The impact of having inadequate self-organizing teams in agile projects

Sindre Gjøystdal

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Abstract

Building self-organizing teams in agile projects are considered the most important job for an agile project leader. However, the reality is that building self-organized teams lacks focus among project leaders. Instead, they go back to managing tasks as it is more concrete and tangible. While there are an excessive number of research proving that developing self-organized teams have a positive contribution to project success, there is a lack of knowledge about the consequences of not doing it, resulting in teams that are inadequate of being self-organized. Therefore, this thesis aims to explore the impact inadequate self-organizing teams have on the success of agile projects.

To address this problem, this thesis has the following main question "How are inadequate self-organizing teams impacting the success of agile projects". To facilitate a conclusion, two sub questions were made to identify failure areas in agile teams that makes them inadequate, and how the failure areas impact critical success factors.

The choice of research strategy was empirical research and survey, fulfilled by one-to-one interviews and questionnaires for data collection methods. Data analysis methods are both qualitative and quantitative. The thesis resulted in identifying five failure areas commonly seen in agile teams that had a negative impact on three success factors. Then, because of a weak linkage between success factors and success criteria on a general basis, a discussion is included with relevant research on success criteria specifically for the impacted success factors identified in this thesis. A conclusion is, therefore, drawn on a general basis to agile success factors, and in particular to agile success criteria with the organization used as example.

This thesis has an extensive extended background section to cope with the many areas that are being addressed. As survey is the choice of research strategy, extractions from the template "development of questionnaire" is incorporated in the standard template to make it more organized. At the end, a discussion is included with originality and significance, future research, final words, and a reflection document.

Synopsis form

Background	The background of the thesis is the lack of focus among project leaders to build self-organizing teams in agile projects. This is a widespread problem in many organizations. The area this thesis belongs to within computer and system science is Agile Project Management.
Problem	The problem that motivates this thesis is the gap of knowledge to what impact inadequate self-organizing teams have on project success in agile projects. It needs to be determined if self-organizing teams are not just a contributing factor for success, but rather a necessity to avoid adverse problems.
Research Question	The main research question that is answered in this thesis is how inadequate self-organizing teams impact the success of agile projects. The following two sub-questions were made: 1) identify failure areas in self-organized teams, and 2) see how the failure areas impact critical success factors.
Method	The research strategy is empirical research and survey. Data collection methods are one-to-one interviews and questionnaires. Data analysis methods are both qualitative and quantitative.
	One-to-one interviews were applied to identify failure areas in a self-organized team by conducting an inductive approach and thematic content analysis to search for patterns within the data. Questionnaires were applied to see how the identified failure areas from the one-to-one interviews impact critical success factors.
	Non-probability sampling was used for both data collection methods, as the surveys were contingent on having participants with special knowledge about the self-organizing teams as well as the critical success factors.
Result	The result of the study is that 5 failure areas were identified from the one-to-one interviews. They had a negative impact on three critical success factors. Communication was the most impacted success factor, followed by collaboration and valuing people.
	A discussion about the impact of the success criteria is tailored for the organization in this study with relevant research as input to the summary.
Discussion	The limitations addressed in the conclusion is the weak linkage between success factors and success criteria, as well as the level of generalizability and reliability.
	Ethical implications were mainly addressed to the one-to-one interviews as it involved receiving honest and detailed information from the respondents about failure areas within their own workplace.
	This thesis is meant to be used for all agile project leaders who lack focus in building self-organized teams to highlight the negative consequences it has on project success.

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1 Introduction

1.1 Background

Over the last years, there has been a radical change in how projects are being executed. Traditional projects are mainly driven by follwing a plan with minimal changes and have scope, schedule and cost as the main constraints to determine the success of the project. In recent years, however, agile project management has become more common to cope with the increasing need to deliver customer value in unstable environments. This, in turn, requires organizations to have an innovating mindset and the ability to respond quickly to changes that might occur both from the customer and competitors.

Agile project management is an important area within computer and systems science, and particularly within software development projects. Studies show that over 50% of software functionality is rarely or never used [1], and that goes to show that customer value has not been achieved even though the project has delivered all customer requirements. The need to have a mindset that encourages and allows for new product development and customer value in a changing environment is, therefore, vital for organizations to be successful. Many associate agile project management with software development projects, but the agile philosophy comes in many forms as it is more an attitude and not a specific process, more environment than methodology [2]. Therefore, the driving factor for the agile mindset is people; people trump processes. This is also the reason why teams, and building self-organized teams, is considered the very core of an agile project leader's job [3]. Self-organizing teams promotes the key business objectives for agile project management and is essential for the success of agile projects.

However, despite the undisputed importance in building self-organizing teams in agile projects, it lacks focus among many agile project leaders. Building self-organized teams can be very challenging, and different barriers for building tasks have been identified in many research [4]. Also, for many project leaders, the concept of having self-organized teams seem fuzzy, messy and un-definable [5]. In addition to that, it has been raised questions about the goodness of self-organizing teams as it has been confused with anarchy [6]. These are some of the reasons why many project leaders go back to the non-agile method of managing tasks instead of leading teams as it is more concrete and tangible. This results to a perception in the organization that projects are complying with the agile philosophy when the reality is quite the opposite as project leaders will say they are agile, "*but they exhibit neither team leadership nor an adapting mindset*" [7].

Because the strength of self-organizing teams in agile projects can be both time-consuming and challenging to measure, this is a "hidden" problem in many organizations. Organizations can say that they are agile with the best intention, believing this is the reality. But as many project leaders lack focus in developing self-organizing teams [8], which is the foundation and backbone for the success of agile project management, this can have a negative effect on the success of the project.

This research aims to explore the impact inadequate self-organized teams have on agile project success to get a richer understanding of the consequences as research proves this to be a widespread problem in many organizations. Going forward, the need for an innovative and adaptive mindset in organizations will only increase in the future and it is vital for project leaders to understand the true importance of developing self-organized teams in agile projects. This research, therefore, contributes to the field of agile project management.

1.2 Problem

Jim Highsmith states that self-organizing teams form the core of Agile Project Management, suggesting that they are the ones who "*consistently deliver on the product vision within the project constraints*" [9]. Self-organizing teams are, in other words, the major contributor for achieving success in agile projects. There is, however, a lack of knowledge about the consequence of having inadequate self-organized teams in agile projects, and what impact that has on project success. Therefore, the relationship between inadequate self-organized team and agile project success is not clear due to limited empirical studies. It needs to be determined if self-organizing teams are not just a contributing factor for success, but rather a necessity to avoid adverse problems for agile project success.

The problem to be addressed in this research is, therefore, the impact inadequate self-organized teams have on agile project success.

The problem is inspired by a research written by Hoda, Rashina, James Noble, and Stuart Marshall who are exploring the impact of inadequate customer collaboration on self-organizing Agile teams [10]. The conclusion of this research is that customer involvement is important in agile projects, but inadequate customer involvement causes adverse problems for agile teams. This thesis expects to have similar results in the sense that a lack of focus in developing self-organizing teams by project leaders will cause adverse problems for the success of the projects.

A prerequisite to address the problem was to find an organization executing agile projects where the development of self-organized teams is believed to have failure factors. Therefore, a company in the oil and gas industry has been used as an example. The reasons for this are as follow:

- Teams are very common in the execution phase of projects in the oil and gas industry [11]

- Projects in the oil and gas industry have a strong agile project management philosophy due to an unstable environment and need for new product development and adaptability due to frequent changes in customer requirements

- Due to high oil prices over the last years, there has been a tunnel vision in the oil and gas industry that has resulted in a lack of focus in other areas such as the ascertain of the collaboration of the people working in teams [12]

Based on this, in addition to the general knowledge that many project leaders don't exhibit a team leadership focus, an assumption was made that inadequate self-organized teams could be identified in the oil and gas industry.

1.3 Research question

Based on the research aim and problem, the following research question is defined:

"*How are inadequate self-organized teams impacting the success of Agile projects"?*

In order to fully address the research question, the following sub questions are asked:

- What are the failure areas for teams that makes them inadequate of being self-organized?

- How does the identified failure areas impact the critical success factors?

1.4 Limitations and delimitations

Type of organization

The organization in this thesis is part of the oil and gas sector. This sector is different from other agile projects such as software development projects in the sense that they have certain governing standards and obligations to reduce risk or harm to people or damage to the environment. One of the most known criticism for Agile Project Management is that is does not work for systems that have (among others) safety requirements [13]. A phrase better known as "responsibly responding to change" has grown in this industry to meet these criteria and still have the agile philosophy as a suitable approach. However, the safety aspect will have an impact in terms of defining critical factors for success that is different from other agile projects.

Geographical area

A limitation in the quantitative research is the number of people that are part of the survey. As the quantitative research only involves one team, in one specific geographical area, the number of respondents are limited to only include this team. For future study, it is recommended to use a larger number of respondents from more teams around the world to get a more reliable result.

Level of generalizability

This thesis aims to be as generalizable as possible for all agile projects, but as the "extended background" section will show, there will be small variances in both critical success factors and key factors for developing self-organizing teams depending on the industry and the organizational structure and context surrounding the team. Both critical success factors and key factors for developing self-organizing teams must be personalized for each organization and project. However, most of the key elements are common in agile projects and while the conclusion of this thesis will not be 100% transferable to all agile projects, it will give a good indication of the criticality of self-organized teams and critical success factors that are most impacted.

Agile project success

Agile project success is measured by the achievement of success criteria. This thesis considers the impact on success factors, as they are factors that will increase the likelihood of achieving the success criteria. However, the linkage between success factors and success criteria is somewhat weak, and therefore the conclusion will be based on the impact on success factors on a general basis, and success criteria in particular to the organization used as example in this thesis.

Reliability of results

While the validity of the results is perceived to be strong in this thesis, the reliability is a bit weaker due to small variances expected to occur in the qualitative analysis and the need for measurements to be taken in the quantitative analysis to maintain the level of validity. If the same questionnaire analysis was to be performed on a different occasion, with a different team, it is believed that some of the questions would be misinterpreted without the same measurements taken.

1.5 Thesis Structure

This thesis is divided in seven chapters, followed by a reference list and appendix. The structure is based on the standard thesis structure, but an extraction of the template "development of questionnaire" is incorporated in chapter 4 and 5 to make it more organized.

Chapter 1 presents the background of the thesis with information about why teams are so important in agile projects. Furthermore, it continues with the problem that many agile project leaders lack focus in building teams and that they go back to the non-agile method of managing tasks instead of leading teams. The chapter ends with a discussion about limitations and delimitations.

Chapter 2 presents the extended background section and gives a more detailed information with regards to literature definition of agile project management in general, before the chapter goes into specific details about the following:

- Project success in agile projects (section 2.2)

- Linking self-organized teams to Agile Project Management (section 2.3)

- Building self-organized teams (section 2.4)

The chapter ends with section 2.5, identifying critical success factors, and the design factors for building self-organizing teams in an organization within the oil and gas industry.

Chapter 3 presents the methodology part and includes research strategies, research methods and ethical aspect. The research strategy is a survey with a mixture of "empirical research" and "at a specific point in time" strategy. The type of survey is two folded; face to face and postal. The data collection methods are interviews and questionnaires, and the instruments for data design are one-to-one interviews and questionnaires with closed questions using the Likert scale. For the data analysis methods, the thesis used both qualitative and quantitative methods as it first identified failure areas for teams that makes them inadequate of being self-organized, and quantitative to test the failure areas on a larger number of people to see if the failure areas impact the critical success factors.

Chapter 4 describes the development of the questionnaires in terms of how the questions were chosen in both surveys, as well as criteria used when developing the questionnaires.

Chapter 5 describes the test run of the questionnaires in both surveys, with an explanation of how the respondents were chosen and how many respondents that completed the survey. The chapter ends with a discussion about the validity and reliability of the responses for both data collections.

Chapter 6 presents the results and analyze section of the thesis. It is divided in two sections: one for the qualitative analysis (one-to-one interviews) and one for the quantitative analysis (questionnaires).

Chapter 7 presents the conclusion part of the thesis and discusses them in terms of originality and significance, future research and final words. A reflection document is attached at the end.

2 Extended background

2.1 What is Agile Project Management?

Before jumping to project success in agile projects and self-organized teams, some clarifications are needed. First, Agile Project Management is not a process. Agile Project Management has more to do with the mindset and attitude than anything else. This is the reason why many project leaders can claim to be agile and get away with it. If it was a process it would be easy to determine if it is implemented in the organization or not, but when it is about the mindset and attitude of the people working in the team, it is not as easy to control.

2.1.1 Defining Agility

Trying to define Agility is not easy. There are many definitions, but none of them encounters all the agile principles. This view is also supported by Kettunen, who says that there is no universal definition [14]. I think the best definition is by Jim Highsmith who claims that Agility is "*the ability to both create and respond to change in order to profit in a turbulent business environment. Agility is the ability to balance flexibility and stability*" [15]. From his definition, there are three key aspects: "create and respond to change", "turbulent business environment" and "balance flexibility and stability". These are, unquestionably, important aspects in the agile philosophy, but it lacks "teams" and "customer value" to be complete. If mixing this definition with Ambler's definition, however, a more complete picture is achieved. His definition (among some others) includes the following aspects "self-organizing teams" "collaborative" and "customer driven" [16].

2.1.2 Agile Project Management values

Trying to understand what Agile Project Management is all about by only looking at the definitions is not a good approach. It is much better to look at the values of Agile Project Management to get a more comprehensive picture. There are two primary sources that are used as reference, the Declaration of Interdependence and the Agile Manifesto [17]. According to Jim Highsmith, the Declaration of Interdependence was developed with projects leaders in mind, and the Agile Manifesto was developed with software development in mind [18]. However, the Agile manifesto has been discussed and argued many times over the last years as the content of it is interpreted differently. It has also been open for much criticism as it has been stated, among other things, that it is too vague and does not have a proper grounding in management theory and philosophy [19]. What Jim Highsmith did, however, was to gather all the information from the Declaration of Interdependence and the Agile Manifesto and summarized it into three key values that are important for agile leaders and what distinguishes them from traditional project leaders: "*Delivering value over meeting constraints*", "*Leading the team over managing tasks*" and "*Adapting to change over conforming to plans*" [20].

These key values include all the aspects in both Highsmith's and Ambler's definition and is a much more suitable approach to understand what Agile Project Management is about.

2.2 Project success in Agile projects

This thesis aims to find out how inadequate self-organizing teams are impacting the success in agile projects. This thesis, therefore, needs to deal with the question of how success is judged in agile projects. When talking about the success of projects, even previous researches have struggled to define the criteria to be used to determine the success of a project [21]. In other words, this is not a straightforward thing to do. Ever since the 1960s, researchers have tried to find out which factors that actually lead to project success. For starters, there is a clear distinction between *"success criteria"*, and *"success factors"* [22].

