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Training of innovative teams

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Problem description

The purpose of this master thesis is to examine how an innovative team can be trained to be aware of and adjust to an appropriate maturity level for a given task. In order to do this, a practical training program have been developed, and further conducted by an innovative team. Accordingly, this master thesis have a practical approach to its research question, which is examined through two perspectives. Firstly, the training program's effect on a team's maturity level is investigated, and secondly, it is determined whether the team's improvement could be tied to the training program. The research is done through a quasi-experimental design, and data is collected through SPGR-analyzes, interviews and sociometric badges.

Preface

This master thesis presents a research conducted during the spring of 2017 at the Norwegian University of Science and Technology (NTNU), Department of Industrial Economics and Technology Management. The field of research is within Strategy and International Business Development, and the aim of the research was to examine how an innovative team can be trained to be aware of and adjust to an appropriate maturity level for a given task.

This master thesis is a contribution to a larger research project on Innovative Teams at NTNU, Department of Industrial Economics and Technology Management, where Endre Sjøvold is the project leader.

Working with this thesis has been interesting and educational, but sometimes challenging. Several people have provided us with help and suggestions during our work on the thesis, and we want to take the opportunity to thank these people. In particular, we want to thank our supervisor Endre Sjøvold for valuable guidance and feedback on our work during the process and PhD. candidate Trond Rikard Olsen for help with the use of badges and interpretation of the data. Further, Hans Kristian S. Omenaas also helped with analyzing the data from the badges. In addition, we want to give a big thank you to the team that participated as a treatment group for showing positive attitude towards our research, and for taking the time to participate in our training program.

Trondheim, May 23rd 2017

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Summary

Innovative teams are essential in most organizations, as they are put together to solve complex challenges. It is important that teams are operating as effective as possible to achieve good results. Research has shown that there is not one type of team that is best fitted to operate in all kind of contexts or to solve all types of tasks. Instead, it is the group dynamics, and thus the maturity level of a team that determine how effective a team works. Furthermore, the importance of team building has been emphasized towards making teams more efficient. Still, there has to our knowledge been small efforts towards establishing an integrated training program that focuses on how teams can become better at adapting their maturity level to a task. Accordingly, this master thesis examine this through the research question: *“How can an innovative team be trained to be aware of and adjust to an appropriate maturity level for a given task?”*

In order to investigate the research question, a literature review conducted in the fall of 2016, served as the theoretical foundation for the development of a training program. First, several factors with direct influence on a team’s maturity level were identified and delimited to shared mental models, psychological safety, trust, and roles and leadership. Additionally, indirect factors affecting the maturity level were found, including team building and context. The training program is built upon these factors, and has been conducted by an innovative team related to the School of Entrepreneurship at NTNU, which was compared to a control group existing of over 30 teams attending the same study program. Data were collected in February and April of 2017, through interviews, SPGR surveys and sociometric badges. Two perspectives have been examined in order to answer the research question: First, the training program’s effect on a team’s maturity level, and second, if the team’s improvement could be tied to the training program. Consequently, the main purpose with this thesis was to investigate if our suggested training program works in practice, and as such contribute to the practical understanding of team building.

The results show that shared mental models are strengthened and psychological safety in the team is improved. Further, the trust level has increased, while the team has a less fixed role structure with more evenly distributed influence after the training. Consequently, the team is able to operate on higher maturity levels. Thus, the thesis conclude that the training program has had measurable effects, making an innovative team more aware of and able to adapt their maturity level to a given task.

Sammendrag

Innovative team settes sammen for å løse komplekse oppgaver, og er således essensielle i de fleste organisasjoner. I forlengelsen av dette er det viktig at team opererer så effektivt som mulig for å oppnå gode resultater. Forskning har vist at det ikke er et spesielt team som er best egnet til å operere i alle slags kontekster eller løse alle typer oppgaver. Istedenfor er det gruppedynamikken til et team, og dermed teamets formålsnivå, som fastslår hvor effektivt et team arbeider. Videre vektlegges teambygging som viktig for å gjøre team mer effektive. Likevel så har det så vidt vi vet vært blitt gjort liten innsats for å etablere et integrert treningsprogram, som fokuserer på hvordan team kan bli bedre til å tilpasse sitt formålsnivå til en oppgave. Følgelig er forskningsspørsmålet for denne masteroppgaven: "Hvordan kan et innovativt team trenes til å bli oppmerksom på og tilpasse seg til et passende formålsnivå for en gitt oppgave?"

For å undersøke forskningsspørsmålet ble et praktisk treningsprogram utviklet, med utgangspunkt i et teoretisk rammeverk etablert basert på et litteraturstudie gjennomført høsten 2016. Først ble en rekke faktorer med direkte innflytelse på et teams formålsnivå identifisert og avgrenset til: delte mentale modeller, psykologisk sikkerhet, tillit, samt roller og lederskap. I tillegg ble faktorer med indirekte innflytelse, slik som teambygging og kontekst, beskrevet. Treningsprogrammet er bygget på disse faktorene, og har blitt gjennomført av et innovativt team knyttet til Entreprenørskolen ved NTNU. Dette teamet ble så sammenlignet med en kontrollgruppe bestående av over 30 team med lignende bakgrunn.

Data ble innsamlet i februar og april 2017 gjennom intervjuer, SPGR-undersøkelser og sosiometriske badger. I masteroppgaven har vi undersøkt to perspektiver i arbeidet med å besvare forskningsspørsmålet: Først, treningsprogrammets effekt på formålsnivå, og deretter om teamets forbedringer kan tilskrives treningsprogrammet. Det betyr at formålet med denne masteroppgaven var å se om det foreslåtte treningsprogrammet fungerer i praksis, og på denne måten bidra til forskning innenfor praktisk forståelse av teambygging.

Resultatene viser at delte mentale modeller er styrket og at den psykologiske sikkerheten i teamet er forbedret. Videre har tillitsnivået økt, samtidig som teamet har mindre fast rollestruktur og mer jevnt fordelt innflytelse etter gjennomført trening. På grunn av dette evner teamet å arbeide på høyere formålsnivå enn tidligere. I masteroppgaven konkluderer vi med at treningsprogrammet har hatt målbare effekter når det gjelder å påvirke et innovativt team til å bli mer bevisst på og i stand til å tilpasse formålsnivået til en gitt oppgave.

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1. Introduction

Teams are often put together to solve problems or challenges. To get the best possible solution, it is important that the team is operating as effective as possible. According to Sjøvold (2014a), there is not one type of team best fitted to operate in all kind of contexts or to solve all types of tasks. Instead, the group dynamics determine how effective a team works together. Accordingly, this master thesis purpose is to examine this through the research question: “*How can an innovative team be trained to be aware of and adjust to an appropriate maturity level for a given task?*”

Many researchers (e.g. Cannon-Bowers & Salas, 1998b; Driskell & Johnston, 1998; Entin & Serfaty, 1999; Salas, Nichols & Driskell, 2007; Sjøvold, 2014a) propose training interventions that are known to improve the group dynamics in some way. To our knowledge, these training interventions have to a small extent been combined and integrated into a training program and tested on teams. As such, there is not yet a complete training program that focus on how an innovative team can be trained to perform at the maturity level needed for the tasks they face. Accordingly, we have developed a training program with this focus, and thus the goal with this master thesis is to measure how an innovative team may improve their group dynamics and maturity level through completing a training program. This means that we have a practical approach to the research question, where the research question is examined through two perspectives. Firstly, we want to examine the training program’s effect on a team’s maturity level, and secondly determine if the team’s improvement could be tied to the training program. Consequently, the main purpose with this master thesis is to investigate if our suggested training program works in practice.

A literature review conducted in the fall of 2016, serves as the theoretical foundation for the development of the training program. Through the work with the literature review, we identified several factors with direct influence on a team’s maturity level, which we further delimited to be shared mental models, psychological safety, trust, and roles and leadership. In addition, several indirect factors influencing the maturity level was identified, including team building and context. The training program has been tested on an innovative team related to the School of Entrepreneurship at NTNU. In order to examine whether the team who has been trained has improved more than an average team, this team is compared to a control group existing of over 30 teams at the School of Entrepreneurship.

Following this introduction, the thesis' practical relevance will be discussed, before an introduction of the case company will be presented. Further, we will introduce the key concepts. At last, the structure of the thesis is given.

1.1 The thesis' practical relevance

Many researchers have developed so-called bullet point lists for teams, aiming to be recipes for creating well performing teams through team building. A quick Google search on "team + well performance + team building" supports this by giving search results like these: *10 Leadership Techniques for Building High-Performing Teams*, *6 Ways Successful Teams Are Built To Last* and *5 Keys to High Performance Team Building*. We regard these recipes as valuable to a certain extent, but a common factor for these bullet point lists seem to be that they regard their bullet points as universal, and consequently suitable for all teams. However, we believe that how a team performs on a certain task is dependent on both the team and the given task and context. As such, we do not believe in an "one-fits-all"-recipe for enhancing a team's performance, making the value of the bullet point lists limited.

Based on this, we aim to enhance the understanding of practical team building in this thesis. In order to do this we have, as mentioned, developed a conceptual model based on a literature review, which we have operationalized into a training program. This training program takes the concept of team maturity into account, and aims to be effective for tasks of different nature by recognizing that different tasks requires different group dynamics. Accordingly, this model will be used to examine how an innovative team can be trained to be aware of and adjust to an appropriate maturity level for a given task. Hence, our research can be regarded as a contribution to the practical understanding of team building.

1.2 Presentation of the case company: The X-team

The X-team is a technology spin-off from a research project at NTNU, and has been working together since January 2017. It has three members, where two of them are students at the School of Entrepreneurship and one is a former NTNU student. Further, the team is a part of a start-up working in the Trondheim area, with ambitions to grow outside Norway. The context they work within is complex and uncertain, and the team needs to be innovative. As such, we have defined the X-team as a team that needs to be an innovative team. In order not to breach confidentiality, the team will be referred to as the X-team. Further information about the team and their goals is found in chapter 5.3.1.1.

1.3 Key concepts

Throughout this thesis, several central concepts and terms are used. In order to ease the reading process, we want to introduce the concepts and terms that our research question are based upon in advance. This introduction can be found in table 1. When these concepts are introduced later in this paper, they are further clarified and explained. It should be pointed out that some of these concepts are our own understanding of the terms based on reading literature on the topics.

Table 1 - Introduction to key concepts

Key concepts	
Innovative team	An innovative team consists of three or more people, who interact with the goal of bursting existing frames. This team is able to adapt their maturity level to the uncertainty and complexity of the task they face.
Maturity level	A group's ability to change flexibly between different group functions, in order to solve challenges as they appear.
Task	An activity or piece of work given to someone that needs to be accomplished. A task can often be broken down further into subtasks. The understanding of a task is dependent on both the context the task is presented in, and the team that is conducting the task.

1.4 Structure of the thesis

The rest of this paper is divided into six main sections. Initially, the theoretical framework established to support our research question is presented in chapter 2, followed by the development of our model in chapter 3. Subsequently, chapter 4 describes and elaborates the methodology used for the research in this thesis. Following the methodology, our empirical findings are addressed in chapter 5. Here, result from the conducted SPGR-surveys and interviews, as well as results from the badges are rendered. The discussion that examines the empirical findings of our case study can be found in chapter 6. Lastly, a conclusion and suggestion for further research are given in chapter 7.

2. Theoretical framework

A preparation for the theoretical framework in this master thesis is a literature review conducted in the fall of 2016, which we will further describe in chapter 4.1.1. The amount of literature existing in the field of teamwork is immense. We therefore chose to limit the topics we studied to those we believed were the most relevant in order to answer the research question in our project thesis. In regards of the master thesis, we did an additional selection of the existing theoretical framework and restructured it in order to support the master thesis's research question: "How can an innovative team be aware of and adjust to an appropriate maturity level for a given task?" Accordingly, the theory presented in this thesis is not a complete review of team theory, but includes topics which we regard as important to understand how adaptation of maturity level, including team building interventions through team development and team training, can be done.

Our theoretical framework consists of three parts. It is initiated with chapter 2.1, which is an introduction to team theory and includes general theory about teams, as well as innovative teams, spin theory, and team maturity. Secondly, in chapter 2.2 we discuss some of the factors with direct impact on team maturity, which we in this study have delimited to be shared mental models, psychological safety, trust, and roles and leadership. Further, these factors with direct impact on team maturity constitute the main body of the analysis and discussion in chapter 6. Our third and final part, 2.3, examine factors that we regard as having an indirect impact on team maturity. This theory serve as supporting literature for developing the training program and for the thesis' discussion. In this part, we discuss context and its impact on situational awareness. Additionally, the definition of adaptability is presented. Further, we distinguish between and define the concepts of team building, team training, and team development. We also introduce the concept of needs assessment. At last, we explore different team development and team training strategies in more detail.

2.1 Introduction to team theory

The purpose of this chapter is to give a theoretical foundation for team theory supporting our research question. This will be done by initially exhibiting different definitions of a team. Next, we will address the difference between a team and an innovative team. Further, spin theory and SPGR will be presented in order to explain the theoretical foundation the thesis is based upon. At last, an introduction to team maturity is given to present the basis for the following direct factors that influence team maturity.

2.1.1 Team

As mentioned, in this section we will introduce teams in general, before innovative teams will be elaborated. We see teams wherever we go, at sports fields, in schools, and in organizations. Being together with others influence how we perform. Katzenbach and Smith (1993) state that teams outperform working groups of individuals because team members learn from each other and can build on each other's achievements. Therefore, it is easy to understand why teams have become so popular. Nevertheless, teams are not always effective: Social facilitation is the phenomenon where an individual perform better when others are present (Allport, 1920), while social loafing is where an individual perform worse as he or she can hide their contribution (Sjøvold, 2014a). Thus, teams can be both effective and ineffective.

In organizations, teams are used to solve problems, but they are also very important for learning (Edmondson, 2012). In today's environment, organizations have to create entirities that is greater than the sum of their parts, which is their employees (Edmondson, 2012). To do this, organizations form teams, which are used when the task complexity exceeds the capacity of an individual, as well as when the nature of the task requires multiple perspectives from team members with various areas of expertise (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000). In the literature, there exists many definitions of teams. Some distinguish between a group and a team, and some do not. Sjøvold (2014a) is one of those who does not make this separation. This is because he argue that there does not exist an ideal team that is best under all conditions. Hence, it makes sense to use the terms interchangeably. Katzenbach and Smith (1993), on the other side, have a specific distinction between a team and a group. Their definition of a team is; "A team is a small number of people with complementary skills who are committed to a common purpose, performance goals and an approach for which they hold themselves mutually accountable." (Katzenbach and Smith, 1993, p. 112). Accordingly, they describe a group as where there exists no shared commitment between the members.

To show that teams and groups can mean even more, we have included some other definitions. "Teams are defined as a distinguishable set of two or more individuals who interact dynamically, adaptively, and interdependently; who share common goals or purposes; and who have specific roles or functions to perform" (Salas, Dickinson, Converse & Tannenbaum, 1992, in Salas, DiazGranados, Klein, Burke, Stagl, Goodwin, & Halpin, 2008, p. 906). "A group is three or more persons that have a common objective and interact to achieve this objective"

(Sjøvold, 2014a, p. 36, translated from Norwegian). “A team is an established, fixed group of people cooperating in pursuit of a common goal” (Edmondson, 2012, p. 13).

According to Simmel (1995, in Sjøvold, 2014a), interaction between two people is considered as a conversation. The communication pattern is drastically altered when the number of people in the group increases from two to three persons. Therefore, Sjøvold (2014a) argues that we cannot talk about a team before there is at least three people. In this paper, Sjøvold's (2014a) definition of a team will be used, and the terms group and team will be used interchangeably, as we agree with Sjøvold (2014a) that no ideal group or team exists. We believe that the upper limit for the number of members in a team is dependent on the context the team faces. Consequently, we do not set an upper limit for number of members in the team.

Innovative teams

As a part of our study, we examine innovative teams. An innovative team share many of the same characteristics as other teams. From the team definition we have that a group consists of three or more people, who interact to achieve a common objective. Furthermore, Edmondson (2012) explains that innovations occur when new ideas and new solutions emerge. The keys to successful innovation are thinking big, taking risks, and experimenting, while remaining aware that failure and dead ends are inevitable (Edmondson, 2012). This means that innovative teams are operating in environments characterized by uncertainty and complexity. Teams operating in such environments are subject to different demands than teams working under predictable circumstances (Edmondson, 2012). Furthermore, how well an innovative team is able to respond to the given task, are determined by the team's maturity. Sjøvold (2014a) describes the team's level of maturity as how well a team will be able to adapt to the complexity of the external environment. Team maturity and context will later be described more closely, respectively in chapter 2.1.3 and 2.3.1. From the theory above, we have derived the following definition of an innovative team: An innovative team consists of three or more people, who interact with the goal of bursting existing frames. This team is able to adapt their maturity level to the uncertainty and complexity of the task they face.

2.1.2 Spin theory and SPGR

Theoretical foundations

The theoretical foundation of the Systematizing Person-Group Relations (SPGR) is an integrated perspective including Bales (1985, 1999) on social interaction systems, Bion (1987) on group emotionality, Mills (1984) on group development, and Parsons, Bales, and Shils (1953) on group functions. The SPGR model has its origins from Bales' method for group

observation shortened SYMLOG, a system for the Multiple Level Observation Groups (Bales & Cohen, 1979, in Sjøvold, 2007).

Both the SYMLOG method and SPGR have connection to the Semantic Differential scaling technique, where both the SYMLOG and SPGR scale make use of the Semantic Differential scaling technique, and is as such an operationalization of the theory. The technique is a method developed by Osgood, Suci, and Tannenbaum (1957), which is used for measuring the meaning of an object to an individual pointing back at how the scale is constructed. Further, Hare (1985) lists the existence of three schools in the study of small groups: Group dynamics and Field Theory with the reference to the work of Lewin (1952, in Sjøvold, 2007), Small Group Research, initially referring to the work of Bales (1950, 1985), and Sociometry work of Moreno (1953). According to Hare (1985), Bales and Cohen (1979, in Sjøvold, 2007), SYMLOG “brings together some of the insights from both Moreno and Lewin with a technology that holds much promise for future analyses” (Hare, 1985, p. 42). Global interest led to a variety of independent innovations, including the early antecedents for what later became the SPGR model.

American and European tradition in viewing groups and building of teams are clearly different. The American tradition with behavioral sciences emphasizes the impartiality and objectivity of the external observer. Hence, this view pushed the development of instrumentation and category systems like Bales' (1950) Interaction Process Analysis (IPA) and the SYMLOG system. On the other hand, the European behavioral sciences care more about action research, with emphasis on engagement and experience-oriented approaches to theory development. The Tavistock clinic, where Bion (1987) developed his theory of group emotionality, is an example of the European tradition.

Spin theory for groups

As explained above, there exists many theories on groups' development and dynamics. According to Sjøvold (2010), the key to trigger groups potential increased performance, lies in understanding the group's inner complexity and the interaction with their surroundings. Spin theory for groups integrates the various contributions to a flexible model, where the ambient requirements establish the basis for what is good dynamics. Moreover, it considers group dynamics as a balance phenomenon. Group potential for performance and its robustness increases with how well the four operations nurture, dependence, control, and opposition are in balance. As such, for a team to reach its potential, all functions must be balanced. This can for instance be done through a set role structure where people occupy different roles, or through flexible role structure where all members develop their behavior aspects to support all functions. If the group is able to exploit the increased flexibility this gives, the flow in the

communication will increase and the group will be able to mobilize everyone's resources. Hence, according to Sjøvold (2010), a group with flexible role structure are better able to perform complex tasks in unpredictable environments. Table 2 exhibits the four group functions.

Table 2 - The four group functions (Sjøvold, 2014a)

Role	Content
Nurture	A person taking this role is caretaking, kind, open and democratic. Moreover, these persons consider themselves and others as equals, show interest in other person's opinions, and balance their own contributions in discussions. A group focusing on nurture culture will tend to focus on the value of interpersonal relations.
Dependence	Persons taking this role is concentrating on the task and the problem solving with an intellectual approach. A group culture with dependence can tend to focus on values that promotes commitment and discipline, which may often lead to passivity and submission.
Control	A control role for a person includes low degree of flexibility, emphasizes systematic approach and the "right" way of doing things. In a group with a control culture, the members have a shared assumption of the goal. However, this assumption is never discussed aloud. Prominent rigidity and use of control systems inhibits the ability to explore new ideas and other ways of doing things.
Opposition	Persons having an opposition role emphasizes no control, resistance against control and authorities, and refuse to adapt to regulations. These persons may not seem reliable, but rather impatient and irritating. An oppositional culture is characterized by mutual suspicion and open acceptance of the right of individuals to have influence and power.

Systematizing Person-Group Relations (SPGR)

Operationalization of a theory includes building tools to help us to map a phenomenon, in order to verify if the model is correct, and predict future development based on existing knowledge (Sjøvold, 2007). SPGR is an instrument to map and set goals of group dynamics and intergroup relations. The instrument is an operationalization of the spin theory for groups, and analyses from SPGR can illustrate and highlight different forms of group dynamics. The SPGR-instruments are a result of over 30 years of development, and has today a norm base of millions of assessments. The results from an SPGR test can be used to analyze possible conflicts, prominent dynamics and role structures in a team, which can be helpful in the mapping and prediction of the team building in different scenarios. There exist different analyses for different purposes when using the SPGR-tool. A well-used analysis is the field chart, which shows the dynamics in the group as well as capturing the mental models of the

members. A more in depth explanation of the field chart and its related vectors can be found in chapter 4.3.1.1.

2.1.3 Introducing team maturity

Phase models like Tuckman and Humphrey's (1965) four stage model and Wheelan's (1994) integrated model of group maturity, and the performance curve of Katzenbach and Smith (1993), were earlier used to explain a group's development and performance level. These models assumed the existence of an optimal stage or level that the group could reach, after developing through some chronological, distinct phases. These phases were not dependent on context nor task, and were equal to all groups. Later research found little to no support for these phase models (McGrath, 1991; Sjøvold, 2006). Thus, researchers have now stepped away from these types of models. Instead, the focus has been on the group's maturity level, where the optimal level is dependent on the context and task the group faces. SPGR is a tool, based on extensive empirical research that is suitable to our research question. With the use of this tool, the team can become aware of its group dynamics, and consequently be able to conduct interventions in order to operate at higher or lower maturity levels. Based on this, we have decided to base our literature regarding team maturity on this model.

Sjøvold (2006) argues that no specific group fits all tasks and contexts, and no documentation supports the assumption that all groups follow the same sequences of development. Instead, Sjøvold (2006) observed that effective groups adapt quickly to the level of maturity and arrange their role structures, in order to fit the task and the context in which they operate. Therefore, this view is an alternative to the ones proposed by Tuckman and Humphrey (1965), Wheelan (1994), and Katzenbach and Smith (1993).

As mentioned in 2.1.2, group composition is defined as the balance of four basic group functions: control, nurture, opposition, and dependence. The group activates the functions that is best suited to meet the specific problem the group faces. This is related to a group's maturity level, as Sjøvold (2014a) states that a group's level of maturity is measured through its ability to flexibly change between the different group functions, in order to solve challenges as they appear. Problems arise if a group is stuck in one function that is not efficient for the task they are facing. These are low maturity level groups, where members tend to take on roles that are in their comfort zone, and thus one member may only support one function.

In contrast, groups that can rapidly activate the group function suited to face the unfolding challenge are defined as mature groups. These groups take on actions where all group

functions are equally present, and members master all of the functions. Furthermore, mature groups are characterized by an ability to change flexibly between group functions, making them highly adaptable (Sjøvold, 2014a). To understand a situation completely, team members have to share, evaluate, decide, and act upon their perceptions of a situation, all in a short period. That is why the less mature groups, where one person has one role, are not perceived as mature in contrast to groups, which are able to balance their group functions. As such, balance means to constantly shift and polarize the different group functions, comparable to a gyroscope becoming stable due to its speed of rotation.

Sjøvold (2006) describe four levels of maturity, summarized in table 3. The marks indicate what functions are required to achieve a specific level of maturity (nurture - N, dependence - D, control - C, opposition - O). Furthermore, we want to point out that Sjøvold (2007) identifies direction, severity, frequency of polarization, and emotional quality of group culture as other factors influencing a group's maturity level. The description of the maturity levels is based on Sjøvold (2014a, p. 64, p. 73).

Table 3 - Maturity levels in the SPGR model

Maturity level	N	D	C	O	Description of the maturity level
Reservation	x				Individual contributions, strong leader leadership, routine tasks, structure
Team Spirit	x	x			Strong companionship, result oriented, clear and caring leader
Production	x	x	x		Continuous improvement within the given context, participation, influence of leader is not as strong as in reservation, democracy
Innovation	x	x	x	x	Free flow of thoughts and criticism with the goal of burst frames, challenging status quo, new solutions outside the given frames

Sjøvold (2014a) explains that *reservation* represents a dynamic that is best suited for routine tasks under stable and known contexts. In reservation, team members tend to exhibit behavior supporting the nurture function. *Team spirit* is characterized by a dependent and strong solidarity. Furthermore, it is result oriented with clear distinctions between the performances of the individual members. In contrast to the reservation level, the team members show great willingness to support each other in the problem solving process. A clear and caring leader figure is holding the group together, and is often a person with high status outside the group. In *production*, the influence of the leader and the other team members are more similar to

each other. The leader is often perceived as unifying through a democratic leader style. Thus, the team members have a larger degree of influence on the team's contribution than in reservation and team spirit. Furthermore, the team is on a continuous search for ways to be better, but only inside the frame of the context they face. The team is very innovative about increasing the efficiency of already existing solutions, but could not think about substituting today's solutions with something radically new. This substitution distinguishes production from *innovation*. In innovation, the overall purpose is to burst the known frames. Nothing is taken for granted and constructive criticism affects everything the members say and do.

Teams tend, as mentioned, to adapt their level of maturity best suited to their task and context. However, a high maturity level requires well-developed personal skills from the team members. If they do not have the competencies needed to handle a challenge, the team may have dysfunctional reactions like groupthink, polarization, and conflict.

In spin theory, group effectiveness and maturity is not always related. A group can be effective without being mature. This is because effectiveness in Sjøvold's (2014a) model is defined as how well the group's resources are mobilized to solve a specific task. Effectiveness is thus always related to task and context. If the context and task is more complex and unpredictable, the group needs a high level of maturity to be successful.

Sjøvold's (2006) findings support the assumption that group effectiveness is about establishing a match between group constitution, the task, and the context the group is facing. He also found that there is no perfect combination of individuals in a team, which works in all situations. Further, Sjøvold's results showed that developing a team to a new maturity level is challenging, but possible.

2.2 Factors with direct impact on team maturity

Our research question focuses on how a team can be trained to become aware of and adjust to an appropriate maturity level for a given task, and as such, we find it appropriate to investigate some factors directly influencing a team's maturity level. This chapter will therefore present theory regarding factors directly influencing team maturity. Sjøvold (2014a) and among others, Converse, Cannon-Bowers, and Salas (1993), point out the importance of shared mental models in teamwork. Furthermore, Edmondson (1999) and Edmondson and Mogelof (2006) explain the importance of psychological safety in teams. In addition, Sjøvold (2007) emphasizes the importance of leadership and trust in the explanation of spin theory. Hence, these factors have been included in the assessment of how a team can be trained to

become aware of and adjust to an appropriate maturity level for a given task. However, the theory is not limited to only these four direct factors, but we have considered these the most important for our research. Accordingly, in this section we will highlight some of the factors that we consider to have a direct impact on team maturity, respectively shared mental models, psychological safety, trust, and roles and leadership. As mentioned in the introduction to chapter 2, these factors will constitute the main body of our analysis and discussion in chapter 6.

2.2.1 Shared mental model

The notion of shared mental models has been used for several years as an explanatory mechanism by those studying team functioning and performance. In order to understand what shared mental models are, one must first know what mental models are. As a general understanding of mental models, Johnson-Laird (1983) suggested that mental models help people understand the world by constructing working models of it in their mind. In this study, Rouse and Morris' (1986) definition of mental models will be used. They argue that a mental model can be defined as "a mechanism whereby humans generate descriptions of system purpose and form, explanations of system functioning and observed system states, and predictions of future system states" (p. 360). Because of this, it could be stated that mental models serve three crucial purposes: to help people describe, explain, and predict events in their environment.

Shared mental models are a group level phenomenon, which means that they are based on more than the sum of individual mental models (Klimoski & Mohammed, 1994). This means that mental models are not limited to the explanation of how humans interact with their environment, but can also be used in the context of teamwork. Based on Rouse and Morris' (1986) definition, the system that mental models concern, is in a group context the team itself. Because of this, shared mental models are used to help describe, explain and predict the behavior of a team (Jonker, Riemsdijk, & Vermeulen, 2011). Furthermore, Jonker et al. (2011) defines shared mental models as; "knowledge structures held by members of a team that enable them to form accurate explanations and expectations for the task, and, in turn, coordinate their actions and adapt their behavior to demands of the task and other team members" (p. 2).

Salas, Sims, and Burke (2005) distinguish between team-related mental models and task related models. Team-related mental models refer to the team functioning and expected behaviors, unlike the task-related mental models which concern information regarding the

materials needed for a task or the manner in which equipment should be used. Related to this, Converse et al. (1993) states that the most important function of shared mental models are to provide expectations about the task and team performance. However, they also argue that having shared mental models do not imply having identical mental models. It is the expectations, rather than the mental models themselves, that need to be shared among team members (Converse et al., 1993). This means that the important fact is that different mental models should be resulting in the same expectations about task and team performance, for the team to be effective. Other researchers have also stated that dissimilarities can be desirable, as different perspectives and understandings may facilitate alternative solutions (Kozlowski, Gully, Nason & Smith, 1999) or remove vulnerability towards groupthink (Janis, 1972). Consequently, team members should have compatible mental models, which lead to common expectations for the task and team (Converse et al., 1993).

Converse et al. (1993) acknowledge shared mental models as an explanation for how teams are able to handle difficult and changing task conditions. Hence, shared mental models can be linked to team performance. The rationale behind this is, according to Converse et al. (1993) that team performance improves if the team members have a common understanding of the task that is to be performed and of the involved teamwork. Additionally, they argue that well-functioning teams have shared mental models that enables them to predict other team members' actions and needs, and hence gain the ability to support each other and coordinate the collective efforts needed in order to achieve a shared goal. Sjøvold (2014a) supports the fact that shared mental models are an important factor for a team's performance. He points out that lack of shared mental models would lead to divergent expectation and misunderstandings, which would reduce the performance of a team.

In addition, Sjøvold (2014a) argues that shared mental models become of greater importance as the group size increases due to higher complexity. Furthermore, the importance of shared mental models increase in stressful conditions where communication opportunities are reduced (Kleinman & Serfaty, 1989). In such conditions, the team is forced to rely more heavily on implicit coordination rather than on explicit communication. Therefore, shared mental models become crucial to team functioning, because they allow team members to predict the information and resource requirements of their teammates (Converse et al., 1993).

Furthermore, shared mental models are important for decision making in teams. Kleinman and Serfaty (1989, in Converse et al., 1993) concluded that group members that had shared mental models under high workload conditions could coordinate implicitly, i.e. without communication. Further, Athens (1982, in Converse et al., 1993) proposed that frequent

communication between military commanders allowed them to develop shared mental models of the environment. In addition, Athens found that shared mental models improved communication and coordination. Athens also exhibited evidence that effective crews build shared mental models of the situation they are in, and that this enhances their performance. The crews could, with the help of shared mental models, articulate plans and strategies for coping with emergent situations, and assign responsibilities to crewmembers (Athens, 1982, in Converse et al., 1993). From these previous conclusions, Converse et al. (1993) concluded that with adopting the shared mental model position in advance, the understanding of how teams make decisions effectively in dynamic, complex, and often ambiguous situations could be better. We conclude that shared mental models make it easier to get an overview of the task.

2.2.2 Psychological safety

When working in a team it is important for the team members that the team environment feels safe. Psychological safety describes taken-for-granted beliefs that others will respond positively when one exposes one's thoughts, such as by asking a question or seeking honest feedback about a new idea (Edmondson, 1999). In her research from 1999, Edmondson explains psychological safety in practice with seeking or giving feedback, making changes and improvements, obtaining or providing help or expertise, experimenting and engaging in constructive conflict or confrontation. Furthermore, Brown and Leigh (1996) adopted Kahn's (1990) definition of psychological safety as referring to an employee's "sense of being able to show and employ one's self without fear of negative consequences to self-image, status or career" (p. 708). Moreover, West (1990) argues that employees working in an organization that provides a personally non-threatening and supportive climate should be more likely to take the risk of proposing a new idea, than in an environment where "proposing a new idea will lead to an attack, to him or her being censored, ridiculed or penalized ..." (p. 312).

Psychological safety has, among other properties, shown to promote creativity and innovation (Edmondson & Mogelof, 2006). Edmondson and Mogelof (2006) explain that psychological safety differs from other constructs that may be associated with creativity such as efficacy (Bandura, 1982), trust (Kramer, 1999), and intrinsic motivation (Amabile, 2001). Whereas efficacy is the belief that taking action will produce a desirable effect, trust is the belief that others' actions will be favorable to one's interest, and intrinsic motivation is primarily motivation through enjoyment, satisfaction and the challenge of the work itself. The experience of psychological safety can allow team members to relax their guard and engage openly in the behaviors that underlie learning and innovation (Edmondson & Mogelof, 2006). Activities

supporting innovation involve risk, uncertainty, and a great probability of failure. Team members are often reluctant to offer novel contributions because of fear of being wrong (Edmondson, 1999) or fear of slowing team progress and creating frustration (Ford & Sullivan, 2004). In conclusion, it is important to remember that psychological safety does not reduce conflict in teams, but rather allows it to be managed more productively than when psychological safety is not present (Kelly & Barsade, 2001).

2.2.3 Trust

When investigating team dynamics, mutual trust is of great importance. Robinson (1996) defined trust as a person's "expectations, assumptions or beliefs about the likelihood that another's future will be beneficial, favorable, or at least not detrimental to one's interests" (p. 576). Kahn (1990) concluded that in the firm he studied, "interpersonal relationships promoted psychological safety when they were supportive and trusting" (p. 708). As such, trust is a defining characteristic of psychological safety. If relationships within a team are characterized by trust and respect, individuals are more likely to believe they will be given the benefit of the doubt (Edmondson, Kramer & Cook, 2004).

Rousseau, Sitkin, Burt, and Camerer (1998) argue, "Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another" (p. 395). Across disciplines, there is an agreement on the conditions that must exist for trust to arise. Firstly, risk is considered essential in psychological, sociological, and economic conceptualizations of trust (Rotter, 1967; Williamson, 1993). Risk can be understood as the perceived probability of loss, as interpreted by a decision maker (Chiles & McMackin, 1996). Trust would not be needed if actions could be undertaken with complete certainty and accordingly no risk (Lewis & Weigert, 1985). Uncertainty regarding whether the other intends to and will act appropriately is the source of risk. Another necessary condition of trust is interdependence, where the interests of one party cannot be achieved without reliance upon another. Although both risk and interdependence are required for trust to emerge, the nature of risk and trust changes as interdependence increases (Sheppard & Sherman, 1998). Degrees of interdependence actually alter the form trust may take, with the nature of trust a firm places in temporary workers being quite distinct from trust associated with its veteran, core employees. Finally, because risk and interdependence are necessary conditions for trust, variations in these factors over the course of a relationship between parties can alter both the level and, potentially, the form that trust takes (Rousseau et al., 1998)

Trust is a psychological state composed of the psychological experiences of individuals, dyads and firms (Rousseau et al., 1998). According to Rousseau et al. (1998), when in the same context, the scope of trust may vary, depending on the relationship's history, stage of development, and cues in the immediate setting. The recognition of variations in the scope of trust is evident in the writings of Williamson (1993), who asked where "calculative" trust ends and "people" trust begins. Further, Lewis & Weigert (1985) argues that the primary function of trust is sociological rather than psychological, since individuals would have no occasion or need to trust apart from social relationships.

Furthermore, Rousseau et al. (1998) argue that there exists three phases of trust: (1) building, where trust is formed or reformed, (2) stability, where trust already exists, and (3) dissolution, where trust declines. The *building phase* is addressed in several articles. For instance, McKnight, Cummings and Chervany (1998) write about the emergence of trust in new organizational settings, and Das and Teng (1998) write about new organizational relationships. Moreover, Whitener, Brodt, Korsgaard, and Werner (1998) explain the context of an existing relationship between workers and managers where trust may be created or enhanced. The functioning of trust under *stable* conditions is central to the broad treatments given to institutional factors associated with trust. Hagen and Choe (1998) write about trust in the Japanese society, while Sheppard and Sherman (1998) explain trust across different relational forms. *Declining trust*, in which the authors explore the effects of reduced trust, is explained both through Mishra and Spreitzer's (1998) work about downsizing, and Elangovan and Shapiro's (1998) work about betrayal.

