................................................. 33
Table 6: Reasons for customer lack of involvement. Hoda et al. 2010 ............................................ 34
Table 7: explanation of the decision-points in PPS at Scania IT (Scania IT, 2014C) ........................................ 39
Table 8: A summary of the projects used in the study .................................................................................. 44
Table 9: A summary of the methodologies seen in the projects .................................................................... 48
Table 10: Summary of how the projects related to PPS ............................................................................ 49
Table 11: A summary of the prioritized project parameters in the projects ................................................. 51
1 Introduction

The following section gives brief overview of the background, organization and scope relevant to the study presented in this report.

1.1 Background

The purpose of this chapter is to give an overview of the history and reasons for agile project management.

The methods for software development have continuously evolved through history. Today, agile development has become one of the most common approaches, and is according to Rico et al (2009) an important paradigm when it comes to software development compared to traditional methods. Traditional methods are, according to Rico et al (2009), project methods requires detailed plans and documentation and are originally based on manufacturing processes. Unnecessarily detailed project- and requirement specifications in combination with long project life cycles are, according to Rico et al (2009), common issues regarding more traditional project methods. Rico et al (2009) further note that agile methods result partly from improvements of existing methods and partly as reactions to overly extensive and detailed software standards and development methodologies. Rico et al (2009) and Davis (2013) argues that agile methods are an effect of the need to create better software which corresponds better with the customers’ actual needs, which are often hard to identify. Davis (2013) also mentions reasons such as a being able to rapidly respond to change and creativity, while also demographics belonging to “Generation Y” tend to view work more in line with agile values and principles. The Agile Impact Report, an investigation by QSM Associates (2008), further shows that agile projects tend to be more successful than more traditionally executed projects such as water-fall or plan-driven methods. The report highlight agile methodologies enable faster time to market, higher productivity and better software quality.

Opelt et al (2013), Davis (2013) as well as Rico et al (2009) describe how the Agile Manifesto, have evolved from agile methodologies, values, and principles. The Agile Manifesto was written in 2001 by a number of software developers who advocated agile principles in software development. Davis (2013) describe that the Agile Manifesto was a reaction to traditional formal processes requiring early estimations, which is considered to be difficult to do. Fowler & Highsmith (2001) describe that the group behind the Agile Manifesto argue that every project and team have different needs. However, the group believes the users of agile methodologies will benefit of a set of common principles. The Agile Manifesto is expressed as follows:
We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

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

That is, while there is value in the items on the right, we value the items on the left more. (Beck et al, 2001)

When describing the values in the Agile Manifesto, Fowler & Highsmith (2001) explains processes and tools are important but interactions between skilled individuals are of greater importance. Furthermore, Fowler & Highsmith (2001) argue the focus must be on the final product (i.e. delivering working software) while the need for documentation must be decided in each situation. The only way to deliver what the client wants is through an understanding of the client needs achieved through collaboration, while contracts only provide necessary boundaries (Fowler & Highsmith, 2001). Fowler & Highsmith (2001) further explain the necessity of being able to alter a plan according to external changes.

However, limitations regarding agile methods and practices are also described in literature, which can be seen for example when reviewing publications by Wysocki (2010), Barlow et al (2011) and Petersen and Wohlin (2010). One example is Petersen & Wohlin (2010) and Petersen & Wohlin (2009) who describe how agile methods require much management coordination, especially in larger projects involving several development teams.

1.2 Putting agile methodologies in a greater context

When reviewing literature regarding agile practices and principles the authors of this report have seen that most literature is focused on agile methodologies at a project and team level. Kähkönen (2004), as well as Medinilla (2012), have made similar findings. However, when implementing agile principles, the context of the team will be affected, according to Dagnino et al (2004), Ambler et al (2013), Boehm & Turner (2005) and Cohn & Ford (2003). Furthermore, a project must interact with existing rules of an organization (Dagnino et al, 2004).

Regardless of what methodology an individual project or team applies, it must interact in its IT organizational context, such as management and support units. However, in order for an agile project to be able to rapidly respond to change, as the agile methodology intend to (Davis, 2013), the context of the agile project must be able to support, for example, quick decision making and flexibility.
In addition, when looking at the IT departments in traditional manufacturing industrial organizations, the culture, values, and processes of that organization might influence the execution of software development projects in this organization. As an example Kathleen (2007) describes that traditional project management emerged from construction, engineering and defense industries (similar to a manufacturing industrial organization). Further Kathleen (2007) describes traditional project management to put emphasis on planning and requirements documentation. However, this can be seen as a contradiction to the description of the Agile Manifesto by Fowler & Highsmith (2001).

It is thus interesting to investigate whether agile software development is possible or even beneficial in an organization which main deliverable is not IT solutions. In this case the developed IT systems aim to support the larger organization, the customer, in the daily business. Thus the development of IT systems might not part of the larger organization’s main deliverables. However, agile methodologies advocate a close and active customer relationship in a project, which places demands on time and resource commitment from a customer (Fowler, 2005; Wysocki, 2014). This would mean that the industrial manufacturing organization must provide resources to a project even though this might not be seen as directly value creating for the organization. In addition, based on Kathleen’s (2007) reasoning, a customer from an industrial manufacturing organization might be more comfortable following traditional project management methods. As a result, it is unclear whether agile practices are possible when it comes to IT development of support systems in a manufacturing industrial organization.

The described scenario is illustrated in Figure 1.

![Figure 1: An illustration of the background of the study](image-url)
To conclude, it is interesting to put an agile way of working in a greater context, i.e. the need of organizational support and customer interactions, especially in a context of a manufacturing industrial organization. Therefore the purpose of this study, presented in the following section, was determined.

1.2 Scope

The purpose of this section is to describe what the authors aim to study and what limitation to the scope exists.

The purpose of this study is to gain an understanding of an agile way of working at an IT organization in a context of a surrounding and otherwise manufacturing industrial organization which mainly works according to plan-driven processes, when it comes to software development projects.

By ‘manufacturing industrial organization’ the author’s refers to an organization with operations primarily focused on manufacturing goods and not operating within the field of services such as IT development.

1.2.1 Research questions

The purpose of this study is treated through the following research questions within the given context of a surrounding and otherwise manufacturing industrial organization:

• To what extent are agile values, principles, and methodologies manifested at an IT organization?
• What is demanded of an IT organization in order for a project to be able to follow agile values and principles?
• To what extent is it possible, and what is demanded, to develop software according to agile values and principles in an IT organization, while the surrounding organization, i.e. customer, is not focused on software development?

1.2.2 Limitations of research

The main focus of this study will be according to the defined scope and research questions. The study is focused on software development projects. Thus e.g. maintenance and projects concerning modification of existing systems, are not considered in this report. The reason being that maintenance and modification projects face different circumstances than development projects do, for example when it comes to customer collaboration and planning. Furthermore, this report will not treat the implementation of agile methods. Thus theories regarding e.g. change management are therefore not analyzed.

Furthermore, lean principles are common at the case company, especially in the surrounding organization of the IT department. There are similarities between agile and lean principles, for example the focus on continues improvement. However, lean principles are not further investigated in this report.
The limitations of the research have been done due to the limited time frame of this master thesis. In addition, the limitations are set in order to enable the authors to identify phenomenon and draw conclusions based on an analysis of these. To draw conclusions would have been difficult without the limitations within the time frame of this master thesis.

The existing literature regarding agile methodologies is mainly focused on an agile team or project. However, the existing literature regarding the context of an agile team or project is not as comprehensive. This poses some limitation on the authors’ abilities to develop concrete solutions to the identified problems in the study.

1.3 Case study

In order to investigate the scope of the study a case organization was selected. The empirical study, of this report is carried out at Scania IT, a subsidiary of truck manufacturer Scania. Scania functions as a customer of Scania IT. Scania functions as an external customer to Scania IT when it comes to IT services. For this reason Scania is referred to as ‘customer’ in this report.

Scania IT is further presented in chapter 4.1 Background description of Scania IT.

1.4 Report disposition

The report is divided into five part through which the scope and research questions are treated.

Chapter 2 Methods gives an overview of the different methods and practical approaches used in the study. Different approaches are discussed while risks and drawbacks are presented.

Chapter 3, 4, and 5 presents the theoretical framework, the empirical results and the analysis related to the subject of the study. The outline of chapter 3, 4, and 5 are based on the first three research questions. Thus the outline follows:

• The use of agile methodologies
• Demands on an IT organization when working agile
• The customers impact on agile practices

In chapter 3 the theoretical framework is presented. A presentation of traditional project management and some common agile methodologies are presented together with the above mentioned outline. The reason for this is to give the reader a background for topics discussed later in the report. As an example a majority of the literature related to agile methodologies and agile project management uses traditional project management as a basis for their discussions.

In chapter 4 the empirical result is presented. First a background of the case company is presented, together with the authors finding during an initial pre-study at the case company. The main part of chapter 4 is the Case study. The Case study presents the authors findings based on interviews with project managers at the IT organization and their corresponding customers in four projects, as well as
interviews with managers at the IT organization. The Case study again follows the above mentioned outline.

Chapter 5 present the analysis where the empirical result is compared to the theoretical framework based on the above mentioned outline.

Finally the authors’ present some conclusions in section 6, based on the research questions defined above in section 1.2 Scope.
2 Method

The aim of this chapter is to describe the different processes, that are undertaken in this report, and to motivate the authors choices of methods. The methods used for the theoretical framework, the empirical studies, and analysis are presented here together with pros, cons and relevant risks that the authors have identified.

2.1 Research design
2.1.1 Pre-study

A pre-study containing an initial review of literature and informal interviews was carried out in order for the authors to gain a better understanding of the area of agile project management. Further the pre-study also helped to identify problem areas, within the context of this report. Through this the scope and research question could be formulated and refined as early as possible. The pre-study also enabled the authors to more critically review later findings, in the context of initial knowledge gained during the pre-study. Furthermore the empirical result from the pre-study could to a certain extent also be used to complement the main empirical study.

The pre-study was initiated by a brief literature study within the field of agile principles and methodologies. This was done in order for the authors to get familiar with different aspects and views within this field. A brief literature study was considered important in order to get an overview of available literature within the field, as well as detect topics that could be further investigated or where literature is missing. Through an initial literature review the authors aimed to reduce the risk of missing out on important perspectives during later initial semi-structured interviews with project managers at the case company Scania IT.

After the brief literature study eight informal, and semi structured interviews, were performed. The interviews were conducted among five project managers, two project methodology designers, and one group manager of a software development team. These interviews were based on a high-level interview outline. The interviews were however allowed to deviate from the outline since the purpose was to gain an overview of different problem areas that the interviewees considered to be important. The informality also aimed to create a relaxed interview environment where the interviewee and the authors could discuss various topics. As an example these interviews could be carried out over a lunch or at the interviewees own office. The interviews usually progressed for about one hour and notes were taken by hand. An overview of the interviewees in the pre-study is presented in table 1.
<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group manager H</td>
<td>Working as group manager in software development projects</td>
</tr>
<tr>
<td>Project methodology designer A</td>
<td>Working with design of processes and methodologies at the Project management office</td>
</tr>
<tr>
<td>Project methodology designer B</td>
<td>Working with design of processes and methodologies at the Project management office</td>
</tr>
<tr>
<td>Project manager C</td>
<td>Working as a project manager at the Project management office. Also part of the case study.</td>
</tr>
<tr>
<td>Project manager D</td>
<td>Working as a project manager at the Project management office. Also part of the case study.</td>
</tr>
<tr>
<td>Project manager E</td>
<td>Working as a project manager at the Project management office.</td>
</tr>
<tr>
<td>Project manager F</td>
<td>Working as a project manager at the Project management office.</td>
</tr>
<tr>
<td>Project manager G</td>
<td>Working as a project manager at the Project management office.</td>
</tr>
</tbody>
</table>

**Table 1: Overview of the interviewees in the pre-study**

The interviews helped the authors to gain an understanding and a more practical insight into the field of agile project management at a case company. Further, the interviews were used in order to identify different problem areas worth to investigate further.

The pre-study was an iterative process where the scope and research questions were formulated and refined continuously, as more information could be apprehended during the interviews. All information gathered was matched with the scope and research questions in order to validate the relevance of the scope. Furthermore the pre-study also functioned as a basis for the Case-study (see chapter 2.1.3) in order to select relevant interview objects and interview questions. The Pre-study is presented in section 4 Empirical result.

2.1.2 Theory

According to Backman (2008) the review of literature aims to provide e.g. an overview of the area of interest, give a historical perspective on the research, present the current research front as well as help define the problem area. Backman (2008) however warns that the researcher of literature might incorporate preconceptions from the literature and thus miss out on relevant conclusions.

The main source for the theoretical framework in this study is academic articles. The target audience for academic articles is other researchers within similar areas why these articles go through reviewing processes before being published. Because of this, the authors consider academic articles to be a credible source for the theoretical framework of this report. By using mainly academic articles, and when applicable comparing several authors within a certain area, the authors aim to minimize the risks such as those mentioned by Backman (2008).
Online databases, Business Source Premier and Scopus, were used in order to initially search for relevant literature. Keywords, relevant to different areas of interest, were defined in order to find relevant literature. References found in relevant literature was used to further broaden the theoretical framework. Table 2 presents keywords initially used, in various combinations. Relevant articles were selected based on a review of articles abstracts. If an article seemed relevant to this study a brief review of the article itself was conducted as a last screening before the article could be used in this report.

<table>
<thead>
<tr>
<th>Agile history AND reasons</th>
<th>Agile methodologies</th>
<th>Software development project</th>
<th>Agile AND scaling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agile AND organizations AND demands</td>
<td>Agile software development AND Customer</td>
<td>Agile OR Software development AND large organizations</td>
<td>Traditional project management</td>
</tr>
<tr>
<td>Agile AND impact</td>
<td>Agile AND drawbacks AND hinders</td>
<td>Agile OR Software development AND traditional organization</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2: Key words used in search for literature**

In order to further develop the theoretical framework, sources such as books and publications, by different associations, were also used to complement the academic articles. The books were found through the above mentioned key words or through recommendations from the author’s supervisor at the university. The reasons, for using less academic publications, are due to the area of agile development being a continuously evolving subject. Non-scientific reports are therefore considered important by the authors of this report, as a complement to the theoretical framework gained from academic literature. However, the authors are aware that these publications might not be considered as credible as academic reports and articles. To compensate, less credible literature is critically compared to, and when possible used together with, other sources. The authors are also aware that publications and reports may be biased due to the interests of the association or article’s author in question, something the authors have considered when reviewing literature.

According to Backman (2008) literature may be reviewed on; whether assumptions and conclusions are credible, are findings valid and supported, are arguments consistent, are statements consistent with the arguments and what statements are significant for the study in question. By following Backman’s (2008) recommendations the authors aimed to select relevant and credible literature.

One issue identified by the authors is that literature regarding agile methodologies and practices are often aimed at criticizing traditional project methodologies in order to prove the benefits of agile. One reason might be that agile is a more recent subject in the academic world. As a consequence of this much literature has been found regarding the drawbacks of traditional plan-driven project management, in comparison to agile project management, while literature regarding drawbacks of agile project
management is rarer. The authors have tried to compensate for this by specifically scanning literature for agile drawbacks, in order to gain a more unbiased view of the subject.

2.1.3 Empirical studies

The empirical study is a qualitative study based on nine interviews. The interviewees were four project managers, three customers, and two line managers. The project managers and the corresponding customer have been involved in the same projects. The line managers have no direct relationship to the mentioned projects, but since they work in the line organization they have experience from providing organizational support for projects. An overview of the interviewees and their relationship to the projects is presented in table 3.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Description</th>
<th>Relation to project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer representative A</td>
<td>Representative of the customer in project A. Working with business relationship management at the case company.</td>
<td>Project A</td>
</tr>
<tr>
<td>Customer C</td>
<td>Specifier of requirements in Project C. Also an end-user of the system developed.</td>
<td>Project C</td>
</tr>
<tr>
<td>Customer D</td>
<td>Purchaser of the system developed in Project D.</td>
<td>Project D</td>
</tr>
<tr>
<td>Manager A</td>
<td>Member of the management team at the case company</td>
<td>-</td>
</tr>
<tr>
<td>Manager B</td>
<td>Working as a manager in the department of infrastructure at the case company.</td>
<td>-</td>
</tr>
<tr>
<td>Project manager A</td>
<td>Project manager in the Project management office at the case company.</td>
<td>Project A</td>
</tr>
<tr>
<td>Project manager B</td>
<td>Project manager in the Project management office at the case company.</td>
<td>Project B</td>
</tr>
<tr>
<td>Project manager C</td>
<td>Project manager in the Project management office at the case company.</td>
<td>Project C</td>
</tr>
<tr>
<td>Project manager D</td>
<td>Project manager in the Project management office at the case company.</td>
<td>Project D</td>
</tr>
</tbody>
</table>

**TABLE 3: OVERVIEW OF THE INTERVIEWEES IN THE CASE STUDY**

The interviews progressed for between one and a half, and two hours. During the interviews one of the authors would interview the interviewee based on an interview outline (described below) while the other took notes. Immediately after an interview the authors reviewed the notes and formulate a transcription of the interview. By immediately doing this the authors aimed to not miss out on important aspects while also reviewing the material while it being fresh in memory. The interview transcriptions could later be used during the writing of the report.

Eriksson & Wiedersheim-Paul (2006) note that, regarding case studies, a diverse spread of sources is important. This might be difficult for a researcher due to lack of insight into e.g. an organization (Eriksson & Wiedersheim-Paul, 2006). Since Scania IT is a rather large organization, the authors noted
that competences relevant to this report are spread among a great number of employees. The selection of subjects for interview thus becomes critical in order for the authors to gain good insights into the processes and problems present. Interviewees were selected based on experiences the authors gained during the Pre-study (see section 2.1.1 Pre-study), in combination with discussions and recommendations by managers at the Project management office at Scania IT. Also the supervisor of the study, at the case company, was consulted. As a result project managers and customers from the corresponding projects denoted Project A, Project B, Project C and Project D, were selected for the study. The projects were selected to be software development projects, which had either just been completed or been on-going for a considerable time. As with all projects at the case company, these projects developed different support systems to be used of the surrounding organization’s daily business. Furthermore the interviewees were selected by the extent of agile methodologies that were used in the projects, according to their respective project manager. Thus the authors aimed to interview project managers and customers with an experience from projects with a varying level of agile practices used, in order to gain an understanding of the benefits, drawbacks and problems faced, in the organizational and customer context.

The customer interviews have two functions. Partly they functioned as a validation of the project manager interviews, through which the authors aimed to gain additional insight. Further the customer interviews were also important since the customers of Scania IT is from the surrounding organization Scania. These interviews thus aimed to also address the research questions related to IT the IT organization and its surrounding organization and allowed us to explore the perspective from the IT organization and the customer. However, due to time and distance factor, not all customers could be interviewed, as can be seen in Project B (see section 4.4 The Case study). When it came to Project A (see section 4.4 The Case study) only a representative of the customer was available, again due to the distance factor. The authors, however, still considered this interview to constitute as an adequate validation of the project manager interview. The project manager interviews are regarded as the main part of the empirical study. Thus the customer interviews were also somewhat briefer but conducted in the same manner as the project manager interviews. The customer of a project, and of Scania IT, is the surrounding Scania organization which orders and pays for the services provided by Scania IT. The end-users of a system could e.g. be employees at a department in the surrounding organization. Thus ordering customer and specifier of system requirements is always an internal Scania department or similar, while the end-users could be part of that department or another Scania department or organization. The systems developed in a project functions as support systems for the end-users daily business. A customer in a project is a representative of the ordering and paying department, of the system. Thus the customer could also be an end-user but does not have to be.

In addition to the project interviews two managers from the IT organization were also interviewed. The selection of managers was based on recommendations and insights gained by the authors during project manager interviews. One of the managers interviewed is part of the executive board of Scania IT while the other functions as a line manager at a maintenance department at Scania IT. The reason for these interviews was to gain an understanding of the IT organizations viewpoint regarding projects at the case
company. This was considered important since questions in the project manager interviews concerned the organization.

An interview outline was created, based on the theoretical fields of interest, and used as a base for each interview. The interview outline discusses subjects that the authors have identified as critical during their earlier Pre-study and through literature review. In order to validate the interview outline pilot interviews were conducted. Based on the outcome of these, the interview outline was then adjusted in order to gain more relevant responses. The pilot interviews both aimed to validate the interview structure as well as the relevance of the areas investigated. Through the pilot interviews an interview outline, that suited both the project manager, customer and organization manager interviews was developed and finalized. The pilot interviews are, due to consistency regarding interview questions, not used in the report.

One of the main benefits of interviews, that the authors considered, is the possibility of gaining a thorough understanding of the underlying reasons for different topics that are discussed with an interview subject. The authors are thus able to investigate more deeply into different problem areas, than compared to e.g. quantitative investigations. The interviews were conducted at the case company Scania IT and its customers, i.e. Scania.

As with less credible literature the authors had to consider risks related to e.g. personal agendas, limitations in the number of interviews and the selection of interviewees. These risks are best avoided, according to the authors, by conducting several interviews while having a critical standpoint towards the answers. Answers were also compared among interviewees with similar background in order to further validate the responses. The interviews carried out during the Pre-study (see section 2.1.1 Pre-study) further enables the authors to validate the responses received from the interview subjects.

2.1.4 Analysis and Conclusions

As opposed to quantitative methods, the analysis of qualitative research is often carried out in parallel to the empirical study (Backman, 2008). The analysis of qualitative data is, however, considered to be one of the more difficult aspects of the qualitative research. It is important to be able to gain both an overview of the problem area as well as identify underlying causes. (Backman, 2008)

In order to account for the difficulties, mentioned by Backman (2008), the authors have to match qualitative results with the theoretical framework in order to gain insight into common factors. By this method, the authors aimed also are able to more critically scrutinize the gathered data.

In the analysis the authors compare the empirical results to the theoretical framework. The authors analyze common factors and differences based on the three research questions described in chapter 1.2. This structure follows the structure also be seen in the theoretical framework as well as in the empirical results. Using the framework of the research questions, the authors formulated keywords based on the theoretical framework relevant to each research question. Keywords were tied to different categories defined by the headings in the theoretical framework. These keywords were then also used
to help divide the empirical results into the same framework. The authors were then able to analyze the empirical data, for each key word, relevant to the corresponding theoretical references.

The analysis was also performed in the context described in chapter 1, i.e. software development projects in an industrial manufacturing organization. Thus the authors used this context to analyze the different areas of the framework, which also the conclusions drawn from each area.

As a final step in the study the authors draw conclusions from the analyzed theory and empirical material. From these conclusions the authors can then generalize their findings to the context of an IT organization within a larger industrial manufacturing organization. One risk, that the authors have considered, is the use of only one case company. This might influence the conclusions from the study. In order to compensate for this the authors have also been examining studies, within relevant areas, conducted at other companies. These studies are not presented in this report but only used in order for the authors to critically be able to validate their findings at the case company.

### 2.2 Credibility of the study

To measure the credibility of a study both Björklund & Pålsson (2010) and Lekvall & Wahlbin (2009) use validity and reliability. Validity is described as to what extent the study measures what it is intended to do, whereas reliability refers to what extent the result of the study would remain the same after repeated attempts of the study.

In Figure 2 Björklund & Pålsson (2010) illustrates validity and reliability with darts on a dartboard. High validity is achieved when the dart hit the center of the dartboard as in image A, whilst reliability is achieved when several darts hit the same area of the dartboard as in image B. To achieve both high validity and reliability at the same time several darts must hit the center of the dartboard, as in image C.

![Figure 2: Illustration of validity and reliability by Björklund & Pålsson (2010)](image-url)
In the following two sections the validity and reliability of this study, as defined by Björklund & Pålsson (2010) and Lekvall & Wahlbin (2009), will be discussed.