2.2.1 Success criteria

Success criteria are *"the measures by which success or failure of a project or business will be judged"* [23]. Defining the success criteria for agile projects can be tricky. In fact, previous research on project success shows that *"it is impossible to generate a universal checklist of project success criteria suitable for all projects"* [24]. The reason for that is that there are a number of contributing factors that are impossible to standardize like size, industry and organizational context. One way forward is to look at the value trigger for the type of project one is operating in. For agile projects, we have adaption and flexibility as key values for agile leaders. For traditional projects, the most common three success criteria are scope, cost and schedule. This does not mean that the three success criteria for traditional projects should not be included in agile projects – they count as well, but they come in addition to the other trademarks. If we combine the traditional projects with agile projects, we get the following two triangles as shown in figure 1 [25]:
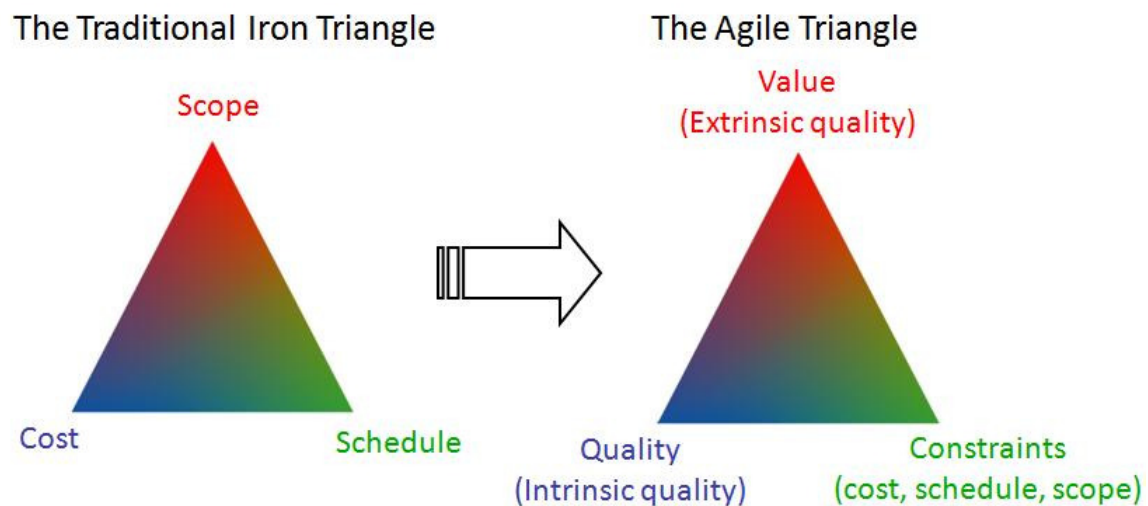
Figure 1: "Agile Performance Measurement". Source: Adopted from Highsmith, J. (2009), page 21

The agile triangle represents all the trademarks identified from the key values, as well as the constraints from the traditional project triangle. Value is the ultimate goal, and quality (adaption and flexibility) and constraints (cost, schedule and scope) are factors that influences value along the way.

2.2.2 Critical success factors

Critical success factors are "*inputs to the management system that lead directly or indirectly to the success of the project or business*" [26]. In other words, they are meant to increase the chances of success of the project. Like most other terms, the definition "critical success factors" differs from one person to another. Rockart defines critical success factors as "*the limited number of areas in which results, if they are satisfactory, will insure successful competitive performance for the organization*" [27]. This definition is (in my opinion) inadequate as it does not imply, nor emphasize, the fact that success factors can be influenced. If looking at Hofer and Schendel's definition, on the other hand, they are defining critical success factors as "*those variables which management can influence through its decision that can affect significantly the overall competitive positions of the various firms in an industry*" [28]. This definition has a more influential focus, which is an important aspect when defining critical success factors.

Many research has been done to determine the success factors in agile projects. SC Misra, V Kumar and U Kumar published a research in 2009 where customer satisfaction, customer collaboration, customer commitment, decision time, corporate culture, control, personal characteristics, societal culture and training and learning were significantly related to success [29]. The limitation with this research is that it was done with software development practices, and therefore cannot be universally applicable to all types of industries and projects.

A second (survey) study of critical success factors in agile projects by Chow, Tsun, and Dac-Buu Cao from 2007 concluded that out of many factors affecting agile projects, the actual number of critical success factors is quite small [30]. Among the most highlighted ones we find that high caliber team, a team environment, a strong customer involvement and a correct delivery strategy. The limitation of that survey was also that it only encounters agile software projects. Both of these researches use survey as data collection method, but unlike the first survey, this survey failed to find supporting evidence of having a strong executive support as a critical factor for success. That is quite contradictory to what the literature states to be fundamental for creating effective teams. According to Susan Wheelan, having support from the organization and the executives is not the only thing that work groups need, but it plays a key factor [31].

A third (empirical) study written by Power, Damien J., Amrik S. Sohal, and Shams-Ur Rahman explores factors differentiating agile companies from less agile organizations [32]. They conclude that the agile companies are more customer focused, and applies different methodologies in order to meet changing customer requirements. They also concluded that the suppliers need to be involved in the process in order to obtain a high level of customer satisfaction. This article is more universal applicable as it is not based on a specific product or industry.

What we can conclude from these researches is that there are many similarities when it comes to critical success factors for agile projects, but there are no universally applicable success factors for *all* agile projects. This is also stated in the definition of Hofer and Scendel's definition that "*The critical success factors usually vary from industry to industry*" [33]. The most universal success factors identified, however, are "culture", "people", "communication" "close interaction with the customer" and "frequent customer feedback" [34]. These five success factors are a result of a workshop that was organized where eighteen agile experts gathered to discuss experiences and knowledge. When combining those success factors with the commonly known "3Cs" in Agile Project Success [35], we get a model that can be illustrated in figure 2:

Figure 2: "3Cs for Agile Project Success". Source:
https://www.slideshare.net/GopinathRamachandran/3cs-for-agile-project-success

As the figure shows, the critical success factors have been reduced to only include three main factors; *collaboration*, *communication* and *customer involvement*. These three success factors include the identified success factors from the workshop session as we can put "people" under "collaboration", and merge "close interaction with the customer" and "frequent customer feedback" to "customer involvement". These three success factors form the baseline for all agile projects, but it is important to remember that they can be broken down into many sub-categories and that variations in the success factors will happen, depending on several issues like the industry and the organizational context. It starts with the vision and the strategies for the organization, and eventually ends up with monitoring the success factors with key performance indicators. The link between these steps can be shown in figure 3:

Figure 3: "Linking vision to critical success factors: Source: www.BSCDesigner.com

As the figure shows, the organization's vision and its strategies is the first starting point in defining your critical success factors. This also needs to have the organization's core values included. This can further be broken down into enterprise goals, and then key activities, which ultimately is your starting point in defining key performance indicators.

2.2.3 Linking success criteria and success factors in Agile projects

Previous research states that "*although there has been significant research on both project success criteria and critical success factors for projects, there has not been a concept defined that can link the two*" [36]. However, an article written by Westerveld had a model called "The Project Excellence Model" attempting to fill this gap [37]. The concept behind the model is to use the findings from all the researches on both success criteria and success factors and link them together. A simplified version of the Project Excellence Model is viewed in figure 4:
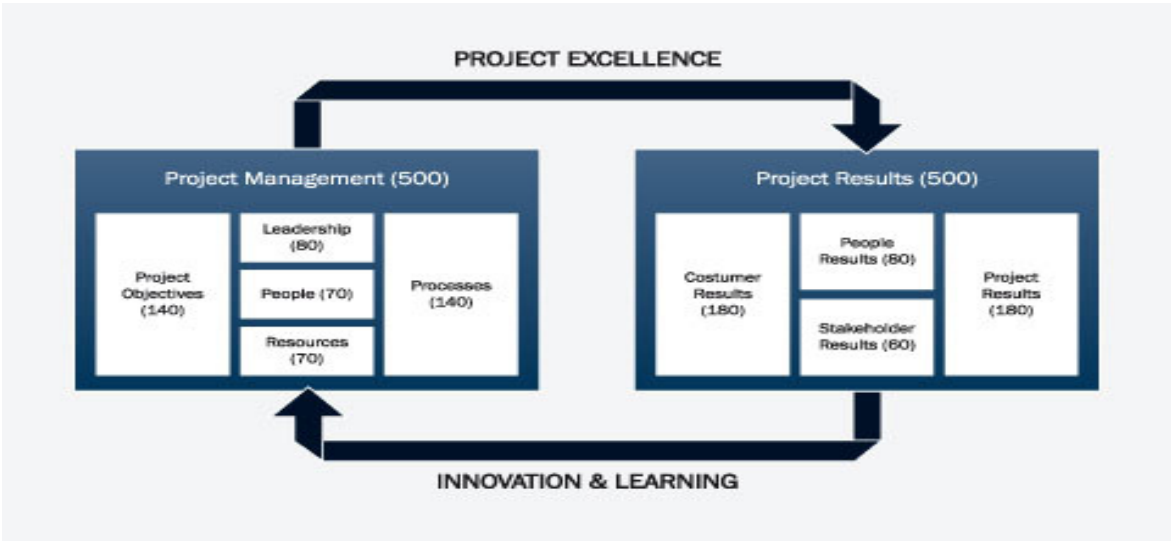
Figure 4: "Project Excellence Model". Source: http://www.projektmanagementhandbuch.de/add-on/project-excellence/

As the model shows, project management is on the left side. That is synonymous with "organization" and represents critical success factors that are directly linked with the project results. An important feature to make notice of is the link between the "Project Results" and "Project Management" called "Innovation and Learning" - this is in line with the previously mentioned definition of critical success factors by Hofer and Schendel stating that the critical success factors are variables which management can influence and are to be changed and tailored based on a learning process from the project results.

By using this model on agile projects, the following can be illustrated in figure 5:
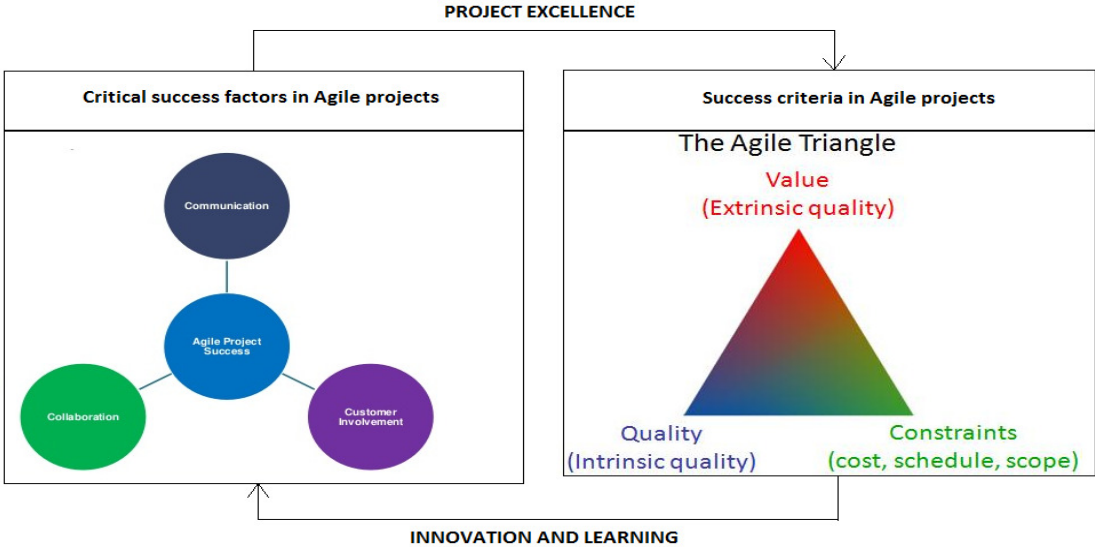
Figure 5: "Project Excellence Model on agile projects". Source: Inspired by the Project Excellence Model

As the figure shows, a linkage between critical success factors and success criteria in agile projects does exist. However, when discussing the linkage, the Project Excellence Model is based on an assumption that the success factors are organizational areas, and success criteria are result areas [38]. It is, therefore, very important to keep in mind that the model is to be used differently depending on the project organization and the project type. This has to do with the fact that it is impossible to standardize on success criteria. The agile triangle shows the constraints that can be used for all agile projects, but it needs to be broken down into more tangible criteria depending on number of issues.

To sum up; when talking about project success, this thesis will assume that universal applicable success factors can be used in agile projects with "collaboration", "communication" and "customer involvement" as starting points. But the impact they have on the success criteria is to be discussed from project to project. That means that the conclusion in this thesis will be based on success factors on a general level, and ultimately the impact on the success criteria in particular to the organization used as example in this thesis.

2.3 Linking self-organized teams to APM

Why are self-organizing teams so important to agile project management? What is the reason why it is one of the 12 principles behind the Agile Manifesto [39] and is centered in the Declaration of Interdependence [40]? To answer this question, one need to look at the key business objectives for agile project management. They are: *continuous innovation, product adaptability, improved time-to-market, people and process adaptability and reliable results* [41]. If looking at teams, in general, research proves they can have a positive contribution in the following areas:

- One of the premises for succeeding with innovative projects [48, 49]

- More productive and proactive [43, 44, 45, 46]

- Increased team effectiveness [42, 43, 45, 46]

- Greater creativity and helping behavior [43, 46]

- Increase the speed and accuracy of problem solving [43, 44, 46]

These team advantages are directly linked with the business objectives and show that teams have a positive contribution to the desired outcome of agile project management. However, a question remains to be answered as to why Highsmith states that building self-organizing teams form the very core of Agile Project Management [47]. Why is it so important that is should be the *main* focus area for an agile project leader?

2.3.1 The people factor

The reason why building self-organizing teams is at the very top of the list in agile project management and form the fundamental principles in the agile project management philosophy is that agile is first, and foremost, for people. It is an attitude and not a specific process, and more environment than methodology. An article written by Cockburn and Highsmith brings up the people factor in agile projects and states that "*agile processes are designed to capitalize on each individual and each team's unique strengths*" [48]. The article emphasizes that agile is for people and that people trump processes. They are, in other words, essential for the success of agile projects. In section 2.2, I stated that the critical success factors for agile projects were *customer involvement*, *communication* and *collaboration*. These factors have, independently, been proven through research to have a positive contribution in the success of agile projects:

- Customer involvement is important in agile projects, and inadequate customer involvement causes adverse problems for agile teams [49]

- The higher the level of complexity, the greater is the need for interactive knowledge sharing via direct communication [50]

- Collaboration is crucial and, if missing, it could affect project success [51]

One thing all these critical success factors and researches have in common is the people factor. They are dependent on having a high performance, self-organized team, that can fulfill these critical success factors and contribute to meet the agile project objectives. There is not a single process in the world that can overcome the human aspect. Cockburn and Highsmith states that "*if the people on the project are good enough, they can use almost any process and accomplish their assignment. If they are not good enough, no process will repair their inadequacy*" [52]. This is why teams, and building self-organized teams, is considered the most important job for a project leader in agile projects – it is the foundation and backbone for the success of the agile methodology.

Ironically, as stated in the background section, this is the part where many agile project leaders fail. They perceive building self-organizing teams as something fuzzy, messy and un-definable. While that holds some truth to it (to be explained in the next section), the real un-definable part is what impact this has on the success of agile projects.

2.4 How to build self-organized teams

When many agile project leaders perceive building self-organizing teams as something fuzzy, messy and undefinable, they are not wrong. It is not an easy thing to do. Self-organized teams are defined as *"individuals who take accountability form managing their own workload, shift among themselves based on need and best fit, and take responsibility for team effectiveness"* [53]. When comparing teams in traditional projects versus agile projects, the difference can be viewed in figure 6:
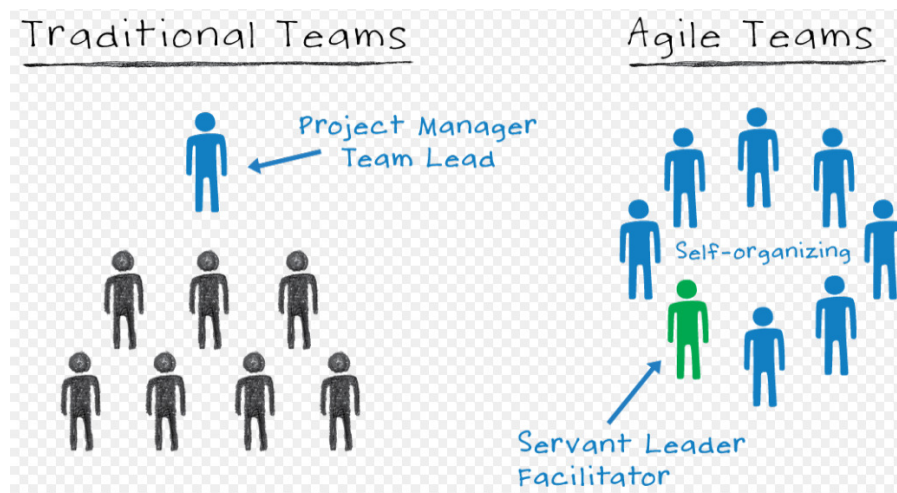
Figure 6: "Traditional projects VS agile projects". Source: http://www.seapine.com/blog/tag/self-organizing-teams/

In traditional projects, there is usually one project manager who is the team leader and who is basically controlling the team and telling them what to do. As for agile teams, however, the team leader can be viewed more as a facilitator than a team leader. This must not be mistaken by a lack of leadership, but more as a style of leadership – the leader's job is to steer the team in the right direction so that they can take a common responsibility for team effectiveness.