Sjøvold (2014a) states that trust is a relative term, as perceived different on different maturity levels. On a low maturity level, e.g. reservation or team spirit, the team is characterized by set procedures, sequential work, and clear roles both socially and academically. On these maturity levels, trust will appear when team members see and can depend on the fact that the individual supports and contributes its expertise when it is needed. The belief that the team will gather to perform their duties, and that other will be there to help when someone needs it, is the basis of trust.

However, on a higher maturity level, trust has a different meaning and content (Sjøvold, 2014a). The acceptance of the individual's monopoly on expert knowledge is replaced with the desire to take real part in this knowledge. If something is not understood, the members of the team ask until the arguments sound reasonable and understandable. An implication of this is that all generalists have the right and duty to challenge the assumptions of the experts. Continuous challenge of the status quo is seen as the key to new knowledge. Hence, it is the

behavior followed by this, which does team on higher maturity levels better able to maneuver in complicated and complex situations.

Further, recent group process research distinguishes task conflict from relationship conflict and argues that the two have different performance consequences (e.g., Amason & Sapienza, 1997; Jehn, 1995; Pelled, Eisenhardt & Xin, 1999). Groups that experience task conflict tend to make better decisions than those that do not, because task conflict encourages greater cognitive understanding of the issue being discussed. Hence, groups of higher maturity level that challenge the status quo, can make better decisions because it is more organized for discussion. If group members trust each other, they will be more likely to accept stated disagreements at face value and less likely to misinterpret task conflict behaviors by inferring hidden agendas or personal attacks as the driving force behind the behavior (Mishra, 1996). Therefore, building trust is extremely important in teams operating on a high maturity level trying to find solutions to difficult tasks (Sjøvold, 2014a).

However, on lower maturity levels, this challenging behavior from generalists will be seen as mistrust or a threat (Sjøvold, 2014a). The challenging and critical behavior that characterizes the dynamics in a group on a high maturity level, leads to a slowness in situations that only require a standard set of operations. Hence, in team development it is important to achieve acceptance of this shift in understanding of what trust is. To sum up, on low maturity levels trust is seen as a belief that experts will and can support the generalist team members, while on high maturity levels, trust is understood as the belief that generalists will challenge and confront the experts.

2.2.4 Roles and leadership

Zaccaro, Rittman, and Marks (2002) propose team leadership as a characteristic of effective team performance. They argue that effective leadership processes represent perhaps the most critical factor in the success of organizational teams. Also, Sjøvold (2014b) acknowledge a shift from individual-based leadership training towards training leaders to build effective teams, which can mean that leadership in teams are becoming more important than training the “perfect” genius leader. Therefore, understanding leadership in the light of maturity level is important in order to answer our problem statement.

Salas et al. (2005) warrant team leadership as one of the five most important aspects of teamwork. They define team leadership as the “ability to direct and coordinate the activities of other team members, assess team performance, assign tasks, develop team knowledge,

skills, and abilities, motivate team members, plan and organize, and establish a positive atmosphere” (p. 560). There are several other perspectives on leadership. Hogan, Hogan, and Kaiser (2011) view leadership in a team building perspective, and states that leadership means “the ability to build, maintain, and guide a team that can outperform the competition” (p. 560). Further, leadership can be viewed as exercising power (McClelland, 1970). Lastly, and most important for us, trust is a precondition to leadership (Sjøvold, 2014a). This may be one of the reasons why organizations led by practice-oriented leaders’ perform better (Collins, 2002) than organizations with leaders who do not have a thorough knowledge about their employees, company or their industry (Sjøvold, 2014a).

According to Salas et al. (2005) team leadership does not affect the team effectiveness through handing down solutions, but rather by facilitating team problem solving through cognitive processes (e.g. shared mental models, explained in 2.2.1), coordination processes and the team’s collective motivation and behaviors. In a similar manner, Sjøvold (2014a) argues that leadership is about teams, as well as to exercise power and manage power relations. Sjøvold (2014a) defines leadership in a team perspective as “the ability to manage power in order to build constructive relationships, and thus increase the probability of the team performing their functions” (p. 214, translated from Norwegian).

How much of the leadership functions that is up to the formal leader and how much that is a responsibility for the team members, is dependent on the maturity level of the team (Sjøvold 2007, 2014a). For example, a group in a stable and controlled environment, performing standardized tasks, and a group in an ever-changing environment with a high degree of autonomy and freedom, need different leader styles in order to be successful. We will explore in more detail how different leadership styles are efficient for different maturity levels.

Roles, leadership and maturity level

As mentioned above, Sjøvold (2014a) argues that there are different leadership requirements for different maturity levels. In this part, we will exhibit how groups at the maturity levels reservation, team spirit, production and innovation require different leadership styles.

Groups that operate in *reservation* work, as mentioned in 2.1.3 best when the tasks are transparent and relatively simple. The members of the group have fixed roles given by their personality or preference. Further, the team members have their own needs as their primary focus, and thus they do not give more to the group than they have to. Because of these characteristics, the group needs strong and clear leadership, in addition to a fixed structure with clear frames of their work. For a group on this level to be successful, the tasks have to be clearly defined and dividable. Procedures and rules are therefore important. The members are

only providing individual contributions, not a contribution that is a result of interaction. Consequently, the central and clear leader has to control that the procedures and rules are followed, coordinate the work, and compile the final product from the members' individual contributions. Additionally, the leader also ensures progress. Therefore, the leader often seems more like a representative of "the system", rather than a member of the group. Reservation implies that the group is not that robust and, if the leader is not strong and clear enough, the group has a high potential for conflict and dissolution. In contrast, a good leader on this maturity level is concerned with recognizing the individual's contributions to the group's result to ensure that the individual's role is safeguarded.

Groups with the maturity level *team spirit* are effective under relatively stable environments, where the task demands everyone's contribution, and is not too complex. The group is able to reach peak performance when the goal is clear and understandable. Further, the groups are characterized by a strong role structure, but the team members also identifies with the group as a whole. Therefore, the team members are able to set their own needs aside and help each other to perform at peak. The team see themselves as something different from the "rest". The members are generally proud to be a part of the group, as well as proud of their heroes and symbols. The leader often poses one of group's heroes. As a consequence, the rest of the group easily submissive to a strong and clear leadership. On the other side, when the leadership fails due to too a complex task or an unpredictable context, the group is not able to perform well. As a result, they are attached to a hope of someone coming to save them. In this way, the leader are often iconized and have a high degree of trust, often far above what is realistic or real. Consequently, the leader faces an equally big downside if he or she fails.

Groups on the *production* maturity level are effective when they operate under relatively stable environments, as well as when high quality and adaptation to incremental changes in the environment are required. Groups on the production level are not as focused, goal oriented or dependent on short-term result as groups in team spirit, and can therefore work patient over a long period on future goals. The members earn acknowledgement from achieved results through open discussion about how things can be done differently. Unity is established through everyone's contribution to the community by committed and long-term work. These groups do not put as much emphasis on heroes and symbols and is rather concerned with what the group achieve, not what it is. Adaptation is a strength of these groups; however, they do not appreciate radical changes. Because of these characteristics, the ideological leader is not necessary in the production level group. Instead, the leader should coordinate the group's resources. Furthermore, the leader have to facilitate good teamwork and show that contributions are appreciated wherever they come from. The leader is also important for the

interaction between the group and different levels in the organization and other entities. The leader is not the only person concerned with externals. The whole group is concerned with changing both the norms for internal interaction and the norms for how they interact with the external environment. In that way, it is possible to exchange feedback from both customers and suppliers.

When the group is on the *innovation* maturity level, the group dynamics allows the sum of the members' contributions to become something entirely new. The flow and high quality of communication between the members make sure that few ideas and opportunities are missed. The group's members are in balance and thus have the ability to switch between being critical, loyal, supporting and leading. Consequently, it is not always clear who came up with the solution, rather it may feel like it just appeared. The group is characterized by not being afraid of the unknown, and have a big interest and curiosity for the world outside. Therefore, the group is able to function optimally under fast changing and complex situations. Strict procedures, rules, and a strong leader, will hinder the group's success, because the members of these groups need a high level of autonomy, freedom, and the possibility to interact with external entities.

From the four paragraphs above, it is apparent that the different maturity levels require different leadership styles. Nevertheless, the leadership style best suited for a given maturity level is not always appreciated by the employees. For instance, Hannah, Uhl-Bien, Avolio & Cavaretta (2009) state that many employees appreciate an authoritative and instructive style of leadership in uncertain situations. Uncertainty implies a need to relate to something new, which can temporarily destabilize our cognitive and interpersonal world and which many people do not like (Schein, 2010). In that regard, Krabberød (2014) notes that an effective leader and an appreciated leader may not be the same. According to Sjøvold (2007), becoming a mature team implies that team members are able and willing to push their comfort zones and hence be able to make own decisions in uncertain environments. Therefore, an authoritative leader that reduces anxiety in uncertain situations may not be the best solution for the overall effectiveness of the team. Hence, different contexts require different styles of leadership. Osborn, Hunt, and Jauch (2002) describe, "Leadership and its effectiveness, in large part, are dependent upon the context. Change the context and the leadership changes" (p. 797). As such, context and its influence on teams is one of the themes that will further explained in the next chapter.

2.3 Factors with indirect impact on team maturity

This chapter will examine the topics of context and team building. We regard these factors to have an indirect impact on team maturity, as the factors are not characteristics within a team but rather external elements affecting the team and as such the maturity level. As already stated in 2.1.3, different maturity levels are required to solve different tasks efficiently. Tasks are always given in a context, and hence context has an indirect impact on team maturity. Furthermore, we wish to present theory on team building, as team building is a way to develop team dynamics over time and consequently have an indirect impact on team maturity. As mentioned in chapter 2, the factors in this chapter will constitute supporting literature for the development of our training program.

2.3.1 Context

In order to investigate how an innovative team can adjust to an appropriate maturity level and group dynamics for the given task, the perception of context is important. Schilit and Theimer (1994) refer to context as location, identities of nearby people and objects, as well as changes to those objects. Other definitions are referring to context as the environment or situation (Brown, 1995; Ward, Jones & Hopper, 1997). Moreover, Schilit, Adams, and Want (1994) state that important aspects of context are where you are, whom you are with, and what resources are nearby. In addition, Dey (2001) argues that context is about the whole situation, which means that the definition provided by Schilit et al. (1994) is too narrow and specific. Combining the definitions above, we have constructed our own definition of context: The context is about the whole situation, including but not limited to where you are, whom you are with, and what resources you have.

After this introduction and definition of context, situational awareness will be explained and a definition of adaptability will be given. Next, a model for situational awareness will be proposed, before the role of shared mental models in developing shared situational awareness is explained. Furthermore, loss of situational awareness is described.

Situational awareness and adaptability

Many different definitions of situational awareness exist, but easily formulated, it can be explained as awareness of the situation. Woods (1988, in Stanton, Chambers & Piggott, 2001) points out that in order for people to maintain an adequate awareness of system status, they need to track the development of events as they gradually unfold. Smith and Hancock (1995) explain situational awareness as adaptive, externally directed consciousness. Furthermore, Bedny and Meister (1999) explain situational awareness as the conscious dynamic reflection on the situation by an individual. At last, Endsley (1995) states that “situational awareness is the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future” (p.36). In this thesis, we chose Endsley’s definition of situational awareness.

By investigating the flow of information, we might better understand the nature of situational awareness in teams. For example, Bowers, Braun, and Kline (1994) found that one factor that might contribute to the level of team situation awareness, is the expression of a plan after receiving a response. This intuitive, clear pattern of communication might serve to quickly orient the team to their present state and provide a clear expectation for future states.

Gaba, Howard, and Small (1995) propose that many aspects of situational awareness can be taught, such as:

1. Practice in scanning relevant displays to maximize perception
2. Use of expanded checklists to ensure that relevant data are not lost
3. Explicit training in allocation of attention
4. Practicing multi-tasking rather than performing isolated tasks
5. Training in pattern recognition and pattern matching

Even though some of these recommendations may seem obvious, situational awareness brings ideas together under a single unifying concept. Some researchers have incorporated situational awareness training into crew resource management programs (Salas, Rozell, Mullen & Driskell, 1999).

When a team have obtained situational awareness, they can start to adapt to the situation. Burke, Stagl, Salas, Pierce, and Kendall (2006) defines adaptability as

(...) an emergent phenomenon that compiles over time from the unfolding of a recursive cycle whereby one or more team members use their resources to functionally change current cognitive or behavioral goal directed action or structures to meet expected or unexpected demands. (p. 1192)

Further, Entin and Serfaty (1999) found in their study that teams could be trained to recognize the signs of increasing workload and stress, and consequently use adaptive coordination strategies to mitigate some of the debilitating effects of high workload and stress. In addition, they found that appropriate training could significantly improve both teamwork skills and task performance. This supports the assertion that the dual concepts of shared mental models and adaptive coordination are a productive approach for understanding and developing effective teamwork.

Three level model of situational awareness

Endsley (1995) developed a three level model of situational awareness. The model is arranged into three hierarchical levels of situational assessment, each stage being a necessary, but not sufficient, precursor to the next level. Endsley's model follows a chain of information processing, from perception of current status, through interpretation of this status, to projection of future status.

Level 1: Perception of the elements in the environment. Perception of the elements in the environment is the lowest level of situational awareness, and concerns available information about the environment. At this stage, no interpretation of the available data is performed. If data could have been elicited at this stage, only status confirmation on particular available data could have been done. Hence, no integration of the data is done.

Level 2: Comprehension of the current situation. At the second level, the available data can be integrated and synthesized to produce an understanding of the relevance to the person's tasks. It is argued that comprehension is essential to understand the significance of the environment's elements and to gain the whole picture of what is going on. Here you can judge whether their actions have the intended outcomes.

Level 3: Projection of future status. The highest level of situational awareness is associated with the ability to project the future of the elements in the environment. Projection provides the knowledge and time necessary to decide on the most favorable course of action to meet one's objective. The prediction on this level is dependent on how accurate the two other levels are completed. The model, in figure 1, shows an increasing degree of awareness as the information is processed from level 1 to 3.

In addition, Endsley (1995) points out that comprehension in this situation, involves integrating external data with the knowledge and the team's goals. The model seems generic, as it is

based on general cognitive processes, offering a broad theoretical construct with many application areas.

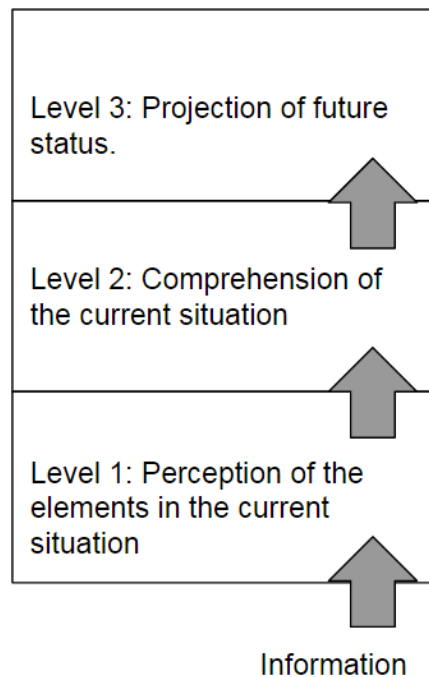


Figure 1 - Three level model for situational awareness (adapted from Endsley, 1995, p. 35)

The role of shared mental models in developing shared situational awareness

Rouse, Cannon-Bowers, and Salas (1992) concluded that most efforts, when considering teamwork and team training, have emphasized the training of individual skills in team setting, rather than training the skills that are demanded by interaction requirements of the team task. In an attempt to address overlooked aspects of teamwork, recent researchers have given shared mental models attention in order to explain how team members are able to anticipate and predict each other's needs and thus adapt to task demands and coordinate their activities. It has been hypothesized that shared mental models among team members are required for effective team coordination (Cannon-Bowers, Converse & Salas, 1993; Rouse et al., 1992). A question that arises when discussing shared mental models among team members, and which is already introduced in chapter 2.2.1, is "What aspects of the mental model do team members need to share?" Addressing this question, there can be possible to think about different types of knowledge that can be shared among team members in performing complex team tasks. It has been proposed that successful teams must share common knowledge of several factors, including: overall task and team goals, individual tasks, team member roles, and the team members themselves (Cannon-Bowers et al., 1993), which all together can be associated with task-related mental models and team-related mental models as introduced in chapter 2.2.1. In addition to support for the importance of shared mental models among team members to

team performance, support for the importance of team situational awareness to team performance has been provided (Orasanu, 1990).

Loss of situational awareness

Stanton et al. (2001) suggest that loss of situational awareness is correlated with poor system performance. Moreover, Endsley and Kiris (1995) state that people who have lost situational awareness may be slower to detect problems within the system they are controlling. Additionally, the loss of situational awareness require additional time to diagnose problems when they are finally detected.

Teams have become important actors to accomplish complex tasks. Sometimes the team is able to coordinate the resources and activities to find a solution, and sometimes team performance deteriorates to a point where team members barely acknowledge one another (Driskell, Salas, Johnson & Forsyth, 1999). This could be the case for stressful situations. Research on stress and situational awareness, indicates that individuals respond to stress by a restriction or narrowing of attentional focus (Cohen, 1980; Combs & Taylor, 1952; Easterbrook, 1959). For instance, Salovey (1992) showed that unexpected events might result in a shift of individual attention from external to a more internal self-focus. In the early research on small group behavior, Torrance (1954) wrote; "Under stress linkages between members may become confused and thus people do not have a clear perception of what they can expect from one another, [and] how they can relate to one another" (p. 754). In their study, Driskell et al. (1999) demonstrated that interdependence leads to a broader team perspective and that stress results in a narrowing of team perspective. Moreover, the results indicated that the narrowing of perspective that occurred under stress led to impaired team performance. Further, as attention narrows, peripheral (less relevant) task cues are first ignored. Later, further restriction of central task-relevant cues appears. Team task require attention to both direct task-related activities and relational teamwork activities, for instance coordination and communication. When these social or team cues are marginalized as attention is narrowed under stress, team perspective is weakened, and thus situational awareness and performance may suffer.

Cohen (1980) presented an argument related to this, when he points that stress leads to increased demand, as the individual must attend to novel and distracting stimuli. Handling the information overload, attention is restricted to those cues most relevant to the task. Cohen also proposed that this restriction might affect both the social and nonsocial cues. Accordingly, a team level perspective is likely to become weakened in groups under stress as these social or interpersonal cues are disregarded. Thus, this indicates that teams are indeed vulnerable

to stress. Driskell et al. (1999) proposes two ways of handling the problem. First, one solution could be to attempt to simplify the increasing complex and demanding task environment. However, reducing the complexity of real-world tasks can be demanding. A second approach to reduce the effect of stress on narrowing team perspective is the attempt to enhance or strengthen team perspective. Wickens (1996) proposed that the attentional narrowing from stress is, at least to some degree, determined by subjective importance. That is, attention on high-priority items to the exclusion of information that is perceived to be of lower importance. Hence, he implies that for many team tasks, the importance of teamwork behaviors such as coordination and communication may be perceived as secondary to other basic, individual task demands.

2.3.2 Team building

Team building is a tool, which can be used for enhancing a team's ability of situational awareness and adaptability. In that sense, it is an interesting topic to examine for us. Teams and team functioning in the workplace have been important topics for investigations since the 1920s. However, today there exists an increased need for organizations to optimize their teams due to the global economy (Shuffler, DiazGranados & Salas, 2011). In regards of this, Cannon-Bowers & Bowers (2011) recognize that well-designed team developmental interventions are essential in fostering effective teams. Consequently, in this chapter we will examine the field of team building, which according to Sjøvold (2014a) consists of team development and team training.

This chapter is built up of three parts. As an introduction, we will discuss the definitions and differences of team building, team development and team training, as well as needs assessment. Following this, team development and team training will be presented as own sections.

2.3.2.1 An overview of team building

Team building originated as group-process interventions designed in order to improve interpersonal relations and social interactions. An example supporting this is Schein (1969), who argued that team building concerns assisting individual team members and the team to analyze, diagnose, and act upon their behavior and interpersonal relationships. From this view, team building has evolved into including the achievement of results, the meeting of goals, and the accomplishment of tasks (Dyer & Dyer, 2013; Salas et al., 1999). As such, team building relates to increase the performance of a team. This is in line with Buller (1986), who claims that the primary purpose of team building is to improve the effectiveness of work teams

within organizations. Furthermore, Sjøvold (2014a) also supports this view and defines team building as:

Long-term, systematic, and goal-oriented work with tasks, performed in the context in which the team operates, where the intention is to increase the team's performance to meet the demands of its surroundings. Team building can take the form of teambuilding or team training (p.71, translated from Norwegian).

In regards of our master thesis, Sjøvold's definition of team building is acknowledged as particularly suitable as it emphasizes that team building is a tool for enhancing a team's capability to adapt its group dynamics to any given task, enabling teams to cope better with different situations. As such, it relates to team maturity and is therefore suitable to support our problem statement. Additionally, Sjøvold (2014a) points out the importance of the context, by stating that team building should be undertaken in the context of which the team usually operates. At last, Sjøvold (2014a) also attaches importance to the fact that team building should be viewed as independent of the team's surroundings. This means that any team building intervention should be tailored to the specific team, implying that a "one-fits-all" solution does not exist.

As mentioned, team building can take the form of team development or team training (Sjøvold, 2014a). Sjøvold (2014a) defines team development as "efforts in order to increase the team's awareness of its own function and ability to operate on a higher maturity level" (p.71, translated from Norwegian). As we can see from this definition, awareness is an important aspect of team development, which involves developing from a lower maturity level to a higher maturity level. This means that team development should also increase the team's ability to balance their group functions, a topic which is already examined in chapter 2.1.3. It should be noted that this does not mean that a team loses the ability to operate on a lower maturity level.

Team training constitute the other aspect of team building, and Sjøvold (2014a) positions it as; "training of a team in order to master the maturity level they already operate on" (p. 71, translated from Norwegian). Consequently, Sjøvold (2014a) regards team training as an effort made in order to enhance team performance for a given maturity level. This can be seen in relation with Goldstein & Ford (2002), who describe team training as a systematic and planned effort to improve team performance by facilitating individuals in the acquisition of knowledge, skills and abilities. Both definitions emphasize the importance of improving team performance.

Effective team building is, according to Arthur, Bennett, Edens, Bell, and Zedeck (2003), dependent on whether a thorough needs assessment is conducted prior to designing the team

building intervention. The aim of conducting such a needs assessment is to uncover the focus of the team building and by that find if it is most appropriate to conduct team development or team training. As such, a needs assessment can be viewed as an investigation of organizational needs (Arthur et al., 2003). Sjøvold (2014a) is concurrent with Arthur et al. (2003), and states that the needs assessment intends to map mutual expectations, achieve a shared understanding of the changes needed, which concrete demands have to be accomplished, and how to achieve the demands. Table 4 is summarizing the definitions used in this subchapter.

Table 4 - Definitions used in this chapter (Sjøvold, 2014a, p.71)

Term	Definition
Team building is ...	long-term, systematic and goal-oriented work with tasks, performed in the context the team operates in, where the intention is to increase the team's performance to meet the demands of its surroundings. Team building can take the form of team development or team training.
Team development is ...	efforts in order to increase the team's awareness of its own function and ability to operate on a higher maturity level.
Team training is ...	training of a team in order to master the maturity level they already operate on
Needs assessment is ...	an assessment that intends to map mutual expectations, achieve a shared understanding of the changes needed, which concrete demands have to be accomplished, and how to achieve the demands.

2.3.2.2 Team development

As mentioned in chapter 2.3.2, Cannon-Bowers and Bowers (2011) emphasize the importance of well-designed team developmental interventions, as being essential in fostering effective teams. In that sense, one may not expect that placing a number of skilled professional individuals in a group, automatically will lead to them performing as an effective team (Kakabadse, Ludlow & Vinnicombe 1988). Moreover, Kakabadse et al. (1988) state that for a team to perform reasonably takes time. This is because it takes time for the team members to become better acquainted with each other, to assess each other's strengths and weaknesses and to reflect whether they can identify with, among others, the values, beliefs and attitudes of their colleagues and a group as a whole. This is in line with Sheard & Kakabadse (2004) who claims that the act of passing through the team development process is the process of converting a loose group into an effective team.

Many researchers have studied the issues surrounding effective team development. In the 1960's, Tuckman and Humphrey's (1965) proposed a development model for team maturity, where they claimed that teams go through a given set of stages before they are able to be an effective team: forming, storming, norming, performing. However, as already specified in chapter 2.1.3, Sjøvold (2006) argues that teams do not develop chronologically through the maturity levels; instead, they may directly evolve to the maturity level suitable for the task at hand. Accordingly, this indicates that groups do not necessarily follow a sequential development towards becoming a well performing and effective team.

Sjøvold (2014a) characterizes team development as the team's willingness to constructively challenge status quo and expand its behavioral aspects. This demands a collective effort where all group members mobilize the creativity and effort required in order to obtain the desired results, which is moving to a higher maturity level. In order for a team to be able to develop, the ability of each individual team member to understand the behavior of teammates, as well as exhibit behavior outside their own comfort zones is necessary. Consequently, this implies a reciprocal relationship between individual development and team development, as the ability to understand behavior only can be developed through feedback from specific situations in the team. This reciprocal relationship is characterized by each individual member gaining insight of the effects of own behavior on others, and vice versa. As such, awareness is an important aspect of team development. Moreover, feedback is of great importance to raise this awareness of how one's behavior affects other people, and vice versa. Important aspects in this regard, are to have the ability to give good guidance and good communication in the team. With this in mind, the following section will treat constructive confrontation (K2) as a tool for promoting guidance and communication. Furthermore, table 5 summarizes the questions that need to be answered in order to have efficient team development.

Table 5 - Different levels of team development (adapted from Sjøvold 2014a, p. 144)

Development	
Context	How do we wish to be perceived by others? What function do we wish to have in the organization? How should we develop our reputation? How do we follow up on our goals and results?
Dynamics	What type of dynamic do we have to develop? What type of management do we need?
Individual	What do a dynamic like this demand from me? Am I willing to perform at the required level?

K2 - Constructive confrontation

Sjøvold (2014a) introduces the concept of constructive confrontation (hereafter referred to as K2), as a fundamental principle of good guidance and communication in groups. As such, its objective is to enhance the communication patterns in a group. K2 is characterized by the continuous quest for more information, and involves constant asking of questions and challenging of statements put forward by team members. This process can be perceived as challenging, as it visualizes the differences in the team member's mental models and requires oppositional behavior. However, Sjøvold (2014a) emphasizes that K2 is all about showing each other respect through a curious communication style that intends to increase the team member's own understandings. This is of great importance, as a lack of understanding can lead to development of alliances, uncertainty and polarizations that would come at the expense of good team cooperation.

Other researchers have examined constructive confrontation, which can be related to Sjøvold's K2. Kellermanns, Floyd, Pearson, and Spencer (2008) claim that it improves the decision quality if the mental models of the team members are different. They also found that a balance could be achieved between the similarities and differences in perspective when constructive confrontation is used. As such, Kellermanns et al. (2008) argue that groupthink can be avoided if constructive confrontation norms are strong in a group. Furthermore, Burgess and Burgess (1996) state that one goal of constructive confrontation is to develop a clear understanding regarding the dimensions of the task, from both the group member's own perspective and the other group members.

Sjøvold (2014a) states that if a team is able to develop K2 as their primary means of communication, they would become self-reliant in their development. Moreover, K2 will eventually lead to the individual being aware of how their behavior affects other people and

vice versa. Consequently, K2 can be viewed as a valuable tool for supporting team development.

2.3.2.3 Team training

Attention to team training has experienced a rapid growth during the past decades (Shuffler et al., 2011). As already mentioned, team training has traditionally been regarded as a systematic and planned effort to improve team performance by facilitating individuals in the acquisition of knowledge, skills, and abilities (KSAs) (Goldstein & Ford, 2002). Delise, Gorman, Brooks, Rentsch, and Steele-Johnson (2010) emphasize that individual training is important in order to ensure that team members possess the necessary KSAs to perform their portion of the team tasks. However, individual competencies are not sufficient in order to ensure the performance of a team. Goldstein & Ford (2002) therefore point out that team members must develop teamwork KSAs in addition to individual KSAs. Salas, Cannon-Bowers and Johnston (1997) have shown that team training, in addition to teamwork KSAs, also targets team processes and performance for improvement.

Furthermore, teams can be trained to make better decisions (Orasanu & Fischer, 1997), to perform better under stress (Saunders, Driskell, Johnston & Salas 1996) and to make fewer errors (Helmreich, Wiener & Kanki, 1993). Moreover, Sjøvold (2014a) argues that the precision of a team's System 1 increases through *training* and drilling in specific situations until the correct reaction is automatized. This is transferable to a team, which can train to get joint team responses in increasingly complex situations (Sjøvold, 2014a). Hence, team training among others can be seen as improving instinctual reactions. However, situations characterized by a high degree of complexity and chaotic work environments also require a well-functioning System 2. This involves individual ability to interpret each other's reactions correctly, as well as the capacity to monitor and share external cues, so that the team's decision is based on a unambiguous understanding (Sjøvold, 2014a). In that sense, team training can also be used in order to develop shared mental models for given situations. It should be noted that while team training helps develop shared mental models in given situations, team development concerns increasing the ability of team members to check each other's mental models.

Sjøvold (2014a) argues that team training follows a successful team development process as a consolidation method. As such, if the desired maturity level is reached, the team building initiative should be designed as a team training intervention. In order to find out if the desired maturity level is reached, SPGR measurements can be made, either as a part of an initial needs assessment or after a team development intervention. As mentioned, the needs

assessment gives the specification of the training objectives, as well as identifies the KSAs, which should be, trained (Arthur et al., 2003). Thus, the design for the training intervention is interlinked with the results from the needs assessment, implying that team training always should be tailored to the distinct needs of a team (Shuffler et al., 2011; Sjøvold 2014a). In the same way as for the needs assessment and team development, Sjøvold (2014a) suggests three important levels of team training. Table 6 summarizes these levels and questions, which should be asked in order to find a suitable team training intervention. With this in mind, the next sections are used in order to give attention to different acknowledged team training strategies.

Table 6 - Different levels of team training (adapted from Sjøvold, 2014, p. 144)

Training	
Context	Which procedures or routines do we have to implement to ensure our position and reputation in the organization?
Dynamics	Which guidelines for our interactions should establish to ensure the dynamics we have developed?
Individual	Which procedures or routines should I establish to be a good team member and ensure my reputation in this team?

Team training strategies

There exists multiple team training interventions, however we will focus on examining what stress training is, in addition to three specific components of team training that have received empirical scrutiny (Salas, Nichols & Driskell, 2007). This is cross-training, guided team self-correction training, and team coordination and adaptation training. The underlying assumption for training interventions is that by partaking in training that addresses the team as a collective whole, the team can be directed towards more effective performance (Salas et al., 2007).

Stress training

By stress training, we are referring to training conducted in conditions, which are different from those encountered in a normal performance environment. Driskell and Johnston (1998) argue that it is challenging to perform a task effectively under high-stress or high-demand condition. This is because informational complexity, task load and time pressure in this context increase the potential for errors. Moreover, they claim that emergencies or crisis can occur suddenly and unexpectedly, and errors can have catastrophic consequences. As such, Driskell and Johnston (1998) emphasize that teams, which could face such conditions, must undergo stress training by performing some tasks in conditions that differ from those encountered in a

normal performance environment. This is because stress include specific task conditions, such as time pressure, ambiguity, increased task load and distractions, which requires specific responses that are different from those in normal performance environments. This is seen as important, as research has shown that normal training interventions often do not improve task performance, when the task has to be performed under stress conditions (Zakay & Wooler, 1984). Consequently, stress training should be conducted in order to prepare the individual to maintain effective performance in a high-stress environment. As such, stress training is used to teach the skills necessary to maintain effective task performance under stress conditions (Driskell & Johnston, 1998).

Cross-training

Cross-training refers to a type of team training based on role-play in which team members consciously act out other team members' roles. This is done by rotating positions in order to develop an understanding of the basic knowledge, skills and abilities necessary to perform successfully the tasks of teammates (Cannon-Bowers & Salas, 1998b). Several studies, among them Volpe, Cannon-Bowers, Salas, and Spector (1996) and Cannon-Bowers, Salas, Blickensderfer, and Bowers (1998), have been conducted on cross-training. They provide initial empirical data suggesting that this training intervention is an effective team training strategy. Additionally, cross-training is seen as important in order to give team members an overall framework for understanding the team's task, and how each member's contribution is vital to achieve these tasks (Salas et al., 2007).

Salas et al. (2007) point out that cross-trained teams outperform teams without such training, for instance by using more efficient communication strategies and higher degrees of interpositional knowledge. Moreover, it has been recognized that cross-training has potential of aiding the development of shared mental models, as a shared understanding of the task and context is established. Consequently, the use of cross-training may imply more effective team performance.

Guided team self-correction

We understand guided team self-correction as a team training strategy, which relies on uncovering a team's knowledge in order to find solutions. This is supported by Salas et al. (2007) which refers to the process whereby a team diagnoses problems in its functioning and develops effective solutions as team self-correction. Furthermore, Blickensderfer, Cannon-Bowers, and Salas (1997) argue that team members often are equipped with much of the information and expertise required in order to identify and solve their own problems. When a team leader or an instructor leads the team self-correction, it has been referred to as guided

team self-correction. Essentially, guided team self-correction is conducted through the facilitator helping the team to determine what specific topics should be discussed and how these should be discussed (Smith-Jentsch, Zeisig, Acton & McPherson 1998). Hence, the team identifies its own problems, which thereafter become the targets for improvement in training exercises (Salas et al., 2007).

Guided team self-correction has been shown to improve performance, as well as fostering shared mental models among team members (Salas et al., 2007). As such, this training intervention may contribute to more effective team performance and support teams' cognitive function of experiential learning, for instance when diagnosing their own problems.

Team coordination and adaptation training

By team coordination and adaptation training, we mean training conducted in order to enhance a team's ability to adapt by shifting their coordination strategies. Salas et al. (2007) points out that teams shift their coordination strategies in order to adapt to increased task demands and stress. This is in line with Serfaty, Entin, and Johnston (1998), who states that highly effective teams adapt to increased task demands and stressful situation by applying effective coordination mechanisms. Moreover, Entin and Serfaty (1999) argue that team coordination strategies are trained through a dynamic adaptation of teamwork processes to changing external and internal conditions. When undergoing such training, team members are required to shift actively from explicit to implicit coordination modes. Consequently, team members learn to alter their coordination strategies and reduce the amount of communication needed in order to perform the team task (Salas et al., 2007; Serfaty et al., 1998). Serfaty et al. (1998) also emphasize that team coordination and adaptation facilitate the development of shared mental models. As such, teams are enabled to maintain team coordination and performance under a wide range of conditions (Serfaty et al., 1998).

In regards of performance, Entin and Serfaty (1990) claim that teams who maintain superior performance under high levels of workload and stress, employ different coordination strategies than low performing teams. Serfaty et al. (1998) studies strengthen this view by indicating that team coordination and adaptation training represents a viable team training intervention. This is also supported by recent research, for instance through Salas et al. (2007) claiming that this is the training intervention, which is the most effective of those we have examined.

3. Developing a model

The different perspectives we have elucidated in chapter 2 will be used to present the conceptual model, which we developed during our project thesis in the fall of 2016. The intention of the conceptual model was to answer the project thesis' problem statement: "How can an operative team be trained to be aware and adjust to an appropriate maturity level for the given context?". However, in this master thesis, the conceptual model is operationalized into a training program and the research question is slightly altered. Accordingly, some of the literature from the project thesis, which are relevant for the development of the conceptual model but not directly for the research question of this thesis, were not given attention in the theory chapter. The research question in this master thesis is altered in order to test if such a model can actually be used to improve a team's ability of becoming aware of and adjust to an appropriate maturity level for a given task. As such, our master thesis have a slightly different focus than the project thesis, moving from looking at an appropriate maturity level for a given context to an appropriate maturity level for a given task, and from an operative team to an innovative team. However, we wish to emphasize that a task is always influenced by its context. Consequently, we will first introduce and describe the conceptual model developed in our project thesis in chapter 3.1, before we present the operationalized model that is the basis for the thesis research in chapter 3.2

3.1 Conceptual model

We have constructed a circular model with five steps, which includes the themes awareness, adaptability, and reflection. The aim of this model is to explain what factors influence a team's ability to become aware of a situation and the task presented, adapt to it accordingly, and learn from the process. The first three steps, Perception, Comprehension, and Projection, are based on Endsley's (1995) model of situational awareness, and constitute the awareness part of our model. The next two steps in the model, Action and Reflection, can also be implicitly found in Endsley's extended model of situational awareness in dynamic decision making. In the extended model, Endsley explains decision making and performance of action in separate steps, but we have chosen to combine these steps into one, namely Action. Hence, we regard action as being about solving the task by making optimal actions and adapting to the context. As such, Action is concerned with a team's adaptability. Further, Endsley uses feedback in the extended model, and we have chosen the step Reflection with a feedback loop back to a new situation, to implement the feedback loop of Endsley's model. Consequently, we see reflection as dealing with learning from the previous steps in order to perform better in the future.