2.2.1 Validity

To measure whether a study is valid or not is according to Lekvall & Wahlbin (2009) impossible. In order to validate the methods of a project the correct result of a study must be know in advance. Instead, Lekvall & Wahlbin (2009) suggest the validity of a study should be measured based on subjective grounds.

While there seems to be difficulties in measuring validity there are ways of improving the validity of a study. As suggested by Björklund & Pålsson (2010), triangulation is one way of increasing the validity by presenting several perspectives on a single topic. Inspired by this, the authors have been striving for having multiple sources for each area and topic investigated. This has been the case both for literature and for empirical sources. Furthermore, Lekvall & Wahlbin (2009) suggest a number of experts within the field should have a look at the study and give their opinion about the validity. This is what Lekvall & Wahlbin (2009) refers to as faced validity something the authors will incorporate by consulting subject matter experts at Scania, the supervisor at Linköping’s University as well as opponents to the thesis work.

In order to achieve a higher validity, the purpose of the study and the according research questions have been regularly, as an iterative process, verified and compared to the ongoing work done by the authors. For example, during the pre-study phase, when new possible interesting information came up, the information was compared to the defined scope of the study. The information was presented, together with the authors view, to the supervisor at Linköping’s University and the supervisor at Scania IT, and was used as a basis of discussion. These discussions regarded the authors’ continuous findings and interpretations of these, as well as how the authors were going to continue their study based on information that arose as the study progressed. One example is the inclusion of project customers, in the empirical studies, which was done after the authors had seen that these seemed to have a great influence on a project. This can be seen as a way of verifying the faced information and adapting the study in order to improve on its validity.

2.2.2 Reliability

Lekvall & Wahlbin (2009) suggest special attention should be put on factors affecting the reliability. They provide a number of factors, among others, affecting the reliability:

- Inconstant personal characteristics of the interviewee such as health, motivation, tiredness, and stress.
- Factors depending on the situation, for example the interaction with the interviewer, distractions.
● They way questions are asked by different interviewers.

● Uncertainties and difficulties in the measuring instrument itself causing several ways of interpreting questions.

During interviews, control questions could be asked in order to increase the reliability (Björklund & Pålsson, 2010). This is done by asking two or more questions regarding similar subjects to determine potential inconsistencies in the interviewee’s responses. Furthermore corresponding questions were also asked to other stakeholders of a project, e.g. customer and managers, as well as other project managers. By comparing these responses the authors aim to improve reliability in their findings. The authors for example identified an inconsistency in the level of agile knowledge and the interpretation, among interviewees, regarding agile. Due to this the authors had to regard this fact when reviewing interviewees’ answers regarding the level of agility in the IT organization and in a project.
3 Theoretical framework
3.1 Overview of traditional methodologies and the project parameters

This section gives an overview of what is considered to be a project. Furthermore the authors present the more traditional, plan-driven methodologies here. The authors give a brief introduction into the waterfall model. The authors consider traditional project methodologies to consist of especially plan-driven methodologies, and the waterfall model as being one of the more typical plan-driven models.

When defining what a project is, Wysocki (2014) states that “A project is a sequence of unique, and connected activities that have one goal or purpose and that must be completed by a specific time, within budget, and according to specifications”. When it comes to project management Wysocki (2014) differentiates between Traditional and Adaptive project management models. These are presented in the following sections.

3.1.1 The plan-driven approach

Traditional project management models (TPM), such as plan-driven approaches, are effective when solutions and goal are easily and clearly described prior to the project’s initialization (Wysocki, 2014). In a similar manner Eisenhardt & Tabrizi (1995) describes the ‘Compression model’ as a product development model focusing on planning and predictability of a development process. These approaches are usually linear, or in some cases somewhat incremental, as described by Wysocki (2014) in Figure 3. This is similar to Tonnquist’s (2008) description of the general project management model, which describes distinct processes and steps in a project. One example of this, mentioned by Tonnquist’s (2008) is ‘serial development’, also known as the waterfall-model.

![Figure 3: Linear Project Management Life Cycle (Wysocki, 2014)](image)

Furthermore Wysocki (2014) describes that plan-driven approaches are distinguished by the early formulation of a detailed plan for the entire project. Kathleen (2007), and Wysocki (2014), Writes that the detailed planning enables the early recognition of the different project phases. Thus, a time schedule and resource needs can be estimated. Eisenhardt & Tabrizi (1995) explains that through planning the following development steps can be compressed and planned. Wysocki (2014) and Tonnquist (2008) both mention that early planning reduces uncertainty and risk for a project. Further Wysocki (2014) also describes that early planning contributes to a common understanding among stakeholders and improves efficiency through planning of activities.
However the early planning is also one of the greater weaknesses of TPM models. For example Wysocki (2014) and Kathleen (2007) describe that these models are relatively intolerant when it comes to changes and assumes external events, that might affect the project, are predictable. This is by Tonnquist (2008) described as unlikely and thus Tonnquist (2008) states that detailed planning of a project is a waste of time. Eisenhardt & Tabrizi (1995) also concludes that plan-driven development, the ‘Compression model’, actually results in slower overall development. Furthermore TPM models usually do not present any result to the customer until the project’s end (Wysocki, 2014). On the subject Kathleen (2007) explain that traditional project methodologies assume that finished project phases will not be revisited. As a consequence, if the results then do not comply with the customers’ acceptance test additional costs might arise (Wysocki, 2014).

One example of a common plan-driven approach, described by e.g. Wysocki (2014), Hansmann & Stober (2010), Tonnquist (2008) and Kathleen (2007), is the Waterfall-model presented in Figure 4.

**Figure 4: Waterfall Model (Wysocki, 2014)**

Historically the waterfall model model contained some feedback-loops, however these are seldom considered nowadays (Wysocki, 2014). Atypical characteristic of the waterfall model is that each phase is completed before the next phase is started (Hansmann & Stober, 2010). Tonnquist (2008) however warns that sequential models such as the Waterfall model are time consuming since each phase must be finished and evaluated before the next phase is initialized. Hansmann & Stober (2010) further points out
that requirements must be thoroughly captured prior to the project’s start since changes to requirements can result in rework, increased cost and wasted implementations. Hansmann & Stober (2010) also state that it is usually close to impossible to conduct larger and innovative projects without some requirement changes arising.

3.1.2 Stage-gate models

The concept of the stage-gate system, or model as Karlström & Runeson (2005) describe it, is described by Cooper (1990). Stage-gate is a way of managing product development processes in an effective and efficient manner (Cooper, 1990). Similar to the description of the waterfall-model, in section 3.1.1 The plan-driven approach, this is done by treating an innovation project as a process that can be divided into a set of predetermined stages (Cooper, 1990). At each stage a certain number of project deliverables is assessed by management in order to determine if the project can move to the next stage (Cooper, 1990). Stage-gate systems provide quality and also a stronger market orientation regarding a new development (Cooper, 1990). Stage-gate systems also allows for several activities to be conducted simultaneously at each stage (Cooper, 1990).

A typical stage-gate model is presented in Figure 5:

![Stage-gate Model](image)

**Figure 5: The stage-gate system. Cooper (1990)**

3.1.3 The traditional view on the project parameters

Literature describing traditional project management, such as Tonnquist (2008), stress the control parameters of a project are time, cost, and time. They together form the project triangle by Tonnquist (2008), presented in Figure 6. Tonnquist (2008) further stress only one of the control parameters can be of highest priority in a project. However, Gustavsson (2007) argues, when it comes to more traditional project methods, the parameters cost and time are usually adjusted in order to deliver a certain result.
However, the view of the project parameters are interpreted in another way by Highsmith (2010), which is presented in section 3.3.3 *The agile view on the project parameters*.

![The Project Management Triangle by Tonnquist (2008)](image)

**Figure 6: The Project Management Triangle by Tonnquist (2008)**

### 3.2 An introduction to agile methodologies

*The purpose of this section is to give the reader an introduction to agile methods: how the Agile methods emerged and the main idea behind the Agile methods.*

When less is known about the solution or goal of a project, adaptive and agile project management solutions are beneficial (Wysocki, 2014). Tonnquist (2008) refers to these methods as ‘dynamic methods’ where the project solution is gradually developed during the project’s lifecycle.

Agile and adaptive project methods are distinguished from traditional methods by being change-driven rather than plan-driven according to Wysocki (2014). This can be compared to Tonnquist’s (2008) description of goal-seeking project management methods. Here Tonnquist (2008) mentions, for example, Scrum which is further presented in section 3.3.1. Figure 7 presents an illustration of a typical iterative project management cycle created by Wysocki (2014).

![Adaptive Project Management Life Cycle (Wysocki, 2014)](image)

**Figure 7: Adaptive Project Management Life Cycle (Wysocki, 2014)**

The following chapter, section gives a closer presentation of Agile methodologies.
3.2.1 Agile is not a new phenomenon

Agile methodologies is not an invention of the second millennium. Williams & Cockburn (2003) describe how software engineers practiced some of the techniques as early as the 1960s, and state agile is a term used in flexible manufacturing practices for a decade. Agile methods, such as Scrum and XP (extreme programming) root back to the late 1980s and early 1990s (Fowler, 2005). Takeuchi & Nonaka (1986) give a very early description of development methods which share many similarities with what today is known as agile methods. For example they mention the benefits of close customer collaboration:

“Because members of the project team stay in close touch with outside sources of information. They can respond quickly to changing market conditions” - (Takeuchi & Nonaka, 1986, p 141)

3.2.2 What is agile software development?

In order to understand the main characteristics of agile software development, it is relevant to explain the word agility. Dingsøyr et al (2012) state ever since the Agile Manifesto appeared both practioners and researchers have tried to explain agility. When reviewing literature, which describes agility, Dingsøyr et al (2012) found several descriptions including descriptions such as the ability to rapidly and flexibly respond to change. Dingsøyr et al (2012) further found the following to be associated with agility:

- Having minimal formal processes
- Light methodologies promoting maneuverability
- Speed of response
- Nimbleness
- Quickness
- Dexterity
- Suppleness
- Alertness

Furthermore, Erickson et al (2005, p89) state “At its core, agility means to strip away as much of the heaviness, commonly associated with traditional software-development methodologies, as possible to promote quick response to changing environments, changes in user requirements, accelerated project deadlines, and the like.”

The need for agility has led to the development of agile methodologies. According to Abrahamsson et al (2002) agile methodologies all share the same characteristics: incremental (small software releases, with rapid development cycles), cooperative (a close customer and developer interaction), straightforward (the method itself is easy to learn and to modify and it is sufficiently documented), and adaptive (the ability to make and react to last moment changes).

Agile methodologies, according to Highsmith & Cockburn (2001), are a response to market expectations of innovative software, developed fast, that meet actual market needs. This is done by responding and embracing change while also reducing the cost of change (Highsmith & Cockburn, 2001). This is achieved
through continuously producing working code and by the skills and effectiveness of the people involved (Highsmith & Cockburn, 2001). Through interactions and working software, quick feedback is achieved (Highsmith & Cockburn, 2001). Fowler (2005) describes continuous feedback as one of the important aspects of adaptive processes such as agile methodologies. Barlow et al. (2011) note that this allows for continuous refinement of a product in order to closer meet the customer’s actual needs and respond to change.

There are several agile methodologies available. Some of them are briefly presented in section 3.3 Overview of agile methodologies and the project parameters. Methodologies categorized as agile methodologies, earlier called lightweight methodologies, share the same values and principles (Cockburn & Williams, 2003). These values and principles were determined by 17 practitioners and authors in February of 2001, in the ski resort of Snowbird, into what is known as Manifesto for Agile Software Development (further referred to as the Agile Manifesto). As described by both Williams & Cockburn (2003) and Fowler (2005), the forming of the Agile Manifesto was not something instantaneous but rather a result of years of development towards what today is known as agile methodologies.

The Agile Manifesto is written by Beck et al (2001) and aims to find more efficient methods for software development. Table 4 gives an overview of the agile values as defined by Beck et al (2001), already presented in chapter 1, as well as a description of the values by Barlow et al (2011).

<table>
<thead>
<tr>
<th>Agile values by Beck et al. (2001)</th>
<th>Description of values by Barlow et al. (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Individuals and interactions over processes and tools”</td>
<td>“Enhance communication within teams and barrier removal”</td>
</tr>
<tr>
<td>“Working software over comprehensive documentation”</td>
<td>“Developers spend more time coding and testing than they do writing extensive documentation”</td>
</tr>
<tr>
<td>“Customer collaboration over contract negotiation”</td>
<td>“Reduce formalities to start and finish faster, with a strong focus on the customer throughout the development process”</td>
</tr>
<tr>
<td>“Responding to change over following a plan”</td>
<td>“Give teams the freedom to make changes and adjust to project needs”</td>
</tr>
</tbody>
</table>

**Table 4: The values in the Agile Manifesto (Beck et al. 2001) and description (Barlow et al., 2011, p 27)**

The principles below are part of the Agile Manifesto defined by Beck et al. (2001).

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer’s competitive advantage.
• Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
• Business people and developers must work together daily throughout the project.
• Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
• The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
• Working software is the primary measure of progress.
• Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
• Continuous attention to technical excellence and good design enhances agility.
• Simplicity—the art of maximizing the amount of work not done—is essential.
• The best architectures, requirements, and designs emerge from self-organizing teams.
• At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

3.2.3 Agile methodologies as a response to the limitations of traditional methodologies

One of the main causes for the agile development, according to Williams & Cockburn (2003) is the ever-changing environment of both business and technology. This results in difficulties when it comes to predefined product requirements since, due to changes in technology and project environment, these are unlikely to result in a desirable outcome (Williams & Cockburn, 2003). Hansmann & Stober (2010) write that it often is difficult to predict and plan the requirements for projects. Barlow et al. (2011) describes specifically how customers’ and sponsors’ expectations for the final product may change during the development of a system. “Software development cannot be considered a defined process because too much change occurs during the time that the team is developing the product” (Williams & Cockburn, 2003, p 40). Highsmith & Cockburn (2001) further notes that the cost of change grows through the project’s life cycle. Thus early and effective response to change is essential in order to reduce cost (Highsmith & Cockburn, 2001).

When it comes to flexibility and responding to change, Ceschi et al (2005) describes how 70% of companies, that follow plan-based methodologies, consider changing customer requirements as being one of the most significant issues. Petersen & Wohlin (2010) found, in their case study, changing requirements as one issue related to plan-driven development. This is due to market changes and might result in requirements becoming obsolete (Petersen & Wohlin, 2010). In addition, Barlow et al (2011) concludes that activities in plan driven development often are mutually dependent, why time and cost spent on early planning might be wasted. Poppendieck (2006) writes that requirements for features, that are developed but not needed, is a great waste in software project. These require resources in the form of e.g. planning, testing and support while at the same time making the delivered product more complex, and thus more difficult to understand and change, than necessary (Poppendieck &
In a conference material from 2007, Poppendieck (2007) further shows how 80% of the developed features and functions of a system are sometimes, rarely or never used. This can be compared with Petersen and Wohlin’s (2010) comparison of wasted requirements in agile and traditional project methodologies, as seen in Figure 8. Their study is based on the investigation of products being developed at a case company which recently migrated to more agile project management methods.

**Figure 8: Wasted requirements (i.e. requirements that have been elicited, documented and reviewed but not implemented) in plan-driven (left) versus agile and incremental practices. (Petersen & Wohlin, 2010)**

Petersen & Wohlin (2009) describe how both customers and developers tend to appreciate agile methods since they provide both parts with continuous feedback and means of influencing the project. Petersen & Wohlin (2010) also states that incremental methods reduce the impact a change of requirements can have on a project. Ceschi et al (2005) describes that organizations, which employ agile methodologies actively, use iterative processes, and on-site customers, to actually encourage requirement changes. As Barlow et al. (2011) note, this allows the project so more accurately meet the customer’s actual needs. By being able to early demonstrate the product value to the customer, and through closer customer relationships, Barlow et al (2011) explain that customer satisfaction generally is higher for agile projects. Wysocki (2014) write that customer satisfaction is potentially higher when using agile methods, since the focus is being put on delivering business value rather than e.g. satisfying time, cost and scope requirements. Barlow et al (2011) also argue that in small and medium sized projects, agile methods can lead to shorter development cycles. This since more emphasis is put on development rather than planning and design (Barlow el. al, 2011).

One issue that Petersen & Wohlin (2010) note, regarding plan-driven methods, is that faults and problems found late in a project are both difficult and expensive to correct. Petersen & Wohlin (2010) further describe early fault detection as one important improvement that agile methods brought on their case company. Since work can be carried out in parallel, activities such as testing can be done
continuously, and thus giving a shorter lead time for the tests (Petersen & Wohlin, 2010). Problems in agile projects are discovered earlier and can be corrected continuously (Petersen & Wohlin, 2010).

Plan-driven methodologies follow well-defined processes, which include detailed planning processes (Fowler, 2005). Through detailed planning, costs, scope, and time can be determined at an early stage (Fowler, 2005). Early planning also removes much of the competence needs from the actual construction phases of a project according to Fowler (2005). Fowler (2005), however, argues that this is not feasible when it comes to software development. This is due to, unlike in e.g. construction projects, that in software development projects a majority of the work is in the design of the system while the actual construction is relatively cheap (Fowler, 2005). Furthermore, Fowler (2005) explains that the team members in software development projects, such as testers and developers, often are both experienced and understand the technical work the best, why design is best carried out by these. Barlow et al. (2011) further argue that project interdependencies, in software development, are not sequential as in more traditional plan-driven development methodologies. Thus the cost and time spent on detailed planning is to some extent wasted (Barlow et al, 2011).

Fowler (2005) write that to early plan and predict the outcome of a software development project is close to impossible. Early plans for software systems are also hard to validate, as opposed to e.g. the drawings of a bridge which to a further extent can be validated mathematically (Fowler, 2005). It may also be hard to early estimate the value of a certain feature, for a customer. Furthermore the dynamic nature of environment, skills and development tools are other factors that hinders early planning. That the majority of resources are demanded by the design activities, in a software development project, is another strong reason for agile methodologies according to Fowler (2005). However Wysocki (2014), as well as Barlow et al (2011), warn that the adaptive nature of e.g. agile methods makes it hard to estimate resource requirements for a project. It is worth noting that literature regarding agile does not opposes pre-studies and planning, only that these should be kept on a high level and be adaptable to changing conditions (authors note).

Another benefit regarding agile values and practices can be seen when looking at communication. Ceschi et al (2005), for example, conclude that most project failures are related to people and project management factors. Communication issues are, as one example, responsible for five out of six reasons for project failure according to Ceschi et al (2005). When investigating benefits, regarding agile software development, Petersen & Wohlin (2009) ide ntifie improved communication as one advantage of agile compared to more traditional plan-driven development. Furthermore agile practices facilitate knowledge transfers and learning in the projects according to Petersen & Wohlin (2009). However Barlow et al (2011) describe demands for established and formal communication mechanisms, in agile projects, might have a negative effect on communication in larger projects.

Wysocki (2014) writes that if a project team cannot be co-located, iterative methods might instead create an increased overhead, for the project manager, in coordinating the project. Furthermore, Barlow et al (2011) explain that due to the large number of interdependencies, in larger and more complex projects, there exists a need for extensive coordination. Thus standardization, as in more plan-based
methodologies, is a more attractive option in these situations. “*Because agile methods depend on mutual adjustment, these methods are usually not preferred for large, complex projects or mature organizations.*” (Bralow et al, 2011).

3.3 Overview of agile methodologies and the project parameters

3.3.1 Common agile methodologies

Some common agile processes, described by Fowler (2005), among others, are XP (extreme programming), Scrum, Crystal, Context Driven Development, RUP (Rational Unified Process), and Lean development. Agile methods focus more on creativity than defining complex rules and processes, in order to manage the complex environment of software development (Highsmith & Cockburn, 2001). This is achieved through only defining a minimal set of rules and practices for the team to follow (Highsmith & Cockburn, 2001).

The authors have chosen to only briefly describe Scrum, XP and RUP since these can be considered common and typical agile methodologies and practices.

Scrum mainly focus on aspects related to project management of software development (Dybå & Dingsøyr, 2008; Barlow et al, 2011). Dybå & Dingsøyr (2008) describe Scrum as an iterative development method. However, Schwaber & Sutherland (2011) describe Scrum as a framework for iterative software development. Within the framework various processes and techniques can be executed (Schwaber & Sutherland, 2011). The framework consist of roles, events, artifacts and rules, which together defines how the Scrum Team shall work (Schwaber & Sutherland, 2011).

The Scrum Team, which is self-organizing and cross-functional, consists of a Product Owner, the Development Team, and a Scrum Master (Schwaber & Sutherland, 2011). The Product Owner manages the Product Backlog (Schwaber & Sutherland, 2011; Dybå & Dingsøyr, 2008), a prioritized list of all requirements for the product (Schwaber & Sutherland, 2011). The Scrum Master makes sure Scrum is followed as intended and understood outside the Scrum Team (Schwaber & Sutherland, 2011), and remove impediments for the Development Team (Schwaber & Sutherland, 2011; Dybå & Dingsøyr, 2008). The Development Team develop the Increment; a set of Product Backlog items (Schwaber & Sutherland, 2011).

The Product Backlog forms the basis for the Sprint Backlog, which is a set of Product Backlog items to be developed in the Sprint, i.e. iteration (Schwaber & Sutherland, 2011). All events within the Sprint are time-boxed, and the Sprint shall not be longer than one month (Schwaber & Sutherland, 2011). The Sprint starts with Sprint Planning and ends with the Sprint Review and Sprint Retrospective (Schwaber & Sutherland, 2011). During Sprint Planning, a plan for the upcoming Sprint is set in order to be able to achieve the Sprint Goal: to release a usable Increment (Schwaber & Sutherland, 2011). During the Sprint Review the Increment is evaluated, and feedback from stakeholders is given (Schwaber & Sutherland, 2011). The result of the Sprint Review is an updated Product Backlog, and the basis for the next Sprint (Schwaber & Sutherland, 2011). The Sprint Retrospective is a meeting where the Scrum Team evaluate...
their process and create a plan for improvement to be implemented in the next Sprint (Schwa\-ber & Sutherland, 2011). During the whole Sprint the Development Team synchronize their activities during the Daily Scrum meeting (Schwa\-ber & Sutherland, 2011). The Daily Scrum meeting focus on the following questions (Schwa\-ber & Sutherland, 2011):

- What did I do yesterday that helped the Development Team meet the Sprint Goal?
- What will I do today to help the Development Team meet the Sprint Goal?
- Do I see any impediment that prevents me or the Development Team from meeting the Sprint Goal?

A typical way of monitoring progress in Scrum is burndown charts (Schwa\-ber & Sutherland, 2011). A burndown chart is “…a large graph relating the quantity of work remaining (on the vertical axis) and the time elapsed since the start of the project (on the horizontal, showing future as well as past)” (Agile Alliance, 2014).

In contrast to Scrum, Extreme Programming (XP) focuses more on the development process itself, rather than project management (Barlow et al, 2011). Similar to Scrum, XP proceeds in iterations of two weeks (Lindstrom & Jeffries, 2004). XP prescribe specific techniques, for example Pair Programming (Barlow et al, 2011). In addition to pair programming, XP consists of eleven other practices for software development (Dybå & Dingsøyr, 2008). However, the core practices are Pair Programming, Simple Design, Test-driven Development, and Design Improvement (Lindstrom & Jeffries, 2004).

In contrast to both Scrum and XP, RUP is a completely documented software engineering process (Wysocki, 2014). It is a framework, or library, of processes, role definitions, artifacts, etc. (Shuja & Krebs, 2008). Central to Rational Unified Process (RUP) is the four phases: Inception, Elaboration, Construction, and Transition (Shuja & Krebs, 2008). Within the phases there is objectives and milestones, and development is done iterative (Shuja & Krebs, 2008).