2.4.1 Understanding the organizational context

Nils Brede Moe asked the question *"what is required for a team to successfully become self-managing?"* [54]. An important factor he brings up is that one must understand the organizational context surrounding the team as that is a critical determinant of the effectiveness of the team. It is not sufficient to only focus on the team itself without knowing the context in which the team operates in. For instance, the structure of the organization and how the resources are being shared between the departments is a strong contributing factor to defining the requirements for a team to become self-organizing.

Furthermore, Highsmith argues that creating a self-organizing team entails: *"getting the right people, articulating the product vision, encouraging collaboration, insisting on accountability, fostering self-discipline and steering rather than control"* [55]. While these aspects are indisputable, it is important to keep in mind that they are very general, and isolated does not bring much value to an agile project leader trying to create a self-organizing team. A parallel can be drawn to what is being considered as

"critical success factors" that are likely to be seen in highly effective teams – they are the cause of the success of the agile project team. In other words, if you have a high score in the factors that Highsmith brings up, you are likely to have a highly effective, self-organized, team. However, there is no purpose of using Highsmith's factors without including the organizational context in the big picture - the key is to combine these two.

2.4.2 Highly effective teams are not necessarily self–organized teams

Teams, in general, are a very comprehensive field, and many researches and books have been made to identify characteristics of high performance teams and keys to productivity. These findings are all contributing factors to the critical success factors of self-organizing teams in agile projects, but a dangerous pitfall is to assume a direct connection without taking into consideration the organizational context that Nils Brede Moe states to be an important factor. Self-organized teams in agile projects are highly effective teams, but highly effective teams are not necessarily self-organized teams. The difference is the unique characteristics of agile project management and its business objectives (as discussed in section 2.3) that self-organizing teams must reflect. If looking back at the factors Highsmith brings up that self-organizing teams must entail, they mirror the key business objectives for agile project management as illustrated in figure 7:
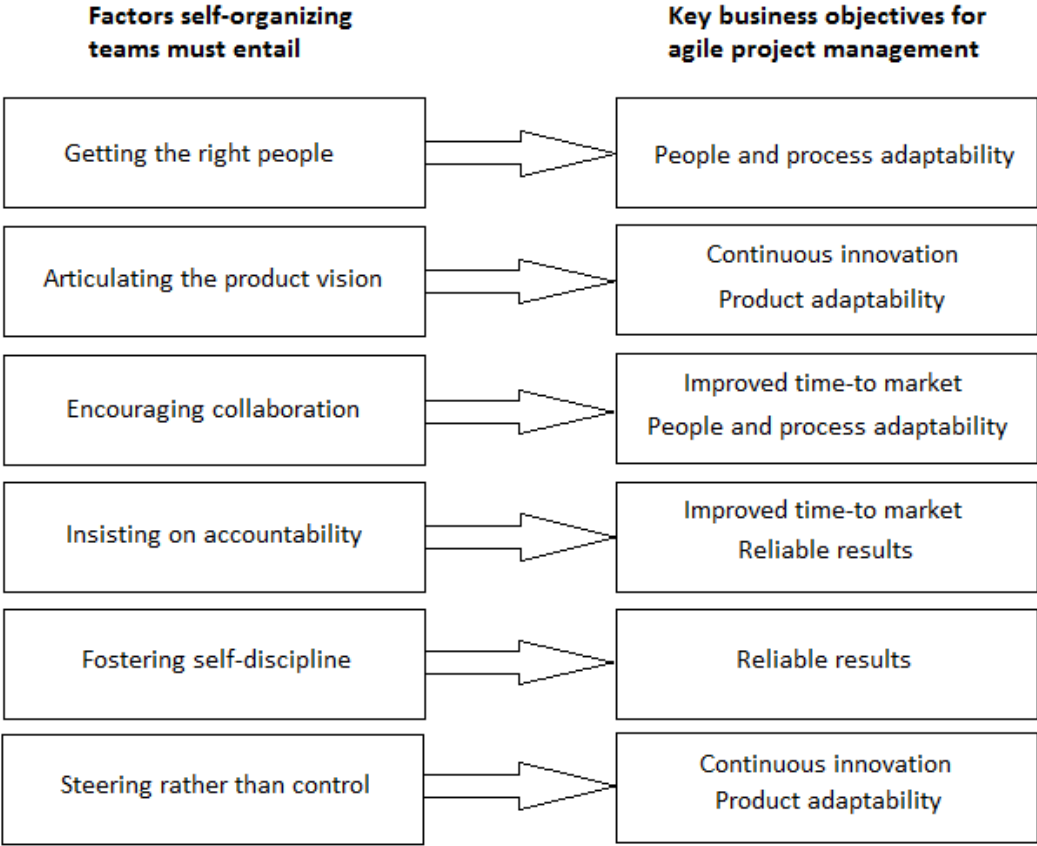
Figure 7: "Self-organizing teams and objectives for agile project management". Source: Inspired by Highsmith, J. (2009) by linking the two factors together

Highly effective teams do not necessarily have the characteristics that is required to meet the key business objectives for agile project management, but self-organized teams in agile projects do. And while the factors of what self-organizing teams must entail are universally applicable, their influence and effect will vary from the industry and the organizational context. This approach is well summarized by Wageman who argues that there are three steps in which a team leader needs to address to build self-organizing teams [56]:

- Knowledge of the design factors that most strongly influence the effectiveness

- The diagnostic to tell which factors are present and which are absent

- Put the missing factors in place

The first one involves knowing the organizational context and the factors that have a strong influence of the critical success factors for a self-organizing team. The second one is to find out which factors the team has, and which factors that are missing. The third one is to address the missing factors in a way that will highlight the failure areas of becoming a self-organizing team to reflect the key business objectives for agile project management. This thesis will be a reflection of this approach as the next section will identify the design factors tailored for the oil and gas industry, and then the method section will identify missing factors as well as putting these factors in place in terms of exploring the effect they have on project execution success.

2.5 Agile Project Management in the oil and gas industry

As the previous sections have discussed Agile Project Management and the importance of self-organizing teams on a general level, this section will address it through an organization within the oil and gas industry to conclude critical success factors, and the design factors for building self-organizing teams. These findings will be used as basis for the survey.

To conclude this, this section started by evaluate the suitability of the agile philosophy in the oil and gas industry, before going into details about the organizational context and how it is set up to facilitate an agile mindset. These two steps are valuable inputs when determining factors for the success in the execution phase as well as important factors for having a well-functioned self-organized team.

Appendix 1 shows the authors evaluation as to why Agile Project Management is suitable in the oil and gas industry, and appendix 2 shows the organizational context in an organization used as example in this thesis within the oil and gas industry.

2.5.1 Critical success factors in the oil and gas industry

The critical success factors are to be defined by first stating the company's vision and core values, then identify project constraints, before eventually being able to define the critical success factor.

Vision and core values

The vision for the organization within the oil and gas industry used as example in this thesis is as follow: "*We will be the undisputed leader in our markets, recognized for setting technical, performance and safety standards in all of our businesses, and for enabling customer success*" [57].

From this vision, there are three goals that can be identified:

-   Setting technical standards (innovation and adaption)

-   Safety (asset integrity)

-   Customer success (value)

These goals are called "enterprise goals", and can be further divided down to "key activities". The relationship between "enterprise goals" and "key activities", can be shown in figure 8:
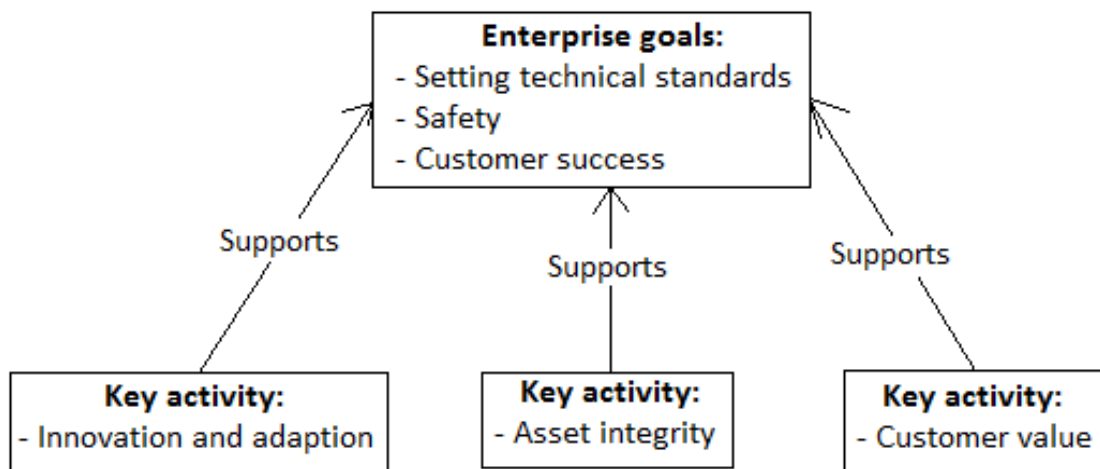
Figure 8: "Enterprise goals and key activities". Source: Inspired by "Performance Management 1" by Erik Perjons from the course Business Intelligence

As the figure shows, the three key activities are supporting goals to the enterprise goals. When including the core values for the organization within the oil and gas industry uses as example for this thesis, there are 7 of them which can be illustrated in figure 9:

Figure 9: "Core Values for an organization within the oil and gas industry".

These can all be linked to the enterprise goals and key activities. Figure 10 shows the correlation:
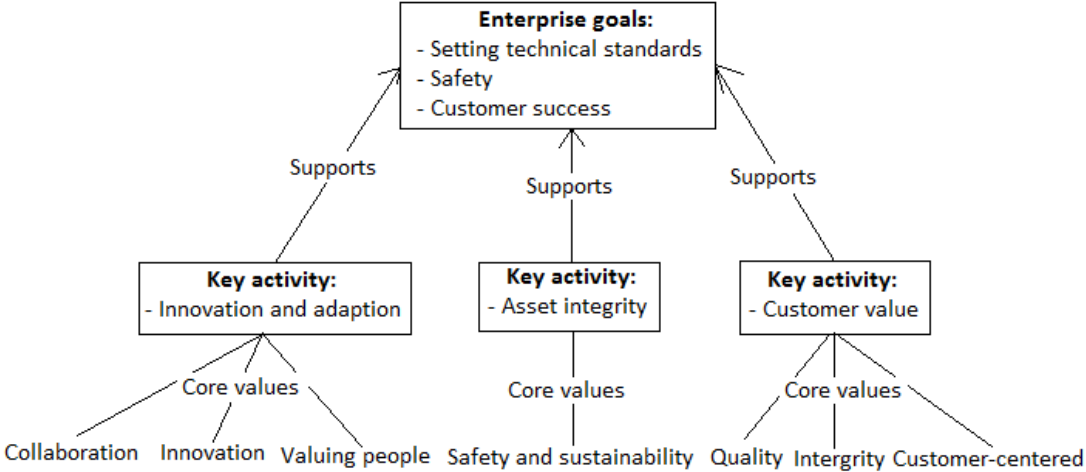
Figure 10: "Linking core values to enterprise goals". Source: Inspired by "Performance Management 1" by Erik Perjons from the course Business Intelligence

When comparing the vision and the core business values to the Agile Project Management philosophy, there is a perfect match with regards to the previously mentioned key values that are important for agile leaders and what distinguishes them from traditional project leaders.

Success criteria and success factors

In the oil and gas industry, it is very common to operate with four success criteria, more commonly known as "SQDC". This is an acronym for "Safety", "Quality", "Delivery" and "Cost" and are performance standards for the success of projects. When comparing these to the previously mentioned "standard" agile triangle (value, quality and constraints), the constraints are basically the same; quality represents both extrinsic quality (customer value) and intrinsic quality (adaption, flexibility and scope). Delivery represents schedule, and cost represents both hardware and hourly cost. Figure 11 shows the correlation between the "normal" agile triangle and the agile triangle for oil and gas organizations:

"Normal" Agile Triangle   *Oil and gas Agile Triangle (SQDC)*
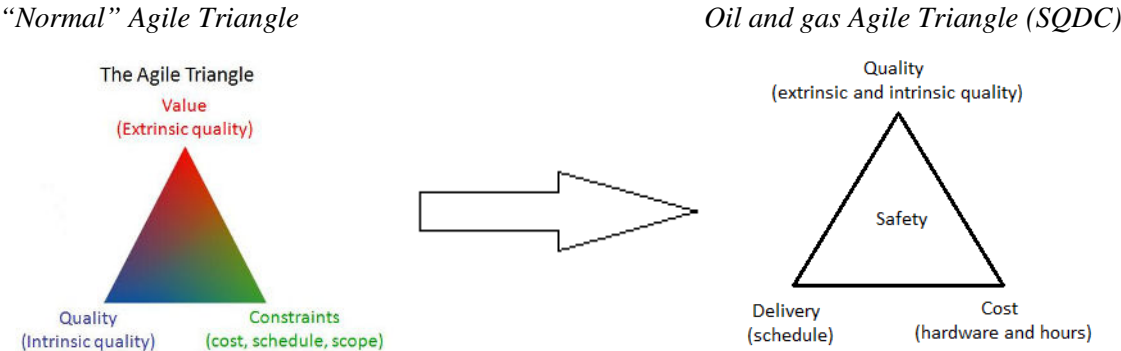
Figure 11: "Oil and gas Agile triangle". Source: Inspired by Agile Performance Measurement"
(Highsmith, J. (2009), page 21)

As the figures show, the only real distinction is the safety and asset integrity aspect, but besides from that, constraints are the same. However, because of the uniqueness of the safety aspect in the oil and gas industry, the critical success factors must be modified. The previous identified universal success factors were "culture", "people", "communication" "close interaction with the customer" and "frequent customer feedback". This was then merged into "communication", "customer involvement" and "collaboration". With the safety aspect included, the critical success factors for the oil and gas industry is illustrated figure 12:
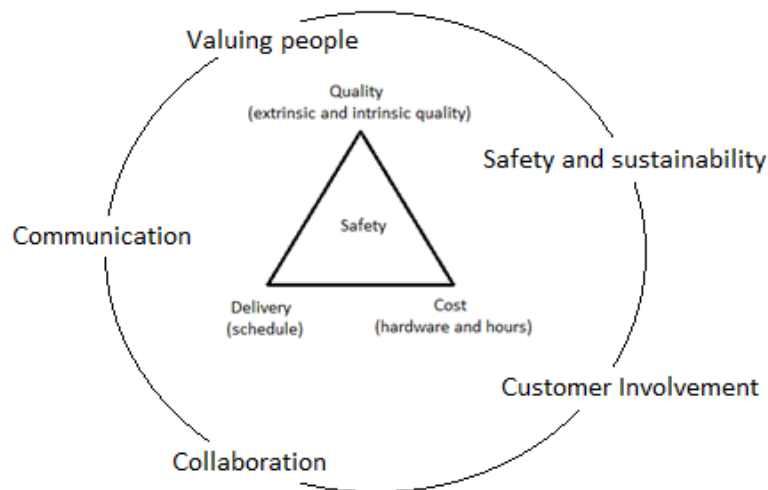
Figure 12: "Critical success factors for the oil and gas industry". Source: Inspired by the Project Excellence Model and the link between success criteria and success factors

As the figure shows, the critical success factors that must be focused on to achieving the success criteria, and maintain the performance standards, are in accordance with the universal success factors for agile projects. The vision and core values for the oil and gas industry have an almost perfect match to the success factors that resulted from the workshop where eighteen agile experts gathered to discuss experiences and knowledge. The only distinction is the added safety aspect and the "valuing people" aspect to be in accordance with the core values for the organization within the oil and gas industry used as example in this thesis. The other core values are either merged into the constraints, or are part of the critical success factors. Everything is linked together.