We wish to point out that even if this model have many similarities with Endsley's model of situational awareness, the model is different when it comes to what we interpret in the different steps. In addition, our model views the process of situational awareness and adaptation in the light of team building, and we propose team building interventions to become better at each step. Our model is presented in figure 2. The bullet points within each step describe parts of the theory we consider most relevant for the specific step. As outlined in the key concepts in chapter 1.3, we argue that the understanding of a task is dependent on both the context the task is presented in, and the team that is conducting the task. Consequently, a task will not necessarily be understood the same way if it is presented in a different context or to a different team. Therefore, we have placed the task in our model at the intersection between the context and the team.

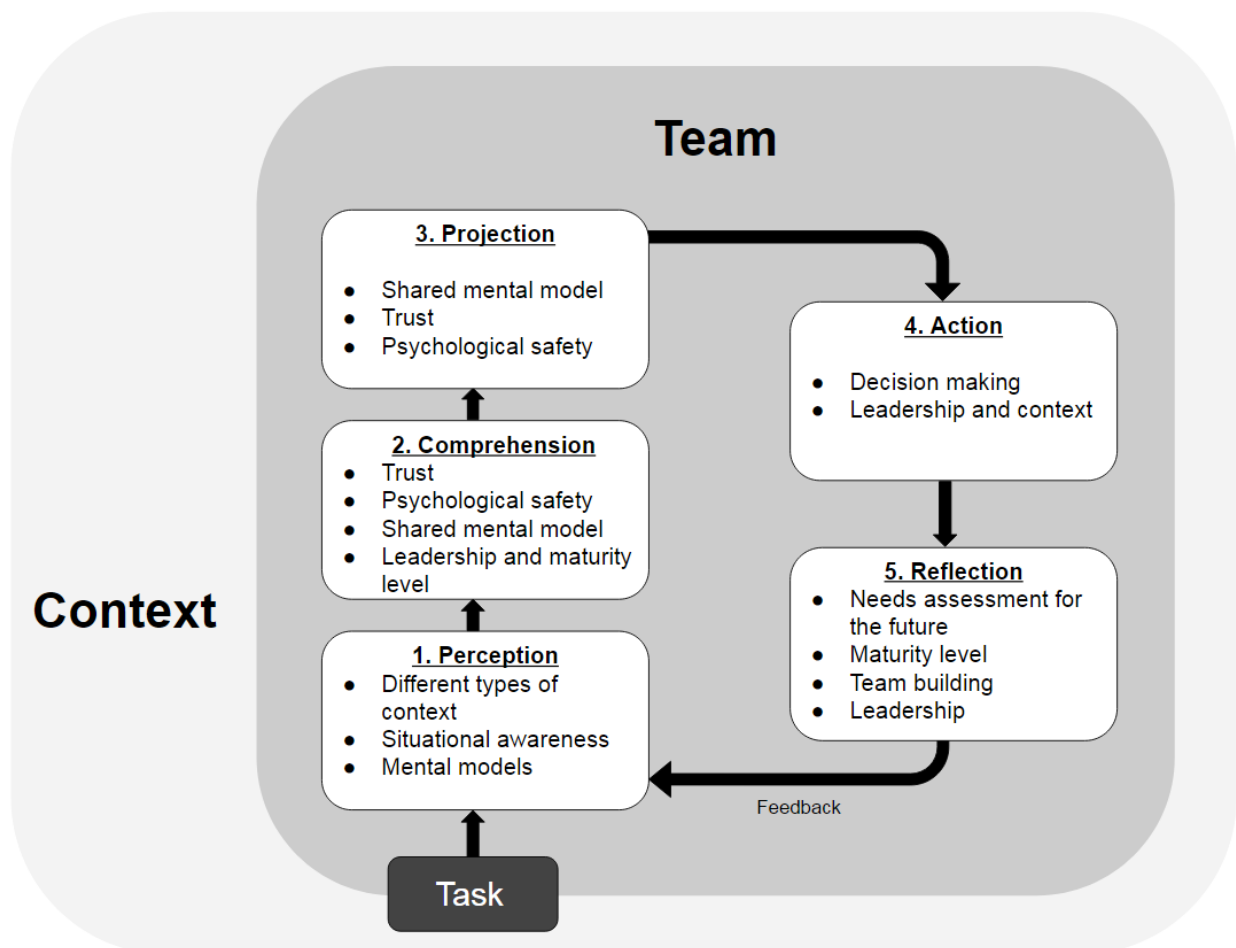


Figure 2 - Conceptual model: How to be aware and adapt the maturity level to the given context in order to make the best possible actions.

It should be noted that this model is not meant to be a phase model, where a team must develop through chronological distinct phases to reach an optimal stage. We regard every

step as important and valuable, and argue that the model is circular. In that sense, an optimal stage does not exist in this model. Furthermore, the separation between the steps are liquid. If a team decides, conscious or unconscious, that they should skip a step, this can cause a degradation of their performance. We argue that a team will get a better understanding of the unfolding task, which will lead to better actions and stronger learning outcomes, when they go through all steps. As such, we favor moving through all five steps.

Figure 3 exhibit our conceptual model compiled with spin theory. As stated in chapter 3.1, we argue that teams can enhance their ability to become aware of and adjust to an appropriate maturity level, which is moving on the maturity level axis, by going through the steps in our conceptual model. As such, this figure shows how a team can move consciously and thereby more efficient on the axis between the maturity levels. The operationalization of our conceptual model aim to exhibit how a team’s conscious movement between maturity levels can be improved in practice. The operationalized model will be presented in the subsequent chapter.

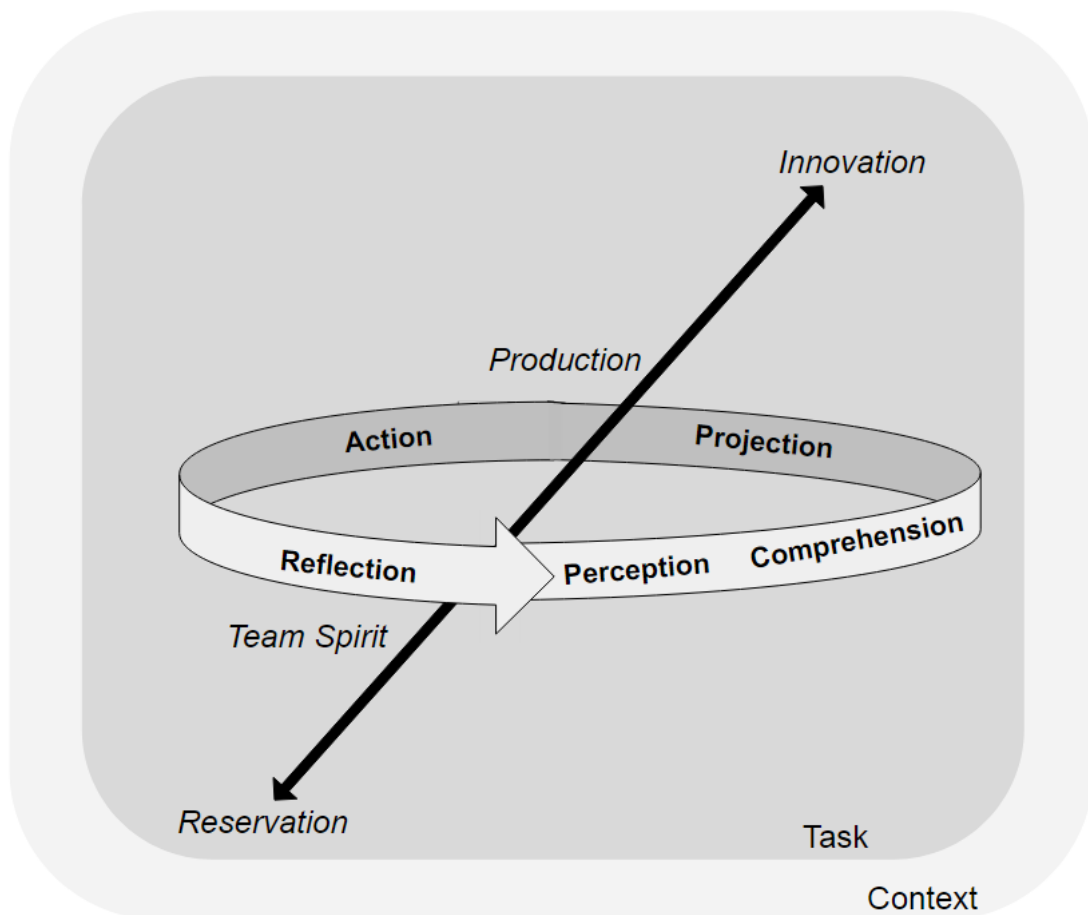


Figure 3 - Conceptual model compiled with spin theory

Next, we will explore in more detail the five steps in our conceptual model (figure 2), and use these to explain how an innovative team can strengthen their awareness and adaptability in order to solve a task, given the context they are operating in. The evaluation of each step is based on already presented theory. For each step, we will first explain its scope. Thereafter, the steps will be concluded with a recommendation on team building to be conducted in order to become better at these steps. The appropriate team building intervention is dependent on whether the team is facing a routine or a complex task and therefore this is taken into account when giving recommendations. Throughout our discussion, we have not made a clear distinction between team development and team training interventions. This is a conscious choice, as we consider that all the mentioned team building interventions can be used both for development to higher maturity levels and training to master the current maturity level. However, whether the goal for a team is to manage higher maturity levels or become better at the current maturity level, we emphasize the importance of having a predefined objective. Accordingly, a conduction of a needs assessment is a prerequisite for successful team building.

3.1.1 Perception

Jane and John are lying in the grass and gazing at the clouds. Suddenly, John says; "Look, there is a big elephant directly above us!" Jane looks up to study the same cloud. "No, you're wrong. Can't you see that it is a flower?"

This example illustrates the concept of perception, where different persons construct their own image of an event. We understand this as team members constructing their own mental models of the task and context. Endsley (1995) defines the first part of situational awareness as "the perception of the elements in the environment within a volume of time and space (...)" (p. 35). Further, she explains that perception concerns available information about the environment. Thus, perception concerns gathering information about the task and context the team faces. At this step, the team members have their subjective perception of the task and context, but these subjective mental models might not be congruent with the rest of the team. This can particularly be the case if the team is not trained to work together.

Team building

The perception step in our model, concerns the individual's perception. As such, the step is at an individual level. To perform better at this step when faced with a routine task, we propose two training methods that we believe will be useful: checklists and practice in scanning relevant displays. We argue that checklists can be used to verify that any important factors of the task

are not missed. Moreover, Gaba et al. (1995) also propose these two methods. They claim that these methods can be conducted in order to learn situational awareness, which we regard consists of, among others, the perception step. They acknowledge practice in scanning relevant displays as efficient to maximize perception of cues from all relevant data streams. As a result, it will be easier for the individuals to determine what is important and what is not. Furthermore, we consider practice in scanning relevant displays also to be effective to train at perception when faced with a complex task. On the other side, we believe checklist will be inadequate for such tasks. In a complex situation, we believe that checklists are not comprehensive enough to consider what factors are relevant. As the factors most likely will change from situation to situation, a general checklist may get the individual to perceive the situation as simpler or different from what it actually is.

Regarding training methods related to complex tasks, we argue that cross training is an appropriate training method. As argued by Cannon-Bowers et al. (1998), the individual team member can become familiar with the other team member's roles and tasks, and thus become more aware of the knowledge, skills and abilities (KSAs) necessary to successfully perform the tasks of the teammates. Additionally, cross-training is seen as important in order to give team members an overall framework for understanding the team's task, and how each member's contribution is vital to achieve this task (Salas et al., 2007). Moreover, we argue that cross-training has potential of aiding the individual's development of a task-related mental model. Our understanding is that when cross training is executed, the individuals get more experience and knowledge, from different perspectives, about what information is the most important in a crisis situation. By doing this, the individuals learn which knowledge, skills, and abilities that are important not only for themselves but for the team as a whole.

3.1.2 Comprehension

James is working at a power plant, where he monitors several different system components. Any small mistake can mean power outages for thousands of households. Thus, John must continuously put together disparate bits of data in order to comprehend what the status of the power plant is, to ensure the power of the households.

This example illustrates the importance of the concept of comprehension. Comprehension means to integrate available data and synthesize this to an understanding of the context and the task (Endsley, 1995). Endsley (1995) argues that comprehension is essential to understand the significance of the elements and to gain the whole picture of a situation. In addition, comprehension involves integrating external data with the knowledge and goals of

the team. Thus, we consider that shared mental models at this step have to be established, in order to achieve a common comprehension of the task and context on a team level. The establishment of shared mental models require the team members to ask questions and challenge other members' statements and perceptions (Sjøvold, 2014a). Further, we argue that trust and psychological safety will act as facilitators to the establishment of shared mental models. In a psychological safe environment, people are not afraid of asking questions and state their own perceptions, and trust is present through the belief that others have your best interest in mind (Edmondson, 1999). Furthermore, we acknowledge leadership that suits the task the team faces as critical, in order to make the process evolving from individual perceptions to common comprehension as appropriate and efficient as possible.

Team building

The comprehension step in our model, concerns the team's comprehension of a task and context. As such, the step is at a team level. By performing better in this step, we argue that a team will increase its ability to become aware of a situation by developing a shared mental model. Furthermore, we believe different team building interventions may be conducted in order to achieve a better comprehension of a task in the given context.

Before a team is facing a task, we suggest that a team could conduct a SPGR survey. According to Arthur et al. (2003), effective team building is dependent on whether a thorough needs assessment is conducted prior to designing the team building intervention. The SPGR survey is a tool to map the group dynamics and intergroup relations. In that way, we regard the survey as an important part of the needs assessment. Additionally, Sjøvold (2014a) states that it can be used to analyze possible conflicts, prominent dynamics and role structures, which can be helpful in the mapping and prediction of the team development in different scenarios. As such, we argue that the results from the SPGR survey may be used in order to enhance a team's shared mental models. The rationale behind this is that by uncovering a team's group dynamics and intergroup relations, the team members may understand their own role and their team members' roles better. In that sense, team-related mental models, which refers to a team's functioning and expected behaviors (Salas et al., 2005), may become more similar. Consequently, we regard SPGR as a tool for improving a team's shared mental models. Additionally, SPGR can be used in order to evaluate whether shared mental models of the context exists and thus the team may be able to detect potential trouble spots in their mental models at an early stage in the process. In a crisis context, where time is a constraint, we argue that it is particularly advantageously to have knowledge about the other team members' mental models this in advance. Joyce and Slocum (1984), who state that a common perception of the work context should exist, also support this view.

The spin theory emphasizes the importance of a flexible role structure as an amplifier for flow in a team's communication, as well as the mobilization of everyone's resources (Sjøvold, 2007). We argue that flow in a team's communication is important in order to develop shared mental models, because we view sharing of perspectives as essential to achieve shared mental models. By sharing perspectives, more information is uncovered, improving both a team's shared task- and team-related models. Consequently, we acknowledge a flexible role structure as desirable. According to Sjøvold (2010), this is achieved through all members developing their behavior aspects to support all group functions, as described in chapter 2.1.2. We consider cross-training as an effective tool in order to create a flexible role structure. By rotating positions, the team members gain a greater understanding of each other's tasks, and among other, what abilities are needed in order to conduct these tasks (Salas et al., 2007). We consider the execution of different group functions as a part of these abilities. As such, we believe that the rotating of positions may train the individuals on acquiring new group functions, resulting in a more flexible role structure, and increased flow in communication and hence better shared mental models. Moreover, cross-training has been shown to help the development of shared mental models, because a shared understanding of the task and context is established (Salas et al., 2007).

Furthermore, we consider Sjøvold's (2014a) notion of constructive confrontation (K2) as an important tool for uncovering other team members' mental models, by asking question and challenging statements. As such, we argue that K2 may be utilized as a starting point for developing a shared mental model. As mentioned in chapter 2.3.2.2, K2 can be perceived as difficult as it requires oppositional behavior. In that sense, our understanding is that it is essential to have established a psychological safe environment and trust in the team. Because oppositional behavior is required in constructive confrontation, we understand trust in K2 as a belief that all team members can and will question other members' perceptions. The questioning in K2 will eventually lead to the individual being aware of how their behavior affects other people and vice versa. This is supported by Burgess and Burgess (1996), who state that constructive confrontation can aid in developing a clear understanding regarding the dimensions of the task, both from their own perspective and from the perspective of others. In addition, as Kellermanns et al. (2008) argue, constructive confrontation is helpful both when mental models are different and similar, as it act as a balancing mechanism that helps decision making.

3.1.3 Projection

Lisa is driving home from work. In front of her, she can see an approaching car driving slowly. Another car is shifting lane in order to pass the slow car. Lisa understands that the distance to these cars are too short for the second car to have the time to pass. Therefore, Lisa chooses to slow down to give the car more time. Hence, a collision is avoided.

This example illustrates the concept of projection, which is the third point in our model. This point concerns projection of future status of the elements in the environment. Endsley (1995) explains that how precise a team is able to project, is dependent on how accurate they have been on the two previous points, perception and comprehension. Moreover, according to Endsley (1995), projection provides the knowledge and time necessary to decide on the most favorable course of action to meet one's objective. From our point of view, it is especially important that the team members have shared mental models of the task. If not, projections of the future status of the elements in the environment may be conflicting. Again, we regard trust and psychological safety as important, as it will make it easier for the team members to express their thoughts.

Team building

The projection step in our model, concerns a team's ability to predict the future status of the elements in the environment. As such, we argue that it is a part of a team's awareness of a task and context. Consequently, we believe that by performing better in this step, a team enhances its ability to become aware of a situation. As for comprehension, we believe that developing shared mental models are of great importance for the projection step. In that sense, one could ensure common projections of future status of the elements in the environment. Consequently, it will be easier for a team to move in the same direction.

Due to the position, shared mental models have in both the comprehension and projection steps, we believe that the same team building intervention as in the comprehension step could be used to a certain extent in the projection step. However, we argue that a shift of focus, from understanding a task and context to target what this task and context demand of the team in the future, needs to be conducted. In other words, we claim that the comprehension step is concerned with the current task and context, in contrast to the projection step where a shared mental model on the current status is not enough. Here, we also acknowledge the importance of having a shared mental model of the future task and context, which among others includes future demands, risks, and tasks.

As mentioned, a SPGR survey can be used to analyze possible conflicts, prominent dynamics and role structures, which can be helpful in the mapping and prediction of the team development in different scenarios (Sjøvold, 2014a). Consequently, we claim that the conduction of a SPGR survey lays a great foundation for team-related shared mental models, which is of essence in order to predict future demands of a team. Moreover, we argue that combining the results of a SPGR survey with thinking of possible scenarios can be valuable, as one could visualize each team member's contribution to a task based on their SPGR results.

Furthermore, we see guided team self-correction as a team building intervention aiding the development of shared mental models also for a team's future status. As team members often are equipped with much of the information and expertise required in order to identify and solve their own problems (Blickensderfer et al., 1997), we argue that they are able to predict future demands, risks, and tasks. It should be noted that guided team self-correction might be challenging to conduct under stressful conditions where decisions need to be made quickly. However, we want to emphasize that the team still are equipped with valuable information and expertise during complex and stressful tasks, but the team is forced to rely more heavily on implicit coordination rather than on explicit communication. As such, we regard shared mental models as becoming even more important in order for the team to move in the same direction. Guided team self-correction has, as mentioned, been shown to improve performance, as well as fostering shared mental models among team members. In that sense, we believe that this team building intervention is valuable to perform when possible, as it lays a foundation for better shared mental models.

3.1.4 Action

Magnus is an experienced chess player. He perceives key patterns on the chessboard, considers them and make out possible future scenarios for different moves before he makes a decision on which move to execute.

In the fourth point of our model, action, we include making the decision and executing it. As such, it is concerned with the adaptability aspect of our model. As the example illustrates, the process of making a decision and executing it, is closely interrelated with the three previous points in our model. Therefore, we argue that the better the performance during the previous steps, the better the foundation to make the right actions are. Particularly, we consider the development of shared mental models as a prerequisite for conducting optimal actions. Furthermore, we acknowledge that trust is important in this step. Primarily because a team

must be able to trust the decisions on which actions to conduct, in order to go through with these actions, regardless of the contexts. Moreover, we claim that oppositional behavior could be important in order to find the best actions, requiring trust in a team. Lastly, we consider a team's adaptability as a function of the actions they conduct. By this, we mean that the more optimal action conducted, the better the team's adaptability. However, the team should be aware of the possibility for the team members to lose situational awareness, which will have a negative effect on the team's ability to adapt.

Team building

As mentioned, the action step in our model is concerned with a team's ability to adapt to a task and context, by conducting the optimal actions. We have argued that how well a team performs in the action step, is dependent on the performance in the three previous steps of our model. We consider it as important for teams to train on making optimal decisions, regardless of the unfolding environment.

For teams in performance environments such as routine contexts, we consider guided team self-correction as a suitable team building intervention. The teams do most likely not experience disturbing elements, allowing them to extract the information they hold through discussion on topics proposed by a facilitator. Consequently, the teams can use the extracted knowledge in order to identify and solve their own problems by conducting appropriate actions. Additionally, we regard K2 as a team building intervention, which could strengthen the positive effect of guided team self-correction. The rationale behind this is that K2 is seen as fundamental principle of good guidance and communication in groups. Moreover, it is characterized by the continuous quest for more information, and involves asking of questions and challenging of statements put forward by team members (Sjøvold, 2014a). As such, we believe that by using K2 in combination with guided team self-correction, more valuable knowledge can be uncovered. We argue that this may lead to better identification of problems and solutions, and ultimately better actions conducted.

We have identified that with complex and stressful tasks, it will not be efficient to run every decision by the leader. Therefore, we argue that the team members need to be trained in taking responsibility in stressful situations. As such, we regard team coordination and adaptation training in combination with stress training as valuable. When undergoing team coordination and adaptation training, Salas et al. (2007) point out that team members are required to shift actively from explicit to implicit coordination modes. In that way, the team members learn to alter their coordination strategies and reduce the amount of communication needed in order to perform the team task. We argue that being able to take responsibility is

crucial for the ability to shift from explicit to implicit coordination modes, as decisions to a smaller extent can be run by a leader. As such, we regard team coordination and adaptation training as suitable for our purpose that team members need to learn to take responsibility. Furthermore, we have seen that Zakay and Wooler (1984) claim that normal training interventions often do not improve task performance, when the task in reality has to be performed under stressful conditions. Consequently, we acknowledge stress training as suitable in order to perform a task effectively under high-stress conditions including informational complexity, task load and time pressure. By conducting stress-training the team members will learn the skills necessary to maintain effective task performance under stress conditions (Driskell & Johnston, 1998).

3.1.5 Reflection

Maria attended a lecture on the topic of shared mental models, but could not concentrate at all even though she found the topic interesting. Afterwards, she tried to make sense of the experience, and she realized that she did not have anything to eat for breakfast that morning. As she understood that, she learned that she should always eat a nutritious breakfast before a tough school day.

This example illustrates the concept of reflection, which can promote learning. After executing a task, a team can reflect upon their actions in order to learn from the experience. In our model, we view reflection as a needs assessment for the future, as reflection includes assessing both what went well and what went wrong. In that way, we believe that the team may be able to recognize which abilities they need to improve and which they need to maintain. Moreover, the needs assessment may reveal in which steps of the model the team did not perform good enough, and consequently disclose which of the proposed team building interventions that are appropriate. Accordingly, we argue that a needs assessment for the future should be conducted in order for the team to be prepared for subsequent events.

Team building

When working with both routine and complex tasks, we believe that a team may not feel they have the time or need to do team building, as they are busy working with a task. Therefore, we propose that training and development should be initiated before the team is given a new task, even if the task is not yet known. We argue that by conducting for instance a SPGR analysis and other team building interventions in advance, the team members can get to know the mental models of each other, and thus be better equipped to know how team members usually react in a certain situation. As such, we regard the Reflection step as a step zero as

well as step five. This is because team building can be done both in advance and hence function as input for the conduction of new tasks, and after teamwork to promote learning for future challenges.

Another of our arguments for performing team building interventions in advance of a task is the importance of establishing a trust base for the team. As shown in chapter 2.2.3, trust appears in different ways on different maturity levels. Rousseau et al. (1998) argue that there exist three phases of trust: building, stability and dissolution. We believe that in order to go from individual perception, to mutual comprehension through shared mental models, the first phase of trust needs to be present. Further, researchers argue that in new contexts (McKnight et al., 1998) and new teams (Das & Teng, 1998), the building of trust is important. Hence, we argue that optimally the building phase of trust is done before the problem solving get started. The next phase, stability, is central for the team members to feel safe during their problem solving. However, this stability can be disrupted and thus trust can be reduced, which is explained as declining trust (Rousseau et al., 1998). Consequently, we acknowledge it as important to ensure that trust in a team is not declining over time. If this happens, we argue that the team should start over again, with trust building and hopefully stability.

We argue that the Reflection step is of the same importance as the other steps in the model. Spending little or no time on this step will lead to loss of important learning objectives, as well as the opportunity to increase performance in the future. This is supported by Sjøvold (2014a), who claims that if a team stops training and developing, their performance will degrade. We regard it as the leader's responsibility to make sure that this step is executed, even if it is tantalizing to start on new tasks. In accordance to this, it is the leader's responsibility to ensure the performance of the team, therefore it should be noted that "A leader is never better than his team: Leadership is team building" (Sjøvold, 2014a, p. 77, translated from Norwegian)

3.2 Operationalization of the conceptual model

When moving from the theoretical conceptual model to an operationalized model, the conceptual model is, as mentioned, used as a background for making a model for practical team training. The operationalized model is built as a training program to improve a team's ability to be aware of and adjust to the most appropriate maturity level given the task they are working with. In addition, the goal is that this training program should be a natural part of the problem solving process. Moreover, the training program takes short time to implement and should be completed every time the team has new and shared tasks to solve. An overview and description of the steps in the operationalized model is given below in table 7.

Table 7 - Description of the operationalized model

Step	Description	Task	Focus
Perception	Each team member creates individual perception of the task.	Each team member writes down how they understand the given task on the first post-it note.	What does this task require from the team and me?
Comprehension	The team creates a common comprehension of the task.	Discuss the perceptions each team member got in step 1. Make sure that the team have the same understanding of the task by asking constructive questions. Each team member writes down the common comprehension of the task on the second post-it note.	Make sure that you are open to other views.
Projection	The team makes projections of the future together.	Perform a short OT-analysis. This is to evaluate future Opportunities and Threats. Find keywords together through a short discussion, and write them down on the third post-it note.	How will the future state of the elements require the team and me to behave?
Action	The team carry out their task by making decisions and executing them.	Use constructive confrontation when/if decisions or actions are unclear or conflicting with the common comprehension.	How can I foster better decision making? Am I acting according to the common comprehension of the task?
Reflection	The team reflects on and evaluates the task- and teamwork conducted during the task.	Perform a short SW-analysis of the team when working with the task. This is Strengths and Weaknesses of the teamwork. Find keywords together through a short discussion, and write them down in a document. Store the results for later use and learning in order to perform better.	What can be done different in order to improve? What should the team continue to do?

The graphical representation of the operationalized model is shown in figure 4. It includes the same number of steps with the same descriptions as the conceptual model (figure 2). However, as seen in both table 7 and figure 4 the content is operationalized for practical use

and training through execution of given tasks at each step. The task is to be solved in a certain context, and hence the team that is solving the task is influenced by the context. It is noted that the feedback from reflection to a new task is very important, and that learning from team dynamics in previous tasks will improve the team's ability to be aware of and adjust to the most appropriate maturity level for a given task.

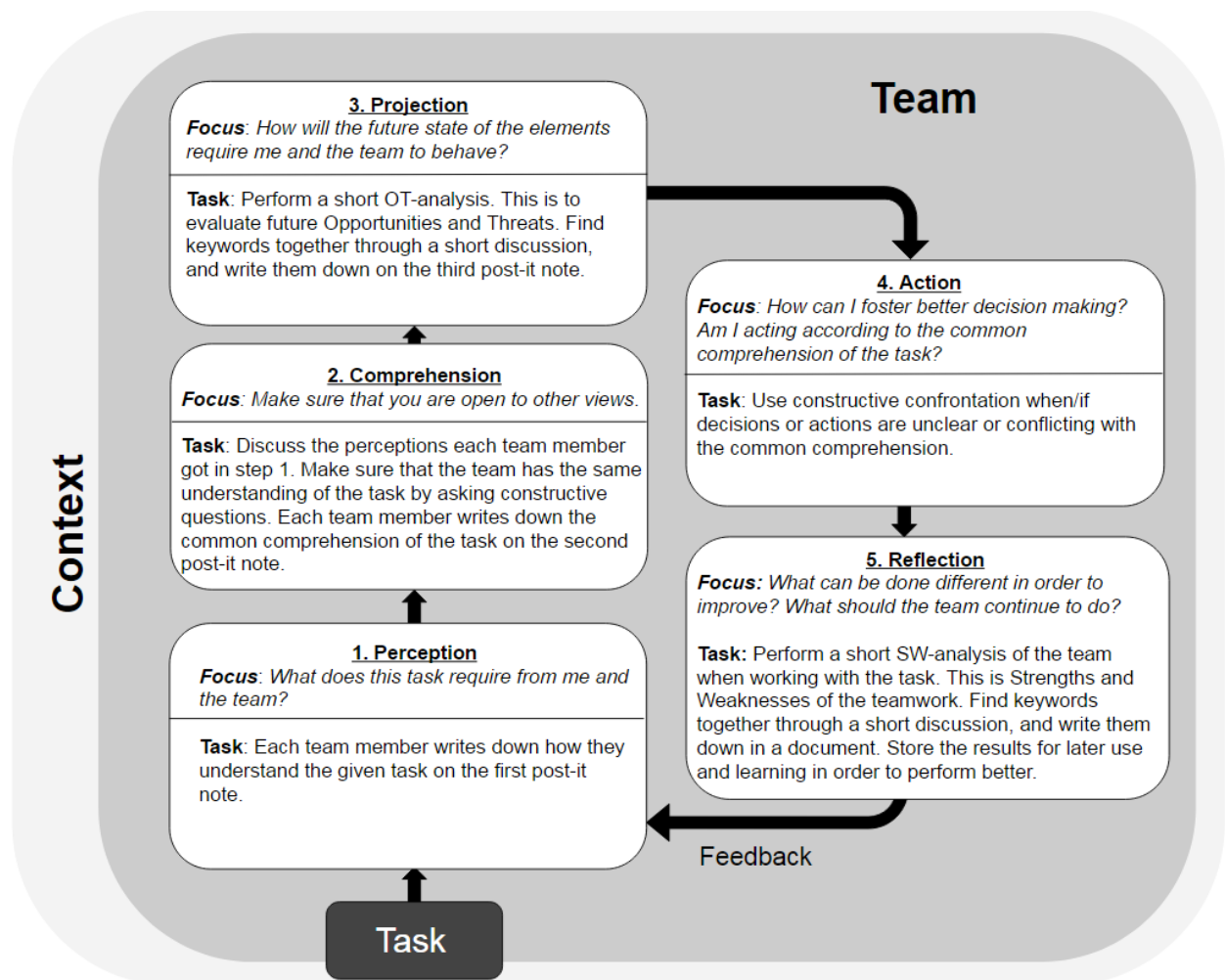


Figure 4 - The operationalization of the conceptual model

An example of the use of post it-notes is shown below in figure 5. This is to be executed in step one, two and three. Moreover, it should be noted that the SW-analysis executed in step five must be stored and used for learning.

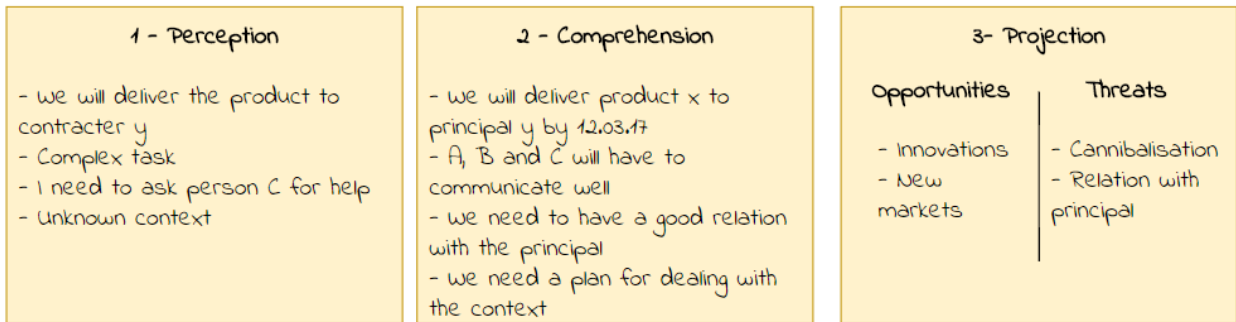


Figure 5 - Example use of post it-notes in the operationalized model

4. Methodology

The main objective of this master thesis is to perform research in order to support our research question. Grønmo (2004) defines a method as “the specific procedures for the planning and implementation of specific scientific studies” (p. 29). As mentioned in chapter 1.2, the treatment group will be referred to as the X-team in order not to breach confidentiality. This chapter will introduce the methodology used in this thesis for investigating our research question. Initially, the choice of research method will be presented, before the research design of this study and the applied research methods are described. Furthermore, we describe how we processed the data, before we will demonstrate the reliability and validity of the data, as well as the limitations of the study. This is followed by an examination of the research ethics. This chapter is concluded with a summary of the methodology.

4.1. Choice of research method

As mentioned in the introduction of this chapter, the purpose of the study is to answer our research question. Van de Ven (2007) view answering a research question as the purpose of scientific research as well. Additionally he argues that there exists two basic research models, which are the qualitative models and quantitative models. We have conducted our research based on a combination of these two research models, as a combination may be advantageous, which we will look into in this chapter. Accordingly, there is a necessity to present the definitions of these models. Strauss and Corbin (1990) refer to *qualitative research*, as any type of research that produces findings not arrived at by statistical procedures or other means of quantification. As such, qualitative research includes collecting, analyzing, and interpret data by observing what people do and say, and refers to the meanings, concepts, definitions, characteristics, metaphors, symbols and descriptions of things (Johannessen, Tufte & Christoffersen, 2006). On the other hand we have *quantitative research*, which by Creswell (1994) are described as a type of research that explains phenomena by collecting numerical data that are analyzed using mathematically based methods.

Our thesis build qualitative research through two rounds of interviews with three employees in the X-team. Furthermore, the quantitative perspective is displayed by SPGR analyzes, which is given theoretical foundation in chapter 2.1.2, and will be given a further practical description in chapter 4.3.1. The SPGR analyzes will also be conducted in two rounds. In addition, we will utilize sociometric badges as a tool for our quantitative data collection. These are badges based on technology developed at MIT media labs. The data collection through badges will

also be done twice, and will collect behavioral data and link it to specific metrics with the goal of improving team performance.

With the use of both qualitative and quantitative research, our research method can be referred to as mixed methods. Another term for mixed methods are triangulation, which is defined by Denzin (1978) as “the combination of methodologies in the study of the same phenomenon” (p. 291). Triangulation is a metaphor from navigation and military strategy that use multiple reference points to locate an object's exact position (Smith, 1975). With the use of both qualitative and quantitative research, multiple reference points are referring to the use of multiple methods to examine the same dimension of a research problem.

We have chosen the approach of mixed methods, because it enables us to capture the best of both the quantitative and qualitative approaches resulting in a more complete, holistic, and contextual portrayal of the research question. Accordingly, the use of mixed methods may enrich our understanding by allowing new or deeper dimensions to emerge (Jick, 1979). Furthermore, the use of several methods gives us the opportunity for cross validation when they yield comparable data. In our research, this translates to the fact that the focus always will be on how a team can be trained to be aware of and adjust to an appropriate maturity level for a given task, but the mode of data collection varies. If the methods reach the same conclusions, a more certain portrayal of this phenomenon is provided (Jick, 1979). Moreover, Mason (2006) claims that mixing several methods during one study is advantageous, as it avoids constraints brought by utilization of a specific method.

Due to the fact that the aim of our research is to answer our research question, it should be noted that extensive work has been put down in order to develop the research question and the conceptual model. The research question and the conceptual model are both rooted in a literature review conducted in the autumn of 2016. Consequently, we find it appropriate to describe the development of this thesis' theoretical framework in the next subchapter.

4.1.1 Literature study

As preparation for this master thesis, we conducted a literature review in the autumn of 2016 with the purpose of giving this thesis a strong theoretical foundation. Tranfield, Denyer, and Smart (2003) argue that conducting a review of the literature is an important part of any research project, as the researchers both map and assess the relevant existing literature in order to specify a research question and build a knowledge base. This is supported by Hart (1998), which points out that the aim of a literature review is to identify theories and previous

research, compare them, and at last establish an overview of the existing literature. Accordingly, the research question in this thesis is based upon the literature review.