### 3.3.2 Agile and stage-gate models

Karlström & Runeson (2005) describe that the agile model provides a tool for planning daily work while the gate model provide coordination between teams and projects. Karlström & Runeson (2005) as well as Karlström & Runeson (2006) conclude that an agile methodology and a stage-gate model can be used together. Karlström & Runeson (2006) mention both agile models and the stage-gate model need to be somewhat adapted. For example, Karlström & Runeson (2006) describe the stage-gate models as being too inflexible to be suited for software development. In addition, the stage-gate models’ demand for documentation needs to be adjusted to fit agile projects (Karlström & Runeson, 2006). Karlström & Runeson (2006) also point out that adjustments to agile models is needed. One example is that an agile model will face more overhead when interacting with a stage-gate model (Karlström & Runeson, 2005). Karlström & Runeson (2006) describe a mismatch between the high iteration frequency in an agile model compared to the information required by a stage-gate model. However, if the stage-gate model is considered to be a plan-driven process, Boehm & Turner (2005) suggest implementing agile processes
should be done by building up the processes rather than tailoring them to existing plan-driven processes. The processes should be based on needs and only process assets, which are truly essential, should be implemented (Boehm & Turner, 2005). Boehm & Turner (2005) suggest that a definition, of when an agile process is appropriate, should be used in the organization and that traditional milestones must be realigned or redefined in order to better support iterative methods.

3.3.3 The agile view on the project parameters

Similar to the traditional project triangle presented in section 3.1.3 The traditional view on the project parameters, Gustavsson (2007) defines time, cost and scope as the boundaries also of an agile. However, Gustavsson (2007) uses scope while Tonnquist (2008) uses quality. Traditionally time and cost are the parameters to be adjusted in order to achieve a specified scope (Gustavsson, 2007). However, when it comes to agile project methodologies, it is more common to adjust the scope parameter rather than time or cost for a project (Gustavsson, 2007).

Opelt et al (2013) stress that the view on scope is what differs most between a traditional waterfall model and the agile methodologies. Opelt et al (2013) claims that, in contrast to the waterfall model, the scope of an agile project is not fixed in details (Figure 9 below), similar to the description by both Gustavsson (2007) and Higsmith (2010). Instead, time and cost are agreed upon, while the scope is steered in a controlled manner according to agreed boundaries and processes throughout the project (Opelt et al, 2013).

Opelt et al (2013) argue that a customer’s true business needs generally are not known at the start of a project. What is considered important at first might change during the project. For this reason an agile fixed-price contract includes scope control rather than fixating the scope as in a traditional contract.

![Figure 9: Waterfall and Agile view on time, cost and scope by Opelt et al (2013)](image)
As a response to the traditional project triangle, Highsmith (2010) introduces the Agile Triangle (Figure 10). Practitioners of the traditional triangle, presented in section 3.1.3 The traditional view on the project parameters considers scope to be known early in a project, a false assumption according to Highsmith (2010). In addition, Highsmith (2010) questions how agile projects, which adapt continuously, ever will be deemed as successful according to the traditional parameters. Highsmith (2010) also questions the agile view on time, cost, and scope; for example the one by Opelt et al (2013) in Figure 8 (the right triangle). Therefore, Highsmith (2010) introduced the Agile Triangle presented in Figure 9.

**Agile Triangle**

![Agile Triangle Diagram](image)

**Figure 10: The Agile Triangle (Highsmith, 2010)**

The Agile Triangle consists of value, quality and constraints (which includes scope, schedule, and cost) (Highsmith, 2010). Highsmith (2010) stress that constraints are still important project parameters. However, Highsmith (2010) does not see the constraints as a project goal, in contrast to value and quality. Highsmith (2010) further argue the constraints should be adjusted to meet value or quality goals, thus rewarding adaptability. Furthermore, Highsmith (2010) describe the parameters as following:

- Value goal: Build a releasable product
- Quality goal: Build a reliable, adaptable product
- Constraint goal: Achieve value and quality goals within acceptable constraints
3.4 The impact of agile values and principles on the organization

This section treats areas affected by an agile approach.

3.4.1 The organizational structure

When analyzing projects, in general, it is relevant to analyze the organizational structure of the organization, in order to put the project in an organizational context. No literature has been found describing a typical organizational structure of an organization working according to agile methodologies. Therefore the article “The project-based organization: an ideal form for managing complex products and systems?” by Hobday (2000) is added to the theoretical framework.

Hobday (2000) describes six ideal-type organizational forms, presented in Figure 11. The pure functional form (Functional) to the pure project form (Project-based Organization) together represent the range of organizational forms presented by Hobday (2000). ‘Function’ represents the different functional departments of the organization, while ‘Project’ represent the projects. Furthermore, the other four organizational forms described by Hobday (2000) are a functionally-oriented matrix with weak project coordination (Functional Matrix), a balanced matrix with stronger project management authority (Balanced Matrix), a project matrix where project managers and functional managers are of equal status (Project Matrix), and finally (Project-led Organization), the project-led organization, in which the needs of projects outweigh the functional influence on decision-making and representation to senior management, but some coordination across project lines occurs.

Figure 11: Four of Hobday’s (2000) described organizational forms. Positioning the project-based organization, Hobday (2000)
The study made by Hobday (2000), comparing the efficiency and effectiveness of the functionally-oriented, matrix organization with the project-based organization (PBO), came to several conclusions. Among several advantages with the PBO, Hobday (2000) found that the flexibility and focus which follow with a PBO better manages emerging requirements and enables the organization to respond to client needs in real time. Additionally, the PBO was effective in integrating different types of competences (Hobday, 2000). Furthermore, the PBO, in contrast to the functional-matrix organization, allowed innovation in collaboration with customers and suppliers through its concurrent model of project management (Hobday, 2000).

Continuing with drawbacks of the PBO, among several, Hobday (2000) stress the PBO encounters problems when it comes to coordination of processes, resources and capabilities across the organization as a whole. The PBO complicates management control if projects “go their own way” (Hobday, 2000). Furthermore, Hobday (2000) identified senior management might find difficulties in tracking, controlling and responding to activities of project teams and directors, which could affect the overall capacity of the business for effective corporate strategy and business coordination. In addition, Engwall (2002) highlight the importance of putting projects in its historical context, and even more relevant, in its organizational context. Thus a project is affected by organizational factors (Engwall, 2002). However, the study by Hobday (2000) found various strategies for dealing with the drawbacks of PBO, among others by using the project-led organization. In the project-led organization project managers hold a strong position, resources and task coordinators are appointed in the line organization, working across project interests and incentives (Hobday, 2000). They have the mission to help coordinate, monitor, improve performance, and solve specific problems across the organization as a whole (Hobday, 2000).

3.4.2 Agile values and principles in the organization

As described by Kähkönen (2004), as well as Medinilla (2012), current agile methodologies are focused on one single team working according to agile practices. However, when implementing agile principles the context of the team will be affected (Dagnino et al, 2004; Ambler et al, 2013; Boehm & Turner, 2005; Cohn & Ford, 2003). Furthermore, during an implementation a project must interact with existing rules of an organization and thus cannot be seen as independent (Dagnino et al, 2004). In addition, getting the whole organization to adopt agile practices, not just one team or project, is a challenge (Dagnino et al, 2004; Boehm & Turner, 2005). To master this challenge is crucial according to Sutherland (2011), to fully adopt agile principles and practices. Medinilla (2012) even states that in order to fully implement agile, outside the team microenvironment, the whole organization must understand and be committed to agile practices, values and principles. Sutherland (2011) argues if an organization cannot quickly adapt to changes and remove impediments for the agile teams, agility will not be achieved.

Sahota (2012) describes that agile, principles, practices and values, require a fundamental shift in thinking and thus require a certain mindset and culture that supports agile work. If an organization is not open for a change of culture, the implantation of agile practices are likely to fail (Sahota, 2012). Sahota (2012) further describe agile as a culture, rather than a process. Similar to Sahota (2012), Sutherland (2011) also state that agility requires a significant mindset change. Instead of focusing on a big upfront
plan, delivering maximum value to the customers, who often change their minds, should be in focus (Sutherland, 2011). However, Fogelström et al (2009) warn the definition of customer value is subjective, and that agile methodologies assume that the value immediately can be confirmed by the customer, which is not always possible. In addition, delivering maximum value, the agile way, demands maximized value creation across the entire process, from developers to management (Sutherland, 2011).

Sutherland (2011) suggest that everyone should be educated and trained on this matter, which should be done by agile individuals. Training everyone in the organization in Scrum, all at once, have proven to be successful (Sutherland, 2011). Similar with Sutherland’s (2011) criticism, Boehm & Turner (2005) identify how everyday business is conducted, is often neglected when comparing agile and traditional engineering processes. One example is decision-making. Decision-making tend to be quicker in teams working according to agile processes compared to plan-driven teams, and frequent, and usually informal, communication is needed to support the quick decision-making (Cohn & Ford, 2003). Having distributed teams complicates such communication, but bringing people together the first week or two of the project increase the likelihood of success (Cohn & Ford, 2003). In addition Boehm & Turner (2005) also mention the difference in life cycles between agile and plan-driven approaches as a challenge to synchronize. Furthermore, Sutherland (2011) has identified a need of agility in operations and infrastructure, in order to support the flow of software.

3.4.3 Management support

Sutherland (2011) has observed that lack of agility in Management, Sales, Marketing, and Product Management prevents an organization to fully adopt agile principles and practices. Sutherland (2011) describe that the problem lies in not having clear business goals, strategies, and objectives.

Implementing agile processes requires knowledge of upper management on how this will impact groups outside the development group, otherwise most efforts will likely fail (Cohn & Ford, 2003).

Particularly managers at higher levels are afraid of losing the feeling of control which plan-driven process artifacts, such as Gantt charts, give them (Cohn & Ford, 2003). Likewise, these managers prefer when developers promise what will be delivered and when, even though the manager know they will not be able to do so (Cohn & Ford, 2003). Furthermore Medinilla (2012) argues that management might find agile practices, such as self-organizing teams, unsatisfactory.

Managers can have difficulties moving from a traditional management attitude to an agile management attitude (Boehm & Turner, 2005). The manufacturing paradigm was the basis for the traditional management attitude, where employees tended to be seen as interchangeable parts, and managers also tended to associate employees with a certain role (Boehm & Turner, 2005). The latter does not apply with the agile approach, where team members are assumed to be able to perform tasks of several roles (Boehm & Turner, 2005).
According to Cohn & Ford (2003) agile managers strive for daily contact with developers, in contrast to plan-driven process where a manager might go a full week without contact. To make sure the developers do not see the daily contact as micro management (regarding due dates and missed deadlines), Cohn & Ford (2003) thus suggest managers should constantly help developers by removing obstacles as quickly as possible and not complain about tasks taking too long. Boehm & Turner (2005) similarly describe the managerial behavior by stating that project managers have two primary roles in agile methods. They can act as a coach and protector (Boehm & Turner, 2005). They further describe that project managers should act as a barrier between the organization and the team and remove distractions during a sprint or a development cycle (Boehm & Turner, 2005). Project managers should also provide experienced technical help when needed (Boehm & Turner, 2005).

3.4.4 Measurements of progress

Both Boehm & Turner (2005) and Cohn & Ford (2003) stress the issue of tracking progress. Cohn & Ford (2003) claim upper managers find plan-driven processes satisfying since they facilitate progress tracking. At the same time Both Boehm & Turner (2005) and Cohn & Ford (2003) have found managers, which have been satisfied with a typical Scrum report. In a plan-driven process Cohn & Ford (2003) state a manager can track a process by first simply asking if the necessary documents have been produced, second weighing the document, and finally reading them. Boehm & Turner (2005) argue this kind of progress measurement won’t support the rapid pace of agile processes, and they have in some cases, in alignment with Cohn & Ford (2003), found agile measurements, such as burn-down charts to be used as reasonable substitutes for more traditional measures.

As earlier mentioned by Cohn & Ford (2003), Brown et al (2013) explains that supporting stakeholders, of a project, might feel threatened by the reduced level of control that agile methods imply. Management governance traditionally competes with developer’s freedom of planning and practices (Brown et al, 2013). Brown et al (2013) mean that it is necessary to integrate management governance with the agile practices in order to reduce this competitiveness. Thus steering mechanisms must provide management with insight and feedback while still providing freedom for the practitioners (Brown et al, 2013). Brown et al (2013) write that measurements that correlates with the dynamically changing environment will help encourage management to support the agile development. Further team members are also more encouraged to improve if the numbers of measurements are small, measurements have a clear interpretation and are automated. Brown et al (2013) gives the following as suitable business- and team-related measurements (see Table 5):
<table>
<thead>
<tr>
<th>Measure</th>
<th>Business-related</th>
<th>Team-related</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle-time reduction</td>
<td>Time from initiation to first delivery</td>
<td>Sprint velocity</td>
</tr>
<tr>
<td>Quality</td>
<td>Production defects per functionalities</td>
<td>Defect trends</td>
</tr>
<tr>
<td>Continuous optimization</td>
<td>Process maturity level</td>
<td>Variance in cost to complete</td>
</tr>
<tr>
<td>Productivity</td>
<td>Functionalities per employee and time</td>
<td>Sprint burn-down chart</td>
</tr>
</tbody>
</table>

**Table 5: Measurements in Agile Organizations. Brown et al., 2013**

### 3.5 The impact of agile values and principles on the customer

*This section describes the role of the customer in agile software development projects. This is considered important, by the authors, since the customer influences a project’s ability to work according to agile practices. Customer problems have also arose as one of the major issues during the pre-study.*

#### 3.5.1 The essential customer

The customer is, according to Gustavsson (2007) an external stakeholder with requirements regarding the project’s end result. Agile methodologies places higher demands on customer involvement compared to more traditional project methodologies, according to both Hoda et al (2010) and Fowler (2005). Martin et al (2006) even state that the customer represents one of the most important roles in agile projects. Chan & Thong (2008) describe that the customer works closely with the developers in order to specify e.g. requirements.

Chan & Thong (2009) write that the success of agile development is largely dependent on the customer playing an active role in the development process. Customers thus are a vital factor also when it comes to adopting agile methodologies in an organization according to Chan & Thong (2009). Customer involvement can benefit both the project as well as the customer, according to Hansmann & Stober (2010), when it comes to adjusting and prioritizing the project’s scope. Hansmann & Stober (2010) explains the reason being that uncertainty and risk can never be fully avoided.

#### 3.5.2 Reasons for lack of customer involvement in agile projects

Hoda et al (2010) state that lack of customer involvement is one of the most significant concerns among agile practitioners. Some problems and consequences of inadequate customer involvement are, among others according to Hoda et al (2010), pressure to over-commit, difficulties of gathering and understanding requirements, lack of feedback, etcetera. Hoda et al (2010) mention several reasons for lack of customer involvement. These are presented in Table 6.
### Causes for lack of customer involvement

<table>
<thead>
<tr>
<th>Cause</th>
<th>Problem Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skepticism and Hype</td>
<td>The customer is unaware and unfamiliar with agile methodologies and thus skeptical towards agile methods. Customer might also consider agile to be something of fashion that needs to be used, without fully understanding the implications of agile.</td>
</tr>
<tr>
<td>Distance factor</td>
<td>The physical distance between a customer and the project also contributes to the level of customer involvement.</td>
</tr>
<tr>
<td>Lack of Time Commitment</td>
<td>It is hard to gain adequate time commitment from the customer. The customer role is also time demanding while the customer might have other commitments to attend to besides the project in question.</td>
</tr>
<tr>
<td>Large organization</td>
<td>Larger organizations shows tendencies to prefer traditional project methods and thus being reluctant towards the role as agile customer.</td>
</tr>
<tr>
<td>Fixed-bid contracts</td>
<td>Fixed price-bid contracts, regarding time, scope and cost, are seen as a limitation to the agile practices.</td>
</tr>
<tr>
<td>Ineffective Customer Representative</td>
<td>The customer representative must be knowledgeable in the area of the project. Thus the representative is able to provide requirements and feedback to the development team.</td>
</tr>
</tbody>
</table>

**Table 6: Reasons for customer lack of involvement. Hoda et al. 2010**

3.5.3 Customer practices in the agile project

The customer should formulate detailed requirements and expectations to the project (Gustavsson, 2007). For this, the customer must choose a representative who possesses the authority and knowledge, to express and clarify the project requirements (Hoda et al., 2010). Furthermore, the customer should also be familiar with agile methods and what this demands from the customer (Hoda et al, 2010). However, Hansmann & Stober (2010) write that it might be hard for a customer to accept the unpredictable nature of an agile project, e.g. that the scope is not fixed. As an example Wysocki (2014), as well as Barlow et al (2011) in section 3.2.3 *Agile methodologies as a response to the limitations of traditional methodologies*, state that it might be hard to make derailed resource estimations in agile projects. This might be hard for the customer of a project to accept according to Wysocki (2014). On the other hand Hansmann & Stober (2010) argue that even waterfall methodologies are to some extent unpredictable.

As an example of customer obligations Hoda et al (2010) write that customer needs to specify and clarify requirements while at the same time being able to prioritize among these. In order for this to be
possible Highsmith & Cockburn (2001) describe “feature planning” and “dynamic prioritization” as some key aspects of the iterative development with continuous feedback. By planning the project around features to be developed, rather than actual tasks, the customer is able to better understand the product and thus dynamically prioritize the features as the project progresses (Highsmith & Cockburn, 2001). Continuous customer feedback is further critical in order to ensure that the desired end product is achieved (Hoda et al, 2010). Without feedback the team might put resources on developing features not intended by the customer (Hoda et al, 2010). For this relationship to work, Hansmann & Stober (2010) write that communication, collaboration and trust is essential. Petersen & Wohlin (2010), on the subject, present investigations showing that, for plan-driven methods such as Waterfall projects, due to lack of communication and feedback only a small portion of the produced code is actually used by the end-user. However, Fowler (2005) and Wysocki (2014) highlight that the close customer collaboration in agile projects put great demands on the customer to actively participate in the project. Wysocki (2014) even describe the demand for customer commitment as a weak point of agile methodologies. Fowler (2005) also highlight that the close customer interaction might be demanding also for developers.

Alahyari et al (2013) investigates the impact of customer-specific teams on customer relations, as in agile software development. They find that advantages such as continuous feedback enables discussions and refinements of the requirements. Further the close customer attention were viewed as an important mean to increase customer satisfaction regarding the project (Alahyari et al, 2013). Hansmann & Stober (2010) even go as far as to recommend that the customer is present on a daily basis, in order to quickly respond to issues that might arise. Hansmann & Stober (2010) further stress, ideally, the customer could be continuously present e.g. during design phases.

Martin et al (2006) describes that successful XP projects has a customer team containing nine key roles. Among these are: ‘Geek interpreter’ - Helps the customer in understanding the technical aspects of a project and ‘Diplomat’ - Organization representatives that represent the organization’s requirements, not just end-user requirements.
4 Empirical result

The empirical result consists of three parts. The first part presents Scania IT, the case used in this study. The second part, present the findings based on the pre-study at Scania IT, performed by the authors prior to the major case study. The major case study, which conclude the third part of the chapter, contains interviews with representatives from the IT organization as well as customers from the surrounding organization.

4.1 Background description of Scania IT

The information in this section, unless otherwise stated, is conducted from interviews with personnel at Scania IT, mainly project managers at the Project management office at Scania IT.

Scania is an international company within the industrial sector, whose main activity revolves around truck manufacturing. Scania IT is a by Scania Group fully owned subsidiary of Scania Group, with its major parts located in Södertälje in Sweden, with approximately 1200 employees globally. The main purpose of Scania IT is to assist the rest of the Scania with IT solutions. The IT solutions are mainly for supporting the business and processes at Scania, rather than software used in the trucks or busses, something managed by other departments at Scania. Scania IT works with new software development projects, as well as maintenance and support of existing software. The organizational structure of Scania IT is presented in section 4.4.3.1 The organizational structure, together with a description of how resources are allocated.

Scania IT’s customers are the surrounding Scania organization, which are ordering and paying for the services provided by Scania IT. An example of a customer and its’ order, could be a production unit purchasing a system to be used in production planning. In that case the production planning department at that particular production unit, would pay for the software development by Scania IT. The end-users of the system are employees at the production planning department. Another example could be a department at Scania, which coordinates suppliers, ordering a system to be used by the suppliers of Scania. Thus the suppliers would be the end-users. To conclude, the ordering customer and specifier of system requirements is always an internal Scania department or similar, while the end-users could be Scania employees as well as business partners of Scania.

The surrounding organization of Scania IT can be considered external to Scania IT, why these also can be considered to be customers of Scania IT, and thus further will be referred to only as customers.

4.2 Intended way of working at Scania IT

BaFDIT (Business & Flow Driven IT) is a new line of business and IT strategies currently being implemented at Scania IT. The main goal is to become more flow efficient, reduce lead-times and increase delivery precision. As part of implementing the new strategies deliverables defining values, principles and processes have been distributed in the IT organization. (Scania IT, 2014)
Through the book *IT @ Scania Core Values and Principles* values and principles, for the new strategy is presented. In the hand-out *The Scania IT guide* practices and working methods are presented.

The core values of Scania IT is presented as a house, see Figure 12. For Scania IT “Customer first”, “Respect for the individual” and “Elimination of waste” are particularly highlighted as the foundation of the Scania IT house. These three values are to be achieved through principles such as “a standard way of working”, “flow”, “pace” and visualization. (Scania CV AB, 2012)

![Figure 12: The Scania IT house. Scania CV AB, 2012](image)

When it comes to “flow” Scania IT prioritize efficiency when it comes to flow of activities over efficiency regarding resources used. In order to achieve a satisfactory flow agile development is advocated. For this close customer cooperation, incremental and iterative development are seen as key factors. However, no further definition how this affect daily work is presented (authors note). (Scania CV AB, 2012)

Regarding processes at Scania IT *The Scania IT Guide* differs between maintenance processes and project processes. These processes are aimed at creating flow through the IT organization and thus reduce time to market. For example *The Scania IT Guide* advocates decisions and resource allocations that allows for an uninterrupted value creating flow. (Scania CV AB, 2013)

For development *The Scania IT Guide* describes three stages to go through; “white arrow”, “yellow arrow” and “green arrow”-stage (see Figure 13). In “white arrow” the idea and business need is identified. In the “yellow arrow”-stage the concepts is further developed, requirements identified and a design created. The “yellow arrow”-stage aims to reduce uncertainties regarding a project. The idea is that the confidence level should be sufficiently high to allow for 9 out of 10 projects to deliver according
to budget and schedule. The result is a PDF (Project definition) which describes how the solution will be developed. In the “Yellow arrow”-stage, in *The Scania IT Guide*, one can identify a feedback loop around the concept and pre-study. The final stage of a development project is the “green arrow”-stage. Here the solution is implemented. *The Scania IT Guide* differs between reusing, renting, buying and developing systems. For development an iterative and incremental approach is advocated. However, since uncertainties and requirements have already been mapped in the “yellow arrow”-stage, 9 out of 10 projects are still expected to deliver on time. (Scania CV AB, 2013)

**Figure 13: White arrow-, Yellow arrow-, and Green arrow-stages (Scania CV AB, 2013)**

4.2.1 PPS – the project steering model at Scania IT

*Since this study investigates projects at Scania IT, the reader is briefly presented the project steering model used at Scania IT.*

Practical Project Steering (PPS) is a project steering model, which describes project steering on three levels; business model, steering model and production model (TietoEnator, 2002). The steering model is central in PPS and here eight decision points define the different stages of a project’s execution (TietoEnator, 2002). The decision points can be compared to the gates in a stage-gate model.

Figure 14 describes what kind of work being conducted between the decision points in PPS at Scania IT (Scania IT, 2014C).