2.5.2 Key factors for developing self-organizing teams in the oil and gas industry

Nils Brede Moe emphasizes the fact that one must understand the organizational context surrounding the team as this is a critical determinant of the effectiveness of the team [58]. When looking at how the execution phase in the subsea project model is defined (ref appendix 2), we see that there is a need for a good collaboration between the different roles, especially in the "product activities" phase between the engineering and planners and procurement. Another important factor is the need for a close face-to-face interaction and communication between the "pre-project award" phase and the "project execution" phase to have a mutual understanding and agreement about requirements. Due to the process-oriented structure of the execution phase, it is also very important that the team have a clear direction with regards to their objectives in the team as well as an understanding of each other's roles and contribution to the team. Closely related to this is, due to the clear and specific guidelines with regards to engineering hours to be created and hardware purchase orders to be made (especially in the "product activity" phase), it is essential that the team members have the basic material resources needed to perform the necessary steps. That requires authorization to use specific transactions in the planning tool, as well as having their own work space and possibility to book meeting rooms when necessary. Also, when looking at how the teams are organized, with shared resources in the different projects, a necessity for this to work is that the team members have the authority to manage their work

and get regularly feedback about their effectiveness and productivity. Because of the many ongoing projects, there will most likely be scenarios where resource conflicts will occur, so a healthy issue negotiation and resolution to ensure that divergent views are welcomed is critical to have constructive dialogues.

In addition to the key factors identified for delivery teams in the oil and gas industry, there are other key factors such as team goals, team norms and team identity that I would like to include as important factors. Because there are so many different delivery teams in the organizations, it is important that the team members know exactly the goals of the team as opposed to all the other teams and that the goals stretch the performance. Team norms is related to what degree the team members play an active role in seeking to learn from each other and if they encourage experimentation with new ways of operating. This is very important in relation to the "quality" aspect in the oil and gas triangle of constraints to have a customer value focus and not just deliver "in accordance with requirements". Team identity is if the team takes ownership of problems and accepts a joint responsibility for their achievement. This factor is more general, and should be included in all self-organizing teams as this is basically what distinguishes a "team" from a "group".

When linking these key factors for developing self-organizing teams in the delivery teams in the oil and gas industry, with the factors that Highsmith states that self-organizing teams must entail, we get the illustration in figure 13:
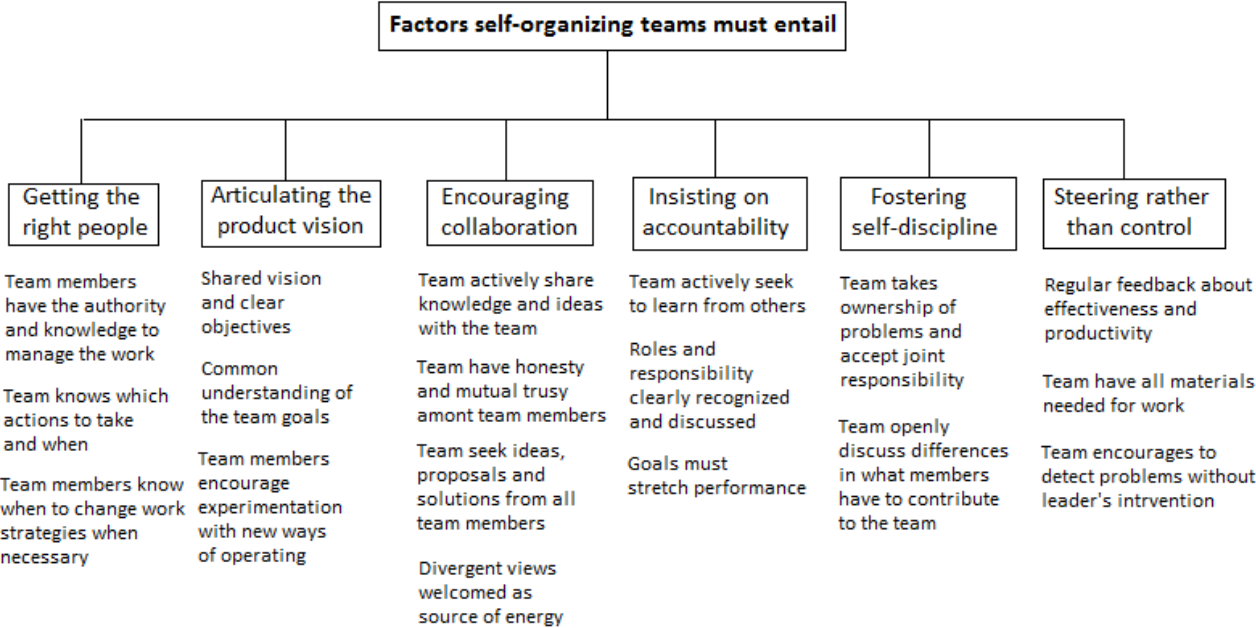
Figure 13: "Factors self-organizing teams must entail in the oil and gas industry". Source: Inspired by Highsmith, J. (2009), page 52

As the figure shows, all the key factors identified in the delivery teams correlate with the factors that Highsmith argues self-organizing teams must entail. As the factors Highsmith lists are universally applicable, the factors supporting them must be tailored to the organization as they are dependent on the structure of the organization and the organizational context surrounding the team in general. So to answer the second sub-question in the research question section of this thesis, which is to find failure areas in the team that makes them inadequate, questions need to be asked directly to the identified key factors for developing self-organizing teams in the delivery team. The development of these questions is in chapter 4 of the thesis.

3 Methodology

This section will include research strategy, research methods and an ethical aspect, and will be divided in the following sections:

- Research strategies

- Data collection methods

- Data analysis methods

- Research ethics

3.1 Research strategies

The research strategy in this thesis is survey. Surveys are described as something that is "viewed comprehensively and in detail" [59]. To attack the aim of this research there is a need for a richer understanding of how the delivery team is functioning, and the main failure areas that makes them inadequate. For that purpose, "real world data" is necessary, and the best way that can be achieved is through the information of the people working in the team. More specifically, the strategy was a mixture of an "empirical research" and "at a specific point in time" strategy, meaning that the research purposefully searched information from relevant people working in the delivery team of how things are right now. This "snapshot" concept is perceived as one of the downsides to using the survey approach as it will give little information on the underlying meaning of the data [60]. However, this thesis circumvented this potential bias by including two independent approaches (qualitative and quantitative) in order to increase the level of reliability of the results. This thesis has a great emphasis in containing all the right questions and asks them in the right way, which is one of the core concepts of succeeding in survey strategies.

Grounded theory was also considered to be used as research strategy in this thesis, and in many ways it could have been a justified approach as it is being increasingly used in agile teams [61]. It is used in the qualitative exploration of data in this thesis to find statements among participants to be applied on a general level, but it was passed on as the main research strategy based on the presumption that there is improvement potential when it comes to having s self-organized team. Grounded theory works best when a research is made without any fixed ideas about the nature of setting that is to be investigated [62]. Besides from that, no other strategies could provide "real world data" as good as surveys in this context. An article by Hoda, Rashina, James Noble, and Stuart Marshall explored the impact of inadequate customer collaboration on self-organizing agile teams used grounded theory [63]. This article is similar to this research in terms of assessing the impact of something inadequate in agile teams, but the use of grounded theory is more justified to that article due to the fact that grounded theory is a suitable approach in areas of research which have not been explored in details before. The area of this thesis is widely known, whereas the relationship between customer collaboration on self-organizing team is more indefinite.

3.1.1 Type of survey

The type of survey is two folded; face to face and postal. This combination of surveys is often referred to as "mixed methods" [64]. The sequence of the order of the survey was qualitative followed by quantitative. In order to comply with the research question of assessing how project success is impacted in agile projects with inadequate self-organized teams, the first step was to get information in terms of interviews from people with special knowledge about the team. Next step was to use that information in a larger scale survey in terms of questions sent by mail. The benefit of having both face to face and postal type of survey is that it allows for more depth to the information that is obtained as well as a large-scale survey to find out the state of the union for the entire team and get a complete picture of the impacted critical success factors.

Looking at comparable articles where team effectiveness is the goal, surveys and interviews are the perceived preferred research strategy [65] [66]. The emphasis of these studies is in-depth information from carefully selected participants who are believed to have special knowledge about the topic. The goals of the articles differ in terms of the industry sector, but they match when it comes to effectiveness of delivery teams – which is transferable to this thesis. One article looked at the association between group potency and performance of groups and teams, and used questionnaires as research strategy (67). This article assumes, however, that the characteristic of group potency is known and it is, therefore, possible to perform a quantitative research without exploring the motives behind group potency in depth. This research needs more in depth information in terms of qualitative analysis before it can be used quantitatively on a larger group of people.

The strength of this thesis in terms of research strategy is the pragmatic approach that the mixed method gives. The strategy of using both qualitative and quantitative research will give a more accurate and comprehensive result to the research question as it will explore in depth as well as finding out failure areas from carefully selected participants from the delivery team based on the in-depth information. The findings from the different methods will be extensively analyzed to reduce the bias of having the two methods not corroborate one another.

3.2 Data collection methods

Based on the survey strategy and the "face to face" and "postal" approaches, the data collection methods will be interviews and questionnaires. These two data collection methods are well linked with the survey strategy.

3.2.1 Instruments for data design

The interview method is one-to-one interviews, and the questionnaires method will be closed questions using the Likert scale.

One-to-one interviews

One-to-one interviews were used on the primary basis of selecting participants with special knowledge about how the team is functioning. One-to-one interviews allow the research to get in-depth information from the respondents. The comparable articles mentioned in the "research strategy" section used respectively "group interviews" and "in-depth interviews" as data collection methods. Group interviews (as well as focus groups) were considered in this research, but because the topic of

the research is sensitive in the way that it will reveal failure areas in the team, the confidence in the participants was easier to achieve by conducting one-to-one sessions where the atmosphere is not affected by other people's opinions. Focus groups also have a negative aspect to it in the sense that it may silence individual voices [68]. This normally happens if the group consists of people with different personalities, combined with a moderator who fails at establishing an open environment. By having one-to-one interviews, this scenario was avoided as the participants were allowed to speak in a "safe" environment without having to worry about other people in the room. One-to-one interviews are described as "a meeting between one researcher and one informant" [69]. The interview approach was a "semi-structured interview", in the sense that it involved "a clear list of issues to be addressed and questions to be answered" [70]. This, however, did not hinder the respondents to speak their mind widely about the topic. For the purpose of the research it was important that the respondents were given the opportunity to elaborate their response to maximize the credibility of the data.

Questionnaires

Closed questionnaires and the Likert scale were then used on the basis of the results of the interview session to see how the failure areas in the team affects the critical factors for success in the project execution phase of the delivery team.

The use of the Likert scale is defined as "*a psychometric response scale primarily used in questionnaires to obtain participant's preferences or degree of agreement with a statement or set of statements*" [71]. The scale used in this research is a 5-point scale ranging from "strongly agree" on one end to "strongly disagree" on the other end. One of the benefits of using the Likert scale is that it is easy to read and complete for the participants, as well as its ability to produce a highly reliable scale [72].

The Likert scale was used on the primary basis that it is easy to work with and also because it gives vital information about the degree of agreement/disagreement with a statement. Other types of questions were also considered such as "agree/disagree with a statement" and "yes/no answers", but these type of questions are not nearly as reliable and does not provide the extremes in the respondent's feedback that is necessary for this research. In a comparable article, where the relation of group potency and perceived organizational support in highly effective teams were analyzed, questionnaires and the Likert scale were also used as an instrument for research method [73]. The article is comparable in terms of knowing what group potency has a positive influence in the effectiveness of teams, and then analyzing its relation to perceived organizational support. The same principle is adaptable to this research as the failure areas has been stated through the one-to-one interview sessions.

3.3 Data analysis methods

Both qualitative and quantitative methods are used in this research; qualitative data analysis is used in the "one-to-one interview" methods, and quantitative for the questionnaire method. The distinction is made on the basis of the treatment of data used in the two methods; the interview session will have words and visual images, and the questionnaire session will be based on numbers.

There are five stages in the data analysis [74]. Table 1 shows the stages used for both methods in this thesis:

	Qualitative data	Quantitative data
Data preparation	- Notes during session to protect data - Data catalogued by giving each question and each participant a code for reference purpose	- Ordinal data with the Likert scale coded from a range of 1-5 (1=strongly agree, 5= strongly disagree)
Initial exploration of the data	- Inductive approach and thematic content analysis to search for patterns within data - Grounded theory to find statements among participants to be applied on a general level	- Obvious trends within the ordinal data were explored
Analysis of the data	- Atlas used as the computer assisted software - Data unitized and fed into the software program - A hierarchy of codes and categories was made to make sense of the data	SPSS used to analyze the data for the following: - Descriptive statistics (mean value and standard deviation) to find key values and obvious trends - Spearman correlation to assess the strength of relationship between questions belonging to the different critical success factors
Presentation and display of the data	- Classification trees - Extracts from interview transcript for supporting arguments	- Stacked columns representing success factors with comments
Validation of the data	- Member validation in terms of carefully selected participants with privileged knowledge and experience of the delivery team - Detailed interview guide to avoid response bias (and therefore false data).	- Non-probability sampling. Respondents carefully selected based on their knowledge and experience of the delivery team

Table 1: "Stages in data analysis". Source: Denscombe, M. (2014), page 247

As the table shows, the two methods differ quite significantly when it comes to data analysis. A few comments to each of the different analysis methods:

For the qualitative approach, there are two fundamental approaches to analyzing data; deductive and inductive [75]. This research has an inductive approach and a thematic content analysis. This approach was selected for the focus it has with regards to reporting patterns within data [76]. "Repeated patterns" is the driving force in the thematic analysis and for this research is it vital to search for patterns within the data to determine common failure areas. This research also includes grounded theory in the qualitative exploration of data to find statements among participants to be applied on a general level [77]. Deductive approach was excluded due to its appropriateness for the unknown with

regards to the study objectives [78]. In this research, the participants were carefully selected because of the knowledge and expertise and the approach was, therefore, discarded.

As for the quantitative approach, ordinal data were used due to its "*assignment to specific categories that stand in clear, ordered relationship*" [79]. When using the Likert scale, the 5-point scale ranging from "strongly agree" on one end to "strongly disagree" on the other end were given codes from 1-5 (1=strongly agree, 5= strongly disagree). This means that the order of the number matters, but not the differences in value. For that reason, ordinal data is appropriate to use. Standard deviation is quite uncommon to use within ordinal data, but when using ordinal data with coded numbers to the Likert scale, it will provide the analysis with good input in terms of trend indication to see to what degree the mean varies from the mean. Spearman correlation was used on questions that belonged to the same critical success factors to assess the significance between the questions.

3.4 Research ethics

According to Denscombe, "*social researchers are expected to approach their task in an ethical manner*" [80].

Because the survey strategy involves one-to-one interviews and questionnaires, both ethics approval and authorization was addressed before any data collection were obtained.

The topic for the one-to-one interviews is quite personal as it involves receiving information from the respondents about failure areas in the team. As for the questionnaires, this is a bit more impersonal as it only involves taking a stand on pre-defined statements. Regardless, full anonymity was granted for both research methods. Respondents were given an informed consent sheet prior to the research with the choice to withdraw from the research at any time. As for the questionnaire survey, the respondents did not sign any consent sheet, but neccessary information was given upfront. Due to the "non-probability sampling", an assurance that the respondents were within the legal age limit for participating in the survey was maintained.

See appendix 3 and 4 for the informed consent sheet for both research methods with neccessary background information.