Our literature review was initiated by reading literature recommended by our supervisor, followed by electronic keyword searches in relevant databases. A basis for our literature review was team theory, a topic that is well covered in the literature. In order not to drown in the flood of published scientific research, we decided to have a systematic approach to our search for relevant literature. This approach consisted of four phases. First, we got together and selected relevant topics suiting our problem statement. Thereafter, keyword searches were conducted. By performing searches with multiple combinations of our keywords in Google Scholar, we got a superficial overview of the existing literature. Moreover, we considered other relevant databases. NTNU's university library, named Oria, and Scopus were used as complementary databases for more extensive research. This was followed by a process of narrowing down the scope of our research by evaluation our research topics. The research topics were consequently divided into four main categories, namely team theory, context, team building, and roles and leadership. At last, measurements in order to draw insight from our literature were conducted. Accordingly, the theory of this chapter is inspired by the literature review, and tailored in order to fit the research question of this thesis.

4.2 Research design for this study

The research design represents a logical model, which allows researchers to draw conclusions about the causal relationship between the variables under investigation (Yin, 2014). Furthermore, Saunders, Saunders, Lewis, and Thornhill (2011) describe the research design as the overall plan on how to answer a research question, where factors affecting the design is the research question, existing knowledge, time, and resources available. As such, it is evident that we need to find an appropriate research design.

We have chosen to base our research design on our research question. Research questions can generally be divided into three categories: what/which, why, and how (Blaikie, 2010). Our research question is formulated as a "how"-question, implying that it investigates how change can be created in practice. Consequently, we have an exploratory research question. Blaikie (2010) claims that the focus of such research questions are how characteristics, social processes or patterns can be changed. We see that this conforms with our research question, where we wish to examine how a team can be trained to find effective group dynamics in order to solve their tasks more effectively. According to Jacobsen (2005), an exploratory research question requires a method, which brings out nuanced data, is in depth, as well as is sensitive

to unexpected conditions and thus open to contextual conditions. Yin (2014) argues that case studies are well suited to answer exploratory research questions. Because of this, we consider a *case study* as a suitable research design to answer our research questions.

A case study is defined by Yin (2014) as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used” (p. 18). Moreover, Yin (2014) points out that a case study is particularly suited when a phenomenon in its actual context is examined, and when behavioral events cannot be controlled. In this thesis, we are examining the X-team operating in their actual context. Additionally, we do not have control over behavioral events affecting the team. Consequently, a case study stands out as an appropriate research design. Furthermore, what we are studying can be described as a complex problem, because many factors are affecting the team's ability to find an appropriate maturity level for a given task. A case study excels at bringing us to an understanding of the complex problem. They are particularly useful when wanting to understand some particular situation or problem in great depth, and in cases rich in information (Patton, 1987).

The case study that we will conduct will have a quasi-experimental design, where we will use a control group in order to get a deeper understanding of the effects of the training program on the X-team. This control group consists of over 30 groups with 3-5 team members, which is assumed to have the same background as the X-team, because they all root from the School of Entrepreneurship. The purpose of the control group is to create a comparative basis in order to evaluate if the training program has any effect. Quasi-experiments share with other types of experiments the purpose of deliberately vary something to discover what happens to something else later - to discover the effects of presumed causes (Shadish, Cook & Campbell, 2002). Shadish et al. (2002) define a quasi-experiment as an empirical study that estimates causal impact of an intervention on its target population without random assignment. The most commonly used quasi-experimental design are probably the nonequivalent groups design. It is structured like a pretest-posttest randomized experiment, but it lacks the key feature of the random assignment (Trochim, 2006). It is the fact that participant are not randomly assigned, that separates a quasi-experiment from an experiment (Cook & Campbell, 1979). In our case, the X-team are the chosen team for our quasi-experimental case study. Furthermore, the quasi-experimental design are commonly employed in the evaluation of educational programs (Gribbons & Herman, 1997). As such, we regard this design as particularly appropriate for our purpose, where we wish to see if our training program has a positive effect on the X-team's ability to be aware of and to adjust to an appropriate maturity level. Accordingly, the X-team is seen as a treatment group given a pretest, receiving a treatment, and then is given a posttest.

At the same time, we have other teams at the Entrepreneur School given a pretest, but do not receive the treatment, and then is given a posttest. The pre- and posttest will be interviews, SPGR-analysis, and measurement through badges, where the treatment is referring to our training program. We will evaluate the effects of our training program through the use of these tests by examining whether the X-team improve more than participants (other groups at the Entrepreneur School) who do not receive the treatment.

As pointed out, the case study with a quasi-experimental design that we will present through this thesis attempt to provide a detailed description of how the X-team respond to a training program we have developed based on our conceptual model. This training program was presented in chapter 3.2. Our thesis's research was done during the period from the end of September 2016 to the end of May 2017. The research was, as mentioned in chapter 4.1.1, initiated by a literature review. Furthermore, the collection of qualitative and quantitative data started in February 2017 with a workshop, interviews, a SPGR survey, and measurements using sociometric badges. The purpose of the workshop was to introduce the training program that we have developed based on our conceptual model to the team investigated, as well as being an arena for the use of the sociometric badges. The workshop, with the same means of collecting data, was repeated in April 2017. Figure 6 shows a timeline for our data collection. The next chapter will describe the methods used for the data collection in a more detailed manner.

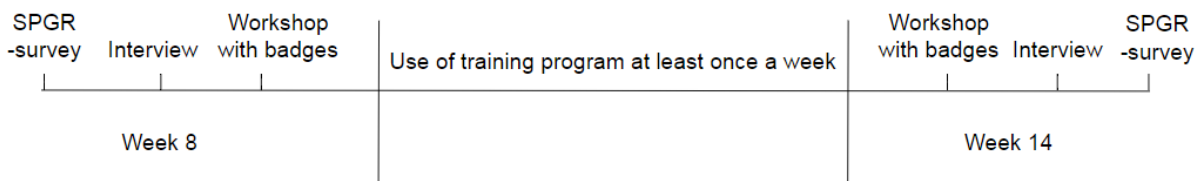


Figure 6 - Timeline for data collection

4.3 Data collection and applied research methods

When conducting data collection in regards to research, Blaikie (2010) explain that data can be distinguished to three types: primary, secondary, and tertiary data. Primary data is data where the researchers themselves conduct data collection, analyzing, and reporting. Furthermore, secondary data relies on data other have collected. At last, tertiary data have already been analyzed by the researcher who developed them, or by someone who has adopted secondary data. Our study relies mainly on primary data. Consequently, we have direct contact with our sources, as well as more control over the process. However, Blaikie (2010) emphasize that the use of primary data requires that we have to consider the quality of

the data collected. This we will do in chapter 4.5. In addition, it should be mentioned that we also utilize secondary data to evaluate our control groups.

Yin (2014) argue that most of the better case studies rely on a variety of sources. As mentioned, we have used both qualitative and quantitative methods when conducting our research. This chapter will focus on giving a thorough description of the research methods utilized in our study: SPGR, badges, and interviews, as well as explaining how the data collection within these methods took place.

4.3.1 SPGR

The SPGR instrument will be introduced in this chapter. Firstly, the field chart showing team relations will be described. In conclusion, the execution of the SPGR instrument in this thesis is presented.

4.3.1.1 Introduction to the SPGR instrument

According to Sjøvold (2007), the SPGR instrument is an operationalization of the spin theory and the tool can be used to map group dynamics within a team. The results from the tool give a field chart, which focuses on group relations. In addition, the results can be used to evaluate the group dynamics and to expand the team members' ability to take different roles.

The field chart

A SPGR field chart is a simplified representation of the several dimensional spin theory model, as described in chapter 2.1.2. The chart can also be called a relation chart, because it shows the relation between the team members, as well as how the team members' behavior affect the other team members. The results from the analyses are placed somewhere in the area with the three functions: Control (blue), Nurture (green) and Opposition (red). Every member of the group will be drawn as a circle where the position show the most prominent behavior in the given situation. The size of the circle says something about how much influence the person has in the group. A person taking a lot of space gets a bigger circle, and opposite, a person taking little space gets a smaller circle. Behavior supporting the fourth function in the spin theory, Dependence, is expressed through small circles in the sectors Control and Nurture ("Smidighetsprofilen", 2017). An example of a field chart is shown in figure 7.

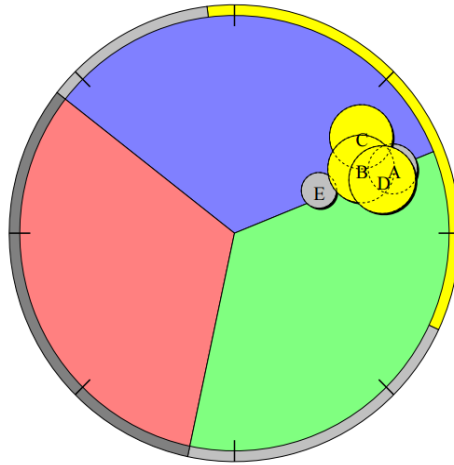


Figure 7 - Example of a field chart

The results from a SPGR show four dimensions. These dimensions are based upon the fundamental group functions in SPGR, which are named: Control (C), Nurture (N), Opposition (O), and Dependence (D) (Sjøvold, 2006; 2007). Furthermore, pairing of these basic group functions gives us two of the four SPGR dimensions, respectively the Control and Nurture (C-N) dimension and the Opposition and Dependence (O-D) dimension. The third dimension is labeled Withdrawal and Synergy (W-S), where the poles show the group's level of maturity. The fourth dimension is the Influence versus passivity (I-P) dimension. Accordingly, an introduction to the four dimensions will follow.

The C-N-dimension: The Control function (C - blue) is dominant in a group with established working rules and has focus on execution and production. Sometimes persons operating in this category can be seen as rigid persons very committed to rules. They can be too concerned about systematics and doing things "the right way". Groups characterized by control has a shared assumption goal crystal clear and unified, but this assumption is never taken up for discussion. On the other side, the Nurture function (N - green) is prominent when establishing and maintaining social relations. Persons operating in this category are perceived friendly, informal, open, and democratic. A group that remain in this function will have a tendency to promote values that support members' satisfaction and interpersonal relationships (Sjøvold, 2006; 2007).

The O-D-dimension: A group characterized of Opposition (O - red) is characterized by a constant challenge of the status quo. Persons operating in this category show no tolerance for control and express resistance against authorities. A group characterized by Opposition shows mutual suspicion and open acceptance for individuals right to gain influence and power. The Dependence function (D - light grey) is on the other pole of this dimension. This function is

prominent when the work is clearly defined. Persons operating in this category are logical, analytical, and concentrated about solving the task. If a group stays in this function, it will have a tendency to promote values as loyalty and discipline (Sjøvold, 2006; 2007).

The W-S-dimension: The W-S dimension indicates the degree to which the four basic group functions are balanced. Team members operating at the Withdrawal pole (W - Dark grey) do not experience a common identity or a common commitment. Hence, the group has low maturity. The different team members are characterized by the attitude “myself first”, and the group by “we, and the others”. The role system is less developed, where individuals more or less take fixed roles. Through their attitude, they show resignation, and that the teamwork is demanding. At the opposite pole, the Synergy pole (S - Yellow), the team members experience strong common identity, high degree of learning, and that discussions lead to new and unique knowledge. The group is actively searching for new knowledge and relations outside of the team. All members master all the fundamental functions and conversations and discussions are characterized of energy and flow. Through their attitude, the group shows engagement combined with the ability to listen and the ability to inspire each other. Hence, the group is operating on a high maturity level (Sjøvold, 2006; 2007). As such, the nearer the Synergy pole, the stronger the group member’s identification with the group (Boëthius, Ögren, Sjøvold, & Sundin, 2004). Moreover, Boëthius et al. (2004) describe a Synergy role to represent group members who present less rigid behaviors, and are able to shift between behaviors that support different group functions.

The I-P-dimension: Sjøvold (2007; 2014a) states that some of the facets in the SPGR tool express more submissive behavior while others more dominant behavior. Combined, these two give a measure of perceived influence by the object. Further, Sjøvold (2007) claims that for a group to propel towards the Synergy pole, all members must provide all functions. Accordingly, in order to succeed getting close to the Synergy pole, the group must be forced to leave its predominant position. In addition, the fixed role structures must be broken and influence must be more evenly distributed. Balance can be skewed to the pole of one given dimension (function) if particular members exert considerable influence on the group, even though that or these members are the minority. However, empirical findings strongly propose that over time the I-P dimension must also be balanced. In fact, extremely dominant individuals in a group tend to freeze the group in a fixed pattern of roles.

A further explanation of the field chart vectors is given in table 8 and figure 8.

Table 8 - Explanations of field chart vectors (“Feltdiagrammet”, 2017, translated from Norwegian).

SPGR code	SPGR vector	Typical behavior	Feature
C	Control		Blue
C1	Task orientation	Substantive, efficient, compliant	
C2	Management	Controlling, authoritarian, rule-oriented	
N	Nurture		Green
N1	Protect	Caring, gregarious, protective	
N2	Creativity	Creative, spontaneous	
D	Dependence		Light grey
D1	Loyalty	Obedient, compliant, accepts assignments	
D2	Acceptance	Trusting, happy, submissive	
O	Opposition		Red
O1	Criticism	Provocative, willful, non-conforming	
O2	Self-assertion	Competition adjuster, stubborn, knows best	
W	Withdrawal		Dark grey
W1	Resignation	Unclear, discouraged, do not contribute	
W2	Self-sacrifice	Self-pitying, entrapped, demanding	
S	Synergy		Yellow
S1	Engagement	Committed, cooperative, constructive	
S2	Empathy	Showing appreciation and interest in others	
I	Influence		Size of circle
Z	Influence	Forceful, active, engaged, dominant	

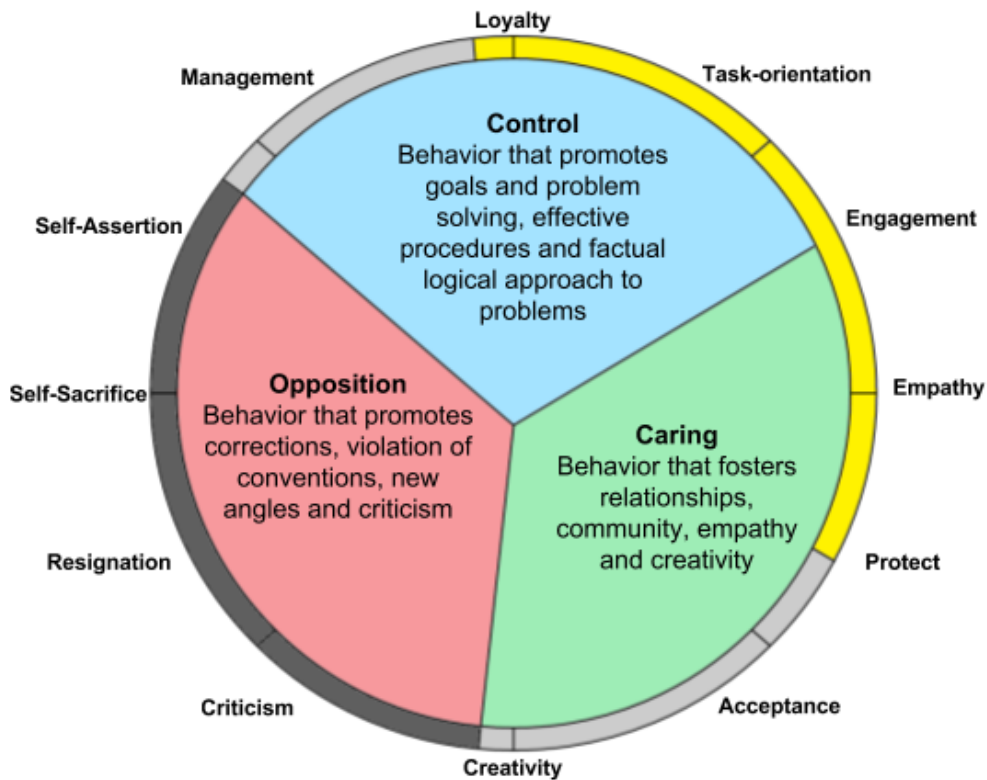


Figure 8 - The SPGR vectors in the field chart (Adapted from Sjøvold, 2002a)

4.3.1.2 Execution of the SPGR-instrument

A team's location along the dimensions mentioned are identified by using the SPGR scales for peer and self-ratings of behavior or the SPGR category system for observation (Sjøvold, 2002b). We have chosen to use the SPGR scales, as it do not require us to be present for observation. The SPGR scales consists of 24 ratings regarding behavior in a set of three words. The respondents rate the person in question according to whether the behavior (1) never or seldom occur, (2) sometimes occur, and (3) often or always occur. The person is then assigned a score, combining the ratings for each word in the behavior, along the C-N, S-W, O-D, and I dimensions. The result of this rating along the dimensions gives the opportunity to understand which function a group member is operating on better, in addition to how the group is interacting. As mentioned in the research design of our study, the X-team received two SPGR surveys, respectively one before the training program and one after the training program. We distributed the SPGR surveys through email, where information about the test was included. Completing the SPGR survey took about ten to fifteen minutes, as it takes approximately five to seven minutes for each team member. We obtained six complete ratings, a response rate on 100% for the two SPGR surveys. The results from the tests were handled anonymously, as we will get back to in 4.6 research ethics. In order to make the X-team more aware of their own situation, the results from both the SPGR surveys were sent to them.

Furthermore, we also collected SPGR data in two rounds from other teams at the Entrepreneur School. We made sure that the time interval between the SPGR data from the Entrepreneur School were approximately the same as for the X-team. This was done in order to create similar conditions for the different teams.

4.3.2 Badges

A badge is a product based on a novel technology able to capture several kinds of human interaction (Stålsett, 2017). The product looks like a cell phone, and has an integrated microphone, accelerometer, bluetooth connection, and other tools typically found in a smart phone. It can measure how people move, how people interact, the tone of their voice, if they leaned forward to listen, and other types of interactions that happen at every company every day (Miller, 2017). As such, Pentland (2012) argues that badges are able to uncover the core of team dynamics through its advanced set of measurements and analysis.

In accordance with Pentland (2012), Olguín, Waber, Kim, Mohan, Ara, and Pentland (2009) describes the idea behind the badges to be a measurement tool with high predictability for different kinds of social cues. Social cues are defined as honest signals (Pentland, 2008). These are signals that so hard to fake, and consequently become integrated into our behavioral repertoire. As a result, honest signals are reliable predictors of human interaction, and therefore are indicators of how teams coordinate their actions verbally and non-verbally. As such, the badges are a tool for examining an additional and unexplored layer of the communication process.

Curhan and Pentland (2007) argue that honest signals can be derived from fine-grained analysis of body movement patterns, timing, energy, and variability of speech. As explained, this is the purpose of the badges. Furthermore, four types of signals are prominent with the use of badges: engagement, mimicry, activity, and consistency (Curhan & Pentland, 2007). Engagement describes the amount of control one person has over the other's behavior. Further, mimicry refers to the reflexive copying of one person by another during a conversation. The energy and time spent in a conversation is translated to the activity signal. At last, consistency relates to extent of variability in speech prosody and activity levels. It should be noted that people employ a combination of these signals, and that these signals should be interpreted in the light of the situations' contexts, because they have different meanings across different contexts.

We made use of the badges two times during our data collection, as the badges were used in conjunction with the workshops we conducted. The study's participants wore the badges during these workshops, which we in advance made sure were fine with the participants. The two workshops had the same composition, and consisted of two different cases that the team was supposed to solve. The two cases required different maturity levels in order to be solved most efficiently. The first case called for a lower maturity level, whereas the second case would best be solved with a higher maturity level. However, during the first workshop one of the badges did not record audio, causing the results linked to audio to be misleading. As such, from the first workshop we have chosen to use only the data linked to the accelerometer. As we view the SPGR and interviews as our main sources of information, the limitation with the badge results from the first workshop is considered as minimal.

4.3.3 Interviews

According to Bryman (2016) the interview is probably the most used method in qualitative research. One of the advantages of this approach is that the interview is highly flexible. It allows the researcher to get a deeper understanding of the attitudes, values, beliefs, and motives of the respondent, in addition to making it possible to observe non-verbal indicators (Yin, 2014). Another advantage, which is especially important to us, is that the interview can help to place the results from the quantitative research into social and cultural relations (McCracken, 1988), thus giving us a more in-depth view.

Jacobsen (2005) explains that an interview may have different degrees of openness. According to Robson (2011), there are three main forms of interviews: Unstructured interviews, semi-structured interviews, and structured interviews. When we place the different forms on a continuum, we have unstructured interviews on one side, which is a conversation about one or several topics chosen by the interviewer (Bryman, 2016). In this form of interview, the interviewer does not use an interview guide with predefined questions and the style of questioning is informal. On the other side, we have structured interviews where the interviewer only uses predefined questions (Bryman, 2016). This is a more formal way, and the goal is to ask the same questions to all the respondents. In the middle, we have semi-structured interviews, where the interviewer typically has a series of questions in the form of an interview guide, but the interviewer is allowed to change the sequence of the questions and ask further questions if necessary (Bryman, 2016).

In order to answer our research question we view semi-structured interviews as the most appropriate form of interview. The main reason for this is that we can gain the insight into the

research participants' view of the group and the group dynamics, without placing the respondents into predefined categories. Another advantage for us, as we are three persons conducting interviews, is that we make sure that the respondents are asked mostly the same questions so that we do not get three different types of interviews. However, with the semi-structured interview there is room for adaptation and further questioning if we find it useful. In addition, the use of a theme-focused interview guide was advantageous for us when choosing to use a semi-structured interview. This makes it possible for the research participant to base the answers on the theme we are discussing, which provides us answers that are more specific. With the use of semi-structured interviews, there are limitations we need to account for. One limitation is that the researcher or the interviewer is not neutral, distant or emotionally detached from the interview (Rubin & Rubin, 2012). As such, the interviewer's biases, mood or prior experiences may affect the way the researcher analyses the data negatively.

The interviews were conducted using the interview guides provided in appendix 1 and 2. All the interviews were held in Norwegian. In order to get as precise data as possible we chose to have two rounds of interviews, one before the training program, and one after. The team studied includes three members, and all the members were interviewed in both rounds in order to ensure a holistic view of the group dynamics. By choosing all members, we got a good data basis for our empirical study. The questions we asked were adapted in the second round, in order to see if the training program had changed the view the research participants had about the group and the group dynamics. Each of the interviews took about 30 to 45 minutes. In order to have the opportunity to get back to the information we received in detail and to ensure that the information was correct, the interviews were recorded. We informed the research participants about this in beforehand and deleted it after transcription. This is further explained in chapter 4.4 and 4.6.

4.4 Processing of the data

After the collection of data was conducted, a need to process the data originated. In order to do this we transcribed the interviews. This is in line with Langdrige (2004), who believe that transcription of data is the first part of the analysis process. Moreover, he emphasize that the transcription will increase the researcher's knowledge of the collected empirical data. Consequently, the transcription constitute an important foundation in terms of our analysis process.

To link the theory to the collected data, we utilized the pattern-matching technique when transcribing the interviews. This technique seeks to establish relationships between empirical

data and assumptions made before the data collection, and hence makes it easier to extract empirical findings relevant to the study (Yin, 2014). In other words, the pattern-matching technique compares the pattern found from the collected data with a theoretical pattern made prior to the data collection. Yin (2014) argues that this is one of the most desirable techniques for case study analysis, and consequently appropriate for us to use. In order to utilize the pattern-matching technique we connected the collected data to the theory by categorizing the empirical material into six main categories based on our theory. The main categories that we set up were introduction of the team (in round 1), the training program (in round 2), shared mental models, psychological safety, trust, and roles and leadership. Further, the main categories were divided into smaller subcategories where we found it appropriate. It should also be noted that we used the six main categories in our interview-guide, which made it easier for us to categorize our data. Furthermore, the analysis in this thesis follows the same structure as the theory chapter, which is seen as the theoretical pattern in the view of the pattern-matching technique. The rationale behind this is that the analyzing of the collected data is done by looking at each of the factors in the theory separately: Shared mental models, psychological safety, trust, maturity level, and roles and leadership. By using the pattern-matching technique, the internal validity of the case study may be strengthened if these patterns exhibit a high degree of similarity (Yin, 2014). Accordingly, the next chapter will evaluate the reliability and validity of our collected data.

4.5 Evaluation and limitations of the study

This study is conducted as a part of our master thesis, thus it is restricted by limited resources. One of them, and maybe most influential, is the time constraint, as the university has a deadline for delivery. In order to ensure the quality of our research, we have given the criteria of validity and reliability attention. These criteria are the two most frequently adopted criteria regarding data evaluation (Yin, 2014). Therefore, this subchapter will first evaluate the validity of the study, before the reliability is considered. Throughout the process of these evaluations, limitations of the study are pointed out.

4.5.1 Validity

Validity is described as the degree to which a research study measures what it intends to measure (Kelley, 1927). CIRT (2017) state that validity concerns are of great importance in quasi-experimental research, because the research designs lack the same level of control mechanisms as true experimental designs, thereby raising questions regarding the validity of the research findings. As such, we need to evaluate the study's validity. There are three validity

test relevant to social-science research; construct validity, internal validity and external validity. Consequently, we will examine how these three types of validity is evident in this study.

4.5.1.1 Construct validity

Construct validity refers to identifying correct operational measures for the concepts being studied (Yin, 2014). This corresponds to Cohen, Manion, and Morrison (2013), who describe construct validity as whether the researcher's understanding of a concept is similar to that which is generally understood and accepted to be the concept. The construct validity is somewhat weakened by utilizing badges, as sociometric badges lack construct validity according to Curhan & Pentland (2007). However, it should be pointed out that ongoing research has the aim of link spin theory to the results of the badges (e.g. Stålsett, 2017). Furthermore, Yin (2014) suggests that a study's quality can be enhanced by using multiple sources of research. This is also the fact for construct validity. Hence, the thesis's construct validity has been strengthened by obtaining data from interviews, SPGR, and badges, previously described as the method of triangulation. This is because the research question has been examined from different viewpoints, and thus explore somewhat different aspect of the research question, and if correlation between the findings are found, the construct validity is strengthened (Yin, 2014).

Furthermore, Yin (2014) argues that establishing a chain of evidence to support the conclusion serves to increase a study's construct validity. As such, we have strived to build a chain of evidence by structuring the results and discussion in 6.1 based on the structure of the thesis theoretical framework. Accordingly, the reader will find it easier to follow the thesis' reasoning and be able to see connections across the different chapters. Hence, we have deliberately made an effort to show how the results have emerged from the empirical data basis to a final conclusion (Yin, 2014).

4.5.1.2 Internal validity

Internal validity is concerned with the accuracy of a study. According to Yin (2014), internal validity refers to forming causal relationships that explains how and why an event leads to another event. As such, internal validity is the confidence that we can place in the cause and effect relationship in a scientific study. CIRT (2017) argues that internal validity is primarily concerned with controlling the extraneous variables and outside influences that may affect the outcome. This is considered as considerably more difficult in quasi-experimental studies than in experimental studies, because participant are not randomly selected. As such, it is more difficult to control the extraneous variables that may influence the findings. Accordingly, it is of great importance for us to evaluate the thesis' internal validity.

Yin (2014) mention the use of pattern-matching as an effort to increase a study's internal validity. We have used pattern-matching in order to sort the collected data material, and by that be able to seek connection between the empirical data and the assumptions made before the data collection. This makes it easier to extract the empirical findings that are relevant to our study (Yin, 2014). In that sense, our interview guide has also been of great help, as it has given us the categories in which we have sorted our material. As such, our interview guide and the pattern-matching technique can be viewed as useful tools to ensure the thesis' internal validity.

Robson (2002) points out that with the use of surveys, there often exists a gap between what people answer and how they actually act. Therefore, a potential weakness that may hurt the thesis' internal validity regarding the use of SPGR, is that there is a risk that the respondents may answer the questions in the way they believe the researcher(s) want them to (Høium, 2010) or how they wish it to be, rather than being honest. This is also the fact regarding the use of interviews. In order to minimize this risk, we emphasized that the respondents both from the SPGR survey and the interviews is held anonymous, which according to Yin (2014) serves to improve sincerity of the answers, and thus the internal validity. It should also be pointed out that the validity and reliability of the SPGR model has been confirmed in previous studies (Sjøvold, 2007; 2014). As such, we consider our study robust against social accepted answers. Further, we argue that the use of badges strengthens the internal validity, because it records honest signals that is expensive to fake (Pentland, 2008). Thus, the badges are supplementing the other methods and may provide data, which may confirm or contradict the other data. Another potential weakness with the use of interviews is that the respondents may misinterpret the question, and by that give answer which do not correlate to our research question. Based on this, we strived to develop a thorough interview guide with distinct question, as well as take time to explain concepts and terms to the respondents. We also would like to point out that the use of semi-structured interviews may enhance the thesis' internal validity, as it is allows respondents to talk about issues and events that are not linked to the interview guide but may give a better understanding of the causal relationships in the study.

4.5.1.3 External validity

External validity refers to whether the result of a study can be generalized beyond the immediate study (Yin, 2014). Yin (2014) argues that the external validity is ensured in the design phase, meaning that one should use theory as a basis for the case study, and then see

if the findings can be traced back to the theory. Hence, the conduction of the literature study, in the autumn of 2016, can be seen as a tool for enhancing this thesis' external validity.

Cohen et al. (2013) argue that results from case studies is hard to generalize, as the research is based on one unique case. On the other hand Yin (2014) states that this is a misinterpretation as case studies provide more detailed knowledge that can be generalized by analytical generalization. The factors having a direct impact on team maturity is generalized concepts, which concerns all teams. As such, we argue that it is possible to generalize some aspects from this study on how a team can become aware of and adjust to an appropriate maturity level. Accordingly, the readers of this thesis have the opportunity to make judgements about how this thesis may have relevance for similar cases.

4.5.2 Reliability

Reliability is defined by Yin (2014) as the consistency and repeatability of research procedures. As such, reliability is concerned with the credibility of the study and if it is possible for others to get the same results and draw the same conclusions as us. An important part to ensure reliability is the methodology chapter in itself, as it is a systematic explanation of the method used to answer the research question. Databases from NTNU's library were used in order to ensure the reliability of the references that we applied. According to Yin (2014), a case protocol can be used to ensure reliability. In our case, such a protocol is the interview guide. Further, the SPGR-questionnaire is a standardized questionnaire, which according to Robson (2011) contribute to higher response reliability.

To ensure the reliability of our study further, we strived to make the conditions in which the interviews were held as similar as possible. In that regard, the interview guide were the same for all the interviewers, but follow-up questions were asked to avoid as many misunderstandings as possible. The data was collected using recorders and the same method was used to transcribe the interviews. Therefore, it was possible for us to re-listen the interview if anything were unclear. Even though we believe that it is not reasonable for the data to be interpreted and described outside what was actually said in the interview, semi-structured interviews have the limitation that the researcher or interviewer is not neutral, distant, or emotionally detached from the interview (Rubin & Rubin, 2012) and thus may bias the data. Another limitation related to the semi-structured interview is that some researchers are concerned that the use of an interview guide will not allow genuine access to the worldview of the respondents, and thus favor an unstructured interview (Bryman, 2016). We are aware of

the limitations and weaknesses of the study, and therefore we are better fitted to deal with them.

4.6 Research ethics

Yin (2014) points out the importance of having knowledge on how to engage in ethically correct research before conducting data collection. As such, focus on research ethics has been a fundamental part of our preparation to our case study. We have explicitly gone through a number of ethical principles relating to data collection in order to accommodate necessary ethical requirements. Especially the requirements of The Norwegian National Committees for Research Ethics (NNCRS), which are independent agencies regarding research ethics, and investigation of misconduct (NNCRS, 2014). Accordingly, this chapter will give a description of what research ethics are, why it is important, as well as how we have strived to conduct our study in accordance to ethical principles and requirements.

Israel and Hay (2006) refer to ethical behavior as behavior, which helps protect individuals, communities, and environment. Moreover, ethical research ensures that documented claims are based on adequate evidence. This complies with the description given by NOU Helse- og omsorgsdepartementet (1999): With ethics, one refer to the careful consideration and portrayal of both individuals and collectives. Furthermore, it is claimed that research ethics refer to values, norms and institutional regulations that help constitute and regulate scientific activity (NENT, 2007). As such, we regard ethical research behavior as important to help create trust towards the case studies participants, build cooperation and not least to give a correct portrayal of the collected data.

In order to accommodate ethical requirements, we have strived to follow two of Fangen's (2009) ethical principles regarding qualitative data collection, which are confidentiality and informed consent. Moreover, we also wanted to ensure the research subjects anonymity in the quantitative data collection, as well as for the transcribed interviews. What these principles imply, and which efforts we have conducted to follow them will be described in the following paragraphs.

Confidentiality means that the information and materials are made anonymous, i.e. no outsiders know who gave the information to the researcher (NNCRS, 2016). Further, confidentiality implies that information is limited to those who have authorized access, and the research subjects should have the researcher's assurance of confidentiality. We find it important to respect the requirement of confidentiality, as we believe that a breach of

confidentiality undermines the research's trust and credibility. In order to meet the requirements of confidentiality, we have emphasized to have an awareness around how we treat and store our interview material. During the process of transcribing the interviews, we anonymized all the research subjects. Moreover, we stored the interviews in a secure manner at a NTNU server with restricted access. As such, the interview recordings cannot be linked to named individuals. At last, the material from the interviews will be deleted upon the expiration of the thesis research.

Postholm (2005) claims that informed consent is helping to underpin a study's ethical value. Consequently, we have made sure to get informed consent during the work with the data collection. Regarding the interviews, we asked the participants in the start of the interview process if they consented to us recording the interviews. As a part of the information sent out regarding the SPGR analysis, we pointed out that the query was voluntary. Furthermore, when we received the results from the SPGR analysis, which included several figures, we specifically asked for the participants consent to use them. Moreover, we also made sure that it was ok for the participants to use the badges during the workshop. As such, we ensured informed consent for the data collection done in this study.

At last, compared with confidentiality, anonymity do not give the researcher information, which can link the results to individuals (NNCRS, 2016). In regards of SPGR and the use of the badges, we wanted to ensure the participants that their anonymity were maintained. Consequently, we gave the participants assurance that their anonymity were maintained through an information sheet during handed out before the workshop. The information sheet explained that the collected data was to be handled by an outside party, our professor at NTNU, without disclosing names to us and that no identities revealed through the badges. With the interviews in mind, we anonymized them and made sure not to use job titles or other information that could disclose the identity of the participants. At last, we deleted the interviews after transcription, in order to keep the anonymity of the participants.

4.7 Summary of methodology

In order to ease the reading process, we have chosen to summarize the methodology in table 9 below.

Table 9 - Summary of methodology

Choice of method	Mixed methods/Triangulation
Research design	Case study with quasi-experimental design
Applied research methods	Interviews, SPGR, and badges
Processing of data	Transcription with pattern-matching
Evaluation and limitations of the study	We have used the following approaches to improve the validity and reliability of the research: <ul style="list-style-type: none">- Construct validity Use of multiple sources of research, establishing chain of evidence- Internal validity Pattern matching, interview guide, explanation of concepts and terms to the research participants- External validity Literature review, generalized concepts- Reliability References from NTNU's library database, interview guides, standardized SPGR-questionnaire
Research ethics	Focus on confidentiality, informed consent, anonymity

5 Empirical findings

This chapter will serve as a presentation of the relevant empirical findings from the data collection. The presentation of the data will be structured by the methods, meaning that we will present the collected data from each method consecutively. Moreover, the data from the pretest and posttest (see chapter 4.2), denoted as round 1 and round 2, will be presented separately. We will start by giving a presentation of the quantitative data, SPGR and badges, before the qualitative data from the interviews are given attention.

5.1 SPGR-results

The results from the SPGR instrument exhibit aggregated group dynamics at a team level, as well as the individual evaluations done by each team member. The analysis of the aggregated group dynamics and the individual evaluation intends to identify the state of shared mental models, the influence of each group member and the social role structures. As mentioned in 4.3.1.1, the SPGR diagram exhibits one colored circle for each team member. This circle's position shows which of the dimensions, explained in 4.3.2.1, that tend to appear most frequently. To explain this more accurate, the placement of the circles is based on three values, X, Y and Z, ranging from -18 to 18. First, the X-value of each circle declares the positioning from left to right in the diagram, with the negative values being on the left, 0 in the center, and the positive values to the right. Second, the Y-value decides the vertical placement of the circle, with positive values above center, 0 in center and negative values below the center of the diagram. At last, the Z-value determines the size of the circle. Based on these values, circles can be colored blue, green, red, yellow, or grey, where descriptions of these colors can be found in table 8. With the color and placement of the circle together with the four dimensions, it is possible to identify the nature of the group structure and dynamic.

5.1.1 Round 1

As mentioned in chapter 4.2, we conducted the first round of the SPGR survey in February 2017. Initially, in chapter 5.1.1.1 it will be given an in-depth explanation of the SPGR-results of the first survey for the X-team. Following this explanation, a comparison between the results of the X-team and the control group is done in chapter 5.1.1.2.

5.1.1.1 The X-team

This chapter will present the data collected by the use of the first SPGR survey, by initially exhibiting the X-team's aggregated evaluation of their group structure and dynamic.

Furthermore, we will go into more detail by presenting the results in two more ways. This is by first examining the team members' individual evaluations of their group structure and dynamic, and secondly by illustrating the field chart vectors of the team.