**Figure 14: The project steering model at Scania IT (Scania IT, 2014C)**
Table 7 describes the decision points used at Scania IT (Scania IT, 2014C). The PPS model include instructions, not only for deliverables related to the decisions points, but also, for example, role descriptions, processes and, document templates (Project methodology designer A, 2014). Each decision point contains a check list that specifies the required documentation for each decision point (Project methodology designer A, 2014).

<table>
<thead>
<tr>
<th>DP1</th>
<th>Decision to initiate project</th>
<th>DP4</th>
<th>Decision to start execution</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP2</td>
<td>Decision to continue, change or interrupt preparation work</td>
<td>DP5</td>
<td>Decision to continue, change or interrupt the project</td>
</tr>
<tr>
<td>DP4p</td>
<td>Decision to start part of the execution work before DP3</td>
<td>DP6</td>
<td>Decision to approve the result of a delivery</td>
</tr>
<tr>
<td>DP3</td>
<td>Decision to approve the project plan</td>
<td>DP7</td>
<td>Decision to transfer responsibility for a delivery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DP8</td>
<td>Decision to close the project</td>
</tr>
</tbody>
</table>

**Table 7: Explanation of the decision-points in PPS at Scania IT (Scania IT, 2014C)**

During a weekly meeting between project managers and line managers, called the project PULS-meeting at Scania IT, the status of all ongoing projects are reported by project managers, respectively, with a reference to the decision points in PPS, visualized on a big board covering a large room (Project methodology designer A, 2014). The project manager reports green (no deviations), yellow (manageable deviations which will not delay the project) or red (deviations that will delay the project) (Project methodology designer A, 2014). Resources from the line organization is also visualized on the board, and if a project manager reports yellow or red, a yellow or red mark is put on the resource causing the deviation. Problems in a specific project can during the meeting be discussed among both project managers and line managers, for example resource owners. However, discussions is most often about the lack of resources (Project methodology designer A, 2014).

Furthermore, there is no explicit project portfolio management ongoing. For example, there is no official priority of projects (Manager A, 2014). However, the IT organization is currently developing a strategy for project portfolio management (Project methodology designer A, 2014).

### 4.3 Pre-study

The following discussion regarding the problem, which has initialized this report, is based on a pre-study executed by the authors during their initial time at the case company, Scania IT. The pre-study functions as a background to the Case study (section 4.4).

Methodologies for projects and product development at Scania IT are relatively old, according to Project methodology designer A (2014). The authors have seen that the current stage-gate model is mainly
based on the needs and values of the IT organization, i.e. Scania IT, rather than on the needs and values of the individual project.

Scania is considered to be a relatively tradition-bound organization, as also confirmed by Project methodology designer A (2014). However, discussions regarding agile project methodologies have become more common at Scania IT. This is for example due to, according to Project methodology designer A (2014), trends in the IT industry towards agility and to the recruiting of new skills. However Scania IT, lacks a common definition and understanding of what agile is and how it should be applied in various projects according to Project methodology designer B (2014). The authors have seen agile individuals, but also seen that some of Scania IT’s employees are unfamiliar with the potential benefits of agile methodologies, something that is also confirmed by Project methodology designer A (2014). For example, it has been identified that several of the lessons learned and problems identified, among Scania IT’s ongoing and closed projects, relates to factors that would be addressed by agile practices, principles and values.

However Project manager E (2014) states that Scania IT is showing tendencies to becoming more agile. In the book, *IT @ Scania Core Values and Principles* (Scania CV AB, 2012) it is mentioned that agile methods are to be sought in the IT organization’s daily business. The book describes how Scania IT, intends to work in relation to its established core values and principles. On the other hand, the book gives no detailed description of what is meant by “agile methods” and how it actually is to be implemented in the IT organization. *IT @ Scania Core Values and Principles* is something that is currently being rolled out at Scania IT’s various departments. However the agile mindset seems to be poorly grounded in some parts of the surrounding organization and the IT organization, in particular when it comes to support functions and management, as seen by the authors during pre-study interviews. These provide help, for example development environments, and resources, respectively. One drawback, regarding agile, that relates to this is the need for synchronization and cooperation between different projects, as identified by Project manager G (2014). This is needed, according to Project manager G (2014) in order for different projects and departments to share resources at Scania IT.

### 4.3.1 Hinders for agile project processes

While Scania IT shows intentions to become more agile the authors have identified several processes, methods and tools for the control of the project which are not in line with the Agile Manifesto. These processes, methods and tools places demands on projects regarding e.g. processes, documentation and early planning. Furthermore, Project manager E (2014) and Project manager F (2014) describe that it is hard to early plan a development project. In addition, Project manager F (2014) describe how early planning was very complicated in the project why agile practices suited the Project manager F’s project better. Especially since customer requirements were not very clear from the project’s start, according to Project manager F (2014). The planning and requirement analysis thus did not create much value in the project according to Project manager F (2014). Project manager G (2014), conclude that customers rarely possess all requirements from the start why an iterative development method, without early
detailed planning, is advantageous. Group manager H (2014) state that the lack of early and detailed planning might however make it harder for upper management to accept agile work.

The interviewees describe that it is not uncommon that projects develop own methods and also lack required documentation. Project methodology designer A (2014) state that several projects instead use alternative processes and tools depending on past experiences, preferences and the customer. For example, Project manager F (2014) had experience of having different project sub teams, which developed their own working methods.

Project methodology designer B (2014) states that current standards, for measuring and following up projects, are not inclusive of all aspects of interest, regarding a project. For example Project manager C (2014a) state demands for documentation and reports, from the IT organization, hinder the agile work in the project. Furthermore Project manager C (2014a) also describe that a project is only evaluated on time and cost, rather than e.g. quality and customer value.

Project methodology designer B (2014) describes Scania IT as being an inflexible organization, something that might hinder agile practices. This is also confirmed by Project manager E (2014) who state that a more or less central steering, at Scania IT, hinder agile work. Project methodology designer B (2014), for example, state that Scania IT is focused on resource optimization, something that makes Scania IT inflexible. Due to resource optimization extra resources, which according to Project manager G (2014) might be necessary in order to create flow in a project, are often lacking. Project flow may be cheaper than halting the project while waiting for resources according to Project manager G (2014). One example mentioned by Project manager G (2014) is projects’ requests for infrastructural resources, from the department of infrastructure at Scania IT. This may take up much time for a project and the need of resources must be determined early by the projects, which is not in line with an agile way of working according to Project manager G (2014).

Project methodology designer B (2014) describe that much in the current methods and standards may be stripped in order better suit a project. There seems to be a lack of support and understanding, from the IT organization’s management, for agile practices in the projects. Group manager H (2014) for example describes that upper management might have a hard time adjusting to agile project methodologies. Group manager H (2014) suggests that this might be due to limited insight and knowledge regarding agile methodologies.

In order for Scania IT to become more agile a gradual change is advocated by Project manager E (2014). Project manager D (2014a), Project manager E (2014), Project manager G (2014), and Group manager H (2014) suggest agile coaches as one measure that might help Scania IT become more agile. Project manager G (2014) describes that projects at Scania IT are more or less iterative, and that it is more a question of implementing a mindset at Scania IT. Project manager D (2014a) further suggests “communities of practice” where e.g. architects can better communicate and exchange experiences.
When it comes to the customers of Scania IT, they rarely work in an agile way and thus may require fixed cost and timeframes for projects with a predetermined delivery at the project’s end (Project methodology designer A, 2014). Thus cost, time, and scope are often fixed from the project’s point of view. Furthermore, since agile development place demand on close customer interaction, customer’s lack of agile knowledge pose as a hinder to agile processes at Scania IT. Project methodology designer B (2014), for example, describes that it is important to involve, educate and have the customer committed to agile, in order for agile practices to be used at Scania IT.

Agile methodologies such as Scrum advocate small regular releases of software which is then incrementally developed to suit customer needs. However, currently at Scania and Scania IT, customer requirements are often agreed upon prior to a project’s start, after which a final product is only expected at the very end of the project. An iterative system development method, such as an agile methodology, with customer feedback, is thus not supported at Scania IT. Project manager E (2014) highlights the importance of clearly communicating requirements among a project’s stakeholders. Especially Project manager E (2014) explains that it is important to understand why a specific feature is needed, something that is not the case today. As an example, Project manager F (2014) describe the lack of customer interaction in the project as a challenge.

Some projects have managed to involve customers in the agile process, which then has been a success factor when it comes to customer satisfaction (Project manager F, 2014; Project manager C, 2014a).

### 4.3.2 Summary of issues identified regarding agile practices at Scania and Scania IT during the Pre-study

The results of the pre-study indicate that Scania IT, in general, wants to become more agile when it comes to IT development projects. It is expressed by employees and it is also written in the IT @ Scania Core Values and Principles (Scania CV AB, 2012). Furthermore, extensive demands on project processes complicates Scania IT’s possibilities to become more agile. These processes include, for example, required documentation and have a high level of detail for the implementation of the project, which generally do not comply with agile methodologies. In reality, projects at Scania IT are executed in several different ways, often without fully following established methodologies and processes. In addition, there seems to exist obstacles in the IT organization in order to fully implement or adopt agile values and principles. For example, the focus on resource optimization, the limited management support, and the current evaluation of projects, are highlighted areas of problems. When it comes to the surrounding organization, limited customer interaction and early project specifications, further poses hinder to an agile way of working in the IT organization.
Overall the pre-study shows that intentions to increase agility exists in the organization of Scania IT. However the following difficulties are also identified:

- A focus on detailed processes, planning and documentation
- A focus on the organization’s needs and values rather than on a project’s
- A resource optimization
- Limited support from management
- Limited knowledge regarding agile methodologies
- Limited customer interactions in the project
- A focus on time and cost, rather than on quality and value

4.4 The Case study
4.4.1 Introduction to the case study

Manager A (2014) has more than 30 years of experience from working at Scania. Before entering Scania IT Manager A (2014) worked in several parts of Scania which are typical customers of Scania IT. Manager A (2014) is member of the management team at Scania IT. (Manager A, 2014)

Manager B has a managing role in the department of infrastructure of Scania IT (Manager B, 2014). Manager B’s department handles coordination of business critical resources to some specific customers (projects working in Scana IT) (Manager B, 2014). Projects function as customers (internally at Scania IT) to the department of infrastructure (Manager B, 2014).

Project A had seven project members, including the project manager. The project manager of Project A entered the project after the initial pre-study phase (Project manager A, 2014). Project manager A functioned as the technical project manager and managed the implementation of the IT-systems (Project manager A, 2014). Project manager A has no experience of projects where an agile methodology has been used (Project manager A, 2014). Customer representative A functioned as a representative for the customer in Project A. In more detail, Customer representative A currently has a position at Scania IT working with business relationship management (Customer representative A, 2014). The customer (purchaser of the system and one of the end-users) was represented in the project team (Project manager A, 2014).

Project B’s team consisted of about ten members, there among four developers, one tester, one architect and one customer representative (Project manager B, 2014). The project was a so called “as-is”-project, which means the project aimed to develop an application according to the specification of an existing application (Project manager B, 2014). The project manager, Project manager B, has no experience of a project where an agile way of working was used (Project manager B, 2014). The customer did not work co-located with the project team, instead met the team ones a week (Project manager B, 2014). The end-users of the system were business partners of Scania (Project manager B, 2014).
Project C is, at the moment of writing, a still ongoing project at Scania IT. The project employs less than 20 team members, some consultants and some Scania IT employees (Project manager C, 2014). Out of the Scania IT employees, the majority are split among other engagements and thus can usually not be dedicated to a higher degree than 50% to the project (Project manager C, 2014). When recruited to the project the project manager of Project C placed demands on Scania IT regarding using an agile project methodology (Project manager C, 2014). Project manager C has previous experiences of agile work (Project manager C, 2014). The project is considered to be a high priority project by Scania IT and the steering committee (Project manager C, 2014). Customer C functioned as a specifier of requirements, an end-user of the system, and worked closely to the project team (Customer C, 2014; Project Manager C, 2014).

Project D’s team consisted of, except for the project manager (Project manager D), one architect and about four developers (Project manager D, 2014). The project reported directly to the executive board of Scania (instead of having a steering committee) and therefore became classed as a high priority project in the IT organization (Project manager D, 2014). The executive board of Scania requested an agile development method to be used, based on recommendations from an external consulting firm (Project manager D, 2014). Project manager D has previous experiences of agile project management (Project manager D, 2014). Customer D (2014) was part of the purchasing department and had insight of the end-users’, in this case sales representatives for driver support services, needs (Customer D, 2014).

A summary of the projects, which the project managers and customers refer to in the study, is presented in Table 8.

<table>
<thead>
<tr>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 7 project members</td>
<td>- 10 project members</td>
</tr>
<tr>
<td>- Plan driven at first (pre-study)</td>
<td>- “As-is”, develop according to previous implementation</td>
</tr>
<tr>
<td>- Became higher in priority as time passed</td>
<td>- PM has no agile experience</td>
</tr>
<tr>
<td>- PM has no agile experiences</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project C</th>
<th>Project D</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Less then 20 project members</td>
<td>- 6 project members</td>
</tr>
<tr>
<td>- High priority</td>
<td>- High priority</td>
</tr>
<tr>
<td>- Agile methods used and PM has agile experiences</td>
<td>- Agile methods used and PM has agile experiences</td>
</tr>
<tr>
<td>- Customer and end-user representative on site</td>
<td>- Customer representative on site</td>
</tr>
</tbody>
</table>

**Table 8: A summary of the projects used in the study**

4.4.2 Overview of used methodologies, the stage-gate model, and the project parameters
4.4.2.1 Methodologies

*Section 4.4.2 presents the methodologies used in the projects investigated during the case study.*
Project A was initialized with a year-long pre-study where requirements were specified (Project manager A, 2014). This resulted in an implementation plan which was handed over to Project manager A (Project manager A, 2014). However all stakeholders had not been included in the pre-study why the project, and the pre-study, was re-started six month into the project (Project manager A, 2014).

“Since the requirements turned out not to be complete, the whole pre-study of one year was wasted. We had to start over.” – Project manager A (2014)

The methodology in Project A evolved during the project’s course but initially intended to follow standard Scania IT methodologies (Project manager A, 2014). Due to a lack of experience, regarding agile, the intended project methodology was the standard Scania methodologies and PPS, in Project A (Project manager A, 2014). However, there existed a disagreement between the project and the customer, regarding what methodologies and processes to follow (Project manager A, 2014). This was especially evident when it comes to decisions in the project. Project manager A (2014) wanted the steering committee to take formal decisions, while the customer representatives preferred taking decisions on their own. The customer however possessed very limited knowledge regarding project management (Project manager A, 2014).

As a result of the failed pre-study the project methodology changed in order to involve the customer to a further extent (Project manager A, 2014). Continuous customer meetings were used to analyze requirements and gain feedback from the customer (Project manager A, 2014). The customer was however located at another company site (Project manager A, 2014). The team worked co-located, which according to Project manager A (2014) was a success factor. The team was also physically located close to the maintenance team responsible for the systems they needed to integrate with (Project manager A, 2014).

The project did not use any continuous evaluation except for a lessons learned at the project’s end. One lessons learned was that documentations could have been more thorough (Project manager A, 2014). E.g. problems has arisen during the hand-over, of the system, to the maintenance team due to incomplete documentation (Project manager A, 2014).

Project B used a mix of agile and water-fall methodologies.

“We have been running a mix of an agile methodology and a waterfall methodology” – Project manager B (2014)

The project (project B) was divided into four sprints, with length varying between one and two months. The sprints included analysis, development, testing, and planning for upcoming sprints (Project manager B, 2014). Regarding testing the project team decided not to end sprints with regression tests. Instead, a complete system test was performed in the end of the third sprint, close to the start of sprint 4 (Project manager B, 2014). The project group work according to an overall picture of the final product, enabling details to evolve (Project manager B, 2014). Project manager B (2014) describe that the methodology
was incrementally improved during the project, but only on a spontaneous basis. Project manager B (2014) prioritized documentation in the project, especially when it came to implementation. This was considered important in order to enable a smooth handover to maintenance (Project manager B, 2014). The team was co-located which was considered to be a key success factor according to Project manager B (2014).

Project C worked based on Scrum while still complying with Scania IT practices (Project manager C, 2014). In order for the steering committee, the customer and the developers to accept an agile work method, in the Project C, Project manager C (2014) had to point out similarities between Scrum and existing Scania methodologies. The project, including stakeholders, currently works according to the Agile Manifesto including the following principles; ‘Business and IT work together’, ‘Cross-functional team’, ‘Team co-located’, ‘Limit handover activities’, ‘Value driven development based on business priority’, ‘Work in short cycles (sprints)’, ‘Know pace in the team’, ‘Early and continues deliveries’, ‘Frequent feedback’, ‘Decrease number of defects’, ‘Demo at the end of each sprint’, ‘Keep it simple’ (Project manager C, 2014). This, except for ‘Keep it simple’, agrees with existing Scania values and methodologies according to Project manager C (2014) why it was easy to argue for an agile work methodology in the project.

“Keep it simple’ was added to reduce unnecessary work, which otherwise is common at Scania IT “ – Project manager C (2014)

‘Keep it simple’ was also added to better follow the values and principles in the Agile Manifesto (Project manager C, 2014). ‘Keep it simple’ e.g. aims to keep documentations on a good enough level (Project manager C, 2014. Through continues close collaboration with the maintenance organization at Scania IT and end-users a satisfactory level of documentation can be established (Project manager C, 2014. Furthermore Project manager C (2014) also strives for having a self-organizing team which have been delegated the responsibility of the delivery, while having the support needed.

Project manager C (2014) describe Scrum is used in the project, with sprints ongoing for three weeks. Furthermore, the team and the customer is co-located (Project manager C, 2014). The objectives and deliverables of the project were initially specified on a high level based (Project manager C, 2014). In order to satisfy the management’s and steering committee’s demand for resource and time estimates Project manager C (2014) made rough estimates based on qualified guesswork. After a few sprints, however, the release planning and the sprint planning could be more accurately estimated based on the development pace and performance of the team (Project manager C, 2014).

The product backlog (in the project known as ‘the priority list’ due to the customer representatives having a different definitions of terminology) contains user stories and their respective story points. This represents the scope of the project (Project manager C, 2014). A story point is a representation of the degree of the complexity of a user story, which is based on a comparison with a reference user story. This enables the customer representatives to better understand and contribute to the planning and estimation of user stories (Project manager C, 2014). Project manager C (2014) explains that agile
project methodologies, used in the project, results in benefits such as reduced development time, effective resource usage and that the customer’s true needs are identified and satisfied. The high velocity, transparency, and limited time put on early analysis in the project has however been a cause of concern among more inexperienced, regarding Scrum, team members and stakeholders (Project manager C, 2014). This concern decreased as the project progressed due to early results and having the customer on-site (Project manager C, 2014).

“We have worked according to Scrum” – Project manager D (2014)

Project D followed Scrum. According to Project manager D (2014), Project D followed Scrum by the book, except from not using burn-down charts and not having a dedicated Product Owner. Instead, Project manager D (2014) described having the role as a product owner. For example Project D had a Scrum Master, a product backlog, sprints, retrospectives after each sprint, used played planning poker, and had daily Scrum meetings and so forth (Project manager D, 2014). Furthermore, the development took place at the customer site and the team was co-located during the project, which according to Project manager D (2014) both was key success factors. Test-driven development was also seen as a key success factor, since it was possible to detect requirements that needed further work. Documentation was supposed to be “good enough”, and only what was really needed was documented. Instead working software was prioritized (Project manager D, 2014).

The planning was done incrementally based on user stories in the product backlog, and the user stories was estimated using T-shirt sizes instead of hours, i.e. a scale from extra-small (less complex tasks) to extra-large (very complex tasks) (Project manager D, 2014). In the development team T-shirt sizes represented complexity, while T-shirt sizes given by the customer represented business value (Project manager D, 2014). The T-shirt sized was used in order to facilitate easier communication with the customer (Project manager D, 2014). After a couple of sprints, Project manager D (2014) knew the velocity of the team, i.e. how many T-shirt size points the team could manage in one sprint. This enabled better planning of the project after a couple of sprints (Project manager D, 2014).

The interviewees presented varying definitions of an agile way of working. To start with, Project manager A (2014) state that a goal is defined, but the way of reaching the goal might change during the project, when working agile. There is no well-defined plan, instead the project work according to milestones, i.e. the sprints (Project manager A, 2014). Having regularly retrospectives is also typical in an agile project (Project manager A, 2014). On the subject, Project manager B (2014) state that agile work implies that group members work interactively with each other and that requirement details are not frozen. Furthermore, an agile way of working implies continuous improvement while being open to change, and also be open to negotiation with the customer (Project manager B, 2014). Project manager C (2014) and Project manager D (2014) define agile according to the Agile Manifesto while Manager A (2014) and Manager B (2014) simply defines agile as an iterative way of working.

In summary, Project A and Project B was less agile, while Project C and Project D showed several aspects indicating an agile methodology. When defining agile project managers and organizational managers
show some variation regarding definition and level of detail. In Table 9 the summary is further presented.

<table>
<thead>
<tr>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Less agile: Plan-driven, initialized by pre-study</td>
<td>- Less agile: “As-is” somewhat similar to plan-driven</td>
</tr>
<tr>
<td>- Followed Scania standard methodologies but evolved slightly to involve customer more</td>
<td>- Mix of agile and waterfall</td>
</tr>
<tr>
<td>- Limited customer knowledge regarding project management</td>
<td>High level plan that evolved through longer “sprints”</td>
</tr>
<tr>
<td>- Later became co-located</td>
<td>- Focus on documentation</td>
</tr>
<tr>
<td></td>
<td>- Co-located team</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project C</th>
<th>Project D</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Agile: following Scrum</td>
<td>- Agile: following Scrum</td>
</tr>
<tr>
<td>- Also followed Scania standards</td>
<td>- Close customer collaboration</td>
</tr>
<tr>
<td>- Close customer collaboration</td>
<td>- Co-located, also with customer</td>
</tr>
<tr>
<td>- Co-located, also with customer</td>
<td>- Feature planning (T-shirt sizes)</td>
</tr>
<tr>
<td>- Feature planning (story points)</td>
<td></td>
</tr>
</tbody>
</table>

**Table 9: A summary of the methodologies seen in the projects**

4.4.2.2 Stage-gate models

Having well defined processes and tools is considered to be important (Manager A, 2014). At the same time the processes and tools should not be too detailed, thus hindering project managers in their work, but instead facilitate structure on a high level (Manager A, 2014).

“The methodologies should be simple and only require the most essential deliverables, based on checklists which everyone follows” – Manager A (2014)

The project manager in Project A followed the decisions points in PPS as intended (Project manager A, 2014). Project Manager A (2014) did not consider the project to be an agile project, but still identified that an agile way of working is complicated in PPS, due to its demand of formality and its current predefined processes. Project manager B (2014), who also followed the decision as described in PPS, considered the level of formality to vary depending on the knowledge of the steering committee. Furthermore, neither Project manager A (2014) nor Project manager B (2014) used much tools from the PPS model, except from deliverables related to the decisions points. In addition, Project manager A (2014) consider the PPS model to be too extensive in order to use it.

Project C followed the decision points in PPS, however in a modified way. Estimates had to be kept at a high level to get through the early decision points, such as DP3 (Project manager C, 2014) which require
a detail project plan. Project manager C (2014) describe that some decision points, in the established PPS model, are not compatible with an iterative working method in its current format, mostly because there are no instructions how to do it. Project manager C (2014) argues the decisions points can be regarded more as a formality while they are not really reflecting the reality.

Project manager C (2014), and also, Project manager D (2014) considered Scania IT need to adjust the PPS model, and also the weekly PULS-meeting, according to an agile way of working. Otherwise there will be confusion and inconsistency (Project manager C, 2014; Project manager D 2014). When working agile, project managers did not know how to properly submit a status report during the PULS-meetings (Project manager C, 2014; Project manager D, 2014). For example, Project manager D (2014) parked the project in DP4p and stayed there until the project finished.