4 Developing questionnaires

This section will explain how the questions were made. It is divided into two sections; one for the one-to-one interviews and one for the questionnaires.

4.1 One-to-one interviews

The questions for the one-to-one interviews were made on the basis of the key factors identified for developing self-organizing teams in the oil and gas industry. The factors are discussed in section 2.5.4 and are categorized under the factors that Highsmith states that self-organized teams must entail. The factors identified for the oil and gas industry are common factors in self-organizing teams, with an

extra focus on collaboration due to the organizational structure and the need for a close and good communication between the three different phases in the project execution model.

4.1.1 Research input for developing questions

Because the factors identified for the oil and gas industry are so common in self-organizing teams, there are many researches for building self-organized teams. However, three specific sources were used in the development of the one-to-one interview questions as they matched the identified areas of importance for the oil and gas industry in terms of the particular focus on collaboration and communication. The three sources used were "*Critical success factors for creating superb self-managing teams*" [81], "*Six elements for effective teamwork* "[82], and the book "*10 Keys to productivity in high performance teams*" [83]. Table 2 is a selection of the main characteristics from the three sources that were used that are relevant for the oil and gas industry:

Critical Success Factors for Creating Superb Self-Managing Teams	Six elements for effective teamwork	10 Keys to productivity in high performance teams
- Clear direction - A real team task - Team rewards - Basic material resources - Authority to manage the work - Team goals - Strategy norms	- Team identity - Shared vision - Communication - Collaboration and participation - Issue negotiation and resolution - Reflection and self-assessment	- Goals - Roles - Interdependence - Leadership - Communication and feedback - Discussion, decision making and planning - Implementation and evaluation - Norms and individual differences - Structure - Cooperation and conflict management

Table 2: "Main characteristics of sources used in questionnaires"

The questions asked were based on these sources and their approach to achieve effective and high performance teams and tailored to the organization within the oil and gas industry used as example.

4.1.2 Type of questions

An interview guide with an elaboration to the questions was made to ensure that all aspects were covered during the interview sessions. Each interview had a total of 5 opening questions, 2 ending questions and 11 main questions followed by a number of sub-questions to help the respondent answer if necessary. The number of questions are based on the recommended number of main questions used in in-depth interviews, which states that there should be no more than 15 main questions [84].

An interview protocol helped keeping focus on the topic throughout the session and it contributed to creating a comfortable environment, allowing the respondents to speak freely. The interview protocol also helped the interviewer focus on the critical aspects needed for face-to-face interviewing as well as avoiding potential bias and using different asking techniques to get the most out of the respondents. The asking techniques included asking "open-ended" questions as opposed to "closed-ended" questions as well as a frequent use of probes in accordance with the "Interview Question Tips" when conducting in-depth interviews [85]. Coaching techniques developed by the International Coach Federation were also used occasionally to maximize the feedback from the respondents. The different

competencies used varied, depending on the question and the willingness to share information from the individual that was being asked. During the interview sessions, field notes were taken to ensure an appropriate recollection of the interviews. Audio recording was excluded due to the previously mentioned sensitivity aspect in the topic of the research.

Appendix 5 and 6 show the interview guide and the interview protocol. The template and the setup for the interview guide and protocol were based on Carolyn Boyce and Palena Neale's guide for designing and conducting in-depth Interviews [86].

4.2 Questionnaires

The questions for the questionnaires data design were made on the basis of the critical success factors identified for the oil and gas industry, as described in section 2.5.3, and the identified failure areas from the one-to-one interviews, as described in the result section. Note that these questions were made after the one-to-one interviews were completed.

4.2.1 Research input for developing questions

The first step was to make sub-categories for each identified critical success factor. The reason for this is first and foremost to be able to ask more than just one question to each success factor, and also to be able to tailoring each question asked to the failure areas to make more sense. Another reason for making sub-categories is to be able to ask the respondents questions directly related to the critical success factors without revealing which success factor they belong to. This is to avoid potential response bias the respondents might have with the critical success factors. The defined sub-categories for each critical success factor were made with input from relevant research about critical success factors in agile projects in combination with core values and enterprise goals to have them tailored for the oil and gas industry. Three specific sources were used as input for developing the questionnaires: *"Identifying some important success factors in adopting agile software development practices"* [87], *"Critical success factors in agile supply chain management – an empirical study"* [88], and *"A survey study of critical success factors in agile software projects"* [89]. Table 3 is a selection of the main characteristics of critical success factors from the three sources that were used in the development of the sub-categories that are relevant factors for the oil and gas industry:

Identifying some important success factors in adapting agile software development practices	Critical success factors in agile supply chain management – an empirical study	A survey study of critical success factors in agile software projects
- Customer satisfaction - Customer collaboration - Customer commitment - Effective communication - The people factor	- Customer satisfaction - Involvement of suppliers - Customer requirements - Ability to develop new products - Product innovation	- Customer involvement - Team environment - The people factor - Team capability - Organizational environment - Project definition process

Table 3: "Main characteristics used in development of sub-category questions"

In addition to that, the article "*A literature Review of Subsea Asset Integrity Framework for Project Execution Phase*" [90] were used as input to define sub-categories to comply with the safety aspect in the oil and gas industry.

A questionnaire protocol was made with an explanation for the sub-categories. A summary of the categories is shown in figure 14:

Valuing people
- Invest in peope's development
- Encouraging opportunities for growth
- Respecting people
- Embracing diversity
- Value different cultures

Communication
- Open dialogue with other people in the team
- Constructive discussions during project stand-down
- Good and effective sharing of information
- Informal communication among team members
- Face-to-face communication

Collaboration
- Mutual understanding of requirements
- Actively sharing ideas and knowledge with team
- Honesty and trust
- Welcoming divergent views
- Actively seeking ideas and solutions from others

Customer involvement
- Good relationship with customers
- Good collaboration with customers
- Identifying customer requirements
- Customer satisfaction
- Customer commitment

Safety and sustainability
- Design integrity
- Technical integrity
- Operational integrity
- No harm to people
- No harm to environment

Perceived success of agile project executions in the oil and gas industry

Quality
(extrinsic and intrinsic quality)

Safety

Delivery
(schedule)

Cost
(hardware and hours)

- Safety
- Quality
- Delivery
- Cost

Figure 14: "Summary of sub-categories used in questionnaire". Source: Inspired by "The research model" from the article "A survey study of critical success factors in agile software projects"

Appendix 7 show the questionnaire protocol.

4.2.2 Type of questions

The next step was to formulate questions from the failure areas as result from the one-to-one interviews directly to the sub-categories. The failure areas identified from the one-to-one interviews (as shown in the result section) were: *lack of effective communication, unclear goals, unclear roles, lack of feedback,* and *lack of team identity.* For each of the five identified failure areas, two questions were asked to carefully selected sub-category for each critical success factor, making the total number of questions asked 50. For each of the identified failure areas, questions were asked based on information the respondents gave from the one-to-one interviews.

According to Denscombe, there is no hard rule about the number of questions that can be included in the questionnaire as it is dependent on factors such as the complexity of the questions and the nature of the respondents [91]. This is a relatively time-consuming and complex questionnaire survey as it involves the respondents to concentrate hard for each question. A great emphasis was, therefore, put on only asking questions that are absolutely vital for the research, which is why a lot of consideration was put in tailoring all the questions from the interview survey to have them match every sub-category of the success factors the best possible way.

Appendix 8 shows the complete questionnaire survey. Each failure area is visible in the questionnaire survey, but the critical success factors area is hidden to avoid the previously mentioned response bias.

5 Test run of the questionnaires

This section explains how the respondents have been chosen and the results. The section is divided into two sections; one for the one-to-one interviews and one for the questionnaires.

5.1 One-to-one interviews

According to Denscombe, interviews are appropriate to use when access to potential interviewees are granted and that the interviews will not incur prohibitive costs [92]. This section will, therefore, discuss the selection of participants as well as the validity of the data.

5.1.1 Participants/sampling

Non-probability sampling was used as data collection methods. Non-probability sampling is used when it is undesirable to rely on random selection of the sample [93]. The interviews were contingent on having participants with special knowledge about self-organizing teams. A total of 5, carefully selected participants were, therefore, chosen to be part of the survey. The participants were the "single point of contact between the team and the project" and were supposed to have the best knowledge to see the complete picture of how the delivery team is functioning. The carefully selected participants were chosen to not only ensure that the respondents could give relevant and vital information to the research, but also to reduce the bias of not receiving an inadequate response rate. By using a non-probability sampling, with carefully selected participants, a 100% response rate was achieved in the interview session.

All the interviews were completed in silent rooms during normal workhours. There was no cost involved as the participancts did this in their free time at work. The interviews had a duration of approximately 40 minutes for each participant. As the interview transcripts show, all the interviews were conducted with great success. Silent rooms were purposely selected, as opposed to meeting rooms, in an attempt to create an informal atmosphere to encourage the respondents to feel more relaxed and comfortable to speak their mind freely. The interview protocol and the interview guide helped maintaining focus during the sessions and contributed to a level of professionalism needed to perform this type of analysis.

Appendix 9 shows the interview transcripts.

5.1.2 Validity and reliability of responses

According to Denscombe, the validity of the data can both be an advantage and a disadvantage for interviews [94]. The advantage is that the field notes that were taken during the interview session can later be used as checkpoint for accuracy. For instance, the "unclear roles" that the respondents were discussing were checked against the execution phase setup to see if there was a legitimate reason to think that "unclear roles" has a significant impact on the key factors for developing self-organizing teams in the oil and gas industry. The disadvantage with validity of the data is that interviews are based on what people say, and not necessarily what people do. As previously mentioned, both an interview protocol and an interview guide were made prior to the interview sessions took place to help keeping focus on the topic and also to use necessary coaching techniques with the intention to get "real" facts from the respondents.

When it comes to the reliability of the data, participants were carefully selected based on their knowledge with self-organizing teams. It is believed that the same conclusions would have been drawn from the analysis with other participants with the same role. However, small variations are likely to occur with other agile teams, depending on the size, industry and organizational context.

5.2 Questionnaires

According to Denscombe, the success of a research questionnaire depends on three things; response rate, completion rate and validity of responses [95].

5.2.1 Response rate

As for the questionnaire sample, a representative sample of 30 respondents in the non-probability sampling was used. Again, the respondents were carefully selected based on their knowledge and experience of the delivery team. A 100% response rate was achieved, but not all the original intended respondents were able to participate, so an additional 9 respondents who used to be part of the delivery team were chosen to complete the survey. It was not an optimal solution to select participants who were no longer part of the delivery team, but because they had all previously worked in the delivery team and knew the processes, it was good enough for this survey. The sample size of 30 respondents were chosen because it is a representative number of respondents based on the total number of people working in the delivery team, and it is also the lowest number that Denscombe recommends to be used in a smaller-scale survey using non-probability sampling [96]. The number of participants was based on a pragmatic approach, meaning that they were selected on the basis of "*what works well enough within given resources*" [97]. For future research, a statistical approach is recommended, but for this research the number or respondents is sufficiently accurate for the purpose of the research.

5.2.2 Completion rate

All the questionnaires from the participants were fully completed.

5.2.3 Validity and reliability of responses

Two measures were taken to increase the validity of responses; 1) measure to increase the accuracy of the survey, and 2) measure to increase the honesty (and quality) of the respondents.

1) Obvious trends within ordinal data with relevant descriptive statistics from SPSS was used to strengthen the accuracy of the survey. Spearman correlation was used to assess the strength of

relationship between the sub-questions to see the participant's responses to similar questions. Standard deviation was used to identify how much the mean varied from the mean, exploring how the respondents are in agreement with each other or not.

2) As this surevey is relatively complex and time-consuming for the respondents, a lottery reward was announced to the selected respondents with the intention to increase the quality of the responses. Also, neccessary instructions (in addition to the informed consent sheet) were given in the e-mail that was sent to the respondents (as well as orally explained to some) with examples of how to address each question. The reason for providing additional instructions is that some of the questions, like the questions belonging to the "team identity" category needed more elaboration due to the fact that it was not clear to everyone the meaning of it in this context.

Because these two measures were taken, the validity of the survey was perceived to be strong. When it comes to the reliability, and whether the survey would produce the same results if it had been done on different occasions, the answer is no. The key to the level of accuracy achieved in this survey was planning, preparation and many team members who were willingly open to acquire necessary background information about the purpose of the thesis to make it as good as possible. If the same questionnaire was to be performed on a different team, the same level of measurements to maintain the level of validity would be necessary.

6 Results

This section describes the study findings and is divided in two separate sections: one for the qualitative data (one-to-one interviews) and one for the quantitative data (questionnaires).

6.1 Qualitative data

Five failure areas were identified from the qualitative data analysis method. They were *lack of effective communication, unclear goals, unclear roles, lack of feedback,* and *lack of team identity.* Below are figures 15-19 with classification trees for each of the failure areas with relevant quotations and subthemes, leading up to the five main themes. The structure of the findings with the usage of classification trees, and the path to conclusions by using subthemes, is inspired by a research done on thematic analysis in psychology by Virginia Braun and Victoria Clarke [98]. Below the classification three is a brief summary of the findings with relevant literature input.

Appendix 10 shows the codes identified from Atlas (with quotations), and appendix 11 shows the themes that were searched for by collating the codes identified from Atlas into own defined subthemes. Each quotation belonging to the different subthemes were given a unique color to distinguish them in a sensible order.

Figure 15: Failure area 1 - Lack of effective communication

Lack of effective communication

Non-constructive arguments

Q8/P3:
"Not a strong team identity for the team as a whole"

Q8/P5:
"Communication only happens when there is a strong need for it in the sense that a problem has occurred. There is never a proactive approach to sharing knowledge and ideas around the team"

Q9/P4:
"Some people have very strong personalities with too much pride to seek ideas, proposals and solutions from the rest of the team members and they only get involved when real problems occur"

Q9/P3:
"On a day-to-day basis, the collaboration and participation is not visible and constructive"

Divergent views not welcomed

Q6/P1:
"Lack of discussing differences and encouraging each other in experimenting with new ways of operating"

Q6/P2:
"The team as a whole is not encouraged to consult with each other, and that is causing people to keep the knowledge to themselves"

Q9/P2:
"The team fails when it comes to seeking ideas, proposals and solution from other team members"

Q8/P4:
"In total, very few people are actively open to share information with each other"

Q6/P3:
"Many people are information to themselves, which hinders open and constructive discussions"

Q6/P4:
"About 90% of the team members do not take initiative to encourage each other to detect problems without the leader's intervention. A lot of "babysitting" is required"

Source: Inspired by the usage of thematic map and classification trees as described by Braun and Clarke Braun, ref appendix 98.