Aggregated evaluation

Figure 9 exhibits the field diagram for the X-team as a whole. The figure illustrates a cluster of different sized circles positioned mainly between the control and nurture sector, implying that these are the most prominent behaviors within the team. However, it is also observed that person A is positioned closer to the opposition sector, indicating that he has a greater tendency towards oppositional behavior than the other team members do. Moreover, it should be pointed out that person B and person C exhibits a stronger tendency towards task-oriented behavior than person A, especially person C who is only positioned in the control sector. As seen, the circle sizes are approximately the same. However, person A and person B exhibits slightly larger circles than person C, indicating that they have somewhat greater influence in the team than person C. In total, the circle sizes of the team members are $A=0$, $B=0.7$ and $C=-0.3$. Furthermore, the color of the circles demonstrate different group functions within the team, as explained in chapter 4.3.1.1 and, as mentioned, illustrated in figure 8. By evaluating the colors of the circle, we observe that person A and person B have yellow circles. Consequently, they show a balanced specter of behavioral traits, i.e. they are able to shift between behaviors that support different group functions. On the other hand, person C exhibits a light grey circle, and can thus be perceived as modest and cautious, but also conscientious. Moreover, a person characterized by a light grey circle expresses a dependency behavior and rarely jump into discussions without being asked.

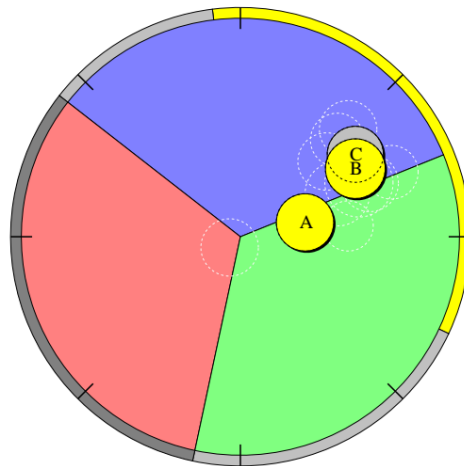


Figure 9 - Field diagram X-team. Round 1

The white, stipulated circles in the figure 9 exhibits the team members' different individual evaluations of the group's dynamics. By evaluating the white, stipulated circles, we observe a large spread with circles in all three colored sectors, indicating that the team members have different interpretations of the team's group dynamics. These variations in interpretations of behavioral characteristics demonstrate that there is a lack of shared mental models in the team. Due to the fact that the stipulated, white circles exhibit interpretations of group dynamics, it can be argued that the lacking shared mental models are team-related, as team-related mental models refer to the team functioning and expected behaviors of the team members. Lastly, it should be noted that the aggregated field diagram does not necessarily give the absolute correct image of the team. As such, we will present the individual evaluations below, in order to give a more nuanced picture of the team.

Individual evaluations

Figure 10 exhibits the individual evaluations from the team members. Person A evaluates all of the team members to be placed on the intersection between the control (blue) and nurture (green) sector. Further, he evaluates person C to take less space in the group (smallest circle) and to be dependent (grey circle). These evaluations corresponds well with the aggregated field diagram. Furthermore, person A evaluates himself to take the most space in the team because his circle is the biggest. However, in the average evaluation of all the three team members circles, person B's circle is the biggest. Person A regards person B to show synergy (yellow) behavior as himself, but with less tendencies towards oppositional behavior. It should be noted that person A is perceived very different by the two other team members, which will be described further.

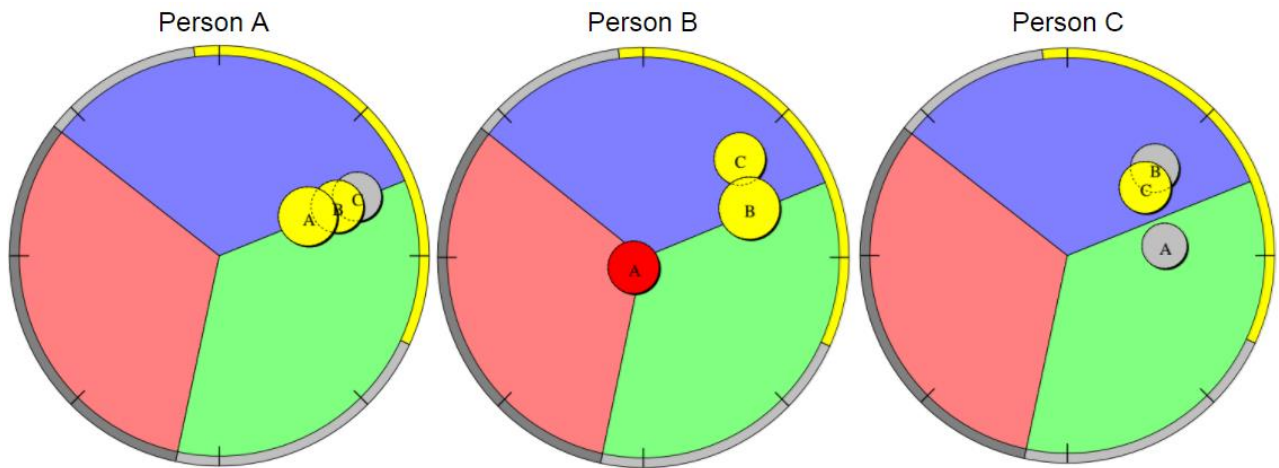


Figure 10 - Individual field diagram X-team. Round 1

Person B evaluates person A to be oppositional as he has a red circle. This indicates that person B perceives person A as having intolerance of control and that he express opposition. It should however be pointed out that this kind of behavior could be an important corrective for a team in some contexts. Furthermore, person B's view of person A is interesting with person A's evaluation in mind, and confirms the lack of team-related shared mental models as pointed out above. Accordingly, person B has a very different perception of person A compared to person A's perception of himself. Furthermore, the size of both person A and person C's circle are quite similar, but visibly smaller than person B's circle. According to person B, person C is also showing balanced behavior which indicates synergy (yellow circle), but as mentioned, taking less space than himself. Person C is placed on the control side of the intersection between control (blue) and nurture (green) sector, which indicates more of a control role, while person B is placed on the intersection.

Person C evaluates both person A and person B to be dependent (grey circles), while he evaluates himself to be exhibit synergy behavior (yellow circle). This is a remarkable contrary to the finding in the aggregated field diagram. Furthermore, Person C evaluates person B to be in the control (blue) sector and person A to be in the nurture (green) sector. The size of C's circle is a slightly bigger than A and B's, which are both around the same size. In conclusion, it is evident that the three group members have very different perceptions on the group dynamics and which roles the different persons take, especially regarding person A's functioning as he seems to be evaluated remarkably different by each of the team members.

Field chart vectors

By examining the field chart vectors, as explained in chapter 4.3.1.1, we can get a deeper understanding of the X-team's group dynamics. The field chart vectors treats the different group dimensions within the team, and will be elaborated after table 10.

Table 10 - Results from SPGR: The X-team. Round 1

Code	Typical behavior	The X-team	
		Avg	St.dev
S Synergy			
S1 Engagement	Energetic, inviting others to contribute	3.44	0.73
S2 Empathy	Supportive, showing interest for others	2.67	1.12
D Dependence			
D1 Loyalty	Obedient, accept tasks, dutiful	3.44	0.88
D2 Acceptance	Cautious, show acceptance of the group	3.11	0.78
O Opposition			
O1 Criticism	Critical, opposing	1.22	1.39
O2 Assertiveness	Assertive, self-promoting	1.78	0.67
W Withdrawal			
W1 Resignation	Sad appearance, showing low self-confidence	0.33	0.50
W2 Self-sacrifice	Passive, reluctant to contribute	0.78	0.67
N Nurture			
N1 Caring	Taking care of others, attentive to relations	3.11	0.93
N2 Creativity	Spontaneous, entertaining, derailing	1.22	1.39
C Control			
C1 Ruling	Controlling, attentive to rules and procedures	1.67	0.87
C2 Task-orientation	Analytical, task-oriented, conforming	3.00	1.12
I Influence			
Z Influence	Forceful, active, engaged, dominant	0.11	1.54

Regarding the control-nurture (C-N) dimension, we observe that $C1(1.67) < N1(3.11)$. It is thus apparent that caring (N1), as in taking care of others and being attentive to relations, is more frequently exhibited than the traits related to ruling (C1), which is associated with controlling behavior. Furthermore, table 10 shows that $C2(3.00) > N2(1.22)$. This result indicates that creativity (N2), explained as spontaneous, entertaining, and derailing behavior, is not as prominent as task orientation (C2) with analytical, task-oriented, and conforming as typical behavior. Regarding the C-N dimension it can because of these vectors be argued that there is a balance between the control and nurture dimension. Consequently, we consider the team as being able to show behavior associated with both dimensions.

When evaluating the opposition-dependence (O-D) dimension, the data show that $O1(1.22) < D1(3.44)$. This implies that critical and opposing behavior, which is behavior associated with the criticism vector (O1), is weaker than obedient, task accepting, and dutiful behavior, associated with the loyalty vector (D1). Furthermore, the results indicate that $O2(1.78) < D2(3.11)$, suggesting that Assertiveness (O2) is not as prominent in the team as acceptance (D2), which is related to cautious behavior. As both of the vectors in the dependency function is more prominent than the opposition vectors, the team most likely have a tendency to promote values like loyalty and discipline. Further, dependence is often prominent when the work is clearly defined.

By comparing the vectors of the withdrawal-synergy (W-S) dimension, we observe that $W1(0.33) < S1(3.44)$ and $W2(0.78) < S2(2.67)$, and hence that the group is placed closer to the synergy pole. Thus, the X-team exhibit behavior linked to engagement (S1) more frequently than traits related to resignation (W1), such as a sad appearance or showing low self-confidence. The other vector in the synergy function is also more prominent than the one of the withdrawal function. Empathy (S2), which is supportive behavior and showing interest for others, is more conspicuous than self-sacrifice (W2), which includes passive and reluctant behavior. When the team is closer to the synergy pole, the team members experience a strong common identity, high degree of learning, and that discussions lead to new and unique knowledge. In addition, the team member's identification with the group is stronger. Lastly, synergy in the group indicates that withdrawal behavior in the team is infrequent, which decreases the threat to team effectiveness.

The Z-value is a measure of the influence-passivity (I-P) vector, and it can be seen from table 10 that the value is 0.11. This is a low value, which implies relatively low influence in the team. However, the standard deviation of this value (1.54) is the highest among all the vectors, which

implies differences within the team. Based on the relatively high standard deviation, it can be argued that there is an unequal distribution of influence within the team. From chapter 4.3.1.1, it is known that extremely dominant individuals in a group tend to freeze the group in a fixed pattern of roles. However, there is not any exceptionally dominant members in the group, thus the group may avoid being frozen in a fixed pattern of roles. Yet, it should be noted that a more evenly distributed influence would be preferred.

5.1.1.2 Comparison with the control group

As mentioned in chapter 4.2, we are conducting a quasi-experimental study where a control group is a necessity. As mentioned in the methodology, the purpose of the control group is to create a comparative basis in order to evaluate if the training program has any effect. It can be assumed that the control group has the same background as the X-team, because they all root from the School of Entrepreneurship. This chapter will therefore present a comparison of the X-team and the control group, in form of a table exhibiting their respective field chart vectors. These vectors is regarded as a “snapshot” of the starting point for both the X-team and control group, and will thus be used to evaluate the effects of the training program. It should be noted that an average for all the teams in the control group is presented.

Table 11, on the next page, demonstrates that the X-team does not differ considerably from the control group, except in regards to the Z-value, which indicates that the X-team is acting more passive than the control group. However, we still choose not to consider the X-team as an exception that stands out from the control group. This is justified by the fact that there will always exist differences between all teams, as every team is unique. Moreover, the vector values for the control group are based on an average of more than 30 groups, and thus do not represent one specific group. This means that other groups will also differ from the average to a certain degree. This is confirmed by the standard deviation not being equal to zero for the control group at any vector. Regarding the Z-value, it is observed that the standard deviation for the control group is noticeably high, indicating that there is a great difference within the control group regarding the Z-value. As such, it can be argued that there is challenging to determine a given Z-value that is considered as a representative Z-value for the entire control group.

Table 11 - Results from SPGR: The X-team compared with the control group. Round 1

Code	Typical behavior	The X-team		The control group	
		Avg	St.dev	Avg	St.dev
S Synergy					
S1 Engagement	Energetic, inviting others to contribute	3.44	0.68	3.44	0.70
S2 Empathy	Supportive, showing interest for others	2.67	1.05	3.12	0.97
D Dependence					
D1 Loyalty	Obedient, accept tasks, dutiful	3.44	0.83	3.13	0.96
D2 Acceptance	Cautious, show acceptance of the group	3.11	0.74	3.47	0.83
O Opposition					
O1 Criticism	Critical, opposing	1.22	1.31	1.05	0.88
O2 Assertiveness	Assertive, self-promoting	1.78	0.63	1.64	1.10
W Withdrawal					
W1 Resignation	Sad appearance, showing low self-confidence	0.33	0.47	0.57	0.73
W2 Self-sacrifice	Passive, reluctant to contribute	0.78	0.63	0.36	0.65
N Nurture					
N1 Caring	Taking care of others, attentive to relations	3.11	0.87	3.13	0.90
N2 Creativity	Spontaneous, entertaining, derailing	1.22	1.31	0.91	0.92
C Control					
C1 Ruling	Controlling, attentive to rules and procedures	1.67	0.82	2.01	1.23
C2 Task-orientation	Analytical, task-oriented, conforming	3.00	1.05	2.99	0.82
I Influence					
Z Influence	Forceful, active, engaged, dominant	0.11	1.45	1.41	3.71

5.1.2 Round 2

As mentioned in chapter 4.2, we conducted the second round of the SPGR survey in April 2017. Initially, in chapter 5.1.2.1 it will be given an in-depth explanation of the SPGR-results of this survey for the X-team. Following this explanation, a comparison between the results of the X-team and the control group is done in chapter 5.1.2.2. The focus in both of these chapters will be the changes in the team dynamics in round 1 compared to round 2.

5.1.2.1 The X-team

This chapter will present the data collected by the use of the second SPGR survey, by initially exhibiting the X-team's aggregated evaluation of their group structure and dynamic. Furthermore, we will go into more detail by presenting the results in three more ways. This is by first examining the team members' individual evaluations of their group structure and dynamic, secondly by illustrating the field chart vectors of the team and at last present features of special interest.

Aggregated evaluation

Figure 11 displays the field diagram for the X-team in the second SPGR round. As the results from round 1 also illustrated, the cluster of circles are positioned between the control and nurture sector, implying that these are the most prominent behaviors within the team. However, the circles are more concentrated than previously. Furthermore, a remarkable change from round 1 is that, all the team members have a yellow colored circle, indicating a balanced range of behavioral traits. In addition, the change of the circle sizes from round 1 to round 2 should be pointed out, where the circle sizes have changed to be more similar than before. This is seen by the circle size values, where $A=3$, $B=2.3$ and $C=1.7$. Hence, the team members have relatively equal influence in the group.

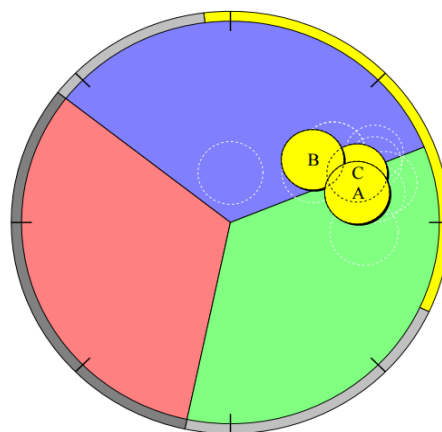


Figure 11 - Field diagram X-team. Round 2

Additionally, regarding the white, stippled circles we can observe a change from round 1 to round 2 where the circles are somewhat more evenly distributed, closer to the average placement of the circles. The stipulated circles exhibits the team members' different individual evaluations of the group's dynamics and thus they give an indication of the team-related mental models of the team members. Consequently, we argue that an enhancement of the team-related mental models can be found. However, it should be pointed out that particularly one white, stippled circle stands out from the rest in the control sector, which indicates that one person views the team's behavior slightly different from the others. We will examine this exception further in the discussion of the individual evaluations below.

Individual evaluation

Figure 12 exhibits the individual field diagrams of the team members. Person A places himself mostly in the control sector, but with greater part of the circle in this sector compared to nurture than in round 1. He evaluates person B to exhibit approximately the same behavior as himself. In round 1, he evaluated person B to be quite similar as well, but with a lower tendency to opposition. Person C, on the other hand, is positioned mostly in the nurture sector, with a small part in the control sector. This is an interesting result because in round 1 he evaluated C with a grey, dependent circle close to yellow periphery. At this time however, all the circles are colored yellow, indicating a balanced specter of behaviors. Further, the size of the circles are identical ($Z = 3$) for all members, indicating that person A perceives all the team members to have the same level of influence in the team. In round 1, this was not the case.

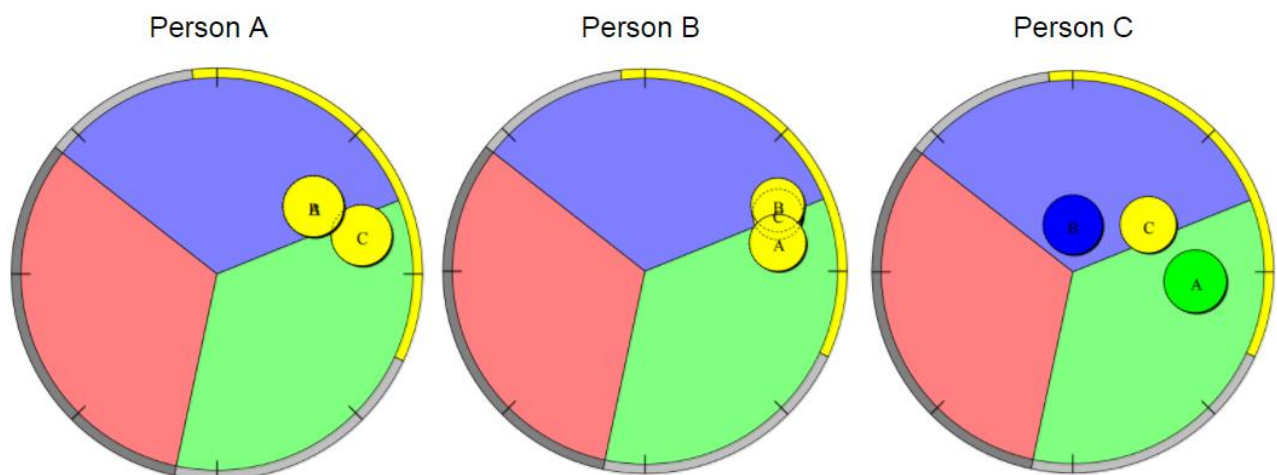


Figure 12 - Individual field diagram X-team. Round 2

Person B positioned himself on the intersection between the control and nurture sector, the same place as in round 1, but with a smaller yellow circle. Moreover, the placement of person B's circle is close to the yellow periphery, which may imply that person B is not that

oppositional. Furthermore, person B evaluates person C to resemble his own behavior, with a small difference being that person B exhibit slightly more of the nurture function. Compared to round 1, person C is shifted from pure control to the intersection between control and nurture. However, Person A is evaluated to hold a stronger nurture function than the two others. This result is very different from round 1, where person A was evaluated with a red circle touching the red sector. The color of the circles is yellow for all the team members, indicating that the team members are able to shift between behaviors that support different group functions. The influence of each of the team members is perceived differently by person B than by Person A. Person B perceives person A to take the most space ($Z = 2$), person B in the middle ($Z = 1$), and person C to take the least space ($Z = 0$). However, the circle sizes are nonetheless quite similar, meaning that the influence is quite evenly distributed among the team members.

Person C perceives the team as more diverse than person A and person B, and this was the case in round 1 as well. He places person A in the nurture sector with a green circle, and person B in the control sector with a blue circle. As such, this is not very different from round 1 where person A is placed in the nurture sector with a smaller grey circle and person B in the control sector with a smaller grey circle. That is, in round 1 person C perceived person A and B as dependent, while he now perceived them as persons with a fixed role. Person C places himself on the intersection between the control and nurture sector. Furthermore, he identifies himself to show balanced behavior, indicated by the yellow circle. The sizes of the circles are interesting, because in round 1 person C perceived himself with most the influence, while in round 2 he perceive person A and B as having more influence. However, it should be noted that the differences in influence are not that big.

Field chart vectors

Table 12 exhibit the results from the field chart vectors from SPGR round 2. Furthermore, we have added a column named “change” to illustrate the change between the team’s result in round 1 and round 2. The values in these column present t-test values, which are used to determine if the results from the two rounds are significantly different. The t-test value therefore give a good indication of the change.

Table 12 - Results from SPGR: The X-team. Round 2

Code	Typical behavior	The X-team		Change
		Avg	St.dev	Significance (T-test)
S Synergy				
S1 Engagement	Energetic, inviting others to contribute	3.44	1.13	0.500
S2 Empathy	Supportive, showing interest for others	3.56	1.01	0.010*
D Dependence				
D1 Loyalty	Obedient, accept tasks, dutiful	3.22	0.83	0.256
D2 Acceptance	Cautious, show acceptance of the group	3.44	0.73	0.141
O Opposition				
O1 Criticism	Critical, opposing	1.11	0.93	0.400
O2 Assertiveness	Assertive, self-promoting	1.56	1.13	0.223
W Withdrawal				
W1 Resignation	Sad appearance, showing low self-confidence	0.67	0.71	0.141
W2 Self-sacrifice	Passive, reluctant to contribute	0.44	0.53	0.141
N Nurture				
N1 Caring	Taking care of others, attentive to relations	3.56	0.73	0.085
N2 Creativity	Spontaneous, entertaining, derailing	0.67	0.87	0.025**
C Control				
C1 Ruling	Controlling, attentive to rules and procedures	2.00	0.87	0.219
C2 Task-orientation	Analytical, task-oriented, conforming	3.56	0.73	0.025**
I Influence				
Z Influence	Forceful, active, engaged, dominant	2.33	1.22	0.012**

* Difference is significant at the 0.01 level

** Difference is significant at the 0.05 level

In regards of the control-nurture (C-N) dimension, we observe that $C1(2.00) < N1(3.56)$. Accordingly, the team show more of both ruling (C1) and caring (N1) behavior, with caring

(N1) being more frequently exhibited than the traits related to ruling (C1). Furthermore, table 12 shows that $C2(3.56) > N2(0.67)$, which means that the team's creativity (N2) has been reduced and the task orientation (C2) has increased from round 1. It should be noted that the t-test shows a significant difference for these changes ($t < 0.05$). As for round 1, it can also be argued based on these results that there is a balance between the control and nurture dimension at this point of time, even though the balance is slightly more skewed towards the control functions than earlier. However, this may be interpreted as a positive change, which we are going to discuss in chapter 6.1

By comparing the vectors of the opposition-dependence (O-D) dimension, it can be found that $O1(1.11) < D1(3.22)$, meaning that both of the values have decreased slightly. However, as seen by the t-test values and the results from round 1, this does not imply a significant change, and critical and opposing behavior (O1) is still weaker than behavior associated with loyalty (D1). Furthermore, the results indicate that $O2(1.56) < D2(3.44)$, implying that assertiveness (O2) is slightly reduced, and acceptance (D2) within the team is slightly increased. The t-test values for this change illustrate that this is a bigger change than for the other vector in the O-D dimension, nonetheless it should be noted that this change is not significant.

When evaluating the vectors linked to the withdrawal-synergy (W-S) dimension, we observe that $W1(0.67) < S1(3.44)$, and that this does not imply a significant change for either of the vectors. The team is however still exhibiting behavior linked to engagement (S1) significantly more than behavior associated with resignation (W1). In regards of the other vector in the W-S dimension, we find that $W2(0.44) < S2(3.56)$, which means that passive and reluctant behavior (W2) in the team has decreased and that the team shows significantly more behavior related to Empathy (S2) according to the t-test value ($t < 0.01$). This finding will be elaborated further in the subchapters of chapter 6.1.

As mentioned earlier, the Z-value is a measure of the influence-passivity (I-P) vector. This vector has increased from 0.11 to 2.33, indicating a significantly positive change seen by the t-test value ($t = 0.012$). Moreover, the standard deviation is also reduced. These two results translate to the fact that the team members have evolved a more evenly distributed influence within the team. This is a prominent finding, which accordingly will be given attention in the discussion.

Features of special interest

We have chosen to take a closer look at four features compiled from the SPGR data, which we believe are of special interest in our study: Polarization, the standard deviation of the influence, shared mental models and cohesion in the X-team. From table 13 we see that all values have been reduced from round 1 to round 2. Polarization has gone from 4.21 to 2.67, which is a substantial decrease. Further, the standard deviation of influence has gone down from 1.54 to 1.22, indicating more equal distribution of influence. Shared mental models in the team are also strengthened as the value has fallen from 2.70 to 2.60, indicating less difference in shared mental models. At last, we see that cohesion has gone down from 3.47 to 2.34.

Table 13 - Features of the X-team

Feature	Round 1	Round 2
Polarization	4.21	2.67
Influence (standard deviation)	1.54	1.22
Shared mental models	2.70	2.60
Cohesion	3.47	2.34

5.1.2.2 Comparison with the control group

This chapter will present a comparison of the X-team and the control group, in form of a table (table 14) exhibiting their respective field chart vectors. These vectors is regarded as a “snapshot” of the situation after the X-team conducted the training program, whereas the control group did not. These results will thus be used to evaluate the effects of the training program by presenting the changes we regard as interesting. It should be noted that an average for all the teams in the control group is presented.

Table 14 - Results from SPGR: The X-team compared with the control group. Round 2

Code	The X team				The control group			
	Round 1		Round 2		Round 1		Round 2	
	Avg	St.dev	Avg	St.dev	Avg	St.dev	Avg	St.dev
S Synergy								
S1 Engagement	3.44	0.68	3.44	1.13	3.44	0.70	3.27	0.73
S2 Empathy	2.67	1.05	3.56	1.01	3.12	0.97	3.23	0.88
D Dependence								
D1 Loyalty	3.44	0.83	3.22	0.83	3.13	0.96	3.03	0.97
D2 Acceptance	3.11	0.74	3.44	0.73	3.47	0.83	3.40	0.86
O Opposition								
O1 Criticism	1.22	1.31	1.11	0.93	1.05	0.88	1.25	0.98
O2 Assertiveness	1.78	0.63	1.56	1.13	1.64	1.10	1.48	1.07
W Withdrawal								
W1 Resignation	0.33	0.47	0.67	0.71	0.57	0.73	0.73	0.90
W2 Self-sacrifice	0.78	0.63	0.44	0.53	0.36	0.65	0.50	0.71
N Nurture								
N1 Caring	3.11	0.87	3.56	0.73	3.13	0.90	3.04	0.95
N2 Creativity	1.22	1.31	0.67	0.87	0.91	0.92	0.88	0.93
C Control								
C1 Ruling	1.67	0.82	2.00	0.87	2.01	1.23	2.00	1.25
C2 Task-orientation	3.00	1.05	3.56	0.73	2.99	0.82	2.88	0.97
I Influence								
Z Influence	0.11	1.45	2.33	1.22	1.41	3.71	1.50	3.59

Primarily it should be noted that the X-team largely experienced changes in their field chart vectors, whereas the control group did not go through an extensive transformation, during the period of the study. The greatest difference is observed regarding empathy (S2), where in fact the X-team group have gone from having a considerably lower value than the control group to

having a considerably higher value after the training program. On the other hand, the control group did not experience a big change, indicating that the training program have great effects on developing behavior connected to empathy (S2). Moreover, regarding the Synergy vector (S), it may be pointed out that the X-team kept their Engagement-level (S1) stable, whereas the control group experienced a slight decrease. Furthermore, critical and opposing behavior (O1) were somewhat reduced for the X-team, while the control group more frequently than before exhibited behavior linked to criticism (O1). Related to this may be the changes in values for behavior linked to self-sacrifice (W2), such as passiveness and being reluctant to contribute. The values for both the groups are in round 2 approximately the same. However, it should be noted that the X-team group experienced a decrease from round 1, whereas the control group showed an increase in such behavior. Regarding the exhibition of caring behavior, the X-team and control group also evolved in different directions, where the X-team became stronger and the control group weaker at this behavior. Furthermore, the X-team had a great reduction in creative behavior (N2). On the other side, the control group's results are nearly the same as in round 1. Lastly, we want to accent the fact that the X-team experienced a strong increase regarding task-oriented behavior (C2), whereas the control group had a small reduction.

5.2 Badges (Workshop)

As mentioned in 4.3.2, we held a workshop with two different cases in order to introduce the training program to the X-team. The first case consisted of quite simple tasks, with the objective of using the training program on a task that required a low maturity level to be solved effectively. In contrast, the second case was more complex and it was assumed that it required a higher level of maturity to be solved effectively. In order to measure if the team performed better after the training program, a workshop was also held afterwards. The cases used here had the same objective as the first ones and were thus similar, but not identical to the first ones.

5.2.1 Round 1

As mentioned in 4.3.2, the badge results from the first workshop will only include the results linked to the accelerometer. Accordingly, this subchapter will present results regarding the team members' energy.

5.2.1.1 Case 1

Figure 13 gives an indication of the team members' energy levels during case 1 that is measured by the accelerator, which captured the team members' movements. Accordingly, the average energy level depends on x, y and z values from accelerator.

From figure 13, we can see that person A and Person C follows approximately the same energy pattern, whereas person B differs in some way by having a higher accumulated energy level throughout large parts of case 1. The fact that person A and C are quite similar indicates a form of mimicry, as explained in chapter 4.3.2 as reflexive copying of one person by another. Furthermore, the figure illustrates that person A started out with a high energy level, which moved towards a lower energy level. The opposite is the case for person C, which started out with a lower energy level, and had a high energy level as the case were finished. Lastly, person B mostly had a high level of energy with a dip towards the end.

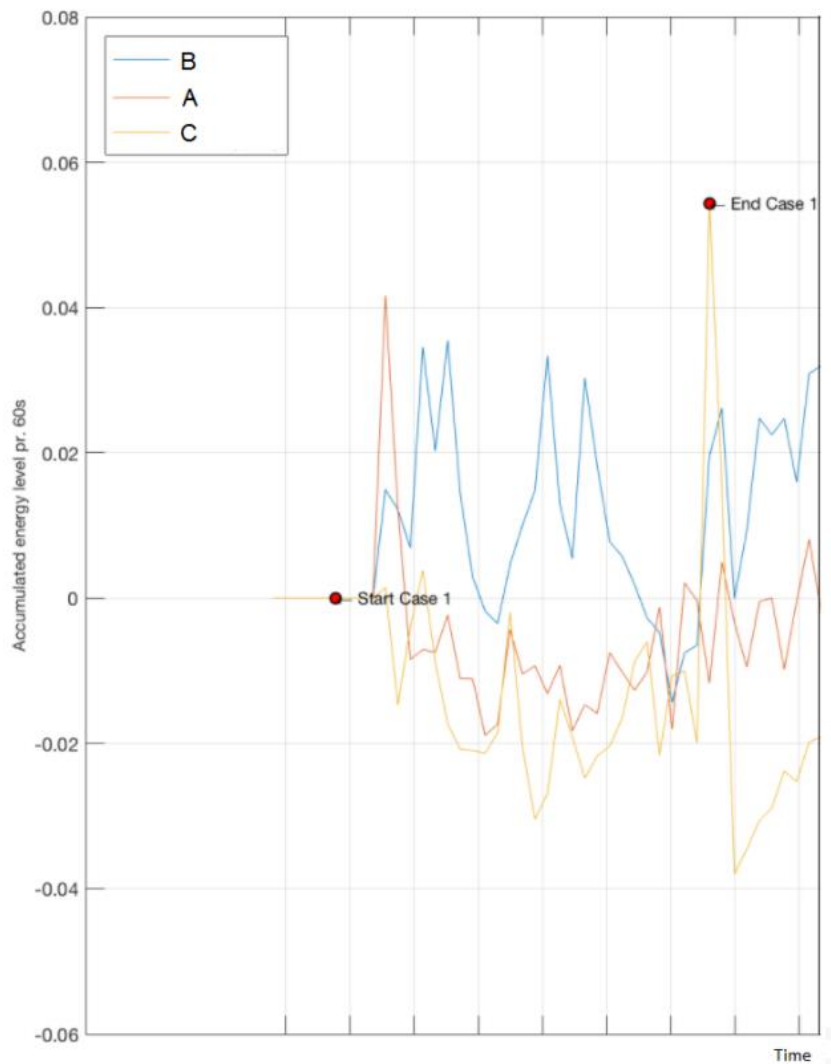


Figure 13 - Average energy level pr. badge id

5.2.1.2 Case 2

Figure 14 shows the team members energy level throughout the second case. Unlike case 1, it seems like person A and person B share more of the same energy pattern and that person C differs from the two others. Moreover, it should be noted that person C exhibits a large variation of energy level, and that the overall energy level and variation of energy level is larger in case 2 than in case 1.

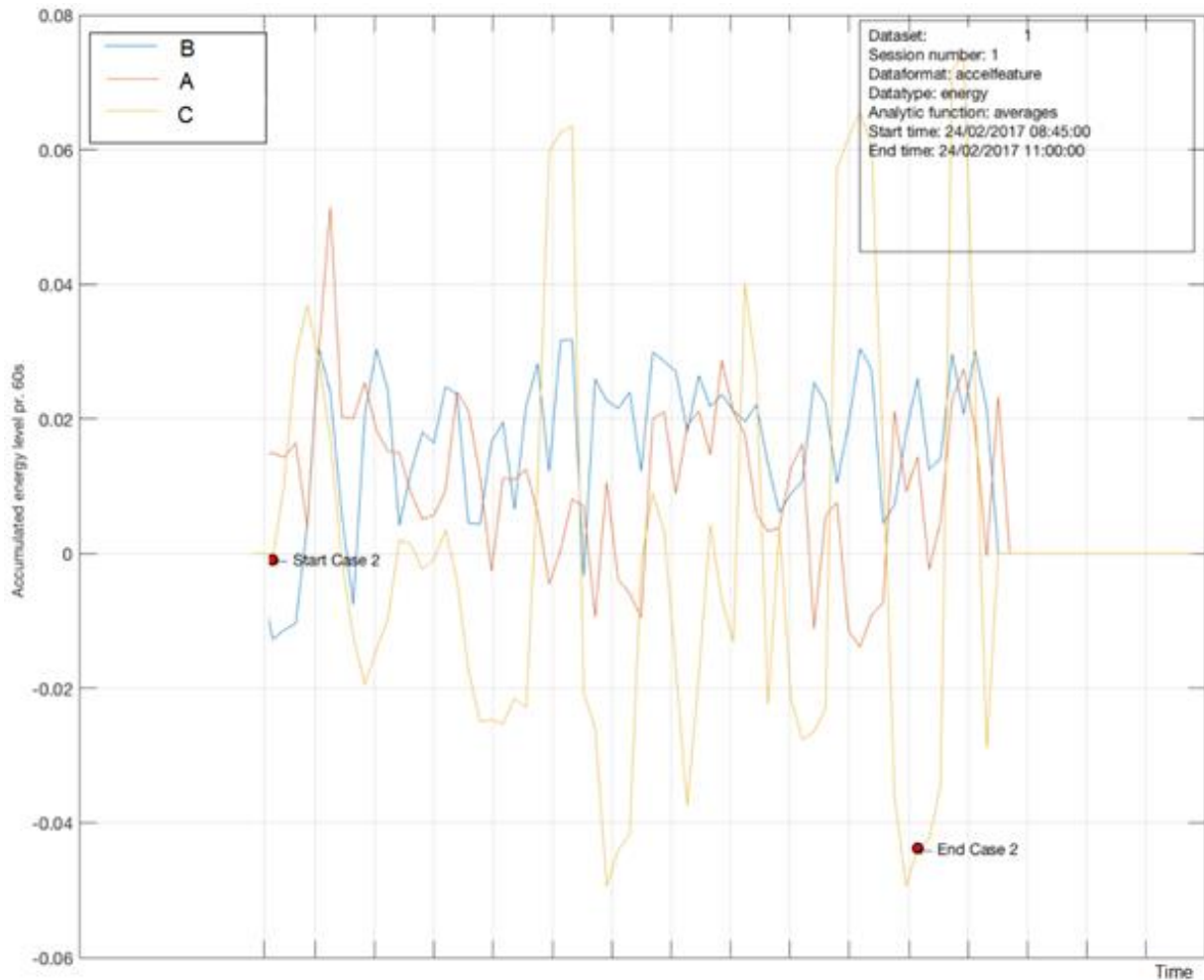


Figure 14 - Average energy level pr. badge id

5.2.1.3 Average values

A summary of the team members' energy levels throughout the two cases is illustrated by figure 15. Person C exhibits the largest variation, whereas person B has a much smaller variation in energy level. Moreover, this figure shows that person B had the highest accumulated energy level during the cases, followed by person A and person C.