“To iterate between DP3 and DP7 would have been better. However, this would not have worked at Scania IT.” – Project manager D (2014)

Similarly, when Project C reached DP5 the project was also put on hold here (Project manager C, 2014). Currently Project C take a new DP5-decision every month on their own initiative (Project manager C, 2014). In reality this is used to validate the work of the latest month’s iteration together with the steering committee (Project manager C, 2014).

Manager A (2014) stresses that not all projects are suited for an agile approach. Similarly, Manager B (2014) explains different parts of Scania IT have different needs regarding agility, something that also needs to be considered when implementing an agile way of working. Furthermore, Manager B (2014) mentions traditional project management usually allows for more detailed resource planning.

To conclude the project managers and managers argue that processes and tools are important, but should only require the most essential deliverables. PPS is used in different ways and extent. While not hindering an agile way of working, PPS still seems to need adjustment for better support of agile methodologies. Different parts of the IT organization have different needs regarding agility, something that must be considered. A summary of how the projects related to PPS is presented in Table 10.

<table>
<thead>
<tr>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Followed the decision points as intended by the IT organization</td>
<td>- Followed the decision points as intended by the IT organization</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project C</th>
<th>Project D</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Followed the decisions points in a modified way</td>
<td>- Followed the decisions points in a modified way</td>
</tr>
</tbody>
</table>

**Table 10: Summary of how the projects related to PPS**
4.4.2.3 The project parameters

In Project A, time was of highest priority in the beginning, but unfortunately the project was delayed for over a year due to time spent on the unsuccessful pre-study (Project manager A, 2014). Because of the unsuccessful pre-study, cost became even less prioritized by the customer, in order to get the project back on schedule (Project manager A, 2014). Similarly, Customer representative A (2014) described scope was of highest priority after the unsuccessful pre-study in order to implement the necessary functionality. Thus time and cost was varying, and the application needed to be just good enough (Customer representative A, 2014).

“It was important the application worked good enough. The customer was clear not to include any nice-to-have functionalities” – Customer representative A (2014)

Project B was carried out with the highest priority on time and scope (Project manager B, 2014). According to Project manager B (2014), the customer in Project B understood cost needed to be adjusted in order to adjust scope, which was Project manager B (2014) saw as beneficial.

Project C is conducted with a clear focus on creating customer value, always working on what is prioritized as highest value for the customer (Project manager C, 2014). The project manager and the customer agreed on prioritizing functionality (i.e. scope) and quality rather than time or cost (Project manager C, 2014). Similarly to Project manager C (2014), Customer C (2014) described the project strived for creating high value high rather having a clear focus on time, cost, quality or scope. In Project D however, Customer D (2014) saw quality as the project parameter of highest priority. As time passed, scope became important too, and in focus, to make sure all “must have” features are completed, but on a just good enough level (Customer C, 2014).

“We have not compromised on quality” – Project manager C (2014)

Project D was according to Project manager D (2014) supposed to deliver as much as possible within the fixed time and cost frame. At first Project manager D (2014) had to argue why an addition to scope, while remaining the same time and cost frame, was not possible. The customer later came to understand this better (Project manager D, 2014). Project manager D (2014), and Customer D (2014), explained quality was of the highest priority in the project, even though it was hard to measure according to Project manager D (2014). However, Customer D (2014) and Project manager D (2014) had a slightly different view regarding the importance of quality. Customer D (2014) considered the regular end-user tests to be a good measure of quality. Thus Customer D, in spite of the quality focus, neglected some quality related implementations according to Project manager D (2014) which lead to later rework of some of the functionalities. One reason might be that Customer D (2014) considered Scania in general to focus too much on details, why doing just good enough solutions was sought. Further, Customer D (2014) asked for a contract to be signed with Scania IT, however it never happened.
The project managers were not aware of whether Scania IT are conducting any performance evaluation of the projects alone or with the customer (Project manager A, 2014; Project manager B 2014, Project manager C, 2014; Project manager D, 2014). However, projects are being asked if they delivered according to the intended time and cost frame, during a lessons learned meeting at the Project Management Office (PMO) (Project manager C, 2014).

“Projects are mainly evaluated on time and cost” – Project manager D (2014)

In a project which adapts to the needs of the customer, focusing on delivering business value, the time, cost and scope of the project changes (Project manager C, 2014). As a result a project which actually delivers good customer value might be interpreted as a failed project since time and budget are not kept (Project manager C, 2014). Similarly, Project manager B (2014) described the agile methodologies are focused on delivering the right things, creating customer value, while Scania IT currently focuses on having control over time and cost, thus hindering project managers to work fully agile. Additionally, customers at Scania tend to demand detailed pre-study plans and cost estimates which hinders the agile processes (Project manager C, 2014). Three out of four project managers request a bigger focus on evaluating the business value and customer satisfaction after the projects (Project manager B, 2014; Project manager C, 2014; Project manager D, 2014). In contrast to the project managers, Manager A (2014) argues customer satisfaction concludes the priority of Scania IT. Manager A (2014) further argue quality is important, however lead time, or time to market, is most important.

To conclude, in the end Project A focused mainly on finishing the specified scope while adjusting time and cost. Similarly, Project B also focused on scope together with a focus on finishing according to schedule. In contrast to Project A and Project B, Project C had a focus on customer value. Furthermore, Project D had a fixed time and cost frame while scope could be adjusted. When it comes to the evaluation-model of projects, time and cost is currently used while aspects such as customer value seem to be neglected. A short summary of what were the highest prioritized project parameters in the projects is presented in Table 11.

<table>
<thead>
<tr>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Highest priority: time in beginning and scope later on</td>
<td>- Highest priority: time and scope</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project C</th>
<th>Project D</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Highest priority: Customer value</td>
<td>- Highest priority: quality</td>
</tr>
</tbody>
</table>

**Table 11: A summary of the prioritized project parameters in the projects**
4.4.3 The impact of agile values and principles on the organization

4.4.3.1 The organizational structure

The IT organization is organized as illustrated in the organization chart in Figure 15 (Scania CV AB, 2014A).

![Organization Chart](image)

**Figure 15: The organization chart of Scania IT (Scania CV AB, 2014A)**

Project managers are mainly located at the Project & Vendor Management Office (PMO), with a few exceptions (Project methodology designer A, 2014; Manager A, 2014). Resources, often seen as specialists, are distributed over the different departments and temporary loaned from the line organization to projects run by project managers at the PMO (Manager A, 2014). Resources cannot always be fully dedicated to a project (Manager A, 2014). Sometimes, parallel to the project, the resources still have ongoing tasks in the line organization, and in some cases a resource might be split between several projects (Manager A, 2014).

4.4.3.2 Agile values and principles in the organization

Project manager A (2014) experienced the knowledge level differed largely in different parts of Scania IT, as well among customers at Scania, and also the opinion regarding to what extent agility should be used. Project manager A (2014) was satisfied with the support from both management and the steering committee, but stated it was due to the high priority of Project A in the IT organization. However, not when it came to the support of agile methodologies (Project manager A, 2014). For example the steering committee preferred clearly planned processes (Project manager A, 2014). Project manager B (2014) had a similar experiences having a steering committee not supporting agile methodologies, as well as the customer and the IT organization. Project manager C (2014) considered the current way of supporting projects at Scania IT hindered an agile way of working. Project manager D (2014) was satisfied with the organizational support from Scania IT, however believed it was due to the high priority of the project within the IT organization. However, Project manager D (2014) and Manager B (2014)
considered some individuals, among them mostly consultants, to be agile, however not the IT organization in general, similar to how Project manager A (2014) described only a few people in the IT organization had knowledge regarding an agile way of working.

Project manager A (2014), Project manager B (2014), Project manager C (2014), and Project manager D (2014) all concluded the lack of support for agile methodologies in the organization was due to the lack of knowledge regarding agile values and principles or methodologies. Furthermore, the project managers in case A, B, C, and D were not aware of any educational activates in the IT organization regarding agile methodologies.

“We have started small, but have a long way to go in order to become agile” – Project Manager A (2014)

In addition, Manager B (2014) identified a need of education. However, Project manager C (2014) and Project manager D (2014) had received knowledge outside the case company. Additionally, Project manager C (2014) educated almost all project members in order to understand the agile processes, or methodologies. Similarly, Project manager D (2014) educated personnel at Scania IT, external to the project, on the subject of agile methodologies. Furthermore, a result due to the lack of knowledge was according to Project manager D (2014) a non-common view of agile, which also can be seen in the various definitions of agile by the project managers in case A, B, C, and D, as well as by Manager A (2014) and Manager B (2014) (see section 4.4.2 Overview of the methodology used in the projects).

Customer representative A (2014) had experienced how Scania IT told its customers an agile way of working was their standard way of working. However, Scania IT lack the knowledge on the subject, according to Customer representative A (2014), and had lots of work left in order to become agile. Customer D (2014) had a similar view, and described the lack of knowledge posed a hinder when Customer D (2014) requested an agile way of working in the project. However, Customer D (2014) pointed out Project manager D (2014) had the knowledge. In contrast, Customer C (2014), as well as Manager B (2014), saw similarities between agile methodologies and the currently used principles at Scania. According to both Customer C (2014) and Manager B (2014) they are well known in the customer organization as well as in the IT organization, why the adoption of an agile way of working should be easy (Customer C, 2014; Manager B, 2014).

“I can see many similarities between the way of working in this project and how I am used to work with manufacturing at Scania” – Customer C (2014)

The lack of support was more likely due to lack of knowledge rather than willingness according to Project manager A (2014), similar to how Project manager D (2014) described no one in the IT organization really opposes agile methodologies. However, Manager B (2014) at the infrastructure department could not see any commitment at Scania IT in the adoption of agile practices.
A result of the lack of knowledge of an agile way of working, in the IT organization, is the non-
understanding for the importance of quick response to the agile teams when help is needed (Project
manager C, 2014). This hinders the agile projects to use short sprints, and reduce the ability to maintain
flow (Project manager C, 2014). Generally it is largely up to the project manager to specify what is
needed of the IT organization of the project in order to solve an issue, which all of the project managers
had experienced (Project manager A, 2014; Project manager B, 2014; Project manager C, 2014; Project
manager D 2014) As a consequence, project managers are largely dependent upon their personal
network in order to get help, which is not described as the intention (Project manager B, 2014; Project
manager C, 2014; Project manager D 2014).

“There are formal ways of solving problems, but in the reality you need to rely on your
personal contacts” – Project manager C (2014)

Furthermore, Project manager B (2014) describe even when a problem is more related to other parts of
Scania IT than the specific project, the project manager still has to operate the whole process in order to
solve the problem, instead of getting help by the IT organization. However, Project manager B (2014)
describes the Scania IT PULS as a forum where problems effectively can be escalated in order to get the
attention needed.

Project manager B (2014) had experienced a lack of agility when help was needed from maintenance
teams. The resources in the maintenance teams was activated based on long-term planning and Change
Requests, which Project manager B (2014) expressed hindered the progress of project B. These teams
often could not answer when they could provide help, and required a Change Request (Project manager
B, 2014).This required the project manager to early plan for resource needs in the project. Similar to
Project manager B (2014)’s description Project manager A (2014) also had problems synchronizing
development with the maintenance teams due to long release cycles.

Both Project manager C (2014) and Project manager D (2014) described that project managers usually
need to know exactly what to request, in particular when help is needed from the department of
infrastructure. Manager B (2014) describe project managers even have to know exactly whom to contact
in order to get a quick response. In order to get help from the department of infrastructure the project
manager currently has to write specifics into a web-form (Project manager C, 2014;Project manager D,
2014; Manager B 2014). In the case of project C, Project manager C (2014) has got a dedicated contact
person at the department of infrastructure, which Project manager C (2014) considered to be critical in
order to achieve agility. Similarly Project manager D (2014) had got a dedicated maintenance manager
who coordinated the activities with the department of infrastructure. However, both Project manager C
(2014) and Project manager D (2014), as well as Manager B (2014), described these situations to belong
to the uncommon.

“Infrastructure and other support functions must change their way of working to better
support an agile approach” – Project manager D (2014)
Project manager C (2014) argued Scania IT should be more service-oriented, why projects should have one single point of contact for different support functions or services, for example infrastructure. Project manager C (2014) described the single point of contact should be able to understand the projects’ needs, thus removing the need for detailed descriptions from the project manager. Manager B (2014) also suggest a dedicated resource (from the department of infrastructure) for larger projects, and a single point of contact for smaller projects. Combined with an agile approach at the department of infrastructure this could be a good solution in order to enable the agile projects to maintain their intended pace (Manager B, 2014). Furthermore, Manager B (2014) describe that the department of infrastructure lacks insight into the needs of the agile projects, or customers as they see them. In addition, Manager B (2014) has not seen any department at all changing their processes or methods in order to support the agile practices, however believe an agile approach would be beneficial for the department of infrastructure.

“The department of infrastructure needs better insight into the projects’ needs in order to modify our release plan, currently consisting of four releases per year” – Manager B (2014)

As mentioned, Project manager C (2014) has educated the project members about agile processes, or methodologies. However, Project manager C (2014) described being privileged by having the opportunity to recruit project members amenable of an agile way of working. Project manager C (2014) also describes a general absence of an agile mindset in the IT organization. The focus on resource optimization reflects the current mindset in the IT organization, which does not support an agile way of working (Project manager C, 2014; Project manager D, 2014).

Project manager B (2014) experiences Scania IT being slow to respond to workload fluctuations, and even consider resource allocation as currently being the most critical hinder for projects. Project manager B (2014), Project manager C (2014), and also Project manager D (2014) and Manager B (2014), further saw the current mindset, the focus on resource optimization, hinders flexibility and flow. However, Project manager D (2014) identifies it might take time before an organization can compare costs and savings between a flow-driven organizational form compared to a resource optimized form.

“Resource allocation does not work well. The person who shouts the loudest get the resources” – Project manager B (2014)

Scania has traditionally been an organization focusing on resource optimization, influencing Scania IT to still be a resource optimized organization (Manager A, 2014). Manager A (2014) state, in order to satisfy a customer high quality software must be delivered, but most importantly the lead time must be maintained. In order to do so, maintaining the flow is very important (Manager A, 2014). Even though Manager A (2014) recognizes the cause to be resource optimized, Manager A (2014) also identifies a contradiction when it comes to achieving flow, but unfortunately has no solution to it. Project manager C (2014), on the other hand, sees as mentioned, flexible resource allocation as critical and therefore suggests that an overcapacity is needed at Scania IT. Manager B (2014) sees benefits of both being
resource oriented as well as being flow oriented. Manager B (2014) further believes the two mindsets might have to be combined in order to meet the different needs of Scania IT, regarding the level of agility.

As mentioned above by Manager A (2014), in section 4.4.3.1 The organizational structure, resources are temporarily put in projects and often in a part-time role. Project manager A (2014) and Project manager B (2014) argues this combined with the focus on maintenance at Scania IT, leads to a loss of commitment and focus needed for the projects. Customer D (2014) also identified problems regarding getting fully dedicated and committed resources from Scania IT. Finally having dedicated resources from Scania IT turned out to be a key success factor (Customer D, 2014).

Furthermore, Project manager C (2014) considered Scania IT in general to be working too much with well-defined processes and routines (however was not controlled by it in project C due to special approval). Furthermore, Project manager C (2014) often felt the focus was more on following the processes rather than creating customer value, and could not see a clear purpose with many of the processes at Scania IT. Similarly Project manager C (2014) describes the view of the project management office at Scania IT to be non-agile. Project manager C (2014) explains that the project management office is more devoted towards developing standards for all projects at Scania IT, rather than creating maximum value for the customer.

“It is unclear why project managers should follow the existing processes. I feel it is often more focus on following the process rather than creating value” –Project manager C (2014)

Furthermore, the idea of process flexibility is not popular at the PMO (Project manager C, 2014). In general Project manager C (2014) believe that there must exist flexibility in methodologies to allow for differences regarding the individual projects and their needs. Similarly, Project manager A (2014) stressed defined frameworks and methods, such as PPS, poses some hinders to fully becoming agile, due to its formality and pre-defined processes.

Project manager B (2014) had however got the steering committee to accept a broadly plan instead of having one with lots of details as normally. To let a detailed plan evolve, and develop incrementally, was seen as advantages by Customer C (2014). This was sine Customer C (2014) considered making adjustments a natural thing. Furthermore, Project manager D (2014) was not constrained by any of the predefined processes and routines. However, this could be expected due to having the approval to work agile from the Board of Directors at Scania (Project manager D, 2014).

To summarize, the project managers experienced a lack of support from the organization, which partially was considered to be due to a lack of knowledge and a common definition. The project managers experience a lack of support when they encounter problems related to the projects. For example, the lack of support was seen in the case with the department of infrastructure. Influenced by Scania, resource optimization partially seems to reflect the mindset of Scania IT, and in general resource
allocation turned out to be a problem, including having part-time resources. The mindset of Scania IT also turned out to vary between focus on following a plan and focus on creating customer value.

4.4.3.3 Management support

The lack of support for agile methodologies is partially a result of the lack of management decisions regarding an implementation of agile methodologies (Project manager B, 2014; Project manager C, 2014). Similarly, there is no official definition of what is meant by working agile (Project manager C, 2014). Even when a customer has requested to work agile it was questioned by Scania IT (Customer D, 2014). However, new strategies and practices, such as BaFDIT, state that the IT organization should be more demand-driven rather than resource optimized as is the case today (Project manager C, 2014). Contradictory, management has got instructions all resources shall be fully utilized - a decision not in line with an agile approach (Project manager D, 2014). This can be seen when project managers ask for help (Project manager D, 2014). The most common response by management is that they need to make sure there are free resources, before they can make a commitment (Project manager D, 2014). In addition, discussions with management is considered to be mostly regarding resources (Project manager A, 2014).

“There are missing decisions of principles regarding an agile way of working. I think it is needed on a management level.” – Project manager B (2014)

When it comes to an agile mindset among management, tendencies towards better support for the projects have been identified (Project manager D, 2014). Although, the lack of support for agile methodologies is more prominent, however is believed to be due to a lack of knowledge among management (Project manager B, 2014; Project manager C, 2014; Project manager D, 2014). For example, Project manager C (2014) sees group managers in the line organization often are unfamiliar with agile practices. Thus agile experience or mindset is not a requirement from management on the employees (Project manager C, 2014). As a consequence the possibility of agile projects is further hindered (Project manager C, 2014). In the end there is an absence of an agile mindset, at Scania IT Project manager C (2014).

“It is up to the individual project manager to run his or hers own agile race” – Project Manager C (2014)

Management at Scania IT is used to be able to influence and be in control of projects, which is fully normal in plan-driven projects (Project manager A, 2014). However, to let go of control, and rely more on others, might be difficult for both management and project managers at Scania IT (Customer representative A, 2014; Project manager A, 2014; Project manager B, 2014; Project manager C, 2014; Project manager D, 2014). For example, Project manager A (2014) experienced management in the steering committee placed high demands on planning, questioned time spent on specific tasks, questioned the performance of the project, and did not show a high level of commitment. Project manager A (2014) argued that education would help the steering committee to get a better
understanding and ability to provide better support for the projects. Furthermore, the current management attitude, the need of being in control, prevent project managers to practice an agile way of working (Project manager B, 2014; Project manager C, 2014; Project manager D 2014).

In addition, the lack of management support, and attitude, influences the project managers. For example, Project manager A (2014) described that the role as a project manager in Project A implied responsibility for resource allocation and cost-estimations, as well as the overall project delivery. Furthermore, Project manager B (2014) acted as a traditional project manager, controlling as well as managing the project members (Project manager B, 2014).

The project manager role was described differently by Project manager C (2014) and Project manager D (2014). To start with, the role as a project manager in Project C was described by Project manager C (2014) as being supportive. Externally, Project manager C (2014) accounted for the project team’s performance and actions, and defended the team if needed. Internally, Project manager C (2014) describe the role as being a coach and that the whole team have a collective responsibility of the work. Generally, Project manager C (2014) describe Scania IT to have a lack of supportive management, rather controlling, thus hindering an agile way of working. Lastly, similar to Project manager C (2014), Project manager D (2014) described striving for being supportive internally, rather than steering the team members. Externally, Project manager D (2014) described the role as being a politician, protecting the team.

“I want to control as little as possible. I want everyone involved in the project feel responsible for the whole project. This came natural since we used Scrum” – Project manager D (2014)

The daily contact with the team members was regarded as essential in order to be supportive (Project manager D, 2014). On one hand, Project manager D (2014) describes the agile methodology allowed the team to commit to a certain deliverable and thus created a more motivated team. On the other hand, Project manager D (2014) also saw that this demanded for the project management to trust the team with making own decisions, thus letting go of some of the control normally associated with the project manager role. However, Manager A (2014) stress, even if project managers let go of control, the steering committee still must be provided with certain documentation, but developers should have space for creativity. Customer representative A (2014) argued that an agile way of working enables the project manager and the customer to easily follow a projects current status. However, external managers of the project might have difficulties gaining insight into the project due to less degree of control (Customer representative A, 2014).

To conclude, a clear standpoint from management regarding an agile way of working is considered to be missing. Furthermore, a contradicting strategy regarding resources is described to hinder an agile approach. In addition, the project managers consider management to lack knowledge in how to support especially agile projects. There is also doubt whether management is able to let go of control, which
prevent managers to practice an agile way of working. A difference in the description of the project manager role is further identified.

4.4.3.4 Measurements of progress

All project managers except Project manager D (2014) have sent, what the project managers refer to as traditional status reports, to their steering committees and no one have been using burn down charts. (Project manager A, 2014; Project manager B, 2014; Project manager C, 2014; Project manager D, 2014). Project manager D (2014) argued no formal status reports was needed since the customer worked co-located with the team (Project manager D, 2014). However, Project manager B (2014) regarded the status report as a great source of waste, due to lack of feedback from management at Scania IT.

“A lot of status reports are written. However, it is mostly one-way communication” – Project manager B (2014)

In contrast, Project manager C (2014) was satisfied with the feedback. The communication with the steering committee focused on transparency, communication of progress, easy-to-read terminology (i.e. no abbreviations), and things was kept on high level in order to get an understanding of the value of the activities performed (Project manager C, 2014). In addition, due to working agile, with regular and frequent releases, Project C have continuously been able to show clear results, which reduced the significance of the formal status reports (Project manager C, 2014).

Furthermore, all of the project managers reported the current status on the weekly project PULS-meetings (Project manager A, 2014; Project manager B, 2014; Project manager C, 2014; Project manager D, 2014). However, Project manager A (2014) could not see any meaningful influence on the performance of Project A.

Project A and Project B did not use any measurements or Key Performance Indicators (KPIs) during the project (Project manager A, 2014; Project manager B, 2014). However, Project C and Project D used sprint velocity as a measurement (Project manager C, 2014; Project manager D, 2014).

“Oh our own initiative we have made a survey regarding the project result together with the customer. Except from that, what I am aware of, we have only been evaluated on time and cost” – Project manager D (2014)

Furthermore, no evaluation according to any measurements or KPIs was done afterwards, except from the evaluation on time and cost, done in all projects after completion at the Project Management Office, mentioned under section 4.4.2.2 The Project parameters (Project manager A, 2014; Project manager B, 2014; Project manager D 2014). However, having KPIs or measurements triggering the desired behaviours in both the project and the IT organization, such as management, is essential in order to give projects attention and help when needed, according to Project manager B (2014).
To conclude, the statuses of the projects are mainly reported through traditional status reports. To be co-located with the customer, or to be able to show concrete results regularly, reduced the need for a formal status report. The use of weekly status reports and project PULS meetings is to some extent seen as wasteful. The use of measurements for internal evaluation of progress vary. In addition, the evaluation of the projects is focused on time and cost.