"Lack of effective communication" is a result of the subthemes "non-constructive arguments" and "divergent views not welcomed". These themes originate from the questions that were asked on the basis of "six elements for effective teamwork"[99] and "10 Keys to productivity in high performance teams" [100]. As the quotations and the subthemes show, the team is not performing well, which ultimately leads to the "lack of effective communication" theme. At the moment, the team is in a combination of level 0 and 1 according to "progress towards best practice", meaning that the members are very protective of their own knowledge and only share with others when there is an absolute need for it [101]. The team is failing miserably when it comes to giving constructive feedback in the intent to improve individual development as well as welcoming divergent views by listening to ideas and suggestions that differ from their own perception. An interesting observation made during the interviews was the fact that the team (due to the distance between the members) often rely on computer-mediated communication instead of face-to-face communication. Studies prove that this type of communication has a negative effect on group performance and it is believed to be more effective when using face-to-face communication [102].
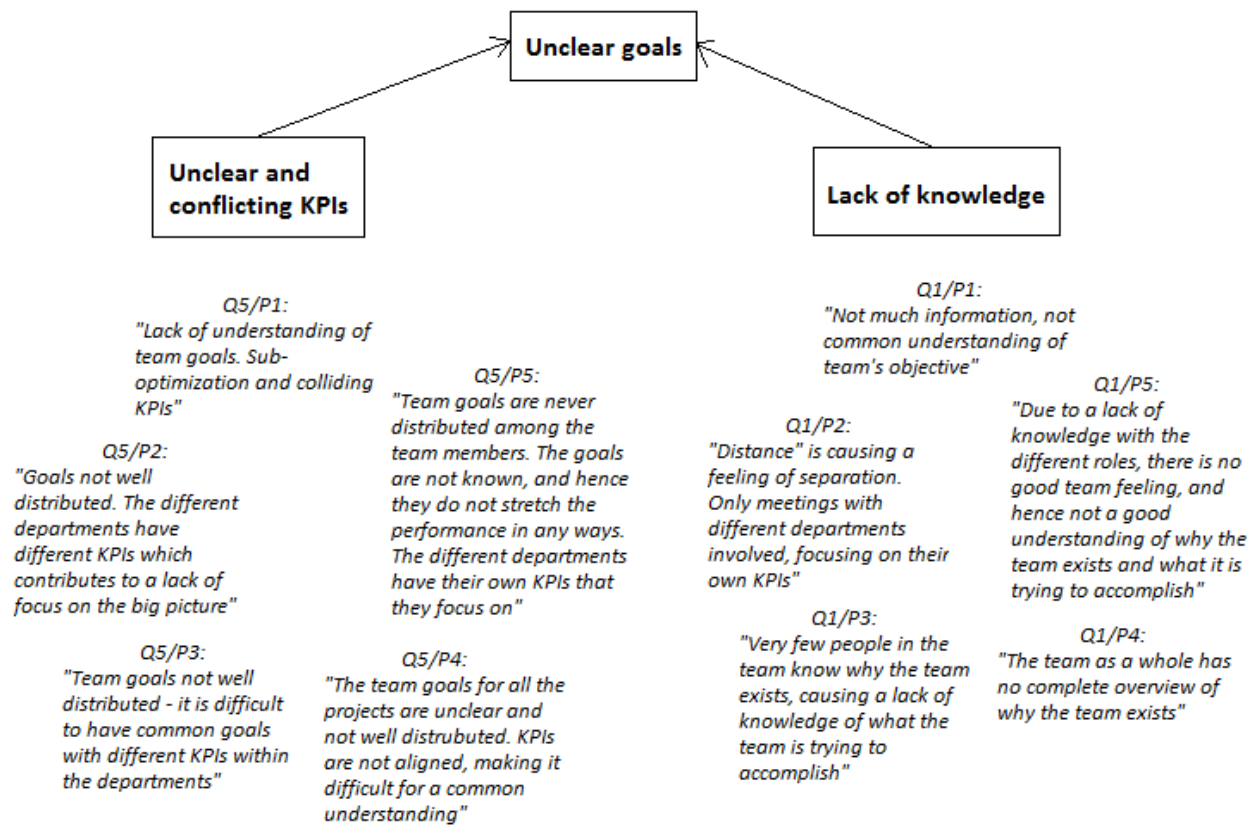
Figure 16: Failure area 2 - Unclear goals

Source: Inspired by the usage of thematic map and classification trees as described by Braun and Clarke Braun, ref appendix 98.

"Unclear goals" is a result of the subthemes "Unclear and conflicting KPIs" and "Lack of knowledge". These themes originate from the questions that were asked on the basis of all the research used when defining the main questions for the interviews as described in the interview guide. During the interview sessions, all the respondents mentioned KPIs as a hinder in their daily work as opposed to a driving motivator. For two of the respondents, it was also mentioned that some of the KPIs are in direct conflict with each other, resulting in a sub-optimization scenario, meaning that the system allows for a coordination between the departments that does not serve the best possible outcome for the team as a whole. An example of this is that the MRP department has their own "on-time" measurement for requisitions made in accordance with the defined lead time in SAP. This requisition (with specified delivery date) is then automatically transferred to procurement regardless of when the need date for the delivery team is. A likely scenario is, therefore, that the MRP department has a perfect score whereas the delivery team as a whole suffers because the actual need date is not taken into consideration. The rest of the respondents did not mention KPIs as conflicting indicators, but they all emphasized the overwhelming focus the department KPIs have, causing a lack of focus on the big picture. Studies prove that superb teams have a very clear sense of why the team exists an what it is trying to accomplish and that the goals are congruent with the organization's objectives [103]. At the moment, the team is in level 0 according to "progress towards best practice", meaning that the members "lack a common vision and clear objectives" [104].
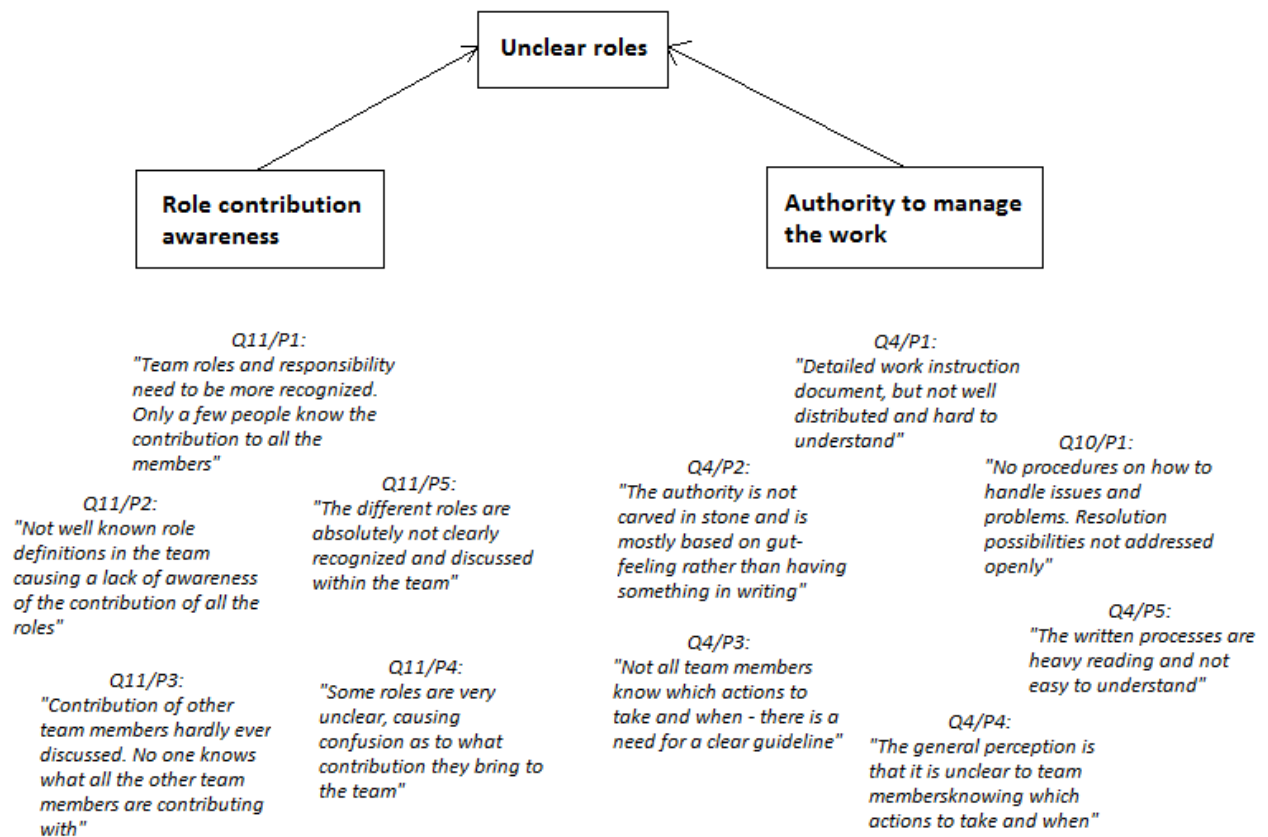
Figure 17: Failure area 3 - Unclear roles

Source: Inspired by the usage of thematic map and classification trees as described by Braun and Clarke Braun, ref appendix 98.

"Unclear roles" is a result of the subthemes "Role contribution awareness" and "Authority to manage the work". These themes originate from the questions that were asked on the basis of "Critical success factors for creating superb self-managing teams" [105], and "10 Keys to productivity in high performance teams" [106]. During the interview sessions, all the respondents agreed that the different roles in the team are not clearly defined with a lack of awareness to the contribution to the team members. The respondents also agreed that their own work instructions are very unclear with no adequate work instruction or guideline written down about which actions to take and when. These two subthemes, therefore, resulted in the main theme that there are very unclear roles in the team. Study proves that in order to accomplish tasks in a group, it is crucial for the team members to be clear about the role he or she is being asked to play [107]. Having clear roles and assignments also require that other group members agree of the different roles and assignments [108]. At the moment, the team is in level 0 and 1, according to "progress towards best practice" [109]. This means that the team "acknowledge that its members have several roles and responsibilities, but they are not reviewed. Very little effort is placed on how the team work together.

Figure 18: Failure area 4 - Lack of feedback

Source: Inspired by the usage of thematic map and classification trees as described by Braun and Clarke Braun, ref appendix 98.

"Lack of feedback" is a result of the subthemes "Team rewards" and "Effectiveness and productivity". These themes originate from the questions that were asked on the basis of "Critical success factors for creating superb self-managing teams" [110], and "10 Keys to productivity in high performance teams" [111]. During the interview sessions, there was a general agreement that no team rewards were given to the team as a complete unit, and no feedback were given with regards to the effectiveness and productivity or the team. Instead, the rewards and feedback were given sporadically and mixed, meaning that every now and then some individuals would get feedback about the effectiveness and productivity that supported the team, and sometimes rewards were given to the team as a whole but distributed differently by team members themselves. One positive measure is an initiative started where the whole team is gathered once a week for a "state of the union" from the persons responsible for running the projects. Study proves that the use of "mixed rewards" is one of the most common error in the reward system design and they undermine the team's ability to operate as an effective unit. It is also associated with the lowest team performance [112]. On the contrary, high performance teams get regular feedback about their effectiveness and productivity. Members of high performance teams also contribute to give each other constructive feedback about individual performance and contribution, which help promote improvement and individual development. At the moment, the team suffers greatly from the lack of feedback.
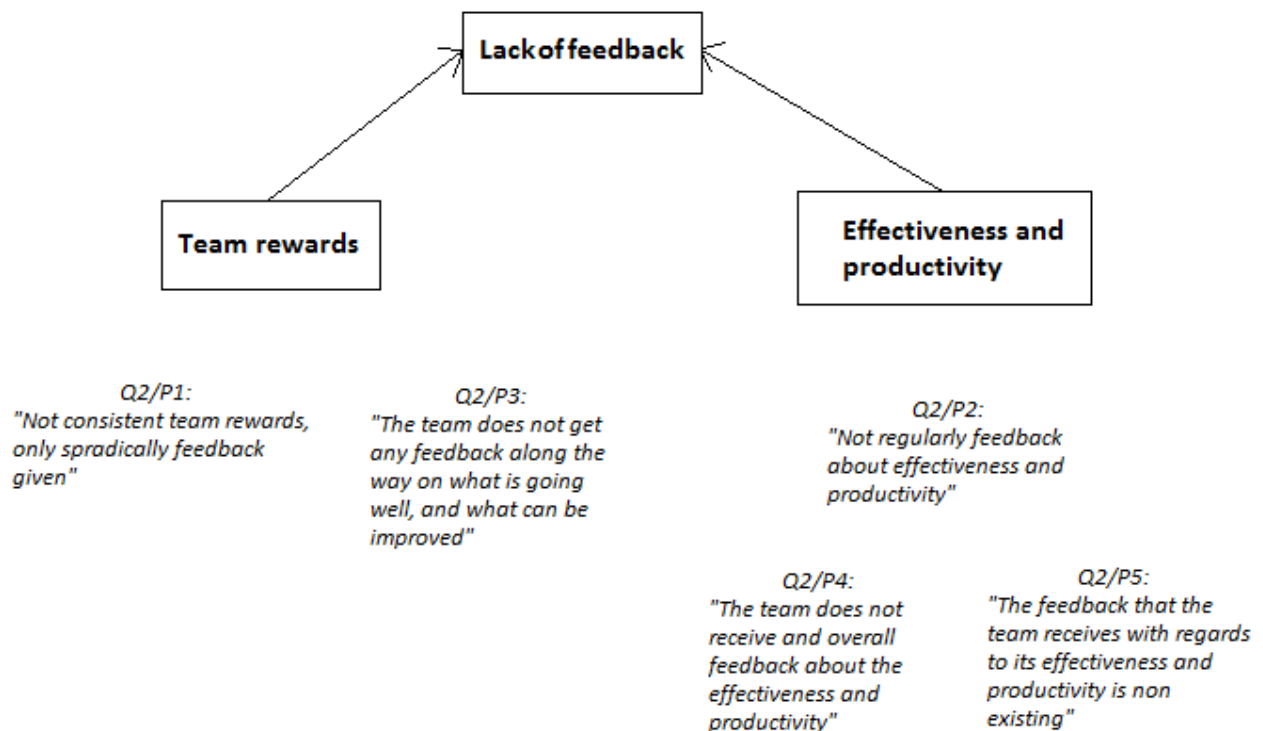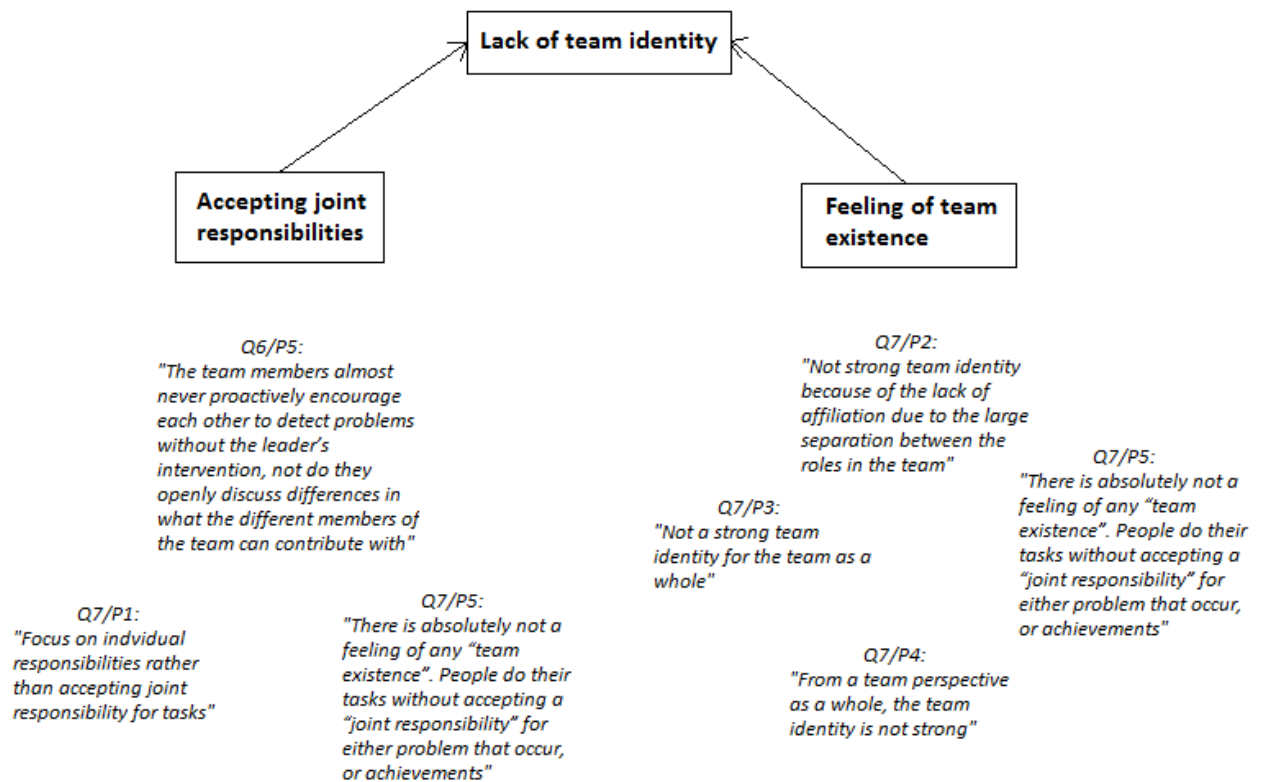
Figure 19: Failure area 5 - Lack of team identity

Source: Inspired by the usage of thematic map and classification trees as described by Braun and Clarke Braun, ref appendix 98

"Lack of team identity" is a result of the subthemes "Accepting joint responsibilities" and "Feeling of team existence". These themes originate from the questions that were asked on the basis of all the research used when defining the main questions for the interviews as described in the interview guide. The term "team identity" is a term used to describe to what extent the team feels like they are working in a team and if they accept and acknowledge the fact that they have a joint responsibility to take ownership for the team's achievement. During the interview sessions there was a unanimous agreement that the team does not accept joint responsibilities, nor is there a feeling of team existence. These two subthemes resulted in the main theme that the team lacks team identity. Study proves that having a solid team identity is very important for an effective team [113]. The superb teams proactively experiment with new ways of working more effectively and seek advice from others. They not only solve problems without waiting for directions, but they also discuss differences in what each member has to contribute to the work. At the moment, the team is in level 0 and 1 according to "progress towards best practice", meaning that the team take limited interest in issues that lie outside their own responsibility and they are, in general, only concerned with their own responsibilities [114].