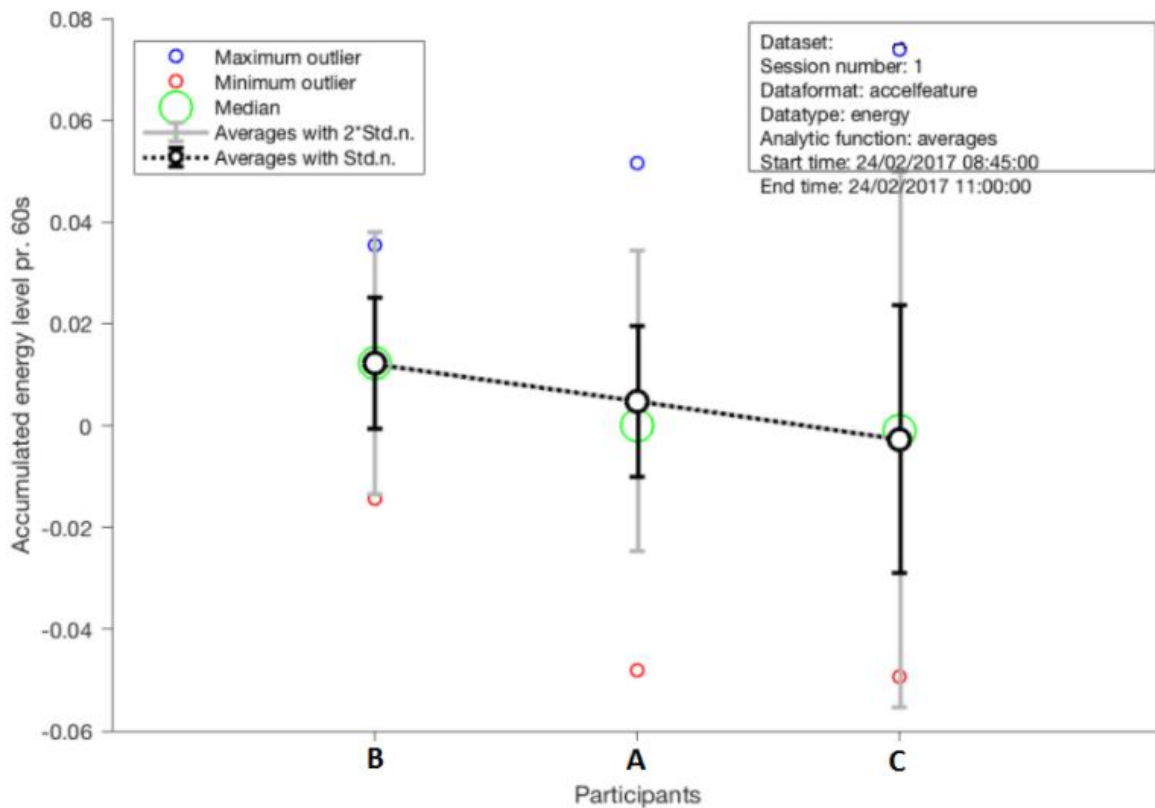


Figure 15 - Average energy level and variation pr. badge id

5.2.2 Round 2

Since the badge results from the first workshop only include the results linked to the accelerometer, we are only able to compare these particular findings with the findings from round 1. In round 2, the microphone in the badges recorded sound from all members, thus giving us speech data as well. We found this data very interesting, and chose to include speech data in our results, even though we were not able to compare the speech data to any data from round 1.

5.2.1.1 Case 1

Figure 16 gives an indication of the team members' energy levels during case 1, which is measured in the same way as in round 1. From figure 15, we see that person B has the highest variance in energy level. He starts with a high energy level, moves through a period in the middle with the lowest energy level, and finishes with high energy level. Person A on the other hand, has the lowest energy level of the team members in case 1. He starts below 0, and stays there during the case. Person B and C seems to mimic each other to some degree. Person C has a moderate energy level, with a dip towards the end. When comparing case 1 from round 2 with case 1 from round 1, we see that person A has a similar energy level in case

1 in both round 1 and round 2. Person C also has a similar pattern in round 1 and round 2, but is a bit more energetic in round 2. At last, person B shows a different pattern in round 2, than in round 1. He has a dip in energy in the middle in round 2 that was not apparent in round 1.

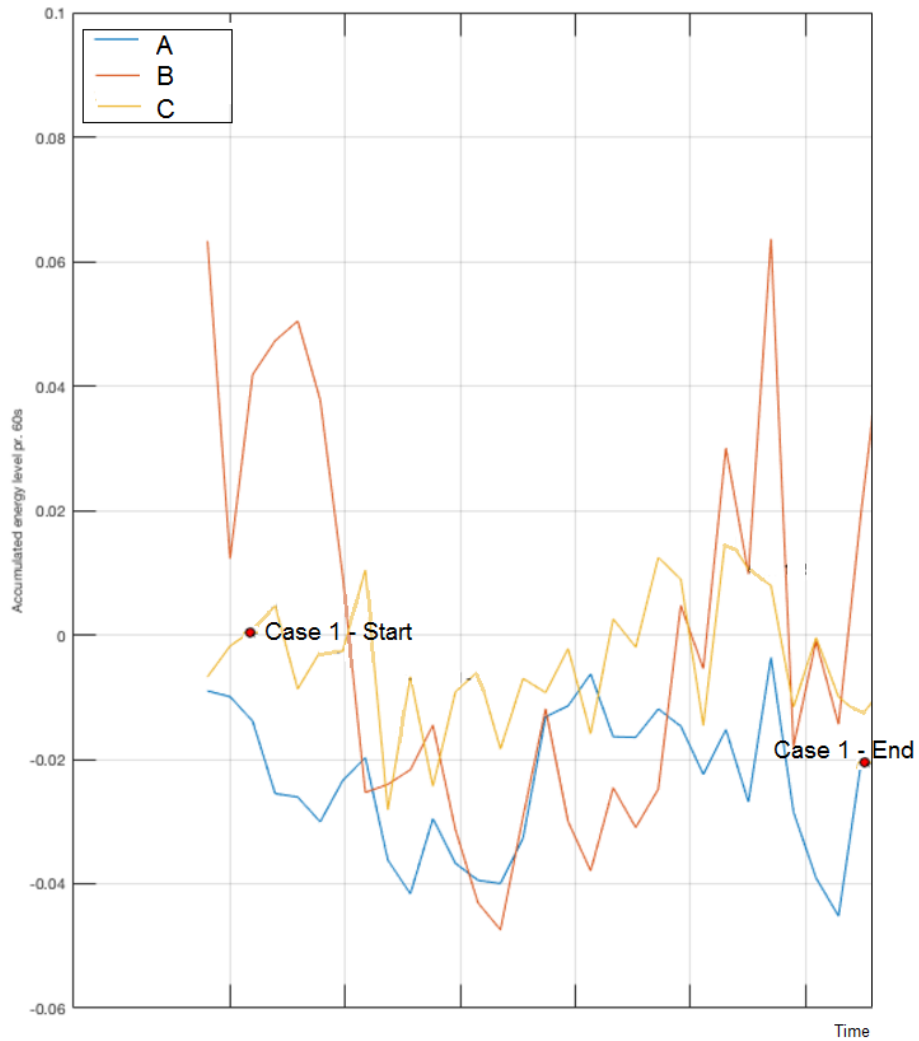


Figure 16 - Average energy level pr. badge id - Case 1

Figure 17 illustrates speech amplitude for the members of the team in case 1. From the figure, we see that person A have the highest amplitude at almost all times. Person B and person C have similar amplitudes. There is low consistency, and thus high variance, in the amplitude of speech of all members, but we see a great deal of mimicry, meaning they reflect each other's pitch height.

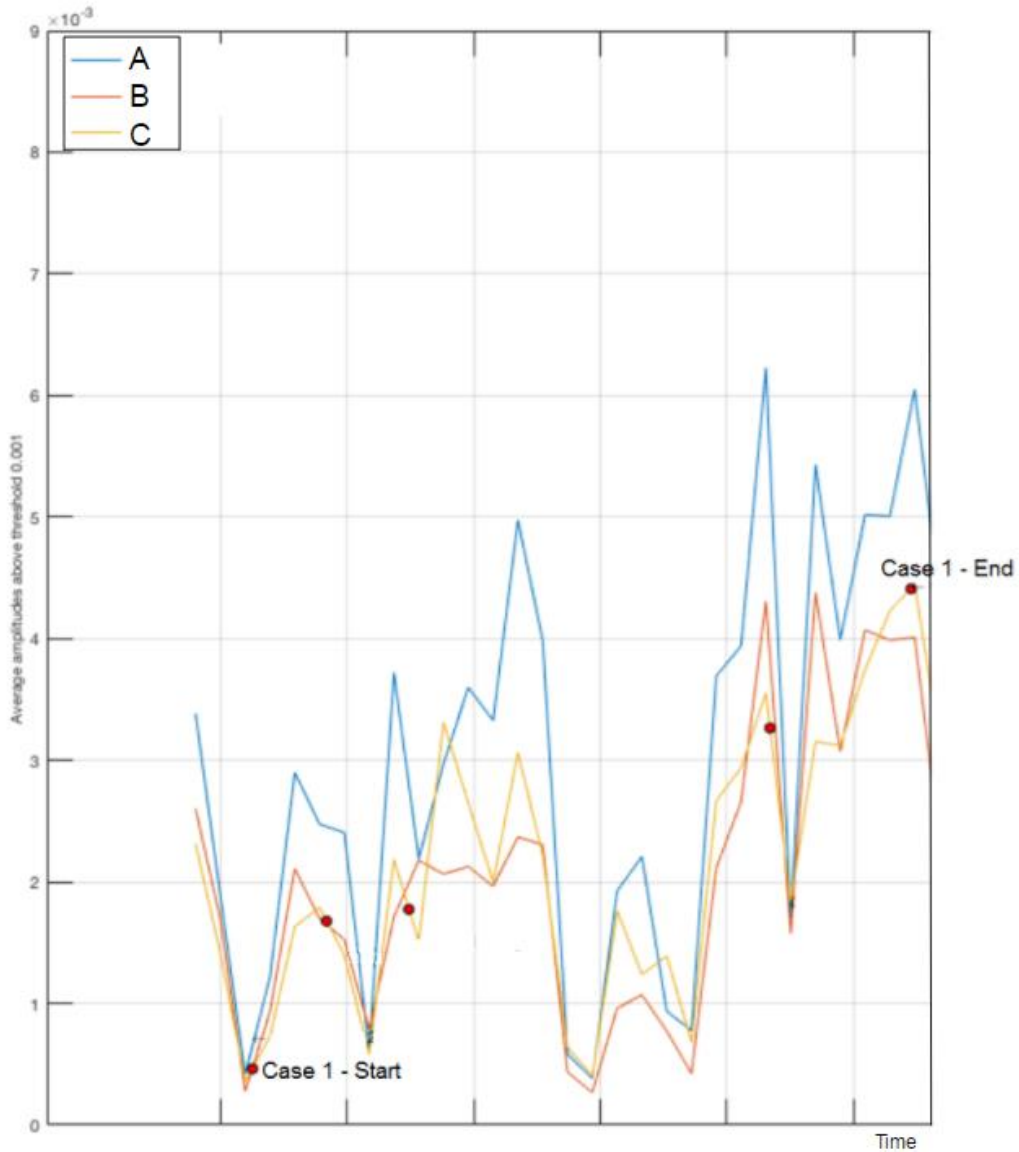


Figure 17 - Speech amplitude pr. badge id - Case 1

5.2.1.2 Case 2

Figure 18 show the team members energy level in case 2. The figure illustrates that person B exhibits the most energetic behavior, with only small dips. Person C shows less energetic behavior than person B does, while person A has a very low energy level. When we compare round 2 to round 1, the graph for case 2 is very different. Person B seems to have been more energetic in round 2 compared to round 1, while person A and C is less energetic in round 2.

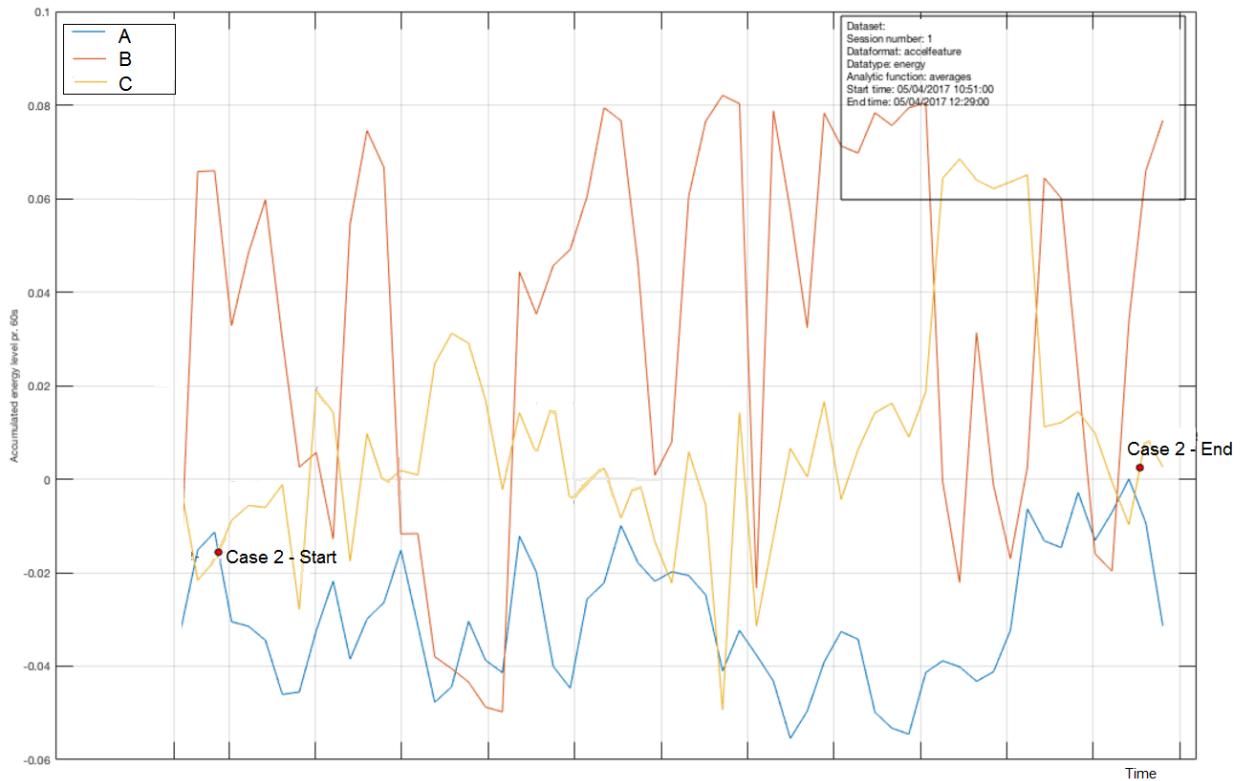


Figure 18 - Average energy level pr. badge id - Case 2

From figure 19, we see speech amplitude for case 2. The tendencies from case 1 is also present in case 2, but in case 2 we see that person C sometimes raises his voice above the level of person A. Person B on the other hand, is active, just like the others, but do not raise his voice as much. There is also some mimicry in this case, but not as apparent as we saw in case 1.

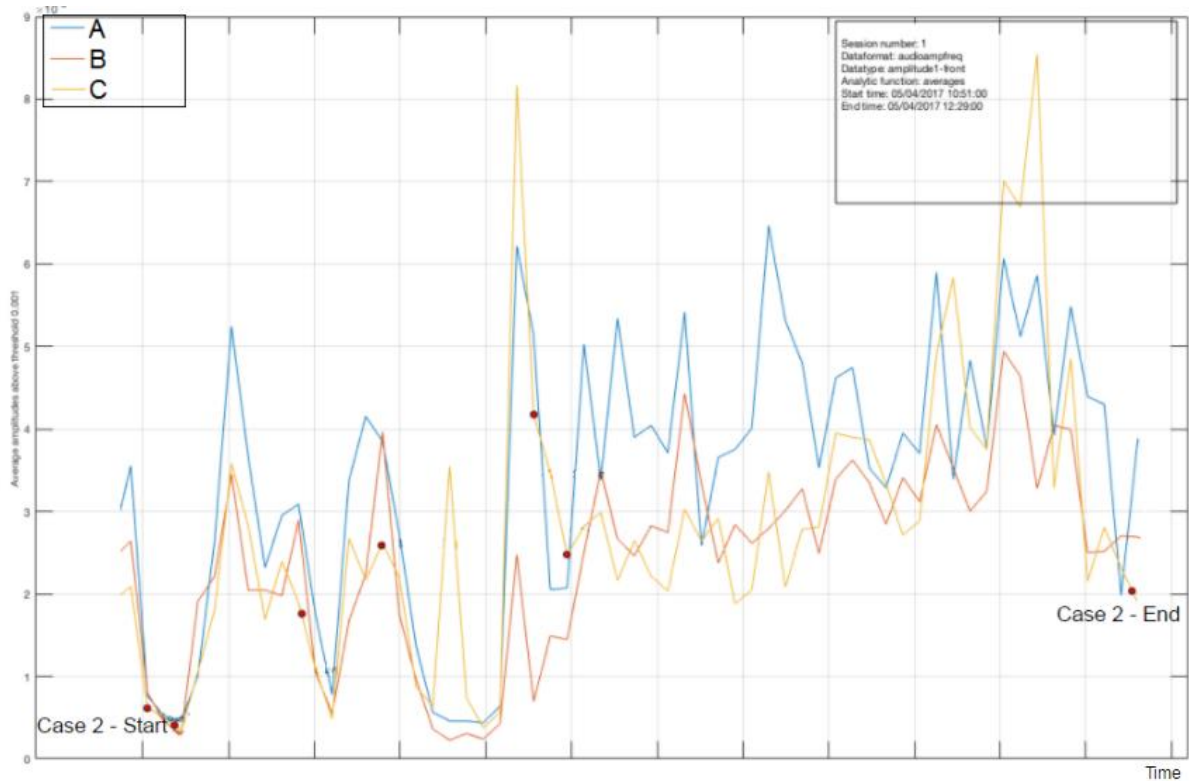


Figure 19 - Speech amplitude pr. badge id - Case 2

5.1.2.3 Average values

A summary of the team members' energy levels throughout the two cases is illustrated by figure 20. This figure shows that person B had the highest accumulated energy level during the cases, followed by person C and person A. Moreover, person B exhibits the largest variation, whereas person A has the lowest variation in energy level. In comparison with round 1, person A has a bit lower energy level, while person B and person C has a bit higher energy level.

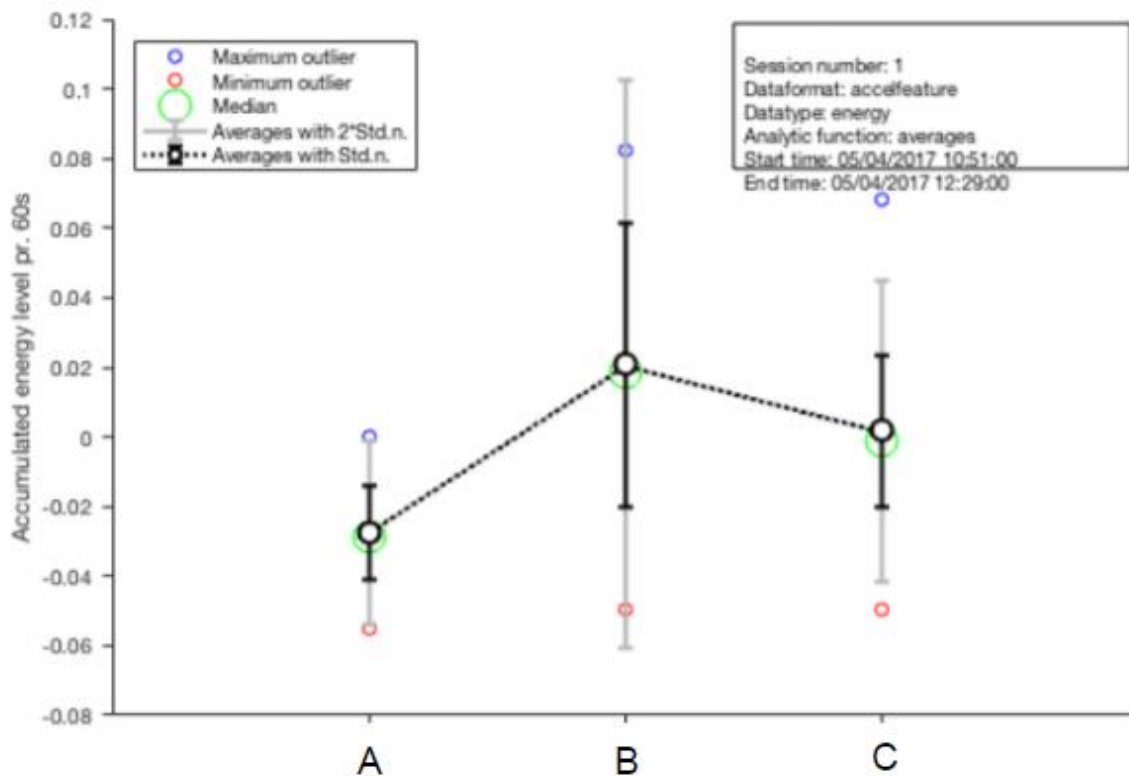


Figure 20 - Average energy level and variation pr. badge id

The average speech level and variation can be found in figure 21. In this figure, we see that the amplitude of speech is quite even between the team members. However, person A has a bit higher amplitude than the others do. This is an interesting finding, because person A is the least energetic person according to figure 20. Person A also has the highest variation in amplitude. Another interesting finding is that person B has the lowest variation and average amplitude, but has the highest energy level. In the middle, we have person C that has almost the same average amplitude as person B, but with higher variance.

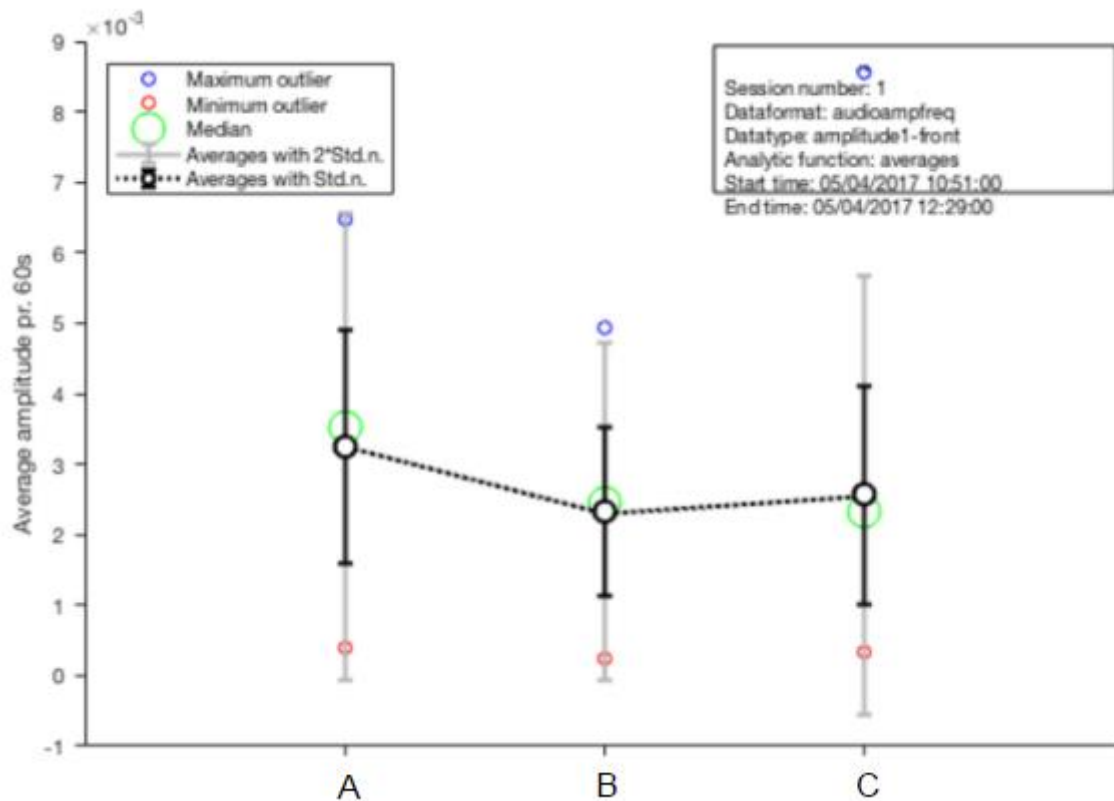


Figure 21 - Average speech level and variation pr. badge id

5.3 Interview

As explained in 4.3.3, we interviewed the three team members for the first time in February 2017. This was done in order to figure out how their team dynamics were before they used our training program. The second round of interviews were conducted in April 2017. This chapter will provide the empirical findings from these two interview rounds, respectively round 1 in chapter 5.3.1 and round 2 in chapter 5.3.2. It should be noted that the citations from the interviews are translated from Norwegian to English.

5.3.1 Round 1 (Pre-interview)

This chapter will present the empirical findings from the first round of interviews. The presentation of the empirical findings are structured into themes from the interview guide. Firstly, the team is introduced, before shared mental models, psychological safety, trust, and finally roles and leadership are elucidated. The interview guide can be found in appendix 1.

5.3.1.1 Introduction of the team

The team is a technology spin-off from a research project at NTNU, and has been working together since January 2017. One of the team members has been working with the project for a longer time, while the two others work with this in relation to their education at NTNU School of Entrepreneurship. Two of the team members have extensive experience with teamwork, while the last member does not have that much experience. The team has contact with each other almost every day through Slack (cloud-based team collaboration tool), and meet face-to-face two to three times a week.

The team agrees that one of their strong sides is that they are open and able to discuss openly without getting angry at each other. For example, person C said, "*We have different views on a few different things, but we are able to discuss. In addition, we manage to agree on a few things that we initially disagreed on. Also there are sometimes we simply agree that we disagree.*" On the other hand, the view on what is the weak sides of the team diverge more. Person C said that he feels that the team is afraid of conflict. Unlike person C, person B states that the team discuss too much and that discussions sometimes take unnecessary long time. Regarding objectives and goals for the company, they have one mutual short-term goal: getting a first sale. However, when speaking about long term goals, each team member has their own subjective goal. Person A emphasis a monetary goal, person C about an environmental goal, and person B about a goal regarding number of full time employees.

5.3.1.2 Shared mental models

When examining the topic of shared mental models, all of the respondents point out that they often have divergent understandings of the task and context that they work within, indicating a lack of shared mental models. Person B explains this phenomenon as a result of how long the different team members have worked within the company, as well as how they communicate, and how they explain tasks and problems to each other. This is in line with person A, who emphasize that person B possess more knowledge of what they are working with, where person A expresses a desire of person B to more frequently give the context of what is going on. Person B addresses this problem during his interview, and states that, "We

are usually focusing on that everyone should understand, unless there is no time.” As such, he emphasize their time constraint as a potential reason for the problem with different understandings. As an example, he explains that when he sends e-mails with person A and person C as CC (carbon copy), the time constraint often prevent him from writing them a separate e-mail where he explains the context. However, Person B also explains that he tries to give the context afterwards where it is needed. Furthermore, person A points out that getting a shared understanding is a two-way process, where he and person C also must make sure to ask person B questions in order to uncover his mental model of a task. Moreover, person C illustrates their problem with different understandings of a task through an example where the team had divergent understandings of what a customer were expecting of them regarding a price quotation: *“We are not on the same wavelength when it comes to what they want from us and how it is wise to present it.”*

There are split perceptions of how different understandings and perspectives are affecting the trust level of the team. Person C does not believe that trust level is affected by diverging perceptions. On the other hand, Person B perceive this as negative for the trust level. However, he points out that if the team gain a shared understanding, he believes this will increase the trust level. His explanation of this is, *“...it means that we have been able to find something common in a factual manner.”*

Different understandings in teams are a common root for misunderstandings and conflicts. Person A and C do not believe that misunderstandings are a common problem for the team, but realize that it sometimes occurs. Person C explains: *“It only happens when people are a little stressed out, and then it happens a little easy. Otherwise I feel that we mostly are on the same wavelength.”*, whereas Person A believes that misunderstanding is the result of communication problems. He utters this as, *“I know that it is extremely challenging to imagine another person - that he or she does not know what you know.”* On the other hand, Person B acknowledge that they often experience misunderstandings.

When it comes to how the team solves misunderstandings or conflicts, person B argues that they solve them in two different ways: *“often the third party come in and expresses that the other two have discussed for a long time, and that one should take a step back. Otherwise we can agree to disagree.”* This somehow corresponds to person A’s view. He claims that they solve their disagreements by addressing the problem and discuss it. This is contrary to how person C view their process of solving their misunderstandings and conflicts. He points out: *“... the team members are very aware of the disagreement, and do not want to create a bad atmosphere. Consequently, I believe that we sometimes give up a little easy.”*

5.3.1.3 Psychological safety

In order to investigate the psychological safety of the team, we examined different factors such as how team members react when someone makes mistakes, how it is to raise difficult themes, how it is to ask for help, and how the respect is within the group. When it comes to how the team members react to mistakes that are made, person B expresses that it relies on the type of mistake that is made. Big mistakes can cause some frustration, whereas smaller mistakes are not causing any strong reactions. Moreover, he argues that they discuss on why the mistakes was made, and often come up with the reason being a form of communication problem. Person A utters a strong desire for a psychologically safe environment within the group: *"I have read about psychological safety, and it is very important. Especially when working with innovation. This is the kind of environment I wish for"*. Furthermore, he argues that a psychologically safe environment is required in order to fix the mistakes and learn from them. Regarding this, he utters, *"When people make mistakes, you want it out in the open as fast as possible."* Person A's desire for a psychologically safe environment is strengthened by Person C's statement: *"Person A is s very committed to creating psychological safety, because he has previously been working in a team who lacked this."* Additionally, person C believes that when someone in the team makes a mistake, it is not held against that person.

In regards of asking critical questions and asking for help, an agreement in the team can be found. All of the respondents consider it as easy to ask critical questions, as well as asking other team members for help. Moreover, person A and person B acknowledge it as crucial to ask critical questions in order to find the best solutions on the problems, which they are facing. Consequently, the team is dependent on being able to ask such questions. Furthermore, person A expresses that question for help from other team members is in fact not a common situation, as they continuously strive to give each other feedback. When it comes to bringing up themes, which can be considered as uncomfortable, both person A and person B bring up the ongoing discussion regarding how they should divide the ownership. Both of them consider this as uncomfortable, where person A says, *"It is very unpleasant, but it has to be done."* Person B explains this by the fact that the theme is very personal and emotional because it may affect both the current and future motivation as it can be interpreted as a sign of how valuable you are.

From the interviews, it is obvious that the team members respect each other. This is justified by several statements. Person A emphasize that the team members have respect for each other's time: *"I believe that the respect is shown through how we ask each other to do things. It is never as if you HAVE to do this. We respect each other this way."* Furthermore, person B

explains that: *"We are tolerant, and we make sure to inform that something is not personally."* At last, person C points out that everybody on the team are being heard, as well as how they resolve their disagreements: *"If there exists a disagreement on something, people will speak in a factual and rational manner"*.

5.3.1.4 Trust

The team has a similar conception of trust. Person B describes that trust is shown through discussions where they can say exactly what they mean, where person A and C have quite similar statements. As such, a statement from person C supports this: *"You're able to be so honest and reliable and thus show that you disagree."* Moreover, person B explains two types of trust: *"I think there are two forms of trust. A kind of confidence is that one can trust that they deliver what they say they will deliver, or have promised that they will deliver. Another form of trust is that you should not be afraid to say anything to the ones you are working with. "*

5.3.1.5 Roles and leadership

Overall, the team members appear to like the way they work together. Person B describes the group dynamics as good. He emphasizes that the team members complement each other, and that they allow each other to say what they believe. Person A has a similar view, he thinks that they may work very well together in the future, but that they have not worked together long enough to be sure. He also adds, *"We need an expectation clarification of the roles in the team"*.

Formally, person B is the general manager of the company. Person C describes Person B as a non-significant leader: *"He has responsibilities, he has control of everything and is very clever, but he has not taken a very significant leadership role"*. In accordance, person B states, *"I am the leader, but I try not to appear like I am sitting on my chair, deciding what everyone should do"*. Person A agrees and adds that person B takes on a lot of responsibility, without being bossy. Furthermore, he describes Person B as easy to work with. At this state of the process, person C expresses that he finds this level of leadership appropriate.

Both person B and person C state that the team members are able to alternate roles. Person C expresses: *"people are pretty good at putting on different hats"*, but that it is often one person that is associated with one, or a few, specific roles. Furthermore, person A claims, *"we often just do what is needed to be done"*. In accordance, person B emphasize that they work together as a team to achieve their objectives. Person A feels like person C and himself often take the role of the "Devil's Advocate" because they have not worked with the project that long. Person B agrees with person A, and describes person C as critical and person A as

investigative. This in order to get an understanding of the project. Person B also emphasize that the other two are caring. In order to see which roles each team member is associated with, see table 15.

Table 15 - Roles associated with each team member based on the interviews

		Roles of team member		
		Person A	Person B	Person C
Describer	Person A	“Devil's Advocate” Support function for person B	Takes responsibility for accounting	Takes responsibility for accounting “Devil's Advocate” Support function for person B
	Person B	Critic Caring	Leader Want things to happen	Investigative Trying to get understanding
	Person C	Curious Driving force	Optimistic Visionary Structured Administrative driving force	Opponent

5.3.2 Round 2 (Post-interview)

This chapter will present the empirical findings from the second round of interviews. The presentation of the empirical findings are structured into themes from the interview guide. Firstly, the X-team’s view on the training program is presented, before shared mental models, psychological safety, trust, and finally roles and leadership are elucidated. The interview guide can be found in appendix 2.

5.3.2.1 The training program

In this section, the X-team’s opinions about the training program will be explained. Firstly, the use of the model in practice, both the pros and cons, will be presented and summarized in table 16. Further, the learning from the use of the program, if they recommend others to use the program, and suggestions for improvement are elaborated. Lastly, explanation of how they felt about using the model in the second workshop compared with the first is given.

Regarding the use of the model, the team members agree that the most positive effect is that they easier find the same mental level and same goal, hence get a shared mental model. This

is supported by person B stating that: *“The best thing with the model was that we worked on shared goals (...) and shared understanding.”* Furthermore, person A expresses, *“I think the model is very reasonable, and that it is useful. It is very natural for me to try to get my team to have the same mental model before we do anything. According to that thought, this model has made it more explicit.”* In addition, he explains that he liked that the model gave tasks to execute on the different steps. Further, person C emphasizes the benefit of the model by describing: *“In many situations when we move forward in multiple directions, the model helps us to take a step back.”*

The most challenging part when using the model was said to be that it was demanding to do something new, and to think different than they did before. Person A describes this as: *“In the beginning of the training program, it is cognitively hard to be so structured. It is much easier to just begin to solve a task - however, that it is not a clever strategy.”* In addition, person C claims that it was challenging to take a step back when you are ready to work: *“I am a person that likes to just work, and instead go back and fix mistakes etc, and that is not the case with this model. It has been challenging, but educational.”* Further, one team member explains that it could be difficult to distinguish between the Projection and Comprehension steps. In addition, one team member adds that he thinks that the team does not work often enough together in person to execute the training sufficiently.

Table 16 - Positive and challenging aspects of the training program

Positive	Challenging
The model is reasonable	Something new
Find shared mental models	Can be hard to take a step back
Tasks to execute and focus areas as guidance on the different steps	Difficult to distinguish between Projection and Comprehension.
Help us to take a step back	The program requires a team that work often together

The team members all agree that they have learned from the training program. For instance, person A states that, *“It is much better to talk about the assumptions, and if they are wrong it is the assumptions and not the person that is wrong. You remove the personal aspect.”* Further, person B reflects around the importance of common understanding, and that if this is missing in the beginning, it will be a “butterfly effect” where the different perceptions in the beginning is only driving the team members further and further apart from each other. This makes it harder to cooperate later in the process, because the team has moved in different

directions. Related to this, person B says that *“I now have learned that it is best for the group that I am able to wait until the other group members understand, or that we get a common understanding.”* In addition, person C explains that when they sit down to discuss jointly, he has gotten more aware of the given context. The same person reflect about himself when it comes to how he works in team. *“I have learned that I reflect the person I am working with when it comes to behavior. That is, I can have an overall view if the person I work with has it, vice versa having a more detailed and narrow view if my co-worker has it.”*

All of the team members will recommend other teams to use the training program. As such, person A states that it is because *“it is much more efficient, but I also think it is much more psychological gentle because it is almost a professionalization of the teamwork process.”* Furthermore, they all state that it is easier to discuss when all team members have the same assumptions, and that this is important when you work in a team. Additionally, they all claim that it was easier to use the model in the second workshop compared with the first. They explain the reason for this to be that they are more familiar with the model and that the psychological safety in the team has increased since the first time. However, when it comes to potential for improvement, person B suggests having an arrow from Action back to Comprehension and/or that you can loop from Action. Further, person C suggests that it could have been given smaller tasks (prepared by us) as “homework” that they were asked to execute x times during a week. He thinks that this could be easier to execute, because in their daily work it has a tendency to become hard to use the model directly on that work when they are used to being facilitated and given tasks from us. This will be elaborated more in chapter 6.3.