4.4.4 The impact of agile values and principles on the customer
4.4.4.1 The essential customer

The customer is responsible for formulating and communicating demands to a project which Project manager A (2014) and Project manager C (2014) highlights. Project manager C (2014) specifies this as writing user stories and validating the results which according to Customer C (2014) has been the customer’s obligations in Project C. Project manager B (2014), as an example, describes initial customer meetings where high level demands were specified.

“I’ve had a role as a specifier of requirements in the project” – Customer C (2014)

Furthermore, both Project manager A (2014) and Project manager D (2014) describe difficulties in the customer relationship regarding requirement specifications. Project manager D (2014) explains that the customer, even if committed to the project, was reluctant to formulate demands and user stories. Instead this had to be done by Project manager D (2014) and a Tester through interviews with the customer (Project manager D, 2014). Customer D (2014) explains that the specification of user stories might be tiresome for a customer and also unnecessary in smaller project teams provided the customer is present in the team, such as in the case of Project D.

“We had to interview the customer in order to gather requirements” – Project manager D (2014)

Also, Project manager A (2014) describes that the customer was reluctant to formulate and clarify requirements. Customer representative A (2014) describes the relationship between the project and the customer as complicated due to unclear project objectives. This made it difficult to operate an agile work methodology in Project A since requirements cannot be prioritized, as also confirmed by Customer representative A (2014). Unclear objectives is a common problem for projects at Scania IT according to Customer representative A (2014).

“The hardest part of the project was gathering customer requirements” – Project manager A (2014)

Having close customer collaboration is seen as beneficial, as described by Manager A (2014), Project manager B (2014), Project manager C (2014) and Project manager D (2014). In Project A, Project manager A (2014) even explains how a closer customer collaboration came to improve on some of the issues described above. A close customer collaboration enables a harmony between the project team
and the customer according to Manager A (2014). This might then result in the identification of new opportunities for the project (Manager A, 2014). Project manager C (2014) and Project manager D (2014) further describes being co-located with the customer as a success factor in their respective projects. Project manager C (2014) explains that this has led to natural and informal communications and thus is a precondition for agile working methodologies. For example Project manager C (2014) describes that changing conditions might delay, or otherwise affect the project, why continuous customer prioritization is an asset to the project. Thus the agile methodology, used in the project, demanded that the customer could make quick decisions as different issues arose (Project manager C, 2014).

To summarize, the project managers expect the customer to specify requirements. However, this might not be feasible for a customer to do in all projects. Furthermore, the empirical study shows benefits when comes to close collaboration with the customer.

4.4.4.2 Reasons for lack of customer involvement in agile projects

As described in the above section (section 4.4.4.1 The essential customer) the lack of customer involvement was a problem in the case of Project A and Project D. One reason for the lack of customer involvement, described by Project manager A (2014), was that the customer did not internally discuss their needs that the project was supposed to address. Furthermore Project manager A (2014) also state that the customer lacked adequate insight into other end-user departments affected by the project. Project manager A (2014) and Customer representative A (2014) also explain that customers often lack knowledge regarding agile work methodologies. As an example Customer representative A (2014) had not received any previous education regarding agile at Scania IT. In the case of Project A, Project manager A (2014) explain that the customer’s knowledge regarding project management methodologies affected how work could be conducted in the project. Project manager D (2014) described that even though the customer wanted to work in an agile way, the customer possessed no knowledge regarding this. This resulted in problems as described above in section 4.4.4.1 The essential customer.

“We had a good requirement specification. However, during project initialization it was discovered that all stakeholders had not been included. Instead requirements were mainly based on the customer’s needs” – Project manager A (2014)

Having experience from being part of a typical customer organization, Manager A (2014) understand why customers could have doubts about following an agile approach in projects. Manager A (2014) believe these doubts occurred due to lack of knowledge regarding agile methodologies and that the uncertainty in what would be delivered in the end of the project was believed to be higher in agile projects. On the subject Project manager C (2014) explain that the customer and steering committee in Project C had to be educated on agile practices prior to the project’s start. Customer representative A (2014) believe that Scania IT needed to better explain and visualize methodologies used, in order to strengthen the relationship with customers. As an example Project manager C (2014) state that in order
to benefit from the advantages of agile methodologies it is demands that the IT organization, and steering committee, can accept changes to the project time plan due to e.g. scope changes.

“At the project’s start we educated everyone on agile work methodologies. This since some had never worked in an agile way before” – Project manager C (2014)

However Customer D (2014) believe that agile practices are less suited when there are many stakeholders involved in the project. This might hinder the demands on an active customer participation in an agile project.

To conclude, a lack of insight regarding the environment or process, the software being developed to support, and doubts when it comes to the agile methodologies affect the customers’ involvement in the projects. A limited understanding for the unpredictable nature of agile methodologies is highlighted as a reason for doubts regarding an agile way of working.

4.4.4.3 Customer practices in the agile project

The importance of knowledge among customers and project specifiers, regarding the environment and processes that a new system is to function in, is presented as important in the empirical study. For example Customer C (2014) and Customer D (2014) claims that it is important to, as a specifier, be familiar with the environment and condition in which the new system is going to function. Customer C (2014) also had experiences of the previous system and was also going to function as an end-user to the new system. Project manager D (2014) further describes that the customer’s process knowledge was a valuable resource to the project. Project manager B (2014) even describes that the customer’s knowledge, regarding the system that Project B was to integrate with, as a success factor for the project.

“It is important to have insight into a system in order to specify requirements for this. One should also be familiar with today’s principles and processes“ – Customer C (2014)

The consequence of limited customer process knowledge is exemplified in Project A where customer requirements, according to Project manager A (2014), were mostly based on personal opinions. As mentioned in section 4.4.2 Overview of the methodology used in the projects all stakeholders had not been included in the pre-study (Project manager A, 2014). As a result some features had to be reworked or adjusted according to the demands of the larger surrounding organization, of which the customer was a part of, according to Project manager A (2014). Customer representative A (2014) describe this as a result of lack of knowledge when the requirement analysis was performed.

Having mandate to make decisions is also considered important by project managers as well as customers in the empirical study. Both Project manager B (2014) and Customer D (2014) argues that the customer having mandate to make decisions when needed enables fast decisions in the project. Also Project manager C (2014) highlights the customer’s mandate as an important factor for the agile work in the project. Customer C (2014) had, for example, mandate to take implementation decisions but had to raise budget questions to department managers (Customer C, 2014)
Furthermore, Project manager C (2014) described in section 4.4.4.2 Reasons for lack of customer involvement in agile projects that the customer had to be educated on agile principles, values and practices. This is also confirmed by Customer C (2014) who had no previous agile experiences (Customer C, 2014). Regarding education also Project manager D (2014) describes a lack of agile knowledge when it comes to the customer. This was clear in the requirement formulation which had to be done by the project manager, and a tester, through interviews with the customer (as opposed to the customer writing and defining user stories). Project manager D (2014) also explained that the customer showed little understanding for new requirements adding the development time. From the project’s beginning, the customer also placed unrealistic demands on development time without the project being able to estimate a development velocity, which meant Project manager D (2014) often had to explain that early estimations were difficult to make. Project manager D (2014) also held continuous meetings with the customer where the backlog was discussed, in order for the customer to gain more insight into the agile practices. Also in Project A a lack of agile knowledge of the customer affected the choice of project method according to Project manager A (2014).

“The customer often presented extra requirements without an understanding for the need of additional time this resulted in” – Project manager D (2014)

Both Customer C (2014) and Customer D (2014) describe initial prototyping and process mapping as a way of gaining an overview of the system to be created. From this Customer C (2014) could create user stories which according to Customer C (2014) has proven to be an effective way of communication between the project and the customer. Having a common communication is also highlighted by Project manager C (2014) who upon project initialization worked together with the customer to develop common communication principles and terminology. Project manager C (2014) for example describes that ‘story points’ represented the complexity of a user story. This enabled the customer representative to better understand and contribute to the estimation and prioritization of user stories and the project scope. Similarly Project manager D (2014) used ‘t-shirt’ sizes to communicate and illustrate complexity and business value between the project and the customer.

“From the project’s start we used an own complexity scale, story points, which also the customer was introduced to” – Project manager C (2014)

The value of continuous feedback is exemplified both when it comes to projects and when it comes to customers in the empirical study. As an example, by the use of story points, the customer, the project manager, and the product owner prioritized the user stories continuously (Customer C, 2014; Project manager C 2014). While the customer also has been able to continuously evaluate the development of the product, new requirements could be formulated in order to adapt the product according to new or emerging needs (Project manager C, 2014). Also Project manager A (2014) describe how the adoption of some agile means of thinking helped resolve the issues earlier described in Project A (see section 4.4.4.1 The essential customer). Project manager A (2014) describe how this allowed for continuous refinement and prioritization of system features. Continuous feedback is described by project managers and
customers, in Project A, Project B, Project C and Project D, as a benefit regarding agile practices and a resource for a project. Project manager B (2014) further state that the continuous customer feedback resulted in the customer becoming more committed to the project and a higher level of trust was achieved. In Project D the customer collaboration and feedback also resulted in the customer gaining a deeper understanding for the project which enabled the customer to continuously adapt the product according to changing requirements (Project manager D, 2014). The possibility to continuously adjust a product, due to e.g. external changes, results in better project outcomes according to Customer representative A (2014) and Customer D (2014). This reduces the risk of having to rework implemented project deliverables late in the project (Customer C, 2014).

“Now we have daily customer contact, where requirements and current status is reviewed. Meetings are sometimes scheduled in order to gain additional feedback” – Project manager A (2014)

Close customer collaboration is also described as important for projects at the Scania IT. This is highlighted by project managers in the investigated projects. Project manager D (2014) also describes the customer collaboration as important in order for the customer to understand the significance of good requirement formulation. The close and continuous customer collaboration in Project C has, according to Project manager C (2014) improved communications and allowed the project team’s work to become more efficient. Customer C (2014) also confirms that the close collaboration with the project team enabled changes and new requirements to be treated much faster. Project manager C (2014) and Customer D (2014) even describe it as a necessity for agile work since the customer must be able to make quick decisions regarding the project without too many intermediates. That the customer is often also the most knowledgeable regarding the environment that the project is to develop for, is seen as another reason for the necessity of an active customer in the project (Customer D, 2014).

Project manager C (2014) and Project manager D (2014) point out that agile methodologies require the customer to have an active role in the project. Customer D (2014) consider this to be a problem in a project, if the customer cannot dedicate the time needed for the project. Furthermore, Customer C (2014) describe that the surrounding organization (i.e. Scania) must become better at supporting and accepting that a customer needs to dedicate time and commitment to a project in order for it to be successful. However, Project manager C (2014) argue that close customer collaboration in an agile project actually reduces the total project time needed. This for example due to late rework of features not being needed thanks to the continuous feedback. Customer C (2014) also confirm that the agile way of working probably has required less time than a non-agile project would have for Customer D (2014). Customer C (2014) also appreciated that the workload was spread over the project’s course rather than focused at the end and beginning.

“It is difficult to get the business side [Scania] to dedicate resources to a project... The business side must accept that a project demands resources in the form of customer commitment” – Customer C (2014)
To conclude, the customer is expected by the project managers to have knowledge about, or insight into, the process to be supported by the software or the end-user perspective. In addition, an understanding regarding agile is highlighted as important by the project managers. Furthermore, to have a common way of communicating (i.e. common and understandable language) is regarded as necessary by some project managers and also customers. Close collaboration and feedback is described to enable the customer to continuously evaluate and adapt the requirements of the project. However, difficulties regarding the active customer role is also seen in the empirical study.
5 Analysis

This section combines the theoretical framework with the empirical results in order to find answers to the scope and research questions of this report. The chapter is divided in a similar manner as the previous chapters.

5.1 Methodologies, stage-gate models, and the project parameters

5.1.1 Methodologies

The empirical results show several similarities, with agile values and principles, in the values and principles of the IT organization studied in the case study. For example as presented in section 4.2 The intended way of working at Scania IT BaFDIT aims to create a more flow efficient organization. This can be related to agile principles where frequent deliveries and support for projects is important. Likewise core values such as “Customer first”, “Respect for the individual” and “Elimination of waste” can be mapped to agile values, in the Agile Manifesto (see section 3.2.2 What is agile software development), such as “Customer collaboration over contract negotiation”, “Individuals and interactions over processes and tools” and “Working software over comprehensive documentation” together with “Responding to change over following a plan”. Principles such as “flow”, “pace” and visualization can also be tied to e.g. iterations and practices such as Scrum-boards used in agile methodologies. The principle “a standard way of working” might contradict the agile value “Responding to change over following a plan”, depending on interpretation. Thus one might conclude that there is no contradiction between agile values and principles compared to the values and principles used an IT organization in an otherwise industrial manufacturing organization.

The Scania IT Guide even explicitly advocates agile development through close customer collaboration, an iterative development and resource allocation that facilitate value creating flow (Scania CV AB, 2013). This agrees with several parts of the Agile Manifesto. However the The Scania IT Guide does not present a more detailed plan regarding how to implement this mindset in the whole IT organization, something that could be questioned.

When comparing the empirical results with earlier research one can identify more traditional project management methods, when it comes to the project practices at the case company. The Scania IT Guide describes how business needs are identified in the “white arrow”-stage and that the “yellow arrow”-stage aims to describe project design and solution to ensure that 9 out of 10 projects are being delivered on time. While there exists a feedback loop within the “yellow arrow”-stage no feedback is described e.g. between the other stages of the project development process. This can be compared to Kathleen (2007), Wysocki’s (2014) and Tonquist’s (2008) description of plan-driven practices why one can question whether this supports an agile approach as advocated in The Scania IT Guide. Furthermore Fowler (2005) and Barlow et al (2011) describes continuous feedback and continuous product refinement as necessary in order to meet actual customer needs, which is a key component of agile methodologies. The lack of feedback might also be seen as a contradiction to the Agile Manifesto’s
principle of welcoming late changes. However one might reason that planning and predictability are necessities in a larger organization where different projects and departments need to be coordinated. Manager A, for example, highlights that there is a need for processes and tools in chapter 4.2.1. Also Manager B exemplifies the need for planning when stating that traditional project management allows for better resource planning (chapter 4.4.2.1).

The study, and earlier research, although shows the consequence of a too inflexible planning. For example when looking at Project manager A’s description of the failed pre-study in Project A connections can be made to Hansmann & Strober (2010) who warns that changing requirements can lead to e.g. increased costs and wasted implementations in a plan-driven projects. Fowler (2005), Hansmann & Strober (2010) and Barlow et al (2011) on the subject describes the difficulties in early estimations due to changing requirements and circumstances. The changing nature of customer requirements is also described by Project manager F (2014) and Project manager G (2014) as a factor complicating early planning.

Consequently the study indicates that agile values and principles can be seen at an IT organization, in the context of a surrounding manufacturing organization. However, when looking at practices and processes in an IT organization, the study in combination with earlier literature shows traditional project practices and processes as more prominent. This might however be justified due to the nature of a larger organization and its need for planning and coordination.

The study shows projects following agile methodologies to a varying level, when comparing the projects in the case study to earlier research. Projects C and D largely agrees with agile methodologies while projects A and B shows aspects in line with literatures’ description of traditional plan-driven methodologies. For example, Project A was initialized with a year-long pre-study which resulted in an implementation plan for the project. This is comparable to earlier research’s descriptions regarding plan-driven methodologies. Barlow et al (2011) further writes that time cost spent on detailed planning often is wasted. A clear example of this is the fact that the pre-study had to be re-taken 6 month into the implementation of Project A. The extensive pre-study further opposes the Agile Manifesto when it comes to both “Working software over comprehensive documentation” and “Responding to change over following a plan”. Thus it may be concluded that Project A, initially, followed a traditional plan-driven methodology. The study further shows, in line with earlier research, the problems associated with early estimations and detailed planning.

The study, in this case Project A, further exemplifies how agile practices improved on some of the issues described. For example Project A changed its work methodology, according to Project manager A, thus improving customer collaboration through regular contact. The project team was also physically located together which was beneficial according to Project manager A (2014). This improved communication and collaboration exemplifies Ceschi et al’s (2005) description of the importance of communication in a project. Furthermore the increased use of customer feedback can also be compared to Poppendieck (2006) who describes the importance of this in order to reduce development waste. The change made in Project A also corresponds better to the values and principles in the Agile Manifesto.
When comparing the case of Project B to earlier research, factors both complying, and not complying, with agile methodologies is seen. An example is the four sprints used which can be compared to an iterative development as described in literature. However the sprint length varied between one and two months which, compared to the Agile Manifesto is on the longer end of the scale. Further the project did not continuously evaluate itself, something that opposes the last principle in the Agile Manifesto. A focus on documentations in the project also somewhat contradicts the Agile Manifesto. On the other hand, the use of an overall project plan, where details are allowed to evolve can be compared to agile values and especially Barlow et al (2011) who describe the importance of continuous refinements in order to meet the customer’s actual needs.

Agile methodologies are seen, in the case of Project C and Project D, in the case study. For example project managers described a project methodology following Scrum which according to Tonnquist (2008) is as an example of an agile methodology. Agile factors used in the projects, such as close customer collaboration, feedback and a co-located project team, are also described in literature when it comes to agile methodologies. Barlow et al (2011), for example, describes close customer collaboration, in agile projects, as beneficial for customer satisfaction, Petersen & Wohlin (2009) exemplifies the importance of feedback while Wysocki (2014) highlights the need for being co-located when using iterative methods. Project manager C (2014) also highlights the use of the principle “Keep it simple” which corresponds well to both Dingsøyr et al (2012) and Erickson et al (2005) who describe that minimal formal processes is a core theme in agile methodologies. In summary the study, when compared with earlier research, identifies Project C and Project D as working according to agile methodologies, values and principles. These findings, however, must be regarded in the context of Project C and Project D being projects of high priority in the organization, and which were allowed to use methodologies of their own. This might have affected how methodologies could be designed in these projects.

The study further show varying definitions of agile among different interviewees. For example Project manager C and Project manager D refers to the Agile Manifesto, when defining agile, while Manager A and Manager B only refers to agile only as an iterative way of working. While the managers’ views does not contradict agile values and principles the limited definitions may be regarded as an indication of a limited understanding for agile values and principles. Comparing these observations to Medinilla’s (2012) description, regarding the importance of an organization’s understanding of agile (Chapter 3.4.2), one can conclude that the varying definitions might pose a hinder to agile practices in the IT organization. On the other hand one can question how much knowledge, regarding agile, a manager of an IT organization could be required to possess. Especially if the manager in question is not directly working in a project environment, as was the case of Manager A and Manager B.

In summary the data, when compared to literature and the Agile Manifesto, shows that agile methodologies are manifested at a varying level in the projects investigated. The data further shows a difference in the level of detail, among interviewees, when defining agile. While this, according to earlier
research, might hinder agile practices in an organization one can also regard this as natural due to the various positions of individuals in an organization.

5.1.2 Stage gate models

The data, in combination with earlier research, indicates the use of a stage-gate model at the case company. For example, when looking at PPS, the model containing various decision points which can be comparable with Cooper’s (1990) description of a stage-gate model. From this, the study in line with earlier research also indicates difficulties in combining a rigid stage-gate model with agile processes. The empirical results indicate several project managers who consider the current stage-gate model (PPS) to be too complicated in order so support an agile way of working. This is in line with earlier research, for example to Karlström & Runeson’s (2006) who describe stage-gate models to be too inflexible for software development. For example while Project A and Project B could follow PPS more agile projects (see chapter 5.1) such as Project C and D both had do modify the model in order to work in an agile way.

The need for adjustments and adaptions is therefore described, in literature as well as in the study, as a necessary solution to these difficulties. For example Project manager C states that PPS, even though used in Project C, is not compatible with an iterative methodology, in its current form. Similarly Karlström & Runeson (2006) describe that if a stage-gate model is modified agile methodologies and stage-gate models can be used together. However while the stage-gate model is seen to need adjustments, the empirical data in line with the literature, describes that also agile methodologies needs to adapt in order to be used together with a stage-gate model. This is for example also described by Karlström & Runeson (2006).

The study and the literature also points at the different needs of different projects and departments must be considered when adapting existing methodologies to agile methodologies. For example Karlström & Runeson’s (2006) sees an issue regarding different iteration frequencies. Similarly Manager B’s (2014) states that the different needs of different departments must also be considered. On the subject Boehm & Turner’s (2005) advocates a definition of when agile processes are appropriate. This could be considered a possible solution to Manager B (2014)’s concern regarding the different needs regarding agility.

Despite advantages with agile, one must also consider the benefits of a stage-gate model such as PPS. For example Cooper (1990) describes that stage-gate models provide a structured way of managing innovation projects. The importance of this is highlighted by Manager A (2014) who sees a need for defined processes and tools. One might thus argue that structured processes and tools are necessary in larger organizations where different projects and departments must interact. However Manager A (2014) also describes that this should only be kept on a higher level.

To summarize, the results point at problems which might indicate that the current stage-gate system used at the case company needs adjustments in order to support an agile way of working. This is in line with literature which however also highlights the need of adjusting also the agile methodologies. When
adjusting the methodologies both literature and the empirical results describe that the needs of different projects and departments must be considered. Furthermore one also has to consider the benefits of a structured model for handling projects, especially when it comes to larger organizations. Consequently while stage-gate models are considered to be inflexible they do not necessarily contradict an agile way of working in an organization. Thus while agile methodologies are not manifested by the use of stage-gate models, they are on the other hand not hindered.

5.1.3 The project parameters

The study and earlier research show how agile projects have a different focus, than traditional plan-driven projects, when it comes to the project parameters. When comparing the empirical results to the literature a more traditional view in the organization, regarding the project parameters, can be seen. One example is Project methodology designer A who states (see chapter 4.3 Pre-study) that projects at Scania IT often are fixed regarding the parameters time, cost and scope. This is an example of Highsmith’s (2010) statement that managers often tries to lock all parameters of a project. Further examples of a traditional view on the project parameters can be seen in the case of Project A and Project B (see section 4.4.2.2 The project parameters) were focus was on achieving a certain scope in a certain time e.g. by adjusting costs. Customer representative A describes time and cost to be adjustable in order to achieve a good enough scope in Project A. These descriptions can be compared to the literature’s description of the traditional project parameters, for example Tonnquist (2008). It is also consistent with Gustavsson’s (2007) explanation of how cost and time are adjusted in more traditional projects, rather than scope.

A more agile view on the project parameters can be identified in the study when considering Project C and Project D. For example Project D had a fixed cost and time frame under which the project was to deliver as much as possible. This indicates that the scope was not fixed, in contrast to time and cost, why this exemplifies Gustavsson’s (2007) and Opelt et al’s (2013) description of how project parameters are used in an agile project.

Furthermore, when looking at Project C one can see similarities between Highsmith’s (2010) description of the ‘Agile triangle’ and the focus on quality and creating customer value, in the project. Highsmith (2010) argues that projects should strive for value and quality rather than focusing on constraints, something that also agrees with Customer C’s (2014) description of the project’s focus.

The benefit of a variable scope is seen in both the literature as well as in the case study. For example Opelt et al (2013) argues that the use of scope control in agile contracts, rather than fixating scope as in the case of traditional contracts, provides the possibility of changes of the customer’s needs as a project progresses. The unsuccessful pre-study in Project A is a clear example of the need for an adaptable scope in a project, rather than a fixed implementation plan. However, one must again consider the need for planning and predictability in a larger organization. Thus it might be difficult for a project’s customer to accept a project where the scope is variable, i.e. is undefined. On the other hand the benefit of adjustability, and allowing for an adaptable scope, is described in literature why a preference for the
traditional view on project parameters could be questioned. A reason for the more traditional view could be a lack of knowledge, regarding agile methodologies and their benefits, as well as concerns regarding the uncertainty of the deliverable in an agile project. For example Manager A believe doubt regarding agile methodologies occur due to a lack of knowledge and the uncertainty of what will be delivered in the end of an agile project.