6.1.1 Summary of the qualitative analysis

The main themes identified from this this survey are normal failure areas in agile projects and contributing reasons to why some agile teams fail. Most research done on common "failures" in agile teams are using Scrum as example, but agile teams can be used in many forms. Using Scrum as an example, however, is not necessarily a bad thing as the scrum team methodology is quite adaptable to agile teams in general. One of many theories out there trying to find common failure areas in Agile teams is an article written by Krishna Sagar, who is a program manager at Microsoft [115]. As far as "immature/weak teams" in the article is concerned, all the identified failure areas in the oil and gas industry are recognized in the common failure areas. Small variations will always occur based on the previously mentioned size, industry and organizational context surrounding the team.

6.2 Quantitative data

The result section of the quantitative data analysis shows the impact each identified failure area has on the critical success factors. The numbers (1-5) on the Y axis in the bar charts below represent the defined values from the Likert scale questionnaires from strongly agreeing (1) to strongly disagreeing (5). The numbers written in the stacked columns represent the average mean value identified by SPSS for each of the sub-questions belonging to the success factors. Given the defined Likert scale values in the questionnaire survey, it means that the lower the score, the more the respondents agree that it has a negative impact on the success factors. Normally, bar charts read the higher the better, but because the interesting data is the negative impact, the values are coded in a way that reflects the lower the worse. Any score less than 2 is believed to have a significantly negative impact on the critical success factors as this would indicate an average score of "agreeing" or stronger made by the respondents to the statements. The conclusion of the scores is based on obvious trends within ordinal data with relevant descriptive statistics from SPSS used to strengthen the validity of the data. The Spearman correlation is used on the sub-questions for each success factor to see if there is a significant relationship between the respondent's response for these two questions. If the two questions are not well correlated it might indicate that one of the two sub-questions are not perceived by the respondents to be a relevant question asked to the success factor. Ideally, all the sub-questions for each success factor should be significantly correlated as they are meant to be asked about the same success factor. The correlation is significant at the 0,05 level. A brief summary of the findings is described below each figure.

Appendix 12 shows descriptive statistics from SPSS with mean value and standard deviation of the respondents, and appendix 13 shows Spearman's correlation between question belonging to the different critical success factors.

Figure 20: Respondents feedback to how "lack of effective communication" in the team is impacting the critical success factors. The lower the score, the more the respondents agree that it has a negative impact on the success factors.

"Lack of effective communication" has a very strong negative impact on "communication" and "collaboration". Of all the 30 respondents, they all either "agree" or "strongly agree" on all the sub-questions asked for those two success factors, with the exception of question 3 and 6, where a total of 4 respondents had a neutral opinion. A relatively low standard deviation is identified for these questions, indicating that the respondents are in agreement with each other. The sub-questions to both "communication" and "collaboration" are also significantly correlated with each other. "Communication" is higher correlated than "collaboration", but this is probably a result of the close connection between the failure area (lack of communication) and the critical success factor (communication).

Figure 21: Unclear goals

Figure 21: Respondents feedback to how "Unclear goals in the team is impacting the critical success factors. The lower the score, the more the respondents agree that it has a negative impact on the success factors.

"Unclear goals" has a very strong negative impact on "collaboration". Of all the 30 respondents, only one disagreed on one of the sub-questions asked for this success factor. That resulted in a slightly higher standard deviation than most of the questions, but when looking at the frequency numbers for question 16 where this "disagree" response occurred, 60% of the respondents still strongly agrees that this statement has a negative impact on collaboration. And when including the "agree" response, they account for more than 86% of the total responses. All in all, it is fair to say that the respondents are in agreement with this success factor. The sub questions for "collaboration" also has the highest correlation of all the sub-questions at the 0,004 level.

Figure 22: Unclear roles

Figure 22: Respondents feedback to how "Unclear roles" in the team is impacting the critical success factors. The lower the score, the more the respondents agree that it has a negative impact on the success factors.

"Unclear roles" has a very strong negative impact on "communication and "collaboration". The standard deviations for the four questions belonging to these success factors are relatively low, which indicates an agreement among the respondents. For question 24 and 25, all the respondents either agreed (16,7%) or strongly agreed (83,3%) with the statements, and for question 23 and 26 only one respondent had a neutral response to one statement for each question. The sub-questions for "communication" is significantly correlated, but "collaboration" is not significantly correlated with a value of 0,090. This could potentially indicate that one of the two sub-questions are wrongly stated or that the respondents misunderstood the meaning of it. However, when looking more closely at the responses, the only variation is between "strongly agreeing" and "agreeing", with only one exception where one of the respondents gave a "neutral" response. With that in mind, a conclusion is made that both two success factors are negatively impacted, with "communication" having the highest negative impact of all the success factors in the survey.

Figure 23: Lack of feedback
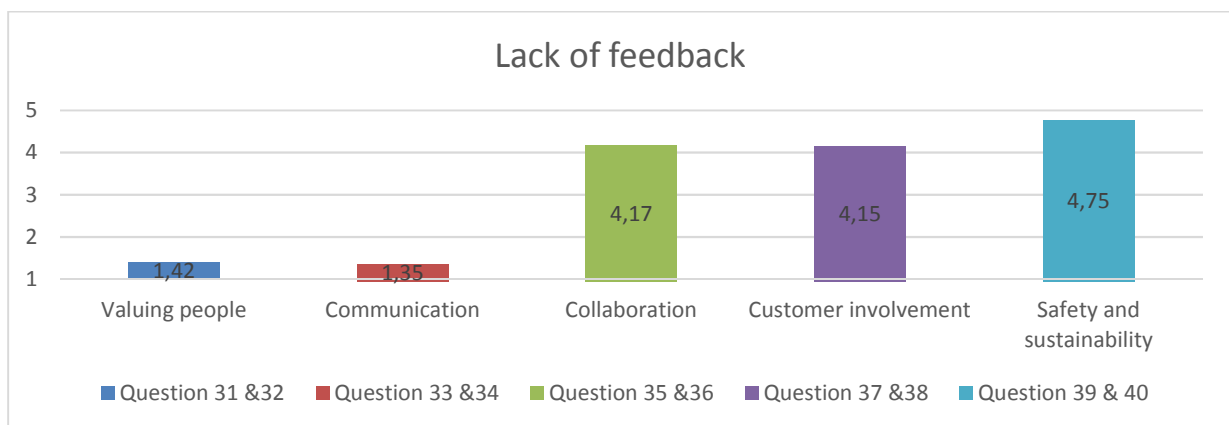
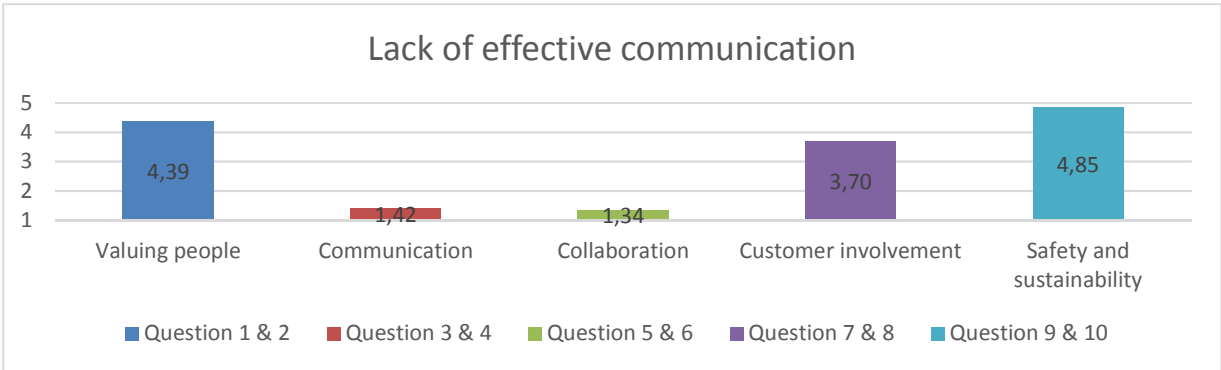*Figure 23: Respondents feedback to how "lack of feedback" in the team is impacting the critical success factors. The lower the score, the more the respondents agree that it has a negative impact on the success factors.*

"Lack of feedback" has a very strong negative impact on "valuing people" and "communication". "Valuing people" is the success factor with score less than 2 with the highest number of "neutral" responses, which results in a higher standard deviation. However, 70% of the responses has "strongly agree" as the response, which makes the overall value of the respondents strongly agreeing to the statements. Both of the sub-questions for each success factor are significantly correlated, which means that there is a very good relationship between the sub-questions. A high standard deviation will in many cases indicate less correlation, but when having a closer look at the responses, one can see that the same respondent (respondent 17) gave a "neutral" value on both question 31 and 32, which contributes to a stronger correlation after all, and adding more reliability to the data.

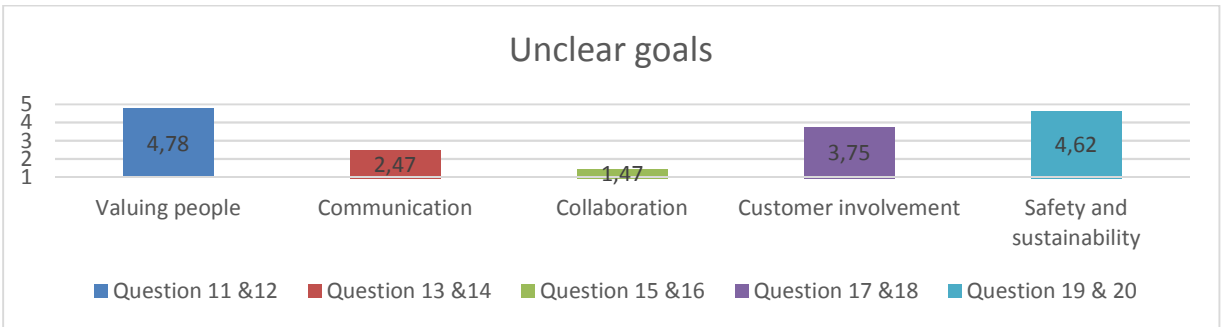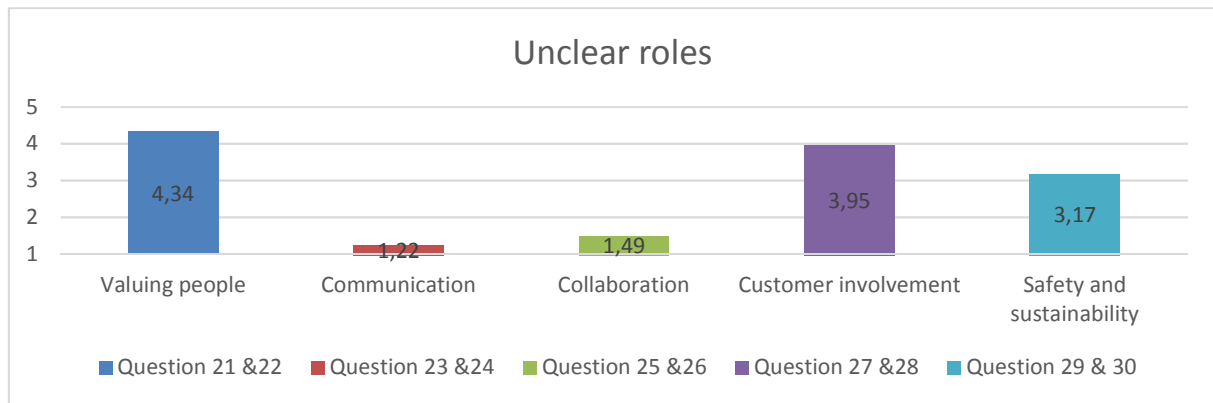*Figure 24: Lack of team identity*
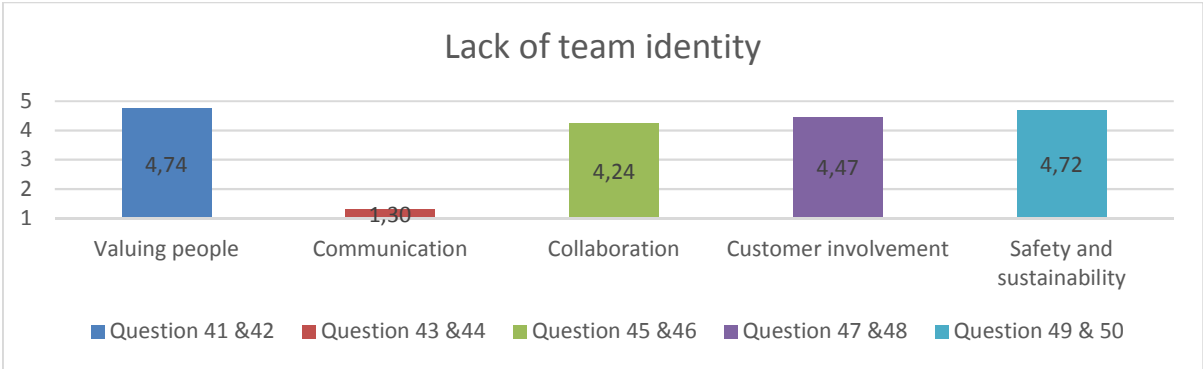
Figure 24: Respondents feedback to how "lack of team identity" in the team is impacting the critical success factors. The lower the score, the more the respondents agree that it has a negative impact on the success factors.

"Lack of team identity" has a very strong negative impact on "communication". Only two of the respondents answered "neutral" on both of the sub-questions combined, making the standard deviation relatively low, but not as low as the "unclear roles" failure area as 33% of the respondents for question 43 gave the value "agree" as opposed to the rest of the respondents who gave the value "strongly agree". As for question 44, a total of 80% of the respondents gave the value "strongly agree" to the statements, contributing to a an overall very solid agreement among the respondents that "lack of team identity" contributes negatively to "communication" as a critical success factor. Both of the sub-questions for this success factor are also significantly correlated.