5.3.2.2 Shared mental models

There are several aspects found from the interviews that indicates an enhancement of the X-team’s shared mental models. Firstly, the team experience that they have gained a greater understanding of the team's interaction and collaboration, as well as becoming more aware of their own role in the team. Furthermore, all of the team members emphasize that they focus on getting a profound understanding of the task beforehand. Person C describes this as the process where the team always take a step back in order to evaluate what is essentially the goal with a certain task. This process is conducted by making sure that team members present their understanding. Person B elaborates this with the following words: *“I think everyone in general have been better to adapt and allow for a combination of all of their ideas”*. He further explains this by referring to a situation where the team was working with a problem statement in a business plan. They all had different views upon how this problem statement should be

put forward. However, the emphasized exploring all of the views, and ultimately landed on a common perception.

How information is communicated is essential in order to make sure that the counterpart actually understands the message, and therefore in order to build a common perception and shared mental models. All of the team members agree that they have adapted a better communication pattern, where making sure that the team members have the same perception is emphasized. Person A and person B argue that this is done by focusing on giving feedback to each other. Furthermore, person C describes the feedback process more thoroughly by giving this example: *“When I put forward my perception of a situation, person A and person B repeat my perception with their own words. As such, it is as mirroring each other - paraphrasing. We have used this to increase our shared understanding.”*

Regarding the level of misunderstandings, all of the team members claim that they experience fewer misunderstandings. Person A justifies this by the fact that the team in a higher degree share the same perceptions of the tasks the team face. Furthermore, person B emphasizes that the model has given the team the opportunity to work iteratively, and refers to their teamwork as agile. Lastly, person C view the model as a tool for avoiding misunderstandings, but also sorts them up by taking a step back if it is needed. When examining how the team faced discussions and conflicts, person A and person B expressed they had become better at it. *“I think we are better at removing the personal aspect from the discussions, and thereby give our assumptions more attention. Moreover, I feel we make better choice of words, for instance by emphasizing that this is MY view, instead of this is actually how it is”*. Person B supports this by arguing that their discussions have become more objective and reflective. Additionally, he believes that the model has been a great tool for improving how the team face discussions. Person C does not completely disagree with the fact that the team can handle discussions better, but acknowledge that in some discussions some parts have easily let go of their opinions. However, this is done in cases where the team members do not feel that it is crucial to promote their own opinion.

5.3.2.3 Psychological safety

In order to investigate the psychological safety of the team, we examined the same factors as in round 1, including how team members react when someone makes mistakes, how it is to raise difficult themes, how it is to ask for help, and how the respect is within the group. When considering how the team members react when someone makes mistakes, all of the team members state that mistakes are not held against the person making the mistake. Person A justifies this by the fact that the team are focusing on establishing a shared mental model

instead of the personal aspect. As such, mistakes made are not tightly linked to the individual, making it less scary to make mistakes. Further, person A have reflected on how this have affected the team's psychological safety and state the following: *"I feel that the training program have increased the psychological safety simply because the focus is moved from the individuals, and trying to establish a shared mental model is instead given attention"*.

To raise difficult questions and themes are considered as easier than before. Person B explains this as being the result of a stronger trust foundation. Additionally, he states, *"It is kind of more comfortable to have the uncomfortable discussion now"*. Furthermore, person A state: *"It's almost a little strange how conflicts almost evaporates if one remove the personal aspect and looks at the assumptions made instead."* In regards of asking critical questions and asking for help, an agreement of this being easy can be found in the interviews. At last, from the interviews, it is obvious that the team members respect each other. This is for instance justified by the fact that person B point out that the team members are considerate of each other.

5.3.2.4 Trust

The trust in the team has increased during the period from the first to the second workshop. The team still rely on the other team members to carry out their tasks. Furthermore, person B states that after working together over a longer period, they have gotten more familiar with each other. In addition, person A elaborates around how the model changes the focus area from a personal aspect to the person's assumptions, and hence the discussion is about the assumptions and not directly about the person's opinions. *"It is easier to disagree on the assumptions, rather than on the personal opinions."*

5.3.2.5 Roles and leadership

Regarding the group dynamics, one event may have specifically influenced the interactions within the team. This event refers to person A choosing to leave the business after this summer. Person A believes that this may have made his role a bit more passive than earlier. However, he regards the teamwork as being good even though he is going his separate way in a few months. When he describes the tasks, they are performing he states: *"We have become more aware that it is a person's assumption that leads to their opinions, therefore we have tried to reveal them [the assumptions]"*. Concerning the group dynamics, person B believes that when the team works together in person, there is a big difference in the group dynamics. When asked about an illustrating example, he states:

We were working on an assignment in a course we are taking, and we were working with two external members that did not have a lot of knowledge regarding the company.

I got annoyed, because I felt like we used almost an hour explaining something very obvious, but it turned out that it was very valuable for the two external members. Then the whole experience was positive and the group dynamics got better as I realized that it was valuable for them. The rest of the group also noticed the improvement.

Likewise, person C believes that the team is working well together when they meet in person. He considers the model as being useful in practice because, *“Everyone is gathered around the common understanding, before we split up to work separately”*.

Considering his own role in the team, person C states that he has not changed that much. He still takes a step back to let person A and person B discuss for a few minutes when they disagree. However, one change that he acknowledges, is that he has become more aware of his tendency to adapt to the persons he is working with, thus he has become more observant of his own role in the team. Person A feels like his own role has changed, but he finds it hard to distinguish the changes that are caused by him leaving the business after the summer to the changes caused by the training program. On the other hand, person B feels like his role has changed. He has become better at allowing others the time to explain their perspective, and he spends time on considering the perspective other has. Compared to the past, person B explains that he has a more positive attitude towards person A's way of working. He states, *“Often I felt like he made a mountain out of a molehill, and wanted to dig too deep into the problems, but actually this is his way of reaching a common understanding. Thus, I view this way of working as more positive than I did previously”*.

From the interviews, it is obvious that the leader's role in the team is probably the role that has changed the most. Person B, the leader, explains, *“I feel like I have become better at explaining what is necessary, i.e. explaining my perception and investigate if the others have the same perception. And if they do not, that we will get a common perception of what we have to”*. In the same manner, person A agrees with person B: *“I believe person B has taken assumptions into consideration [...] and that it is important to be aware of the assumptions as these leads to the wrong results if they are wrong”*. Person C adds that person B has become better at showing understanding and that he feels more safeguarded now than previously. Further, person C thinks that the training program has had a positive influence on the relationship to person B, in addition to the natural development of it.

6. Discussion of empirical findings

This discussion will, based on our empirical findings, answer our research question, which is, “How can an innovative team be trained to be aware of and adjust to an appropriate maturity level for a given task?” In order for a team to be able to be aware of and adjust to an appropriate maturity level, we believe that the key factor is that the team is able to master all of the maturity levels. Only at this point of time, we consider a team to have the ability of actually recognizing different maturity levels and adapt to these. Accordingly, the goal of our training program was to enable the X-team to master all the maturity levels, which is referred to as team development by Sjøvold (2014a). The training program aimed for the team to become aware of their group dynamics. This in order to make it possible for the team to adapt their group dynamics to solve the tasks they are facing efficiently. Furthermore, the training program focused on enhancing the team’s shared mental models, psychological safety, trust, and roles and leadership, which constitute factors we regard as being of great importance in order to reach higher maturity levels. The purpose of this discussion will therefore be to examine the training program’s effect on these factors, and by that be able to evaluate the team’s development in regards of being able to reach higher maturity levels. In chapter 6.1, we will examine the development of the four direct factors influencing the X-team’s maturity level. This examination forms the basis of the discussion in chapter 6.2, where we will evaluate the X-team’s maturity level before and after the conduction of the training program. Additionally, chapter 6.2 will discuss areas of further improvement for the X-team. At last, in chapter 6.3 we will evaluate the training program.

6.1 Development of the direct factors influencing the X-team’s maturity level

In this section, we will investigate factors with direct influence on the X-team’s maturity level. For each of the direct factors we will determine how well the team is capturing the possibilities of that factor in round 1 and in round 2. First, shared mental models will be discussed, before psychological safety will be examined. Next, trust in the team will be considered, before roles and leadership will be discussed. At last, we will give a summary of the most important findings.

6.1.1 Shared mental models

Round 1 - Weak developed shared mental models caused by divergent perceptions

Well-developed shared mental models are, as stated in chapter 2.2.1, of great essence when it comes to team performance, as the performance improves if the team members have a common understanding of the task that is to be performed and of the involved teamwork (Converse et al., 1993). Concerning the findings in chapter 5, we consider the X-team to have poorly developed shared mental models, both team- and task-related, at the time of round 1. The aggregated SPGR evaluation illustrates a lack of team-related shared mental models, referring to the team functioning and expected behaviors (Salas et al., 2005), due to the weak concentration of the white stippled circles. As mentioned in chapter 5.1.2.1, this is because the white stippled circles represent the team members' different interpretations of the team's group dynamics. Closely associated with this is the individual SPGR evaluations of the team members, which exhibit that all of the team members hold profoundly different perception of the other team members' behavior, indicating a lack of team-related mental models.

The SPGR findings are supported by the qualitative data from the interviews in round 1, where all of the team members point out that they often have divergent understandings of the given task and context. As such, we argue that the team experience a lack of task-related shared mental models as well, which refers to having a shared perception of how a task should be solved and what is needed in order to do so (Salas et al., 2005). This view is enhanced by the fact that the team members possess different amounts of knowledge regarding both the technology they work with and the given context. Moreover, we believe that the team members that do not have a sufficient overview of the technology and context can be exposed to loss of situational awareness. This is correlated with poor performance (Stanton et al., 2001), and hence it may harm the team's efficiency. Through the interviews in round 1, it is also evident that the team often experience misunderstandings. This is certainly a sign of lacking shared mental models, as Sjøvold (2014a) points out that a lack of shared mental models would lead to divergent expectation and misunderstandings, which would reduce the performance of a team.

Round 2 - Increased focus on developing common understandings

At the time of round 2, we argue that the team has made a significant improvement of their shared mental models, both team- and task-related. Firstly, this is justified by a greater concentration of the white stippled circles in the aggregated SPGR evaluation and more consistent individual SPGR evaluation. It should be noted that especially one white stippled circle in the aggregated evaluation differs from the others, and as such may reduce the degree

of shared mental models. However, Converse et al. (1993) argue that having shared mental models do not imply having identical mental models. It is the expectations, rather than the mental models themselves, that need to be shared among team members. Accordingly, we do not consider the mentioned exception to challenge the team-related shared mental models profoundly. Secondly, it appears from the qualitative data from the interviews that the team members have gained a greater understanding of the team's interaction and collaboration, and as such enhanced their team-related shared mental models. In addition, the team members emphasize that they focus on getting a profound shared understanding of the task beforehand, which we consider as aiding in the development of task-related mental models.

Thirdly, the results from the field chart vectors can be used to strengthen our argumentation of increased shared mental models within the team. With regards of the team-related model, we highlight the changes in the Acceptance (D2) vector. The X-team shows an increase for this vector, whereas the control group experience less acceptance of the group, tying the change more strongly to the training program. The increase in Acceptance (D2) can be seen in accordance with person B's statement regarding how he have developed a deeper understanding of how person A works: *"Often I felt like he made a mountain out of a molehill, and wanted to dig too deep into the problems, but actually this is his way of reaching a common understanding"*. As such, we argue that the increase in Acceptance (D2), among other things, may be rooted in gaining a deeper understanding of the other team members' behavior, which ultimately leads to better team-related shared mental models.

When evaluating the task-related shared mental models, we recognize multiple changes in the field chart vectors as being aiding for the development of better task-related shared mental models. As mentioned, it was evident from the interviews that the X-team is investing more time to get a common understanding of the tasks they face. This can be seen in relation to the changes in the Task-orientation (C2) vector, the Creativity (N2) vector, and the Self-sacrifice (W2) vector. The X-team have experienced a significant change with a strong increase of Task-oriented behavior (C2), which we tie to the training program due to the fact that the control group moved in the opposite direction with a small reduction in Task-orientation (C2). We argue that an increase in task-oriented behavior supports the development of task-related shared mental models, as the tasks are given a greater focus. Additionally, this supports the finding from the interview regarding the fact that the team to a greater extent than before emphasize creating a common understanding of the tasks they face.

Furthermore, the X-team also experienced a significant change regarding the Creativity (N2) vector, contrary to the control group, which remained at nearly the same value. We believe that this is linked to the X-team having a more systematic approach to how they attack their

tasks. Instead of jumping into a task without establishing a common understanding of the tasks, as they were more likely to do in round 1, they try to establish common ground. This accordingly supports the evolvement of the task-related mental models. Person C explains this process as the team “*in general have been better to adapt and allow for a combination of all of their ideas*” and by this ultimately land on a common perception. Another example of their systematic approach to the tasks are the feedback process described by person C. The feedback process involves team members repeating, and by that mirroring, each other’s perceptions in order to ensure that they understand each other.

Lastly, the X-team have a reduction in behavior connected to Self-sacrifice (W2), such as passiveness and being reluctant to contribute. On the other side, the control group experienced an increase in such behavior, indicating the effects of the training program to be a reduction in Self-sacrifice (W2) behavior. Additionally, the increase of the circle sizes in the aggregated SPGR field diagram from round 1 to round 2 should be pointed, as this implies that the overall influence in the team have increased. This will be discussed further in chapter 6.1.4; however, we regard an increase in influence as positive, because we see this as all of the team members’ thoughts and opinions being taken into account. We argue that a reduction in Self-sacrifice (W2) behavior and a more evenly distributed influence is beneficial in terms of establishing task-related mental models. This is because it leads to more contributions, which is of great essence as the team members need to share their perceptions in order to gain task-related shared mental models.

6.1.2 Psychological safety

Round 1 - Shortcomings regarding support, asking critical questions, and fear of mistakes reduced the X-team’s psychological safety

In chapter 2.2.2, we explained that a psychological safe environment is important when working in a team. For the X-team, which strive to be innovative, psychological safety is especially important; as it has been shown that psychological safety promote innovation (Edmondson & Mogelof, 2006). In round 1, all of the X-team members expressed that they respected each other and that it was easy, but not always needed to ask for help. They acknowledged that it was important and necessary to ask critical questions, but it was revealed that they sometimes held back, in order to not make each other uncomfortable. In addition, smaller mistakes were not causing strong reactions, whereas bigger mistakes provoked some frustration. When we combine these four factors (ease of asking for help, showing respect, fear of mistakes, asking critical questions), we argue that the X-team had moderate

psychological safety in the team with room for improvement, especially regarding asking critical questions and tolerating mistakes.

This view is enhanced by the fact that the X-team's Self-sacrifice (W2) value were noticeably higher than the control group's value, indicating that the X-team to a greater extent were passive and reluctant to contribute. We regard this as a sign of the team members being reluctant to offer novel contributions in fear of making mistakes, as well as not contributing with critical questions. Associated with this, we find that the X-team had a remarkably low Influence (Z) vector value, which indicate that the team was passive. Seen in the light of asking critical questions, we regard this as negative. The traits of asking critical questions and tolerating mistakes are crucial for the X-team as an innovative team, because innovative teams have to burst existing frames, challenge status quo, take risks, experiment, and be aware that failure are inevitable (Sjøvold, 2014a; Edmondson, 2012). Lastly, the X-team's ability to exhibit behavior connected to the Empathy (S2) vector, were considerably lower than the control group, which we regard as unfavorable for the psychological safety within the team. Accordingly, the X-team may not be able to reach their full potential as a team, and hence not be as innovative as they wish to, because of the mentioned shortcomings when it comes to building a psychologically safe environment.

Round 2 - Enhancement of the X-team's psychological safety

Unlike the results in round 1, the results in round 2 exhibit a more promising image of the psychological safety in the X-team. This will be justified by evaluating the change in the factors regarding how it is to ask for help, how the respect is within the team, how team members react when someone makes mistakes, and how it is to raise difficult themes. Initially, it was revealed from the qualitative data that asking and providing help within the team is still regarded as easy. This is supported by the findings regarding the Engagement (S1) vector, which have remained stable for the X-team and decreased slightly for the control group. As the Engagement (S1) value measure how likely team members are to invite the other team members to contribute, we regard the stable value as a sign that it is still easy to ask for and provide help, because the team members still invite others to contribute. Additionally, the X-team have experienced a decrease, and the control group an increase, in behavior associated with Self-sacrifice (W2). We believe that because psychological safety implies that everyone should have contributions, the decrease in Self-sacrifice (W2) can be interpreted as the team members finding it easier to contribute, and as such ask for help and provide help. Moreover, we believe this makes the X-team more open for each other's views. Based on this increased openness and ease of asking for and providing help, we see an enhancement in the team's psychological safety.

Furthermore, the interviews show that the team members still respect each other and the others' way of working. Even though the team found this easy also in the first round, we argue that they have become better at this. We justify this by the mentioned increase in the Acceptance (D2) vector, meaning that the team members have more acceptance for the group, which we interpret as the team showing greater respect towards each other. As such, we see a hint of improvement in the team's psychological safety.

Regarding tolerating mistakes there has been a change from round 1 to round 2, where all of the members now state that any kind of mistake is not held against the person making the mistake. Person A view this as the result of the team being more focused on establishing a shared mental model instead of the personal aspect. As explained in chapter 6.1.1, the greater focus on establishing shared mental models is supported by the increase in, among others, the Task-orientation (C2) vector. We therefore regard mistakes as not being tightly linked to the individuals, but rather to the team's task-related shared mental models, thus making it less scary for the team members to make mistakes. Additionally, we claim that the significant increase in the Influence (Z) vector, which is unique for the X-team, are strengthening our view regarding less fear of making mistakes within the team. This is because we view an increase in influence among the team members as an expression of the team members being more active, and as such not reluctant to offer novel contributions due to fear of being wrong, slowing team progress or creating frustration. Another finding supporting involvement and influence from all team members is seen in the speech data results from the badges. Here we see a great deal of mimicry in the pitch height of the voice of the team members, which may indicate that when one person in the team gets excited or involved in the discussion, the others follow. Consequently, we argue that there exists an enhancement in the psychologically safe environment, as the team have become better at tolerating mistakes.

When it comes to asking critical questions, it is from the qualitative data expressed that: "*It is kind of more comfortable to have the uncomfortable discussion now*", and that the conflicts evaporates when the personal aspect is removed in exchange for a greater focus on the team members' assumptions. In the same way as for tolerating mistakes, we view the increase in Task-orientation (C2) as beneficial as it may remove the personal aspect, and as such, the team members may not take critical questions personally. Accordingly, more task-oriented behavior contribute to an environment where critical questions are positive in order to uncover mental models, rather than attacks on the individual. Even though we expected the Criticism (O1) vector to increase in round 2 when considering the answers from the interviews, we see that it has not. We believe that this discrepancy between the SPGR results and the interviews

may arise because the perception of what is critical behavior may have changed within the team. The team members may think it is easier to disagree at this point of time, as the personal aspect is reduced and the team is focusing on the assumptions made and the development of shared mental models. Thus, we believe that the X-team to a certain degree have become better at asking critical questions and bringing up difficult themes, which ultimately leads to an increase in the team's psychological safety.

The investigation of the four factors connected to psychological safety gives us a strong rationale for arguing that there has been an improvement of the psychological safety in the team. We believe that this view is strengthened by the changes in the Empathy (S2) vector and the Caring (N1) vector. As shown in 5.1.2.2., the X-team has a significant increase in the Empathy (S2) vector, whereas the control group only has a small increase. Furthermore, behavior connected to Caring (N1) is more frequent than before, while the control group have experienced a decrease. We believe that the increase in these vectors are positive, as we regard being supportive and showing interest to others, as well as taking care of others and being attentive to relations, promote psychological safety. High psychological safety is linked to innovation and allowance of team members to relax their guard and engage openly in the behaviors that underlie learning (Edmondson & Mogelof, 2006). Although psychological safety does not reduce conflict in the team, Kelly and Barsade (2001) state that it allows to be managed more productively than when psychological safety is not present. In conclusion, the X-team may experience more innovation, learning, and productive conflict than they did before the training program was initiated.

6.1.3 Trust

Round 1 - Trust existed in the form of relying on others to do what they were supposed to do

The qualitative data from round 1 illustrates that the team members possessed the same perception of the concept of trust at the time of round 1. Trust was mainly associated with being able to trust that the other team members did what they were supposed to do. When evaluating the Loyalty (D2) vector, we find that the X-team frequently exhibited behavior connected to this vector. This indicates that the team members were obedient and dutiful. Accordingly, we argue that the trust level with regards of depending on others to do what they were supposed to do, were high at this point of time. However, as Sjøvold (2014a) states trust is a relative term, which is perceived different on different maturity level. On higher maturity levels, trust is associated with, among others, critical questioning in order to take real part in knowledge (Sjøvold, 2014a). As illustrated in chapter 6.1.2, this was to a certain degree

perceived as challenging at the time of round 1. Additionally, we view critical questioning as being a root to disagreements. If handled right, these disagreements can be positive contributions to the teamwork. However, statements regarding fear of creating bad atmosphere were found from the interview data, indicating that the trust within the X-team were not optimal for reaching higher maturity levels.

Round 2 - Enhancement of the psychological safety facilitates a stronger trust level

Trust is a defining characteristic of psychological safety (Kahn, 1990). As such, trust and psychological safety is closely intertwined, and hence we argue that the changes in trust to a great extent follows the changes in psychological safety. As for psychological safety, the qualitative data from the interviews also show that the trust level among the team members have increased. Regarding the team members relying on each other to carry out their tasks, the trust level is still high. However, we argue that a change in trust can be found as the team members find it less uncomfortable to disagree with each other. This is further explained by person A elaborating around how the training program changes the focus area from a personal aspect to a person's assumptions, and hence the discussion is about the assumptions and not directly about the person's opinions: "*It is easier to disagree on the assumptions, rather than the personal opinions.*" As explained in both chapter 6.1.1 and 6.1.2, this is, among other, the result of the increased Task-orientation (C2) within the group, which shifts the focus and effort over to developing shared mental models. This is in line with the interview data, where it is found that the team's discussions have become more objective and reflective.

Due to the fact that trust and psychological safety is so tightly connected, it is reasonable that the changes discussed in the field chart vectors regarding psychological safety are also applicable to examine the changes in trust. As such, we regard the changes in the Acceptance (D2) vector, Empathy (S2) vector, Caring (N1) and Influence (Z) vector, as contributing to an increase in trust within the team, as a more psychologically safe environment nurtures trust. Consequently, we acknowledge that there has been a development in the trust level, which at first only involved trusting each other to fulfill their task, and now to a greater extent includes being able to ask critical questions and raise difficult themes.

6.1.4 Roles and leadership

Round 1 - The team had somewhat fixed roles

From the theory chapter, it is known that for a team to reach its potential, all the four functions; nurture, control, opposition, and dependence, must be balanced. Sjøvold (2010) suggests that this can be done for instance through a set role structure, where people occupy different roles,

or through a flexible role structure where all members develop their behavior aspects to support all functions. Analyzing the results from the first SPGR data collection, we argue that the X-team may not reach their full potential as we find their role structure to be somewhat unbalanced at the time of round 1. Firstly, person C exhibit dependent behavior seen from his grey circle, in contrast to person A and person B that have yellow circles, indicating a balanced range of behavioral traits. Accordingly, it would be more optimal for the role structure if person C also had developed a more balanced range of behavioral traits. Furthermore, being placed in one particular sector can be a sign of low abilities to perform other types of behavior. From the aggregated field diagram in figure 9, we find that person C's circle is placed only in the control sector. Further, person B is allocated in the control sector, while person A is placed mostly in the nurture sector. Contrary to this, it is from the interviews found that the team members' think they are able to alternate roles, for instance through this statement: "*people are pretty good at putting on different hats*". However, the interviews also reveal that there is often one person that is associated with one, or a few, specific roles. For instance, person A explains that person C and himself often take the role as the "Devil's Advocate". With further evaluation of the SPGR results in figure 9, we observe that person A is placed quite close to the red opposition sector, verifying his statement in regards of his own behavior. However, this is not the case for person C, making it questionable how oppositional person C is in practice. It should also be noted that person C's result as dependent indicate that he is not able to switch between all behaviors, and operating with a grey circle may lead to submission and passivity.

Furthermore when evaluating the team's role structure, it is known that extremely dominant individuals in a group tend to freeze the group in a fixed pattern of roles (Sjøvold, 2007). However, when examining figure 9, no exceptionally dominant members in the group can be found as the circle sizes are quite similar, indicating that the team may not freeze in a fixed pattern of roles due to dominant team members. Yet, it should be noted that a more evenly distributed influence within the team would be preferred. This is based on finding that the value for the team's Influence (Z) vector have a relatively high standard deviation, which may indicate that there is an unequal distribution of influence within the team. We argue that the result of this may be that some team members talk, engage, and influence a lot more than others. From the sociometric badge data, we found that during both case 1 and 2 in the first workshop, person B was the person with the highest energy level, which can be translated into the same as having the most influence. In case 1, person A and person C had quite similar energy levels, but on a lower level than person B. Furthermore, we believe that the unbalanced influence may harm the team's ability to reach its full potential, as we believe it is important for all team members to be able to influence in order to uncover all valuable thoughts and

opinions. Ultimately, when evaluating the role structure of the X-team concerning the colors, placements, and sizes of the circles in figure 9, as well as the Z-value in mind, we argue that the X-team to a certain degree had fixed roles at the time of round 1. This is according to Sjøvold (2014a) a hinder to a team needing to be at an innovation maturity level, as the members in the team need a high level of autonomy freedom to be able to innovate.

In regards of the leadership at the time of round 1, we view it as sufficient, but with room for improvement. Firstly, this is based on the leader's statement: *"I am the leader, but I try not to appear like I am sitting on my chair, deciding what everyone should do"*. The other team members seem to agree on this, and claim that the leader takes on a lot of responsibility, without being bossy. We acknowledge this as important, as we believe that a bossy leader would diminish the engagement and the psychological safety within the team, which would lead to weaker results. However, above it was revealed that the influence within the team was not optimally distributed, thus we believe that the leader at this point of time could be better at making sure that all of the team members opinions came forward. Lastly, the qualitative data from the interviews showed that the leader possessed more knowledge than the other team members did, and that there existed a potential for getting better at sharing this knowledge. At the same time, it should be pointed out that on higher maturity levels all team members to a greater extent seek to take part in all knowledge by challenging each other's views (Sjøvold, 2007). Hence, on higher maturity levels it is not the leader's responsibility alone to ensure knowledge transfer. However, as we will discuss further in chapter 6.2.1, the team was not able to reach high maturity levels at the time of round 1. From chapter 2.2.4, it is known that a team on a lower maturity level need strong and clear leadership, thus we argue that the leader himself at this point of time had a potential for getting better at sharing his knowledge.

Round 2 - Less fixed roles and more evenly distributed influence

The results from round 2, with regards of the aggregated field diagram in figure 11, show a more concentrated cluster of circles positioned between the control and nurture sector, and indicates that these are the most prominent behaviors within the team. The allocation of the circles imply that the team members are better able to shift between different kinds of behaviors at this point of time. This is supported by a remarkable change from round 1, where all the team members now have a yellow colored circle, indicating a balanced range of behavioral traits. We acknowledge this as an important change in regards of hindering a fixed role pattern.

Above it was elaborated on how the uneven distribution of influence within the X-team could prohibit them from reaching their full potential. The data collected in round 2 exhibit promising

results, as it seems like the influence within the team has both increased and is more evenly distributed than earlier. This is justified by the fact that the value for the Influence (Z) vector have significantly increased, and at the same time the standard deviation is somewhat reduced. Furthermore, figure 11 shows that the circles are of approximately the same size, indicating equal influence. The badge data from case 1 in workshop 2 also show tendencies towards a more evenly distributed influence, as the team members' energy levels were quite similar. In addition, the increase of the circle sizes from round 1 to round 2 should be pointed out when evaluating the change in influence, as this implies that the overall influence in the team have increased. The increase is seen by the Z-values, where $A=3$, $B=2.3$ and $C=1.7$ in round 2, whereas the results from round 1 showed that the corresponding values were $A=0$, $B=0.7$ and $C=-0.3$.

Based on these results, we argue that there is a greater chance that all of the team members' thoughts and opinions are taken into consideration, and hence that the team can take advantage of this, and thereby be better equipped to reach their full potential. This may be supported by the qualitative data, where it is found that all of the team members have felt a positive change towards how they interact with each other. We believe that this positive change may be correlated with the fact that all of the team members' experience that their opinions are taken into account, and that this could be a sign of increased influence. Furthermore, this view is strengthened by the increase in Task-orientation (C2), which we regard as positive influence the team to a greater extent than earlier explore all of the team members' opinions. When evaluating the role structure after round 2, with regards of the colors, placements and sizes of the circles in figure 11, as well as influence in mind, we argue that the X-team have more flexible roles and a more evenly distributed influence.

In regards of the leadership at the time of round 2, the interviews show that the leader's role in the team is probably the role that has changed the most. The leadership in round 1 were evaluated to be sufficient, however with room for improvement, especially concerning sharing knowledge within the team. Regarding this, person B, the leader, explains: *"I feel like I have become better at explaining what is necessary, i.e. explaining my perception and investigate if the others have the same perception. And if they do not, that we will get a common perception of what we have to do"*. Hence, it can be argued that the leader has become more aware of his own influence on the team, better at sharing his knowledge, as well as including the others to share their knowledge. The statement also shows that the other team members does not necessarily always agree with the leader, implying that there is room for challenging each other's views at this point of time, which is important in order to reach higher maturity levels. Furthermore, person C adds that the leader has become better at showing

understanding and that he feels more safeguarded now than previously, indicating that the leader have contributed to create a more psychologically safe environment.

6.1.5 Summary

Table 17 summarizes the most important findings in regards of strengthening the X-team's ability to operate on a higher maturity level.

Table 17 - Summary of findings: Development from round 1 to round 2

Findings which strengthens the team's ability to operate on a higher maturity level

Shared mental models

- Team-related shared mental models strengthened
 - Greater concentration of the white stippled circles in the aggregated SPGR evaluation
 - Greater understanding of the team's interaction and collaboration
- Task-related shared mental models strengthened
 - Focus on getting a profound shared understanding of the task beforehand
 - Higher task-orientation
 - More contribution of thoughts and opinions

Psychological safety

- Psychological safety is strengthened
 - It has remained easy to ask for and provide help
 - The team members still respect each other, and has increased acceptance in the group
 - Mistakes are not held against the person making mistakes
 - Increased focus on task and assumptions instead of person, making it easier to ask critical questions
 - Influence and thus participation in the group is increased

Trust

- Trust level has increased
 - Enhancement of the psychological safety facilitates a stronger trust level
 - Less uncomfortable to disagree with each other
 - Easier for the team members to challenge each other's views
 - The shift of focus from person to task is explained as an important reason for the increased trust by the team members

Roles and leadership

- Less fixed roles and more evenly distributed influence
 - All team members shows balanced specter of behavioral traits
 - A more even distribution of influence
 - All team members have more influence
 - Team members are more positive to each other's way of working
- The leader is better at sharing his knowledge
 - The leader has become more aware of his position and influence on the team
 - The leader has become more understanding
 - Team members could challenge the leader's view more often

6.2 Evaluation of the X-team's maturity level

From the discussion of the X-team's development from round 1 to round 2 above, we are able to connect the four direct factors to analyze the X-team's maturity level. In this subchapter, we will first investigate the maturity level in round 1, before we analyze the effect of the development of the factors, and accordingly the maturity the level in round 2. At last, we will examine what the X-team should improve in order to continue to develop their ability to operate on different maturity levels.

6.2.1 Round 1 - Maturity Level Team Spirit

In order to determine the maturity level of the X-team at the time of round 1, we have analyzed the direct factors influencing team maturity in figure 22 below.

Factors with direct influence on team maturity level	Evaluation			Total evaluation for factor
	Low	Medium	High	
Shared mental models Task-related Team-related	X X			Low
Psychological safety Respect Provide and ask for help Ask critical questions Handling mistakes	X	X	X X	Medium
Trust Rely on the others to fulfill tasks Challenging each other's views	X		X	Low/Medium
Roles and leadership Leadership Flexible and balanced roles		X X		Medium
TOTAL EVALUATION OF MATURITY LEVEL	Low/Medium			

Figure 22 - Direct factors influencing team maturity level in round 1

In regards of the first direct factor, shared mental models, we claim that the X-team at the time of round 1 were not able to operate on a high maturity level. From figure 22, we see that both task- and team-related mental models are placed in the low (red) section. The reason is that the X-team often experienced misunderstandings, and that the team members possessed

different amount of knowledge about the task and context. This was from the qualitative data explained to be a result of poor communication. We argue that communication problems function as an obstacle for reaching higher maturity levels, for instance due to the fact that the highest maturity level, innovation, requires free flow of thoughts and criticism.

The second direct factor, psychological safety, has a total evaluation of being at a medium level. This is because respect and asking for help is perceived as easy in the X-team, but according to Edmondson (1999), experimenting and engaging in constructive conflict or confrontation is also important in order to have psychological safety in a team. In round 1, some frustration were evident connected to making big mistakes. Moreover, quantitative data revealed that asking critical questions were sometimes regarded as unpleasant.

With respect to the factor trust, we argue that the X-team's trust were in accordance with trust on a low maturity level in round 1. As mentioned in 2.2.3 and 6.1.3, trust is a relative term, which is perceived different on different maturity levels (Sjøvold, 2014a). At the time of round 1, trust was characterized by the belief that the team members did what they were supposed to do and not the belief that the team members will challenge the views of each other by asking critical questions, which is seen as important for higher maturity levels. Relying on the team members to fulfill their tasks correlates to Sjøvold's (2014a) description of trust on lower maturity levels, which is the expectation that team members can depend on that the other individuals support and contribute their expertise when it is needed. Hence, even though the team is evaluated to have high trust when relying on each other to fulfill their tasks, the total evaluation is that the team can only reach lower maturity levels in regards of trust.

Regarding the factor including roles and leadership, we have a total evaluation of a medium level. The leadership in the team has to be adapted to the maturity level of the team (Sjøvold, 2014a), thus the leadership and the roles the team members take, have to correspond. The leadership in round 1 is evaluated to be at a medium level, because the leader is good at not being bossy and his leadership style is appreciated by the team members. However, he could get better at including the others by sharing his knowledge of the tasks and the context. Regarding the roles of the two others, we see from the SPGR survey that one person show a balanced range of behavioral traits, whereas the other person is dependent. Furthermore, the findings from chapter 6.1.4 suggests that the team have somewhat fixed roles, which is not a characteristic of a high maturity level (Sjøvold, 2014). At last, the qualitative data indicate that all the team members seem to take roles mostly within their comfort zone. Thus, we evaluate the roles to be placed at a medium level.

The total evaluation of the team’s maturity level at the time of round 1 includes all the factors combined. From the discussion above and figure 22, we have concluded that shared mental models is on a low level, psychological safety is on a medium level, trust is on a low level, and roles are on a medium level. Translated into maturity level for the team, we argue that the team has a low to medium maturity level. Our view is thus that the team usually operates on the lowest maturity level (Reservation), with the opportunity of sometimes reaching the second lowest maturity level (Team spirit). These maturity levels is described by Sjøvold (2014a) in chapter 2.1.3.

6.2.2 Round 2 - Maturity Level Production/Innovation

In the same way as for round 1, we have analyzed the direct factors influencing the maturity level in order to understand which maturity level the team is operating on after conducting the training program. The findings are exhibited in figure 23.

Factors with direct influence on team maturity level	Evaluation			Total evaluation for factor
	Low	Medium	High	
Shared mental models Task-related Team-related		X	X	Medium/High
Psychological safety Respect Provide and ask for help Ask critical questions Handling mistakes		X	X X X	High
Trust Rely on the others to fulfill tasks Challenging each others views		X	X	Medium/high
Roles and leadership Leadership Flexible and balanced roles			X X	High
TOTAL EVALUATION OF MATURITY LEVEL	Medium/High			

Figure 23 - Direct factors influencing team maturity level in round 2

As the discussions in chapter 6.1 show, we see substantial changes in the evaluation of the direct factors in round 2. Initially, we have evaluated the factor shared mental models to be at

a medium/high level. One of the reasons for this is that the task-related shared mental models have improved from a low to a high level. As Athens (1982, in Converse et al., 1993) claims, shared mental models improve communication and coordination, and our qualitative results show a significant improvement of this. In addition, the team has made some improvements related to team-related shared mental models according to the results from the SPGR survey and the interviews. As a result of improving their shared mental models, we therefore argue that the X-team is better equipped to reach higher maturity levels after conducting the training program.