From the case study, a problem is seen when an agile project constantly adjusts its scope in order to deliver a high customer value, even though the project is evaluated only on time and cost. Comparing this to Tonnquist’s (2008) and Gustavsson’s (2007) description of time and cost being flexible, in the traditional view of the project parameters, one can conclude that agile projects are evaluated on the same basis as traditional plan-driven projects. As described by Project manager C, this causes problems since a successful agile project might then be regarded as unsuccessful. One possible solution to these problems would be to also evaluate projects on other parameters, such as customer value and quality.

Both agile and more traditional elements can be identified, regarding the project parameters, when analyzing the empirical findings together with the theoretical framework. While both literature and the study exemplifies benefits regarding an agile view on the project parameters, the case company’s evaluation of projects is still seen to focus more on the traditional aspects. One possible reason for a more traditional focus, regarding the project parameters, is lack of knowledge and an uncertainty of what an agile project will deliver. A variable scope also hinders early planning why the more traditional focus might be favored in a larger organization, such as in the context of this report. Project managers, however, expresses that the current evaluation methods hinder agile work and those evaluations should be based on e.g. value creation rather than performance according to time and cost constraints, which for example could be fixed. In conclusion the study, when compared to earlier research, shows that agile values and principles are manifested at a varying level, when it comes to the project parameters, in an IT organization in the context of a manufacturing industrial organization.

5.2 The agile values and principles in the organization
5.2.1 The organizational structure

The empirical study showed resources in the IT organization are mainly located at the different departments, and are temporarily loaned to projects, but might still have duties in the line organization parallel with the projects. This indicates a Functional Matrix or a Balanced Matrix as described by Hobday (2000). The empirical study shows that line managers hold a strong position in the IT organization, for example when it comes to resources (see section 4.5.3.2 Agile values and principles in the organization). This could be seen as evidence for a Functional Matrix rather than a Balanced Matrix.

Furthermore, an organization with project-based business, which strive for an agile way of working should strive for agility, which have been described as for example, the ability to rapidly and flexibly respond to change (Dingsøyr et al, 2012), and to promote quick response to changing environments (Erickson et al, 2005). The need for more agility was for example seen in the empirical study when project managers interacted with the department of infrastructure. Furthermore, agile methodologies
also have the characteristic of being in close collaboration with the customer (Abrahamsson et al, 2002), which was highlighted by project managers in the IT organization to be important but not always possible. In addition, the empirical study highlighted problems regarding resource allocation, where more flexibility was requested and regarded as important. This might indicate that the current organizational structure does not fully enable agility, close customer collaboration or effective resource allocation. It also might indicate a need for an organizational structure similar to a Project Based Organization or a Project Led Organization rather than a Functional Matrix, since they are found to better handle for example flexibility, customer collaboration etc.

To conclude, the data combined with earlier research indicate the investigated IT organization have an organizational structure similar to a Functional Matrix. However, when looking at for example the need of flexibility and close customer collaboration, as highlighted as important in the empirical study, the Project Based Organization or a Project Led Organization might be a better organizational structure for an IT organization with project-based business.

5.2.2 Agile values and principles in the organization

Earlier studies describe agile methodologies as focused on the individual team rather than the whole organization. In addition, earlier studies have highlighted the challenge, and also importance and need, of an adoption of agile values and principles in the whole organization. It has been identified in the analysis that some projects were agile (Project C and Project D), which indicates the agile methodologies have been implemented successfully within the project. However, the empirical study have several times indicated the IT organization in its whole have had difficulties to adopt agile values and principles. This limits the IT organization’s ability to support an agile way of working.

First, some project managers experienced slow responses from the IT organization hindering agile projects to maintain flow and the use of short sprints, and also hindering progress. Furthermore, all of the project managers described they need to provide detailed descriptions in order to get help from the IT organization the formal way. Therefore the project managers were dependent on their personal networks in order to solve problems. This indicates there is a need of more frequent and informal communication to better support the quick decision-making of agile teams or projects, as similarly described by Cohn & Ford (2003).

Second, the weekly project PULS-meeting in the IT organization was highlighted as a forum where problems effectively can be escalated. The problems were described to be mostly regarding resource allocation, which in addition to resource optimization was highlighted to be a general problem, in the empirical study. Furthermore, the weekly gap between the PULS meetings can be considered to reduce the possibility for agility. Since issues are only treated once a week, one could question whether the organization is be able to rapidly enough adapt to changes and remove impediments for the agile teams, as highlighted as important by Sutherland (2011) in order to achieve agility. However, the problem regarding resource allocation and resource optimization is not a new phenomenon, regardless of project methodology, and is described in existing project management literature. A possible explanation of the
problem might be the non-existing project portfolio management in the IT organization. A more active project portfolio management could probably ease the problem by quick decisions regarding resources. Furthermore, agility includes flexibility, quickness, alertness etc. (Dingsøyr et al., 2012), why a more flexible resource allocation could be motivated. An overcapacity in the IT organization, as suggested by Project manager C, might be suitable. However, an overcapacity is hard to foreseen whether or not it is profitable. Furthermore, an explanation of the focus on resource optimization in IT organization was given by Manager A. The mindset was explained to originate from the surrounding organization, i.e. the manufacturing industrial organization, where a focus on standardization and optimization is common.

Thirdly, problems in the interaction with the department of infrastructure were identified by some project managers and Manager B (working at the department of infrastructure), and also in interaction with maintenance teams, as hindering agility. These situations are comparable to Sutherland (2011) who highlight the need of agility in operations and infrastructure in order to support the flow of software. However, a dedicated maintenance manager who coordinates the contact with the department of infrastructure as in Project C, or a single point of contact as in Project D, improved the ability to achieve agility.

Fourthly, the empirical study showed projects facing problems when teams have different release cycles, similar to the challenge to synchronize teams according to Boehm & Turner (2005). One example was Project A, which however was not considered to be working in an agile way.

Fifthly, the two projects (Project A and Project D) which experienced a higher degree of support in general (not only related to an agile way of working), had got high priority in the IT organization. In addition, Project C and Project D had got exceptions from the normal way of working in the IT organization. The latter could for example be seen in the interaction with the department of infrastructure. Thus the projects did not interact with existing rules of the IT organization, and was somewhat seen as independent, in contrast to what Dagnino et al (2004) describe as being appropriate. If a project has got a high priority it is expected that the project gets more attention, but the empirical study indicates the priority was not official since no active project portfolio management exist. What also is noteworthy is that an agile way of working was seen as an exception, rather than the normal way of working, even though the IT organization have decided to work agile.

Sixthly, the literature describes agility to include having minimal formal processes and light methodologies thus promoting maneuverability (Dingsøyr et al., 2012). Similarly Sutherland (2012) described focus should be on delivering customer value rather than following a big-upfront plan. The empirical study has shown the IT organization to follow plans and having formal processes, while at the same time describing a focus on customer value and also sometimes allowing for less formal processes to be used. The plans and formal processes were for example described by Project manager C regarding the project management office at the IT organization. The focus on customer value and use of more flexible methods could be seen in for example Project A where the steering committee (after the failed pre-study) accepted a broadly plan and also in Project C and Project D which was allowed to follow agile methodologies. On the one hand, when having the perspective of an agile project manager, informal
processes could be considered to be beneficial. Informal process might more easily adapt to current situations and therefore better enables the agile project manager to deliver maximum customer value. On the other hand, management in the IT organization must be able to overview the ongoing projects. For example in order to work with project portfolio management, why more formal processes could be motivated. This indicates there is a need for a balance between the two.

Finally, earlier studies as well as the empirical study have described mindsets, and also highlighted the importance of an agile mindset. For example, Sutherland (2011) and Sahota (2012) describe the need for a certain mindset in the organization that supports agile work. In the empirical study, Project manager C described a general absence of an agile mindset in the IT organization. Instead resource optimization was considered, by both managers and project managers, to reflect the current mindset in the IT organization. The descriptions of a mindset indicate conformity with Sahota (2012) who describe agile as a culture, rather than a process. However, even though agile could be described as a culture it is still applied through methodologies and processes. Therefore agile could be described as both a culture and a way of working. Furthermore, even though an agile mindset is described to be important, a large IT organization is likely in need of several mindsets, and the described mindsets in the empirical study might be an identification of some of them. Management for example will have to coordinate the IT organization and therefore might not be able to only adopt the agile mindset.

The above described situations exemplifies the challenge described by Dagnino et al (2004) and Boehm & Turner (2005), when it comes to getting a whole organization to adopt agile principles and practices, and not just one team or project. Furthermore, all of the projects were in need of help from the IT organization when a problem occurred. Especially the agile projects was in particular need of rapid support in order to maintain their pace. The described demands on the IT organization complies with how Dagnino et al (2004), Boehm & Turner (2005), and Cohn & Ford (2003) describe the context of the team will be affected when implementing agile principles.

Project manager A and Project manager D describe the IT organization to be open for a change, which according to (Sahota, 2012) is important when implementing agile practices. In addition, Customer C and Manager B argued the adoption should be easy, since they recognized similarities between agile methodologies and the principles in the industrial manufacturing organization, which are well grounded in that organization as well as in the IT organization. Furthermore, similarities are seen between the core values of the IT organization (described in IT @ Scania Core Values and Principles) and The Agile Manifesto (Beck et al, 2001), why a better adoption of agile values and principles should be possible.

Whether or not the whole IT organization should adopt agile values and principles could be questioned. However, the departments at the IT organization in direct and often contact with the project should consider it for better support for an agile way of working in the projects. As earlier research have identified, there is a lack of guidance in the literature how the surrounding environment of a project or team shall support an agile way of working. The lack of support might therefore be somewhat expected. However, the support could still be considered to be important, since people within the same organization should work together and solve problems together, to be able to achieve a common goal.
In addition, quick removal of impediments and adoption to change seems to be critical for agile projects and teams, which further strengthens the argument that the IT organization should consider to revise the current way agile projects are being supported.

The empirical study has indicated the lack of support for agile methodologies could be due to a lack of knowledge in the IT organization regarding agile values and principles or methodologies. At the same time, earlier research suggests not only a project or team should be educated and trained in an agile methodology. Education for functions outside the team or project is also important, as well as understanding and commitment for agile values and principles. For example, Medinilla (2012) states the whole organization must understand and be committed to agile values, principles and practices for a fully implementation. However, Manager B identified a lack of commitment in the IT organization. In addition, Sutherland (2011) argue an agile way of working demands maximum value creation across the entire process, from developers to management. Furthermore, it is suggested by Sutherland (2011) educational activities should be done by agile individuals. The project managers identified a need for education, and suggested it should be done by agile coaches, similar to what Sutherland (2011) suggest. However, only a few individuals in the IT organization were considered to have the necessary knowledge, among them most were consultants. Even though the need for educational activities can be identified, the educational activities should be on a reasonable level. For example, a senior manager in the IT organization, whose main responsibility is far from developing software, might not need detailed knowledge about an agile methodology. However, an understanding of the agile values and principles, and probably even more important, what needs an agile team or project have could be an appropriate level of knowledge. Furthermore, if a new way of working is to be implemented in an organization, regardless if it is an agile way of working or not, some people in the organization must be committed to it and drive the change, i.e. work with change management. In addition, in order to implement a new way of working there must be clear instructions how to work in the new way. Therefore the non-detailed description of agile in IT @ Scania Core Values and Principles could be a possible cause to uncertainty and lack of support in the IT organization. This indicates a need for a better implementation of agile, including a common definition or a common view of an agile way of working, as highlighted by Project methodology designer B in the Pre-study and also by Project manager D. This argument could be seen as consistent with Medinilla’s (2012) statement that the whole organization must understand and commit to agile values, principles, and practices to fully implement agile outside the team microenvironment.

To conclude, earlier studies combined with presented data, have identified challenges for an IT organization when it comes to support of an agile way of working in projects. It has also been identified that an agile way of working places certain demands on the IT organization. For example when it comes to communication, decision-making, quick removal of impediments, release cycles, resource allocation, and mindsets. Furthermore, a need for a balance between freedom for project managers and structure for management was identified. In addition, everyone in an IT organization might need knowledge and a common understanding of an agile way of working, but on different levels, depending on the employees’ position within the IT organization.
5.2.3 Management support

The empirical study has in line with earlier studies identified a lack of decisions regarding an agile way of working. For example Sutherland (2011) has observed that lack of agility in Management, Sales, Marketing, and Product Management prevents an organization to fully adopt agile principles and practices. Sutherland (2011) further describe that the problem lies in not having clear business goals, strategies, and objectives. Similarly the empirical study indicates there is no clear standpoint from management in the IT organization whether an agile way of working shall be used. Some of the project managers as well as Customer D observed it. As identified by the earlier analysis (5.2.2 Agile values and principles in the organization) there is guidance for how to implement an agile way of working in a team or a project. However, it is not as clear when it comes to the surrounding organization of the team or the project, including management. Since management probably has difficulties in knowing how an agile way of working would affect the IT organization they might be afraid of making a clear standpoint regarding an agile way of working. If they would, with their current level of knowledge, they probably would not be able to lead the IT organization. Therefore the project managers and others in the IT organization might experience a lack of a standpoint from management, even though the managers are trying. However, in order for the IT organization to work agile, management will have to make a clear standpoint at some point to get everyone to accept and strive for an agile way of working. Cohn & Ford (2003) for example state upper management must have knowledge how an implementation of agile processes will impact groups outside the development group. Otherwise most efforts will likely fail (Cohn & Ford, 2003). A consequence of this could be seen in the empirical study regarding the department of infrastructure and maintenance teams, which indicate management has not adjusted groups outside the development teams. Furthermore, Project manager C highlighted management is not demanding employees to have an agile mindset, which might contradict an agile way of working. However, while the IT organization need employees with agile skills the IT organization is also depending on having employees who have experience and knowledge from the IT organization as well as the industrial manufacturing organization. Otherwise the IT organization will have difficulties keeping its historical context and knowledge critical for understanding and delivering customer value. Therefore management in the IT organization might not be able to demand everyone in the IT organization to have an agile mindset.

Earlier studies and the empirical study have shown difficulties for management to accept an agile way of working. For example, Cohn & Ford (2003) and Medinilla (2012) describe situations where managers are afraid of losing the feeling of being in control, which plan-driven processes provide better in comparison to agile processes. Similarly several project managers in the empirical study described management in the IT organization have difficulties letting go of control, which also was described to prevent project managers to practice an agile way of working. For example, the need for control could be seen in Project C where Project manager had to provide management with estimates for their satisfaction, even though it was more of a guess provided (see section 4.4.2 Overview of the methodology used in the projects). In addition, parallels could be drawn to Project manager D that had similar struggles with the customer (see section 4.4.4.3 Customer practices in the agile project). This situations are similar to how Cohn &
Ford (2003) describe managers prefer when developers promise what will be delivered and when, even though the manager know they will not be able to do so.

Furthermore, earlier studies have identified that managers who have a traditional management attitude (which was described to derive from the manufacturing paradigm) have difficulties moving to an agile management attitude (Cohn & Ford, 2003). Since many of the managers within the IT organization have a background from the surrounding organization, i.e. the manufacturing industrial organization, the managers’ attitude in the IT organization might be influenced by the surrounding organization. For example, both Project manager A and Project manager B described their roles as project managers to be the role of a traditional project manager. However, the empirical study has also shown managers who have worked according to the description of an agile project manager. For example, the description of an agile project manager by Boehm & Turner (2005), as well as by Cohn & Ford (2003), complies well with the how Project manager C and Project manager D described their role of being a project manager. Boehm & Turner (2005) further highlights project managers should provide experienced technical help when needed. However, one could question if the project managers in the IT organization have the time for this, due to the lack of support for projects in the IT organization which the empirical study highlighted (see section 4.4.3.1 Agile values and principles in the organization).

To summarize, the data point at a lack of agility in management. Management shows signs of having difficulties letting go of the feeling of being in control which plan-driven processes provide. However, it could be a consequence of the lack of guidance on how to implement an agile way of working outside a team or project, including on a management level. Furthermore, when an organization strives for an agile way of working, management need to make a clear standpoint. Furthermore, management should make sure employees have agile skills but should also take other aspects into consideration. The IT organization was identified to have both agile project managers as well as more traditional project managers. The reason the latter exist could be due to the context of the IT organization, i.e. the industrial manufacturing organization.

5.2.4 Measurements of progress

The literature describes different views on how managers can track progress and processes. The empirical study has not identified any projects using burn-down charts why it is difficult to say whether these could be a reasonable substitute to deliverables such as documents, which was discussed by Cohn & Ford (2003) and Boehm & Turner (2005). However, project managers are supposed to deliver several documents related to the decision points in the stage gate model, as described in 4.3.1 PPS – the project steering model at Scania IT, and there exists checklists for the steering committee specifying the required documentation. In addition, all of the project managers, except Project manager D provided their steering committees with what they referred to as traditional status reports. Project manager B considered the status-reports to be waste due to a lack of feedback from management. The way documents and status reports are used indicates the plan-driven way of tracking a process, as described by Cohn & Ford (2003). However, the empirical study also show examples of less formality. For example, Project C managed to reduce the significance of the status-reports due to the ability to show concrete
results instead, which an agile way of working enables through frequent releases. Project manager D removed the need of a formal status report due to being co-located with the customer. Furthermore, there was no sign management felt threatened by the reduced level of control, which Brown et al (2013) similarly describe supporting stakeholders might feel when an agile methodology is used. To be able to show clear results or working co-located with the customer or management (which provides continues feedback) is probably gratefully for project managers. However, in order to coordinate a large organization management must be provided with certain information and numbers. Therefor the status reports should be considered important. At the same time management must prove it is important, for example by providing feedback based on the status-reports. Furthermore, regardless if it is a status report or some other way of tracking progress of a project, it must support the rapid pace of agile process, which Boehm & Turner (2005) discuss.

Brown et al (2013) argues measurements that correlates with the dynamically changing environment will help encourage management to support the agile development, and also encourage team members to improve if the right kind of measurements are used. Project manager B gave a similar description of a need for measurements triggering the desired behaviors in the project and the IT organization in general. However, the empirical study showed almost no measurement currently was being used, except from Project C and Project D, which used sprint velocity as an internal measure. Since the analysis already has identified a lack of support from management, an introduction of measurements as suggested by Brown et al (2013) both within the project, and to external stakeholders, might improve the support from management, as well as from the IT organization in general. However, having measurements is not specific for an agile way of working. The IT organization would probably benefit from a more widespread use of measurements in general, since it would motivate the whole organization to improve the numbers.

To conclude, the data combiner with earlier research shows tracking progress is often done by controlling if the necessary documentation has been provided. However, being co-located with management or the customer and showing concrete results seems to enable less formal ways of tracking progress and complete a status report. Furthermore, the study did not identify a systematic use of measurements. However, in an organization striving for an agile way of working the introduction of measurements supporting agility is motivated.

5.3 The impact of agile values and principles on the customer
5.3.1 The essential customer

The case study and earlier research presented in Chapter 3 Theoretical framework shows the importance of the customer in a project. Especially Chan & Thong (2009) and Martin et al (2006) describe the customer as one of the most important roles in an agile project. The benefit of having an active customer that specifies requirements is, for example, seen in the empirical results where most project managers describe the close customer collaboration as beneficial for their projects. This can be compared to Chan & Thong’s (2009) description of how the success of an agile project is largely
dependent on the customer playing an active role in a project. Project Manager A’s description of how increased customer collaboration improved the project work can be regarded as another concrete example of Chan & Thong’s (2009) statement.

In the project, the customer is responsible for providing requirements, clarifications and continuous input. Both theory and the data indicate on the importance of this why the customer needs to have an active role in a project. One example is Project C where the customer formulated, and reformulated, requirements and user stories. This can be compared to Hansmann & Stober’s (2010) description of how a customer prioritizes and adjusts requirements, in an agile project. Furthermore, examples can also be seen in Project D were the customer continuously groomed and reprioritized the project. This can further be compared to Hansmann & Stober’s (2010) of how customer involvement helps reduce e.g. uncertainty in a project. An example of the opposite is seen in Project A were Customer representative A describe that problems in the customer relationship, resulting in unclear objectives which hindered an agile approach in the project.

However the empirical studies (see Chapter 4 Empirical result) points out difficulties regarding the active customer role. For example in projects A and D the customers were reluctant to formulate requirements and demands, something that opposes Gustavsson’s (2007) description of a customer’s responsibility in a project. These difficulties, and Customer D’s statement that the specification of requirements may be tiresome for customers, can further be regarded as an example of Fowler’s (2005) and Hoda et al’s (2010) description of agile methodologies being demanding for the customer. Following Fowler’s (2005) and Hoda et al’s (2010) reasoning the customer obligations, presented by Gustavsson (2007), might thus be difficult to fulfill for a customer. Looking at an industrial manufacturing organization, the development of IT systems for supporting daily operations is not directly part of the organization’s value creating chain. Thus it might be hard for a customer to reallocate, and motivate the reallocation of, resources from a value creating operation. Furthermore, less agile project processes, e.g. stage-gate models that are used at customer’s organizations, might further complicate an adaption to agile processes.

In summary the analysis points at the importance of an active customer role in a project. The customer is perceived as important in order for a project to achieve a successful result, when it comes to software development projects. However the empirical study shows that an active customer is not always possible, as also described in some earlier research. For example customers may consider regular project involvement to be time consuming and difficult. It could also be debated whether it is feasible for a department in an industrial manufacturing organization to dedicate resources to an IT development project for a support system. Especially since software development might not be part of a customer’s core activities. Furthermore differences in project processes, between a customer’s organization and a project, could further complicate the collaboration.
5.3.2 Reasons for lack of customer involvement

The case study shows the importance of customer involvement. This is in line with earlier research which describes lack of customer involvement as a hinder to agile processes. An example of this can be seen in the case of Project A. The customer, in Project A, lacked insight into the end-user needs which led to problems e.g. when it came to requirements. This can be compared to Hoda et al’s (2010) description of “Ineffective Customer Representative”, as a reason for Project A’s difficulties.

Physical distance and the involvement of a large organization, in a project, can be seen to hinder customer involvement in a project. Since the customer, of Project A, was based in another city one might argue that the “Distance Factor”, described by Hoda et al (2010), further might have affected the customer relationship. In Project C one can, as an example, observe the very opposite situation, where the on-site customer resulted in good customer involvement and communication. Further Hoda et al’s (2010) mention of a “Large organization” as a reason for lack of customer involvement is also exemplified by Customer D and parallels can also be drawn to the ineffective pre-study in Project A. However while Hoda et al (2010) describes “Large organization” and “Distance factor” as reasons for lack of customer involvement one might consider these factors to be quite natural in a larger manufacturing industrial organization. For this reason it might be physically difficult to always allocate a customer close to a project.

The data also points out examples where the customer had a willingness to work according to agile principles but possessed no knowledge of what this implied. Parallels here can be drawn to Hoda et al’s (2010) description of “Skepticism and Hype”, i.e. lack of knowledge resulting in skepticism towards the agile practices and thus resulting in difficulties regarding customer involvement. The empirical result also describes a need for the education of customers, regarding agile. This can be considered a mean to counteract the “Ineffective Customer Representative”- and the of “Skepticism and Hype”-syndrome. On the other hand one can question how much knowledge, regarding agile practices, which can be demanded of a customer to have. Especially when it comes to a manufacturing industrial organization, where agile practices are rarely used in the daily business, a lack of agile knowledge could be considered natural.

Consequently, the data shows, in line with previous studies, that several factors might hinder an adequate customer involvement in a project. Factors such as ineffectiveness, knowledge and distance are some reasons mentioned in data and earlier research. However these factors could be considered natural elements in a larger manufacturing industrial organization.