6.2.1 Summary of the quantitative analysis

An assumed prerequisite for determining which factors are negatively impacted by the failure areas are the factors receiving a total score less than 2 from the two sub-questions related to each success factor. That indicates that the respondents are either agreeing to the statements, or moving towards stronger agreeing, depending on how low the numbers are. Various analyzes were also used to strengthen the validation of the data. All the factors having a negative impact for each of the failure areas are easily noticeable, and most of them stand out significantly from the other factors except for "communication" for the "unclear goals" category. Many respondents agreed to the statements for this success factor, but as over half of the respondents had a "neutral" response to both of the sub-questions, it was not an obvious trend within the ordinal data to conclude this to have a negative impact. In total, there were only three success factors affected by the failure areas: *Communication, Collaboration* and *Valuing people.*

6.3 Summary of both analyses

When summarizing the two analyses, the findings can be summarized in figure 25:
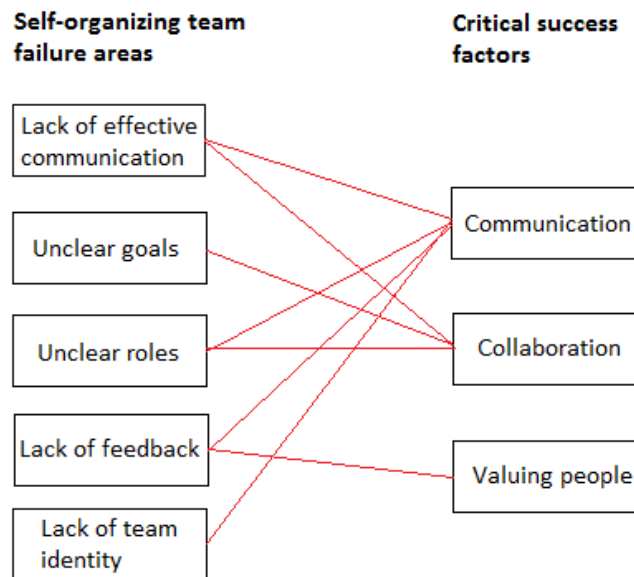
Figure 25:"Summary of both analysis"

As the figure shows:

- "Lack of effective communication" has a negative impact on "communication and collaboration

- "Unclear goals" has a negative impact on "collaboration"

- "Unclear roles" has a negative impact on "communication" and "collaboration"

- "Lack of feedback" has a negative impact on "communication" and "valuing people"

- "Lack of team identity" has a negative impact on "communication

"Communication" is the critical success factor that is mostly affected by having inadequate self-organizing teams, followed by "collaboration" and "valuing people". "Customer involvement" and "safety and sustainability" were not significantly impacted by the team's failure areas. The fact that "safety and sustainability" was not impacted was not that surprising because there are so many waterproof processes defined to secure their asset integrity (as explained in appendix 1). "Customer involvement" was also expected to have no significant impact because any involvement with the customer happens on an individual basis by the team members, and not by the team as a group. "Lack of effective communication" was the failure area that had the most negatively impact on "customer involvement", but it was far off from being significant. All in all, the outcome of the results was in line with what was expected.

6.3.1 Linking research to the result findings

The result section shows the impact inadequate self-organizing teams have on success factors. The success factors are generally applicable for agile projects. However, as stated in section 2, the impact they have on the success criteria must be discussed from project to project as it is impossible to standardize on success criteria. The Project Excellence Model distinguishes between six result areas that are covering all the success criteria [116]. Because the oil and gas industry are commonly operating with the four success criteria "SQDC" (as described in section 2), they belong in the "Project results" category of the Project Excellence Model. The linkage between the success factors and the success criteria must, therefore, be addressed from a project result perspective. The project result perspective must not be confused with the "*so-called golden triangle of time, budget and required quality*" [117], because the SQDC reflects the agile triangle and has the agile trademarks incorporated.

Appendix 14 has the relevant research linking the success factors to the specific success criteria for the organization within the oil and gas industry used as example (SQDC = Safety, Quality, Delivery and Cost). This will be summarized in the next section.

7 Conclusion and discussions

This section will conclude the research questions and discuss the thesis in terms of originality and significance, future research and final words.

7.1 Conclusions

The goal of this thesis was to answer the following main question:

"*How are inadequate self-organized teams impacting the success of agile projects"?*

To answer this, the thesis needed to identify the following:

- What are the failure areas for teams that makes them inadequate of being self-organized?

- How does the identified failure areas impact the critical success factors?

This thesis used qualitative analysis to identify the failure areas for self-organized teams that makes them inadequate, and quantitative analysis to see the impact on the critical success factors. The findings can be summarized in figure 26:
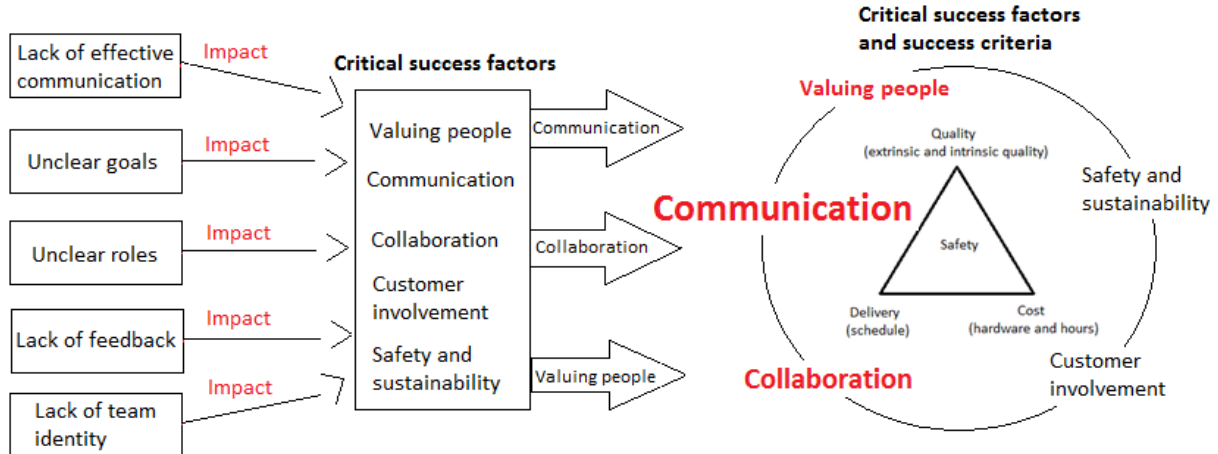
Figure 26: "Inadequate self-organizing teams impact on Agile project success"

*The impacted success factors are highlighted in red. Communication is the success factor that is most negatively impacted as it has a negative impact by 4 team failure areas, followed by collaboration (impacted by 3 team failure areas), and valuing people (impacted by 1 team failure area).

As the figure shows:

- 5 identified failure areas were identified that makes them inadequate of being self-organized.

- All of them have a negative impact on one or more of the success factors, and three turned out to be significantly impacted; *communication*, *collaboration* and *valuing people*.

- All the three impacted success factors will directly influence a project's success criteria to varying degrees:

  o Communication:

    ▪ Intrinsic quality (adaption, flexibility and scope) will suffer due to need for good knowledge sharing and direct verbal communication in the project execution phase.

    ▪ Cost will be indirectly affected as more hours will be used on defining the scope and making sure all requirements are met.

    ▪ Delay in projects are expected due to the need of good coordinating between the members working in the team.

  o Collaboration:

    ▪ Intrinsic quality (adaption, flexibility and scope) will suffer as the team are not able to develop the social and technical relationship needed to be both adaptable and flexible.

    ▪ Extrinsic quality (customer value) will suffer as there is a risk of having vital customer requirements not being shared and perceived correctly among the team members.

- Cost will be indirectly affected as information is not shared in an optimized way, resulting in missed requirements and an increase in hours due to lack of efficiency.

- Hardware cost is likely to increase as late design release could trig acceleration cost to be initiated to external suppliers.

- Schedule impact is likely to occur because delivery will be affected as a result of information not being shared in an optimized way, causing release of parts and procurement to be initiated later than planned.

o Valuing people:

- Lack of succeeding with valuing the people working in the team could hurt project execution in all the project constraints and have a significant negative impact on quality, delivery and cost as it forms the fundamental principles in the agile project management philosophy.

One of the limitations in this thesis is that there are no universally applicable success criteria for all agile projects. Therefore, the linkage between the success factors and the success criteria is weak. It needs to be addressed from project to project. The impact on the success criteria is based on the Project Excellence Model's linkage between the success factors and the success criteria. This model suggests different scenarios where a linkage can be used, depending on the type of project. Therefore, the discussion is tailored for the success criteria for the organization within the oil and gas industry used as example with relevant research as input to the summary. As the summary shows, all the success criteria are impacted, except for "safety". Both extrinsic quality (customer value) and intrinsic quality (adaption, flexibility and scope) are taking a big hit because of the impacted communication and collaboration factors. Increased cost and schedule impact are also likely to occur as a result of the impacted success factors.

One other limitation in this thesis is the level of generalizability. The research question is searching for an answer that can be applicable for all agile projects. The identified failure areas and critical success factors are very common in agile projects. There will always be small variances, depending on the industry and the organizational context, but they give a very good indication of the how inadequate self-organizing teams impact the success factors that are transferrable to other agile projects. Unfortunately, the success criteria are not generalizable as it is impossible to generate a universal checklist suitable for all projects. So, the research question can only be fully answered with success criteria in particular to the oil and gas industry, and on a general level with success factors.

The validity of the surveys is strong, with solid measures taken on both the interview session and questionnaires to increase the accuracy of the data. The reliability is weaker, especially for the questionnaires sample. Because of the necessary measures needed to maintain the strong validity, it is assumed that the same results would not happen if the survey was done on different occasions with different teams. This is addressed in the future research section below.

7.2 Originality and significance

The reason for exploring the impact of inadequate self-organizing teams all the way to success criteria is because the thesis is meant to have value for the organization used as example in this thesis. It would have been a justified approach just to see the impact on the success factors, but then it would not have been as useful for the organization. It needed to be broken down into measures by which success or failure of the project will be judged. As previously mentioned, the linkage between success factors and success criteria is weak and difficult to standardized to be applicable for all projects. This is not something new. To the best of my knowledge, there is no work related to finding a link between inadequate self-organizing teams and critical success factors. Many researches have been done on self-organizing teams in general and the fact that they are important for the success of agile projects. However, there is currently a lack of empirical study when it comes to the impact inadequate self-organizing teams have on success factors in agile projects. The aim of the thesis was to fill this gap of knowledge. In that sense, it brings a certain originality to the area within computer and system science, and particularly within software development projects, because of the commonly used Agile project management philosophy.

This thesis proves that having a well-functioned self-organizing team in Agile projects are not just a contributing factor for success, but rather a necessity to avoid adverse problems for success criteria. For practical use, this thesis serves as a wakeup call for all agile leaders out there who lack focus in building self-organizing teams and go back to the non-agile method of managing tasks instead of leading teams as it is more concrete and tangible. Jim Highsmith states that building self-organizing teams is *the* most important job for an agile leader, but he doesn't really back up the statement with enough empirical research claiming why (in my opinion). This thesis proves that he is right as it not only serves as a contributing factor for success, but also avoid adverse problems.

7.3 Future research

For future research, I hope that one day we can have a better link between success factors and success criteria. A link that, despite the fact that it is "impossible" to generate a universal checklist of success criteria, can be tailored to agile projects in particular. That way it would be easier to see the measurable consequences for the projects. Due to the limited results that exists from research today, this thesis is concluded on the basis of impact the critical success factors have from other research on a general level, but not to what extent it will be affected on a quantified level.

Also, two of the limitations with this thesis was the type of organization and geographical area in which this thesis was performed. For future research, it is recommended to use a larger number of respondents from more teams around the world from different agile projects in other industries to get a more reliable result. As for the questions used in the questionnaire survey, the experience from this research was that the questions were hard to interpret, meaning that a lot of measurements were necessary to explain the meaning behind the questions before the actual survey took place to avoid response bias. For future research, if they are to be tested on a broader scale of people with different teams, the questions need to be adjusted to be more compliable to general success factors, and not tailored to a specific organization to get more reliable results.

Last, future research is recommended to more research on how to build highly effective, self-organized, teams. As stated in section 2, highly effective teams are not necessarily self-organized teams. Good self-organized teams will always be highly effective, but not the other way around. To

the best of my knowledge, there are a lot of research on how to build highly effective teams, but not how to be self-organized. Possibly, this is one of the reasons why many agile project leaders perceive the concept of having self-organized teams seem fuzzy, messy and un-definable.

7.4 Final words

I have been working in the oil and gas industry for about eight years. During that time period, I have "survived" five headcount reduction processes where people were let go due to market turndowns. This caused me to think about how projects are being executed and eventually had me realize that something is not right. Surely, these repeatable patterns of hiring people when the oil prices are high and then letting them go as soon as there is a market turndown is extremely costly for the organization. It had me think that something was wrong in the project execution phase and that efficiency was not optimized. Many people are probably reading about the issues with agile project leaders lacking focus or knowledge about building self-organizing team without putting any real concerns to it, and I can honestly say that it was my first reaction as well. I later realized not only the truthfulness behind the statement, but also the massive extent of it. Agile project leaders are not spending time building self-organizing teams, causing the teams to become inadequate of being self-organized.

This thesis is a result of this as I started to explore how projects are being executed and at the same time learning about Agile Project Management. The wording of the title in this thesis is negatively charged with the word "inadequate", with intention, as this is the sad truth in so many organizations. Even when hiring new agile project leaders, experience has it that no emphasis is put on evaluating the person's ability to building teams. This is a dangerous development in the Agile Project Management philosophy. Jim Highsmith says the reason why so many agile project leaders go back to the non-agile method of managing tasks instead of leading teams is that it is "more concrete and tangible". I suppose it is easier to show progress of your own contribution to management by managing tasks. At the end of the day, however, the success of the project will suffer from this. Building self-organizing teams is a very cheap investment when considering the consequences of not doing it.

7.5 Reflection document

Overall, this study corresponds very well with the goals of the thesis course. In particular, I would like to highlight my independence to complete an academic thesis by using scientific methods and relevant scientific literature. Also, this study has a broad collection of relevant scientific literature that has been summarized and reflected in, what I believe, a professional manner. Last, but not least, the study provides some originality to the area within computer and system science by addressing a widespread problem in Agile project management that has not (to my knowledge) been explored.

The courses that have been most relevant with this thesis work are:

- Research methodology for computer and system sciences (ML304U)

- Scientific communication and research methodology (ML301U)

- IT Project Methodology (IB464U)

The research courses were very helpful in terms of completing the qualitative and quantitative analysis. "The Good Research Guide" by Martyn Denscombe was used to follow the guidelines for both analysis. The IT Project Methodology course contributed to information regarding Agile Project Management. The book "Agile Project Management" by Jim Higsmith was used to gather facts about Agile Project Management in general and was an important starting point for collecting more research. In addition to that, all the leadership courses, as well as the course "communication and collaboration in it-projects" served as valuable input to the thesis in terms of critical success factors and teams. This thesis corresponded well with the overall Project Management study as it involved different input from almost all the courses.

This thesis was completed in addition to having a fulltime job, so the planning of the work was essential. It required an intense self-discipline and commitment to have a steady work progress. I was the only person in my class to start on the thesis in accordance with the study plan, which made it a bit more challenging for me as I did not have any other students to seek advice, guidance and tips from. I had to rely solely from instructions online and counseling from the supervisor. Given the challenging situation with having a fulltime job, I am quite happy with the planning of my study work, and I do not believe I could have done anything better. It might seem like a bold statement, but finishing this thesis on time is unquestionably the hardest thing I have ever done.

I currently work as a project manager, so the topic of this thesis is highly relevant for my work situation. My current job was part of the reason why I decided to explore self-organizing teams in agile projects because I see on an everyday basis that this is an area that lacks focus. Going forward, I consider it essential for Agile project leaders to spend more time in building self-organized teams. It is an area that does not give any immediate tangible results, but it is a very cheap investment when seeing the negative impacts of not doing it. Overall, I am very satisfied with my thesis work, in general, and the results. I truly believe that the combination of all the input I have included from previous research and literature combined with a real-life scenario has produced something valuable and original to the area within computer and system science. One of my greatest concerns when I started was that the results would be too specific too the organization I used as example, and not generally applicable for other agile organizations. However, as I continued with the work and gathered more input from literature and other research I quickly realized that both the success factors and the failure areas identified are common for agile projects. This really strengthen the reliability of the results.

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9 Appendices

Appendices are removed and can be provided upon request by the author of the thesis.