5.3.3 Customer practices in the agile project

The empirical result, as well as previous research, suggests that customer knowledge, regarding the process and environment that a project is developing for, is an important factor for a project’s success. Hoda et al (2010), for example, writes that a customer should not just provide requirements but also be able to prioritize among these. Again the example of Project A’s insufficient pre-study can be seen as an
example of the consequence of a limited customer knowledge. Parallels can here be drawn to Hoda et al’s (2010) explanation that the customer must be knowledgeable regarding the processes and environment a product is going to function in. Furthermore the customer having authority to make decisions is also shown to be an important factor among project in the case study and also in literature, e.g. by Hoda et al (2010). As an example the customers in projects C and D describe knowledge, authority and the ability to make fast decisions as important for a customer representative. The description of the demands on the customer can be compared to Martin et al’s (2006) description of a “Diplomat” who has insight into both organizational, and end-user, demands. Looking at a project developing a support system for an industrial manufacturing organization it might be hard for the surrounding organization to provide adequate customers according to the above discussions. For example the end-users of a system might belong to several parts of the organization why a customer with a 100 percent process knowledge and authority might not exist. Further the customer in a project might not have the authority to make decisions regarding all aspects of a project, for example when it comes to the budget as can be seen from Customer C’s description in section 4.4.4.3 Customer practices in the agile project.

The case study, as well as earlier studies, also indicates on the importance of a customer’s knowledge regarding agile practices. Hoda et al (2010), for example, recommend that a customer is familiar with agile methods in order to support an agile. The customer in project C was for example educated by the project manager in order for the customer to support the agile processes. The effect of limited customer knowledge, regarding agile practices, is seen in the empirical results especially in projects A and D where this caused extra work in the projects. The pre-study of this report further shows how lack of agile knowledge, among customers, hinders iterative agile practices such as close customer collaboration something that further exemplifies Hoda et al’s (2010) recommendation. As mentioned in section 5.3.2 Reasons for lack of customer involvement one can however question how much agile knowledge a customer could be demanded to have in a project.

The empirical result also shows that a customer might find the dynamic and unpredictable nature, of agile projects to be demanding. This is in line with earlier research, for example, Hansmann & Stober (2014), why a customer’s knowledge regarding agile methodologies can be further motivated. The dynamic nature of agile methodologies is also described by Fowler (2005), Wysocki (2014) and Barlow et al (2011) in section 3.2.3 Agile methodologies as a response to the limitations of traditional methodologies. Here Wysocki (2014) and Barlow et al (2011) describe this to makes estimations difficult in an agile project. The importance of an understanding for agile processes may thus be seen as an important mean in order for the customer to be able to interact with an agile project. The problem regarding early estimations and limited agile knowledge is seen in Project D where the customer placed unrealistic demands, regarding time and estimations, on the project. Further the pre-study of this report (section 4.3 Pre-study) describes customers demanding fixed cost, time and scope contracts, which opposes the above mentioned literature. On the other hand, intolerance for unpredictability and demand for early estimations might be natural in a large industrial manufacturing organization. Parallels can be drawn to Barlow et al (2011) who in section 3.2.3 Agile methodologies as a response to the
limitations of traditional methodologies describe how agile processes requires extensive coordination, especially in larger projects. This may also be true in a large organization where a project might involve several stakeholders, why the need for predictability is greater in this case.

The importance of good communications between a project and a customer is also seen in the case study, as well as earlier literature. Highsmith & Cockburn’s (2001) for example describe feature planning as an important mean for communication and to helps the customer understand the product and its features, and thus prioritize among these. Examples can be seen in the case of Project C and Project D which used story points and t-shirt sizes to illustrate feature complexities. Both project managers describe this as a mean to communicate the complexity and business value between the project team and the customer. Project manager C even states, on the subject, that the story points enabled the customer representatives to better understand and contribute to the estimation of user stories. The use of feature planning can also be seen in both Customer C’s and Customer D’s description of how the project was initiated using a prototype, or overview of the functionalities, which demonstrated the overall features of the system to be developed.

The story points and t-shirt sizes can further be compared to Martin et al’s (2006) description of a ‘Geek interpreter’, which helps the customer understand technical aspects of a project, in successful XP projects. Customer C, as an example, highlights that user stories and story points were effective means of communication since Customer C had no previous experience of IT development. The importance of feature planning and easy communication could further be considered motivated when viewing a software project in context of an organization primarily not focused on software development. Since a customer might have limited time and resources, to put on a project, understandable communication may save time for a customer since only limited IT knowledge is required, as was the case for Customer C.

Close customer collaboration, and frequent feedback, is in the empirical studies described as beneficial and important for the projects. This is in line with the literature’s description of the importance of communication, collaboration and feedback in a project. Feedback is seen to gives the customer the possibility to continuously adapt and refine the project in order ensure a desired end result, as seen in the empirical studies and in earlier research. Looking at the theory presented in 3.2.3 Agile methodologies as a response to the limitations of traditional methodologies one can also identify a possibility to reduce waste, closer meet customer’s needs and deliver accrual business value (Petersen and Wohlin, 2010; Barlow et al, 2011, Petersen & Wohlin, 2009; Wysocki, 2009). Hansmann & Stober (2010) even recommends that a customer is continuously present in a project. When this is the case, the case study shows that this has led to improved communications and faster decisions. Alahyari et al (2013), on the subject, mentions that close customer collaboration is an important mean in order to create customer satisfaction. The empirical results, in line with literature, further shows the importance of trust in a project, for which open communication is seen as important. For example Project manager C describe customer trust as an important resource in the project. On one hand, the possibility for close customer collaboration and feedback might however be questioned due to the nature of an industrial
manufacturing organization. Since software development is not part of the organizations core business it might be hard to motivate the continuous interaction between the customer of a project and the project. On the other hand, it should be in the interest of a customer to make sure to get what really is needed. Even though software is not the customer’s core business, the right software will probably enable better or even more effective business support, in a long term perspective.

The empirical studies however give several examples of problems, in an agile project’s customer relationship, when it comes to the demand for an active customer role. This can also be seen in literature where, for example, Hansmann & Stober (2010) and Fowler (2005) write that agile methodologies put greater demands on the customer. Wysocki (2014) even describe the customer as a weak-point in an agile project. For example Customer D’s describe this as a problem if a customer is unable to dedicate enough time for a project. However, as opposed to Hansmann & Stober’s (2010) and Fowler’s (2005) warning that agile practices is demanding for a customer, the empirical studies indicates that the agile practices probably has required less time commitment than compared to a plan-driven methodology, for a customer. One explanation for this could be that faults and changes are discovered earlier in agile projects why rework and fixes are easier.

Consequently, the data presented in the empirical studies shows, when compared to previous studies, that customers must possess knowledge and authority to make decisions and clarify requirements in a project. A knowledge regarding agile processes is also seen to be beneficial even though it can be questioned whether this can be demanded of a project’s customer, especially in an industrial manufacturing organization. Furthermore the facilitation of easy and clear communication is in several cases described as important, both in the case study and in literature. However agile processes are also described to be time consuming and demanding for customers. One has to consider the agile project in the context of a large industrial manufacturing organization. Because of this the customer demands, that exists in agile project, might not be motivated due to the core business of the organization not being focused on software development.
6 Conclusion

This chapter draws conclusions, from the report’s analysis chapter, in order to answer the scope and research questions. Through this the chapter aims to gain an understanding of an agile way of working at an IT organization in a context of a surrounding and otherwise manufacturing industrial organization, when it comes to software development projects.

6.1 To what extent are agile values, principles, and methodologies manifested at an IT organization?

When compared to earlier research and the Agile Manifesto, the empirical study shows agile values and principles present in the values and principles of an IT organization, in a context of a surrounding manufacturing organization. However, when it comes to the actual practices and processes a more traditional approach is used. One reason for this is debated in chapter 5.1, is the nature of a large organization and its need for planning and coordination. Thus one can conclude that agile values and principles are manifested at an IT organization, in the described context, while agile methodologies and practices are less prominent. As an example the empirical study, when compared to the literature, describe a varying use of agile methodologies, used in the projects, at the IT organization investigated.

When considering the processes at the IT organization data, as well as earlier research, shows the need for adjusting the current stage-gate model if an agile way of working is to be supported. Both literature and the empirical study motivate this due to an inflexible nature of stage-gate models. However, also the agile methodologies must in this case be adjusted. It might thus be concluded that while stage-gate models are considered to be inflexible they do not necessarily contradict an agile way of working in an organization. Thus while agile methodologies are not manifested by the use of stage-gate models, they are on the other hand not hindered. One must also highlight the benefits of a structured system, such as a stage-gate model, in a large organization such as in the context of this study.

When considering the evaluation of projects both agile and more traditional elements can be identified, regarding the project parameters, when analyzing the empirical findings together with the theoretical framework. While both literature and the study exemplifies benefits regarding an agile view on the project parameters, the case company’s evaluation of projects is still seen to focus more on the traditional aspects. The traditional evaluation methods are described in the empirical results to hinder agile work. Instead it is, in the empirical results as well as in literature suggested that evaluations are based on value creation rather than performance according to time and cost constraints. Here it can be concluded that agile practices are poorly manifested when it comes to the project parameters and project evaluations in the IT organization. Reasons such as limited knowledge, uncertainty regarding project deliveries, and limited early planning are debated to cause a more traditional view, on the project parameters, in an IT organization within a large industrial manufacturing organization.

To conclude, the analysis shows agile values and principles manifested, in the IT organization investigated, while agile practices are less prominent. This is also exemplified by the varying definitions
of agile, presented in the analysis. While the analysis shows examples of agile projects these are often in some way allowed deviating from established processes and tools.

6.2 What is demanded of an IT organization in order for a project to be able to follow agile values and principles?

The analysis of agile values and principles put in an organizational context was performed within four areas; the organizational structure, the impact on the organization in its whole, management support and finally measurements of progress.

Given an IT organization with project-based business, suitable organizational structures for an IT organization which strive for an agile way of working are identified in the analysis. Common to these suitable organizational structures, are for example their allowance for flexibility and quickly respond to changes, which are also some typical descriptions of agility. Therefore agile values and principles could be considered to demand an IT organization to have an organizational structure that better enables agility.

Looking at an IT organization, several areas are identified where projects following agile values and principles places extra demands on an IT organization. For example, the IT organization must facilitate an easy ways to communicate in order to support of quick decision-making and quick removal of impediments, which agile projects needs. Furthermore, the high pace of agile project demands an IT organization to be flexible in allocating resources. Most important is, however, that the whole IT organization should to a certain degree have a common understanding of an agile way of working, in particular regarding knowledge about the needs of agile projects.

The empirical study, combined with earlier research, identified that management needs to have a clear standpoint in order for an IT organization, and its projects, to follow agile values and principles. However, it has been seen that the agile methodologies are not providing guidance for how management shall implement an agile way of working outside an agile team or project. Furthermore, if management is to follow agile values and principles they have to rely more on their employees, and therefore let go of some control in order to promote agility. In addition, an IT organization within an industrial manufacturing organization might have challenges to accept a more agile management attitude, due to its somewhat unpredictable nature.

How an IT organization tracks progress or uses measurements might need adjustments in order to better support projects following agile values and principles. The analysis showed that agile projects might not need formal status reports to the same level as plan-driven projects, since agile projects are able to show results continuously throughout the project. Furthermore, in an organization striving for an agile way of working the introduction of measurements, supporting agility, might be beneficial.
No parts of the investigated IT organization have proved to be unaffected by projects following agile values and principles. This further indicates that agile might not only be a methodology or way of working in a project but may even be better described as a culture or mindset, as described by earlier research.

To conclude, if projects shall be able to follow agile values and principles an IT organization must strive for agility on all levels in the organization, to a certain degree. Otherwise agile projects will not be able to maintain their rapid pace.

6.3 To what extent is it possible, and what is demanded, to develop software according to agile values and principles in an IT organization, while the surrounding organization, i.e. customer, is not focused on software development?

The importance of the customer role, in a project, can be concluded from the analysis. Some project managers, as well as earlier research, even describe the customer interactions as critical to a project’s success. In a project, including the case of an agile project, the analysis further highlights the importance of an efficient customer representative in the projects. For example a customer must possess knowledge and authority to make decisions in a project and clarify requirements.

In order for an effective customer relationship, in an agile project, the analysis points at a number of additional important factors such as knowledge regarding agile methods, close collaboration and good communications. One could reason that these factors help counteract some of the drawbacks of agile methodologies, such as the unpredictable nature, which is mentioned as a possible reason for a customer’s doubts regarding these methodologies. The need for good and easy communication is further debated to be necessary in an organization where the customer does not possess any deeper technical knowledge. The close customer collaboration enables continuous feedback, a common aspect in agile methodologies which allows for the continuous refinement of a project’s scope.

However, active customer involvement is not always without problems, as described in the analysis. Especially the demanding nature of agile projects might not be practical when it comes to the development of business support systems in an organization not primarily focused on IT development. The empirical study, as well as earlier research, describes that an agile way of working requires a customer’s organization to dedicate resources and time to a project. At the same time the difficulties regarding planning and estimations might further pose a hinder for a customer’s willingness to work according to agile methodologies. Furthermore the customer’s department, in the context of an industrial manufacturing organization, might use project management methods which are hard to adapt in order to collaborate with an agile project.

The analysis shows that an ineffective customer representative, e.g. due to the above mentioned reasons, might hinder agile processes in a project. However some of these factors, such as agile knowledge, and great distance hindering, close collaborations could be considered quite natural in a
larger organization such as in the context of this study. One has to consider the agile project in the context of a large industrial manufacturing organization. Because of this the customer demands, that exists in agile project, might not be motivated due to the core business of the organization not being focused on software development. On the other hand the empirical results describes examples of customers considering agile projects to actually be time and effort saving. One explanation for this could be that faults and changes are discovered earlier in agile projects why rework and fixes are easier.

To summarize, the occurrence of agile projects have been identified, in the empirical results, at an IT organization within a larger industrial manufacturing organization. Agile project methodologies are seen to have many benefits for both the IT organization and for the customer in the larger surrounding organization. On the other hand, the drawbacks discussed regarding agile methodologies in a project, are particularly prominent in the context of an organization where the core business is not focused on IT development. One can however conclude that it is possible to develop software according to agile values and principles in an IT organization, while the surrounding organization, i.e. customer, is not focused on software development, e.g. when it comes to development time and delivering customer value. One can also conclude that when this applies it is often beneficial for a project’s results. However, one also has to consider the benefit of a potentially better project result in relation to what resources a customer organization is willing to dedicate for the development of a business support system. Thus the above conclusions are only valid provided an active customer representative can be acquired.

6.4 Theoretical contribution and further research

The study has in line with earlier research indicated there is a lack of guidance on how to implement an agile way of working outside the team or project. Therefore the theoretical contribution of this study could be considered putting an agile way of working in a greater context, i.e. organizational context. Furthermore, the study points at problems related to different mindsets within an IT organization and also the surrounding customer organization.

When looking at an individual project no problems regarding the use of agile methodologies has been identified. However, an organization should strive for using one general agile methodology in all projects. The use of one general methodology enables recognition within the IT organization. It also enables easy identifications of opportunities for improvements. This could also enable resources to move between projects without struggle. Furthermore, when investigating projects in a larger perspective, i.e. organizational context, the agile methodologies seem to be regarded as a silver bullet or even a buzzword. The use of agile methodologies most likely requires a change management process due to many areas affected in an organization, as highlighted in the study. In the case of the investigated IT organization this seems to be neglected to some extent why an adoption of agile methodologies is complicated. An implementation of agile methodologies requires an effort of the whole organization, even though on different levels. For example, agile methodologies affect developers, project managers as well as other employees in an organization. Management must also be included in educational activities regarding an agile way of working in order to understand the needs of agile project. A person
who is responsible for the change management together with a group of people with knowledge about agile values, principles and methodologies might be one solution. When the change is implemented agile coaches, such as these, should be present all over the IT organization in order to help the IT organization to learn and improve their agile way of working. This might also create more frequent, and natural, discussions regarding an agile way of working, which further will help the IT organization to better support an agile way of working.

What also should be more frequently discussed is the customer. The IT organization must of course have low costs and deliver on time, but customer value should not be neglected. By introducing an evaluation process together with the customer after project completion, the IT organization will be able to identify what the customers appreciate. Furthermore, the IT organization should highlight for customers that project results are more likely to be successful with an active customer representative, but at the same time this might be difficult to require when developing support systems.

Similarly to the customer evaluation, the IT organization should perform an internal evaluation or measure during and after projects in order to identify where projects experience good and bad support for an agile way of working. It could for example be the support from management, the department of infrastructure, an agile coach, if it is easy or difficult to release code etc.

Furthermore, the use of a stage-gate model might not hinder an agile way of working but the IT organization should review the deliverables and clearly communicate what is required of project managers. The IT organization should also provide instructions how agile projects should relate to the stage-gate model.

When looking at the values and principles of the investigated IT organization, several similarities was identified when compared to the Agile Manifesto. However, the use of a “Normal situation” might not be appropriate when it comes to software development due to its nature, i.e. changing environment, but might be a natural consequence of the surrounding industrial manufacturing organization. Instead the IT organization could use Agility as their new “Normal situation” and by that strive for achieving flow and handle the changing environment.

In addition, the study identified several areas interesting for further research regarded an agile way of working. For example when it comes to resource allocation, the organizational structure, management support, and customer involvement. Therefore the following is suggested for further research:

- Project portfolio management and resource allocation in project-based organizations with an agile way of working.
- A comparison of several organizations with an agile way of working and how their different organizational structures affect the agile way of working.
- A study investigating how the distribution of control and steering should be done in a project-based organization.
- The value generated by an agile way of working in contrast to the time and resource demands of the customer, especially when it comes to business support systems.
7 References

7.1 Literature


89 (98)


Erickson, J., Lyytinen, K., & Siau, K., 2005. *Agile modeling, agile software development, and extreme programming: The state of research.* Journal Of Database Management, 16, 4, pp. 88-100


Karlström, D, & Runeson, P 2006. *Integrating agile software development into stage-gate managed product development,* Empirical Software Engineering, 11, 2, p. 203-225


7.2 Online resources

Agile Alliance, Guide to Agile Practices [Online]
Available at: www.guide.agilealliance.org
[Accessed on 2014-04-03].

Available at: www.agilemanifesto.org
[Accessed on 2014-04-03].

[Accessed 2014-03-20]

[Accessed 2014-02-22]

Available at: http://www.infoq.com/minibooks/agile-adoption-transformation
[Accessed on 2014-04-17]

Scrum.org, Schwaber & Sutherland, 2011.
Available at: Scrum.org: https://www.scrum.org/Portals/0/Documents/Scrum%20Guides/Scrum_Guide.pdf
[Accessed on 2014-05-31]

Sutherland, J., 2011. Ten Year Agile Retrospective: How We Can Improve In The Next Ten Years. [Online]
[Accessed 2014-03-25]

Available at: http://www.it.uu.se/edu/course/homepage/acsd/ht03/ACSD9-PPS.pdf
[Accessed on 2014-05-12]

Available at: http://agile2007.agilealliance.org/downloads/handouts/Poppendieck_422.pdf
[Accessed 2014-04-09]
7.3 Oral resources

7.4 Scania Internal Documentation
Scania CV AB, 2012. IT @ Scania Core Values and Principles. Sweden: Scania CV AB.
Scania IT, 2014A. Organization Scania IT, Sweden: Scania CV AB.
Scania IT, 2014B. Overview of Business & Flow driven IT. Sweden: Scania CV AB.
Scania IT, 2014C. Projects & Processes at Scania IT. Sweden: Scania CV AB.
8 Appendices

8.1 Appendix 1: Interview questions Project Managers

The questions below were used during the interviews with Project manager A, B, C, and D.

Background

1. Please briefly describe the organization and background of the project.

Methodology

1. Please describe the methodology used in the project
2. How does your project work when it comes to:
   a. Customer interaction
   b. Requirements
   c. Changes to requirements
   d. Leadership
   e. Planning
   f. Improving processes
   g. Documentation
   h. Communication (internally and externally)
   i. Localization of team members and other resources
3. How did you relate to existing methods and agile methods respectively?

Organization

1. What kind of support have you needed from the organization and have you got the support you need from the organization?
2. What have the organization done in order to adjust itself according to an agile way of working?
3. What have the organization demanded of the project?
4. What have management done in order to adjust itself according to an agile way of working?

Management

1. How has the organization been educated on agile methods?
2. How did you track progress of the project?
3. If you could decide, how would you want to track progress of projects?
4. How would you describe your role as a project manager?
5. How would you describe the responsibilities of a manager?
6. What measurements did you use internally and externally respectively?
7. How did you prioritize between time, cost, quality and scope in the project?
8. To consider your project as successful, what did you have to fulfil?
Customer interaction with the project

1. How did you work with the customer during the project?
2. How would you describe the relationship and interaction with the customer?
   a. Did you discuss what methodology to follow in the project?
   b. How often have you met with the customer?
   c. What has been the role of the customer?
   d. Have there been any difficulties in the relationship with the customer?
   e. Has the customer been committed to the project?
3. Did the customer have enough knowledge to be able to specify and formulate requirements?
   a. Were requirements prioritized?
   b. Were requirements reviewed, reformulated and/or re-prioritized?
4. Did the customer have mandate to take decisions?
5. Did the customer have knowledge about how to work agile, and both advantages and drawbacks that comes with it?
6. If non-agile: Is there a particular reason why you haven’t been working according to agile methodologies?
7. How did the customer prioritize between time, cost, quality and scope?
8. How was the contract formulated with regards to time, cost, quality and scope?

Round up questions

1. What pros and cons do you see when it come to:
   a. Plan-driven processes or methodologies
   b. Agile processes or methodologies
8.2 Appendix 2: Interview questions Managers

The questions below were used during the interview with Manager A and Manager B.

Background

1. Please describe your position within the organization

Organization

1. What have the organization done in order to adjust itself according to an agile way of working?
2. What kind of support is given for a project?
3. What is your view on project planning?
4. How do you relate to existing methods and agile methods respectively?

Management

1. Have the organization been educated on agile methods?
2. How do you track progress of projects?
3. If you could decide, how would you want to track progress of projects?
4. How would you describe the role and responsibilities of a project manager or manager, related to projects?
5. How would you describe the responsibilities of a manager?
6. What measurements do you use in the organization?
7. How do you prioritize between time, cost, quality and scope when it comes to projects?
8. When is a project considered to be successful?

Round up questions

1. What pros and cons do you see when it come to:
   a. Plan-driven processes or methodologies
   d. Agile processes or methodologies
2. What future plans exists regarding an agile way of working?
8.3 Appendix 3: Interview questions Customers

The questions below were used during the interview with Customer representative A, Customer C, and Customer D.

Background

1. Please briefly describe what the purpose of the project was

Organization

1. Are you aware of that Scania IT strive for working according to agile methodologies?
2. Have you changed your way of working with Scania IT because of this?
3. What is your view on project planning?
4. How do you relate to existing methods and agile methods respectively?

Management

1. Have you been educated on agile methods?
2. How did you track progress of the project?
3. If you could decide, how would you want to track progress of projects?
4. What measurements was presented to you?
5. How did you prioritize between time, cost, quality and scope in the project?
6. When is a project considered to be successful?

Customer

1. How would you describe the relationship and interaction with the project?
2. Did you discuss what methodology to follow in the project?
3. How often have you met with the project?
4. What has been your role in the project?
5. Have there been any difficulties in the relationship with the project?
6. How did you specify and formulate requirements during the project?
7. On what level of detail?
8. Were requirements prioritized?
9. Were requirements reviewed, reformulated and/or re-prioritized?
10. Were requirements discussed with the project?
11. Did you have mandate to take decisions?
12. What knowledge do you have about agile methodologies?
13. If non-agile: Is there a particular reason why you haven’t been working according to agile methodologies?
14. How was the contract formulated with regards to time, cost, quality and scope?
Round up questions

2. What pros and cons do you see when it comes to:
   a. Plan-driven processes or methodologies
   b. Agile processes or methodologies