In addition, the X-team have enhanced the psychological safety at the time of round 2. They have done this by becoming better at handling mistakes and asking critical questions, while keeping respect and helping at a high level. The team experience that handling mistakes is done by moving the focus from the person who made the mistake, to the assumptions made, thus not making the team members afraid of making mistakes. Further, the X-team has become better at asking critical questions, again because the focus has been moved from person to task. However, as we see from the SPGR survey results, there is still possible to exhibit more critical behavior in the team. Thus, the asking critical question sub-factor is at a medium level. When we combine the four sub-factors (making mistakes, asking critical questions, asking for and providing help, and respect) into psychological safety, we believe that the team has high psychological safety. We argue that this enhancement in psychological safety is a contribution towards operating on a higher maturity level.

In regards of trust at the time of round 2, our view is that the X-team is able to have the trust necessary to operate on a high maturity level. We observed a development of the trust concept to include being able to a certain degree to ask critical questions and raise difficult themes. It should be noted that the team could still get better at this, as also pointed out in the paragraph above. As mentioned in 6.1.3, at higher maturity levels trust is associated with, among others, challenging each other in order to take real part in knowledge (Sjøvold, 2014a). As such, it is evident that, in regards of trust, being able to ask critical questions and raise difficult themes are a prerequisite to reach higher maturity levels. Accordingly, as the team has become better at this, they have the opportunity to reach higher maturity levels.

When discussing roles and leadership, we argue that the team has become better at understanding each other's perspectives and better at asking questions when they do not understand. Hence, it is plausible to believe that they engage more into the task, and that they are able to take different roles during the work. This is supported by the fact that all of the team members had synergy roles at the time of round 2, according to the SPGR results. In

line with Sjøvold (2014a), members of a team at a high maturity level are in balance and thus have the ability to switch between being critical, loyal, supporting, and leading. Moreover, the leadership in the group has also changed, as the leader (person B) has become better at including the other member's views, and the influence in the team has increased and become more evenly distributed. In addition, it was evident from the badge data that everyone got involved in the discussion. Thus, it can be argued that the team is operating on a higher maturity level.

When combining all the factors, we see that shared mental models is on a medium/high level, psychological safety is on a high level, trust is on a medium/high level, and roles are on a high level. Thus, our total evaluation of the X-team's maturity level is medium/high. This corresponds to a production or innovation maturity level in Sjøvold's (2014a) framework. The reason why we include two maturity levels is that we believe the group sometimes are able to operate on the innovation maturity level, but that it is still uncomfortable for them to ask critical questions and be in opposition. As such, we believe that they are not able to operate on the innovation maturity level every time it is required, and are instead operating on the production maturity level. To address what we consider the team could become better at, and how they could continue to improve their teamwork, we have included subchapter 6.2.3.

6.2.3 Areas of Improvement

In 6.2.2, we argued that the X-team could become better at asking critical questions and having critical behavior when needed. From figure 23, we see that challenging each other's views; in addition to developing stronger team-related mental models represent areas of improvement. We believe that team building, i.e. becoming better at the maturity level they are already on and the ability to reach a higher maturity level is important. The team development should include means to improve the oppositional behavior in the team, in order for the team to become better at asking critical questions and challenging each other's views, and by that be better equipped to reach the highest maturity level (Innovation). This can be done by, for example, adopting the team development intervention of constructive confrontation (K2), as explained in chapter 2.3.2.2. Furthermore, K2 is known to be effective for developing better understanding of other's ways of thinking and mental models, both task- and team-related (Burgess and Burgess, 1996; Sjøvold, 2014a), and at the same time avoid group think (Kellermanns et al., 2008). As such, K2 could also be used to improve the team's team-related mental models further. Additionally, in order to focus even more on team-related shared mental models, the X-team's further training could include guided self-correction. This form of training may contribute to more effective team performance and support teams' cognitive

function of experiential learning, for instance when diagnosing their own problems (Salas et al., 2007).

6.3 Evaluation of the training program

In order to measure if and how the training program has helped an innovative team to become more aware of and able to adjust to an appropriate maturity level, we have compared the X-team with the control group. That is, we have investigated the change from round 1 to round 2 in the 13 vectors for the X-team and the control group, to see if it exists statistical evidence that the program actually worked. In conclusion, we will offer considerations about improvements with this research.

We found that the Empathy (S2) vector has increased with statistical significance from 2.67 to 3.56 ($p < 0.01$ level), while for the control group the increase was much smaller, from 1.41 to 1.50, and not statistical significant. Hence, we have evidence showing that the training program helped to increase the X-team's ability to show empathy. It is positive for the X-team that they get more supportive of each other and show more interest for each other. This in order to understand what the other team members think, and to operate on a higher maturity level.

Further, it is evident that the control group experienced a statistically significant ($p < 0.05$) reduction in the Creativity (N2) vector from 1.22 to 0.67, while the control group had an insignificant increase from 0.88 to 0.91. For the X-team, this can be positive, because they become more task oriented and structured in the way they work. Our experience is that entrepreneurs may tend to have many ideas flowing, and accordingly may experience a lack of structure in the way they work. Consequently, the argument from the interviews in round 2 supports the positive effects of more structure for the X-team, where person A describes this as: *"In the beginning of the training program, it is cognitively hard to be so structured. It is much easier to just begin to solve a task - however, that is not a clever strategy."*

Accordingly, the opposite vector, Task-orientation (C2) has increased from 3.00 to 3.52 on the same statistically significant level as Creativity ($p < 0.05$) for the X-team. In comparison, the control group experienced a small decrease from 2.99 to 2.88 in this vector. For the X-team, this increase is positive because the focus is taken away from the person to the task and perceptions in discussions. An example of this is given from person A who states, *"It is much*

better to talk about the assumptions, and if they are wrong it is the assumptions and not the person that is wrong. You remove the personal aspect.”

The last statistical significant result for the X-team is found for the Influence (Z) vector, which have increased from 0.11 to 2.33 ($p < 0.05$), while the control group only experienced a small increase from 3.12 to 3.23. Hence, the X-team's team members are now more engaged and more active in the teamwork, which definitely is positive for the team if they want to operate on the highest maturity levels, where for instance all team members contribute and care about finding a solution outside the box (Sjøvold, 2014a).

In addition to the vectors, it has been completed calculations on the change in a few parameters. These four parameters are polarization, standard deviation on influence, Shared mental models and cohesion. The polarization has decreased from 4.21 to 2.67, which is regarded as a positive change as low polarization within a team is desirable (Sjøvold, 2014a). Additionally, Sjøvold (2014a) argues that teams on a lower maturity level may have dysfunctional reactions like groupthink, polarization and conflict, and hence a decrease in the polarization is a positive change for the team. Further, we can see that the standard deviation of the influence vector has decreased from 1.54 to 1.22. Lower standard deviation means more similarity of the influence in the group, and hence this is a positive change, particularly when we know that the influence vector itself has increased for the team. Consequently, the team members are after conducting the training program more engaged in the work, and the difference between the member's influence has decreased.

Investigating the parameter measuring shared mental models, we observe that it has slightly decreased from 2.70 to 2.60, which is a small but positive change. The parameter measuring shared mental models measures the difference between the team members mental models, and hence the higher the number the worse the shared mental models in the team. Optimally, this decrease could have been even bigger, but still according to the qualitative data and the earlier discussion it can be argued that the team has experienced an improvement in the area. The last parameter, cohesion, has decreased from 3.47 to 2.34. Hence, the change is positive for the group dynamic. Lower cohesion, means less variance between the team members when it comes to connection and closeness within the team.

The usefulness of the training program is also supported by the qualitative data. As stated previously, the team members point out that reaching common understanding is a significant

result of using the training program. Furthermore as mentioned above, Person A explains that it was hard to undertake the training program in the beginning because they were used to going straight to task solving. However, he admits that this might not always be the smartest and most effective way of working. In addition, person C claims that it was challenging to take a step back when you are ready to work: (...). *It has been challenging, but educational.*” According to the qualitative data, all of the team members will recommend other teams to use the training program. However, some areas of improvement were also pointed out.

Person B suggests to have an arrow from Action back to Comprehension and/or that you can loop back to the first three steps from Action, as illustrated by the blue arrows in figure 24. The idea behind this is that the team can go back to previous step if needed. Further, person C suggests that it could have been given smaller tasks (prepared by us) as “homework”, that they were asked to execute x times during a week. He thinks that this could be easier to complete in a startup phase, because in their daily work it has a tendency to become challenging to use the model directly before they have the use of the training program fully integrated into their work process.

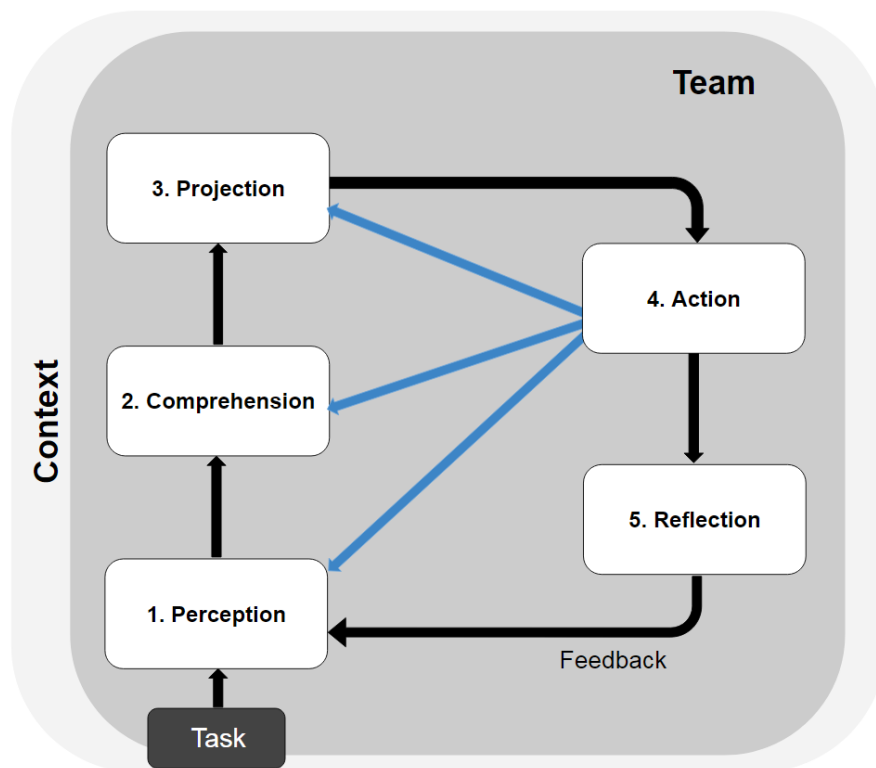


Figure 24 - The X-team’s suggestion for improvement of the model

In conclusion, we have seen that the training program has improved the X-team’s ability to be aware and adjust to an appropriate maturity level. Compared to the control group, the X-team

has experienced significant improvement ($p < 0.01$, $p < 0.05$) on four of the 13 vectors. We want to point out that because the p-value is dependent on the size of the sample, and our sample is small, it is harder to get statistically significant results. Thus, the fact that this research have significant results may show that the training program has had a great positive effect. This is in line with the discussions from chapter 6.1 and 6.2, where we saw a positive development of the four factors investigated, and that the team is able to reach higher maturity levels after completing the training program. At last, the qualitative data from the interviews support the fact that the X-team have experienced a development in their group dynamics. Hence, we have reason to state that the training program has had a positive effect on the team's ability to become aware of and adjust their maturity level, but we still want to point out that there exist possibilities for improvement, as mentioned above.

7. Conclusion

From the literature study conducted during the autumn of 2016, we developed a conceptual model with five steps in order to increase a team's ability to be aware and adjust to an appropriate maturity level for the given context. The conceptual model was developed based on team theory and included among others four identified factors: shared mental models, psychological safety, trust, and roles and leadership that if well developed within a team make the team better equipped to reach higher maturity levels. Our research question for this master thesis were, "How can an innovative team be trained to be aware of and adjust to an appropriate maturity level for a given task?" To address the research question, we used the conceptual model as a background for making a model for practical team training, with the purpose of improving a team's ability to be aware of and adjust to the most appropriate maturity level given the tasks they face. As stated in the discussion, we believe that it is essential for a team to be able to master all of the maturity levels, in order to be able to be aware of and adjust to an appropriate maturity level. Accordingly, one of the areas of focus for the training program were to develop the four factors, which found in the literature study to be of great importance in order to reach higher maturity levels. As such, the master thesis' research question were examined with a practical approach through two perspectives. Firstly, we wanted to examine the training program's effect on the X-team's maturity level through the development of the four factors, and secondly determine if the X-team's improvement could be tied to the training program.

Our findings suggests that the X-team, through the use of the training program, have improved their shared mental models, psychological safety, trust, and achieved more balanced roles within the team, as illustrated in figure 25. Consequently, it is argued that the X-team have developed from a team operating on lower maturity levels, meaning operating on reservation or team spirit, to a team operating on medium to high maturity levels, meaning operating on production and to some degree on innovation. As seen from the discussion, we acknowledge an opportunity for improvement for the X-team, in regards of becoming better at critical questioning and challenging of other team members' views, and hence be better equipped to reach the highest maturity level (Innovation). As such, we also acknowledge that the training program itself could be further developed to include training interventions, which enhance a team's ability of critical questioning and challenge of views. A more extensive use of K2 in the training program was, among other team building interventions, suggested in the discussion to improve this.

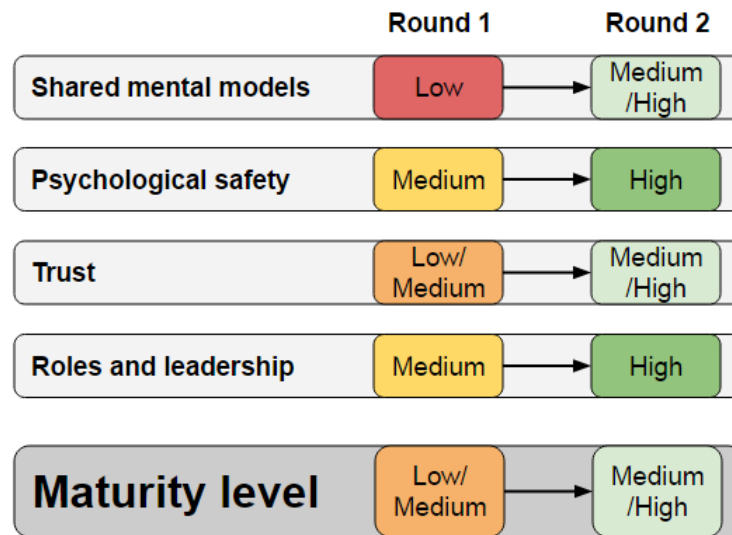


Figure 25 - Development of direct factors and maturity level for the X-team

The research in this master thesis was designed as a quasi-experimental study with a control group to create a comparative basis, in order to determine if the X-team's improvement could be tied to the training program. The control group consisted of over 30 groups, which is assumed to have the same background as the X-team, because they all root from the School of Entrepreneurship. The SPGR vector values show that the X-team have improved significantly more than the control group in some areas, which figure 26 illustrated as being Empathy (S2), Creativity (N2), Task-orientation (C2), and Influence (Z). As the discussion show, these changes are regarded as positive in order to reach higher maturity level. In contrary, the control group has experienced little or no change in regards of these or any other vectors.

	The X-team			The control group		
	Round 1	Round 2	Change	Round 1	Round 2	Change
Empathy (S2)	2.67	3.56	↑	1.41	1.50	↑
Creativity (N2)	1.22	0.67	↓	0.88	0.91	□
Task-orientation (C2)	3.00	3.52	↑	2.99	2.88	↓
Influence (Z)	0.11	2.33	↑	3.12	3.23	↑

Figure 26 - Significant changes in the X-team compared to the control group

Based on these results and our previous discussion, we argue that the training program has had a positive effect on the X-team's maturity level, and accordingly have made them better equipped to be aware of and adjust to a given task. The reason for this is that the X-team is

able to operate on higher maturity levels than before, and are aware of different ways of using their group dynamics to perform different types of tasks. Furthermore, the X-team themselves stated that the training program had become a part of their way of working together. Ultimately, the thought of this training program is that teams eventually do not need to conduct it explicitly, as the goal is that the team develops a group dynamic where they implicitly ensure a common understanding of the task they face. As such, the aim is that this way of working becomes a routine, which results in a team better equipped to become aware of and adjust their maturity level to a given task.

7.1 Suggestions for further research

Regardless of the valuable research executed in this thesis, it is clear that more research is needed to fully understand and verify the impact that such a training program can have. Accordingly, we suggest that more teams complete the training program and that their development throughout the period is measured. In addition, we recommend that the team development is measured over more than six-eight weeks in order to investigate more long-term effects. As such, longitudinal studies can be an alternative to verify this. In addition, it can be possible to investigate different types of teams. In this particular case, the team was quite new and the members did not know each other that well. It should be pointed out that research on such teams are also valuable, but that one should conduct similar research on more established teams in order to a greater extent verify the training program. Moreover, the concept with workshops can be investigated and developed even more to pursue the best possible learning. Technical problems with the badges resulted in a lack of speech data from our first workshop. Accordingly, we suggest further research with the use of sociometric badges, which may give valuable knowledge. Other interesting suggestions for further research are to look at the relationship between a team's results (e.g. efficiency, innovation, or results in monetary terms) and the development of the group dynamics.

References

- Allport, F. H. (1920). The influence of the group upon association and thought. *Journal of Experimental Psychology*, 3(3), 159-182. doi: 10.1037/h0067891
- Amabile, T. M. (2001). Beyond talent: John Irving and the passionate craft of creativity. *American psychologist* 56(4): 333.
- Amason, A. C., & Sapienza, H. J. (1997). The effects of top management team size and interaction norms on cognitive and affective conflict. *Journal of management*, 23(4), 495-516
- Arthur, W., Bennett, W., Edens, P. S., Bell, S. T., & Zedeck, S. (2003). Effectiveness of Training in Organizations: A Meta-Analysis of Design and Evaluation Features. *Journal of Applied Psychology*, 88(2), 234-245. doi: 10.1037/0021-9010.88.2.234
- Bales, R. F. (1950). *Interaction process analysis: A method for the study of small groups*. Cambridge, MA: Addison-Wesley.
- Bales, R. F. (1985). The new field theory in social psychology. *International Journal of Small Group Research*, 1(1), 1-18.
- Bales, R. F. (1999). *Social interaction systems*. New Brunswick, NJ: Transaction Publishers.
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American psychologist* 37(2): 122.
- Bedny, G. & Meister, D. (1999). Theory of activity and situation awareness. *International Journal of cognitive ergonomics* 3(1): 63-72.
- Bion, W. R. (1987). *Experiences in groups*. London: Tavistock Publications
- Blaikie, N. (2010). *Designing Social Research*: Polity Press.
- Blickensderfer, E., Cannon-Bowers, J., & Salas, E. (1997). Fostering shared mental models through team self-correction: theoretical bases and propositions. *Advances in interdisciplinary studies in work teams series*, 4, 249-279.
- Boëthius, S. B., Ögren, M.-L., Sjøvold, E., & Sundin, E. C. (2004). *Experiences of group culture and patterns of interaction in psychotherapy supervision groups*. *The clinical supervisor*, 23(1), 101-120.
- Bowers, C., Braun, C., & Kline, P. (1994). Communication and team situational awareness. In R. D. Gilson, D. J. Garland & J. M. Koonce (Eds.), *Situational awareness in complex systems* (pp. 305-311). Daytona Beach, FL: Embry-Riddle Aeronautical Press.
- Brown, P. J. (1995). The stick-e document: a framework for creating context-aware applications. *ELECTRONIC PUBLISHING-CHICHESTER*- 8: 259-272.

- Brown, S. P. & Leigh, T. W. (1996). A new look at psychological climate and its relationship to job involvement, effort, and performance. *Journal of Applied Psychology* 81(4): 358.
- Bryman, A. (2016). *Social research methods*: Oxford university press.
- Burgess, H., & Burgess, G. (1996). Constructive confrontation: A transformative approach to intractable conflicts. *Mediation quarterly*, 13(4), 305-322.
- Buller, P. F. (1986). The team building-task performance relation: Some conceptual and methodological refinements. *Group & Organization Management* 11(3): 147-168.
- Burke, C. S., Stagl, K. C., Salas, E., Pierce, L., & Kendall, D. (2006). Understanding team adaptation: a conceptual analysis and model. *Journal of Applied Psychology*, 91(6), 1189.
- Cannon-Bowers, J., Converse, S., & Salas, E. (1993). Shared mental models in expert team decision making. In N. J. Castellan (Ed.), *Individual and group decision making: Current* (pp. 221-246). Hillsdale, New Jersey: Psychological Press.
- Cannon-Bowers, J., Salas, E., Blickensderfer, E., & Bowers, C. (1998a). The impact of cross-training and workload on team functioning: A replication and extension of initial findings. *Human Factors*, 40(1), 92.
- Cannon-Bowers, J. A., & Salas, E. (1998b). Team Performance and Training in Complex Environments: Recent Findings From Applied Research. *Current Directions in Psychological Science*, 7(3), 83-87. doi: 10.1111/1467-8721.ep10773005
- Cannon-Bowers, J. A., & Bowers, C. (2011). Team development and functioning. In S. Zedeck (Ed.), *APA handbook of industrial and organizational psychology (Vol. Vol 1: Building and developing the organization* (pp. 597-650). Washington, DC, US: American Psychological Association.
- Chiles, T. H., & McMackin, J. F. (1996). Integrating variable risk preferences, trust, and transaction cost economics. *Academy of management review*, 21(1), 73-99.
- CIRT (2017). *Validity in Quasi-Experimental Research*. Cirt.gcu.edu. Retrieved 7 March 2017, From https://cirt.gcu.edu/research/developmentresources/research_ready/quasiexperimental/validity
- Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education*: Routledge
- Cohen, S. (1980). Aftereffects of stress on human performance and social behavior: a review of research and theory. *Psychological Bulletin*, 88(1), 82.
- Collins, J. (2002). *Good to great : hvorfor noen virksomheter blir fremragende og andre ikke*. Oslo: Universitetsforl.
- Combs, A. W., & Taylor, C. (1952). The effect of the perception of mild degrees of threat on performance. *The Journal of Abnormal and Social Psychology*, 47(2S), 420.

- Converse, S., Cannon-Bowers, J., & Salas, E. (1993). Shared mental models in expert team decision making. *Individual and group decision making: Current*(1993), 221.
- Cook, T., & Campbell, D. (1979). *Quasi-experimentation: Design and analysis for field settings*. Boston, MA
- Creswell, J. W. (1994). *Research design: Quantitative and qualitative approaches*. Thousand Oakes: Sage Publication.
- Curhan, J. R., & Pentland, A. (2007). Thin slices of negotiation: Predicting outcomes from conversational dynamics within the first 5 minutes. *Journal of applied psychology*, 92(3), 802-811. doi: 10.1037/0021-9010.92.3.802
- Das, T. K., & Teng, B.-S. (1998). Between trust and control: Developing confidence in partner cooperation in alliances. *Academy of management review*, 23(3), 491-512.
- Denzin, K.(1978) *The Research Act*, 2d ed. New York: McGraw-Hill.
- Dey, A. K. (2001). Understanding and using context. *Personal and ubiquitous computing* 5(1): 4-7.
- Delise, L. A., Allen Gorman, C., Brooks, A. M., Rentsch, J. R., & Steele-Johnson, D. (2010). The effects of team training on team outcomes: A meta-analysis. *Performance Improvement Quarterly*, 22(4), 53-80.
- Driskell, J. E., & Johnston, J. H. (1998). Stress exposure training. In J. A. Cannon-Bowers, & E. E. Salas (Eds.). *Making decisions under stress: Implications for individual and team training* (pp. 191-217). Washington, DC, US: American Psychological Association.
- Driskell, J. E., Salas, E., Johnston, J., & Forsyth, D. R. (1999). Does Stress Lead to a Loss of Team Perspective? *Group Dynamics: Theory, Research, and Practice*, 3(4), 291-302. doi: 10.1037/1089-2699.3.4.291
- Dyer, W. G., & Dyer, J. H. (2013). *Team building: Proven strategies for improving team performance*. John Wiley & Sons.
- Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological review*, 66(3), 183.
- Edmondson, A. C. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly* 44(2): 350-383.
- Edmondson, A. C. (2012). *Teaming: How organizations learn, innovate, and compete in the knowledge economy*. San Francisco, Calif: Jossey-Bass.
- Edmondson, A. C., Kramer, R. M., & Cook, K. S. (2004). Psychological safety, trust, and learning in organizations: A group-level lens. *Trust and distrust in organizations: Dilemmas and approaches*, 12, 239-272.

- Edmondson, A. C. & Mogelof, J. P. (2006). Explaining psychological safety in innovation teams: organizational culture, team dynamics, or personality. *Creativity and innovation in organizational teams*: 109-136.
- Elangovan, A., & Shapiro, D. L. (1998). Betrayal of trust in organizations. *Academy of management review*, 23(3), 547-566.
- Endsley, M. R. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors: The Journal of the Human Factors and Ergonomics Society* 37(1): 32-64.
- Endsley, M. R., & Kiris, E. O. (1995). The out-of-the-loop performance problem and level of control in automation. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 37(2), 381-394.
- Entin, E. E. & Serfaty, D. (1990). *Information gathering and decision making under stress*. NTIS HC A05. MF A01. Technical Report Number ADA218233.
- Entin, E. E. & Serfaty, D. (1999). Adaptive team coordination. *Human Factors: The Journal of the Human Factors and Ergonomics Society* 41(2): 312-325.
- Fangen, K. (2009). *Kvalitativ metode*. Retrieved 6 February 2017, from: <https://www.etikkom.no/FBIB/Introduksjon/Metoder-og-tilnarminger/Kvalitativmetode/>
- Feldiagrammet*. (2017). SPGR. Retrieved 6 February 2017, from https://www.spgr.no/Nedlasting/SPGR_perspektiver.pdf
- Ford, C. & Sullivan, D. M. (2004). A time for everything: How the timing of novel contributions influences project team outcomes. *Journal of organizational behavior* 25(2): 279-292.
- Gaba, D. M., Howard, S. K., & Small, S. D. (1995). Situation awareness in anesthesiology. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 37(1), 20-31.
- Goldstein, I. L., & Ford, J. (2002). *Training in organizations: Needs assessment, development, and evaluation* Wadsworth. Belmont, CA.
- Gribbons, B & Herman, J. (1997). *True and quasi-experimental designs*. Practical Assessment, Research & Evaluation, 5(14).
- Grønmo, S. (2004). *Samfunnsvitenskapelige metoder*. Bergen: Fagbokforl.
- Hagen, J. M., & Choe, S. (1998). Trust in Japanese interfirm relations: Institutional sanctions matter. *Academy of management review*, 23(3), 589-600.
- Hannah, S. T., Uhl-Bien, M., Avolio, B. J., & Cavarretta, F. L. (2009). A framework for examining leadership in extreme contexts. *The Leadership Quarterly*, 20(6), 897-919.
- Hare, A. P. (1985). The significance of SYMLOG in the study of group dynamics. *International Journal of Small Group Research*, 1(1), 38-50.

- Hart, C. (1998). *Doing a literature review: Releasing the social science research imagination*. London, UK: Sage.
- Helmreich, R. L., Wiener, E. L., & Kanki, B. G. (1993). The future of crew resource management in the cockpit and elsewhere. *Cockpit resource management*, 479-501.
- Hogan, J., Hogan, R., & Kaiser, R. B. (2011). Management derailment. In S. Zedeck (Ed.), *APA handbook of industrial and organizational psychology* (Vol. 3, pp. 555-575). Washington, DC, US: American Psychological Association.
- Høium, K. (2010). *Relasjoner mellom forsker - utforsket*. I E. Arntzen & J. Tolsby (Red.), *Studenten som forsker i utdanning og yrke. Vitenskapelig tenkning og metodebruk* (s. 50-65). Høgskolen i Akershus
- Israel, M., & Hay, I. (2006). *Research ethics for social scientists*: Sage.
- Jacobsen, D. I. (2005). *Hvordan gjennomføre undersøkelser? Innføring i samfunnsvitenskapelig metode*: Høyskoleforlaget.
- Janis, I. L. (1972). *Victims of groupthink : a psychological study of foreign-policy decisions and fiascoes*. Atlanta: Houghton Mifflin.
- Jehn, K. A. (1995). A multimethod examination of the benefits and detriments of intragroup conflict. *Administrative Science Quarterly*: 256-282.
- Jick, T. D. (1979). *Mixing qualitative and quantitative methods: Triangulation in action*. *Administrative science quarterly*, 24(4), 602-611. Jick, T. D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative science quarterly*, 24(4), 602-611.
- Johannessen, A., Tufte, P. A., & Christoffersen, L. (2006). *Introduksjon til samfunnsvitenskapelig metode*. Oslo: Abstrakt forl.
- Johnson-Laird, P. N. (1983). *Mental models: Towards a cognitive science of language, inference, and consciousness*: Harvard University Press.
- Jonker, C., Riemsdijk, M., & Vermeulen, B. (2011). *Shared Mental Models - A Conceptual Analysis*. Delft University of Technology.
- Joyce, W. F., & Slocum, J. W. (1984). Collective climate: Agreement as a basis for defining aggregate climates in organizations. *Academy of management journal*, 27(4), 721-742.
- Kahn, W. A. (1990). Psychological conditions of personal engagement and disengagement at work. *Academy of management journal* 33(4): 692-724.
- Kakabadse, A., Ludlow, R., & Vinnicombe, S. (1988). *Working in Organizations*, Londra: Penguin Co.
- Katzenbach, J. R., & Smith, D. K. (1993). *The wisdom of teams: Creating the high-performance organization*: Harvard Business Press.

- Kellermanns, F. W., Floyd, S. W., Pearson, A. W., & Spencer, B. (2008). The contingent effect of constructive confrontation on the relationship between shared mental models and decision quality. *Journal of organizational behavior*, 29(1), 119-137. doi: 10.1002/job.497
- Kelley, T. L. (1927). *Interpretation of educational measurements*. Oxford, England: World Book Co.
- Kelly, J. R. & Barsade, S. G. (2001). Mood and emotions in small groups and work teams. *Organizational behavior and human decision processes* 86(1): 99-130.
- Kleinman, D. L. & Serfaty, D. (1989). *Team performance assessment in distributed decision making*. Proceedings of the Symposium on Interactive Networked Simulation for Training.
- Klimoski, R. & Mohammed, S. (1994). Team mental model: construct or metaphor? *Journal of Management* 20(2): 403-437.
- Kozlowski, S. W. J., Gully, S. M., Nason, E. R., & Smith, E. M. (1999). Developing adaptive teams: A theory of compilation and performance across levels and time. In D. R. Ilgen & E. D. Pulaokos (Eds.), 64 *The changing nature of performance: Implications for staffing, motivation, and development* (pp. 240-292). San Francisco: Jossey-Bass.
- Krabberød, T. (2014). Task Uncertainty and Mission Command in a Naval Context. *Small Group Research*, 45(4), 416.
- Kramer, R. M. (1999). Trust and distrust in organizations: Emerging perspectives, enduring questions. *Annual review of psychology* 50(1): 569-598.
- Langdridge, D. (2004). *Introduction to research methods and data analysis in psychology*. Harlow: Pearson.
- Lewis, J. D., & Weigert, A. (1985). Trust as a social reality. *Social forces*, 63(4), 967-985.
- Mason, J. (2006). *Mixing methods in a qualitatively driven way*. *Qualitative Research*, 6(1), 9-25.
- Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J. A. (2000). The influence of shared mental models on team process and performance. *Journal of Applied Psychology*, 85(2), 273.
- McClelland, D. C. (1970). The two faces of power. *Journal of international Affairs*, 24(1), 29-47.
- McCracken, G. (1988). *The long interview* (Vol. 13): Sage.
- McGrath, J. E. (1991). Time, Interaction, and Performance (TIP): A Theory of Groups *Small Group Research*, 22(2), 147-174. doi: 10.1177/1046496491222001
- McKnight, D. H., Cummings, L. L., & Chervany, N. L. (1998). Initial trust formation in new organizational relationships. *Academy of management review*, 23(3), 473-490.

- Miller, R. (2017). *New Firm Combines Wearables And Data To Improve Decision Making*. Retrieved Feb 10 2017, from <https://techcrunch.com/2015/02/24/new-firm-combines-wearables-and-data-to-improve-decision-making/>
- Mills, T. M. (1984). *The sociology of small groups*. Englewood Cliffs, NJ: Prentice Hall.
- Mishra, A. K. (1996). Organizational responses to crisis: The centrality of trust. In R. Kramer & T. Tyler (Eds.), *Trust in organizations: Frontiers*
- Mishra, A. K., & Spreitzer, G. M. (1998). Explaining how survivors respond to downsizing: The roles of trust, empowerment, justice, and work redesign. *Academy of management review*, 23(3), 567-588.
- Moreno, J. L. (1953). *Who shall survive? foundations of sociometry, group psychotherapy and sociodrama*. Beacon, N.Y: Beacon House.
- NENT. (2007). *Guidelines for research ethics in science and technology*. In T. N. C. f. R. E.i. S. a. T. (NENT) (Ed.)
- NNCRS (2014). *The Norwegian National Committees for Research Ethics*. Retrieved 8 May 2017 from <https://www.etikkom.no/en/>
- NNCRS (2016). *Beskyttelse av forskningsdeltakere*. Retrieved 6 February 2017, from <https://www.etikkom.no/forskningsetiske-retningslinjer/Naturvitenskap-og-teknologi/beskyttelse-av-forskningsdeltakere/>
- NOU Helse- og omsorgsdepartementet. (1999). *Å vite eller ikke vite*. Retrieved 7 March 2017, from <http://www.regjeringen.no/nb/dep/hod/dok/nouer/1999/nou-1999-20/5/1.html?d=354006>
- Olguín, D. O., Waber, B. N., Kim, T., Mohan, A., Ara, K., & Pentland, A. (2009). Sensible organizations: Technology and methodology for automatically measuring organizational behavior. *Systems, Man, and Cybernetics, Part B: Cybernetics, IEEE Transactions on*, 39(1), 43-55.
- Orasanu, J. M. (1990). *Shared mental models and crew decision making*. Unpublished manuscript, Princeton University, Cognitive Sciences Laboratory: 174-181.
- Orasanu, J., & Fischer, U. (1997). Finding decisions in natural environments: The view from the cockpit. *Naturalistic decision making*, 343-357.
- Osborn, R. N., Hunt, J. G., & Jauch, L. R. (2002). Toward a contextual theory of leadership. *The Leadership Quarterly*, 13(6), 797-837.
- Osgood, C. E., Suci, C. J., & Tannenbaum, P. H. (1957). *The measurement of meaning*. Urbana: University of Illinois Press.
- Parsons, T., Bales, R. F., & Shils, E. A. (Eds.). (1953). *Working papers in the theory of action*. New York: Free Press.
- Patton, M. Q. (1987). *How to use qualitative methods in evaluation*: Sage.

- Pelled, L. H., Eisenhardt, K. M., & Xin, K. R. (1999). Exploring the black box: An analysis of work group diversity, conflict and performance. *Administrative science quarterly*, 44(1), 1-28.
- Pentland, A. (2008). *Honest Signals: How They Shape Our World*. MA: MIT Press.
- Pentland, A. (2012). *The new science of building great teams*. Harvard Business Review, 90(4), 60-69.
- Postholm, M. B. (2005). *Kvalitativ metode: en innføring med fokus på fenomenologi, etnografi og kasustudier*. Oslo: Universitetsforlaget.
- Robinson, S. L. (1996). Trust and breach of the psychological contract. *Administrative science quarterly*, 574-599.
- Robson, C. (2002). *Real world research: a resource for social scientists and practitioner researchers*. Oxford:Blackwell.
- Robson, C. (2011). *Real world research : a resource for users of social research methods in applied settings (3rd ed.)*. Chichester: Wiley.
- Rotter, J. B. (1967). A new scale for the measurement of interpersonal trust¹. *Journal of personality*, 35(4), 651-665.
- Rouse, W. B., Cannon-Bowers, J. A., & Salas, E. (1992). The role of mental models in team performance in complex systems. *IEEE transactions on systems, man, and cybernetics*, 22(6), 1296-1308.
- Rouse, W. B. & Morris, N. M. (1986). On looking into the black box: Prospects and limits in the search for mental models. *Psychological Bulletin* 100(3): 349.
- Rousseau, D. M., Sitkin, S. B., Burt, R. S., & Camerer, C. (1998). Not so different after all: A cross-discipline view of trust. *Academy of management review*, 23(3), 393-404.
- Rubin, H. J., & Rubin, I. S. (2012). *Qualitative interviewing: The art of hearing data*: Sage.
- Salas, E., Cannon-Bowers, J. A., & Johnston, J. H. (1997). How can you turn a team of experts into an expert team?: Emerging training strategies. *Naturalistic decision making*, 359-370.
- Salas, E., Granados, D., Klein, C., Burke, C. S., Stagl, K. C., Goodwin, G. F., & Halpin, S. M. (2008). Does team training improve team performance? A meta-analysis. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 50(6), 903-933.
- Salas, E., Nichols, D., & Driskell, J. (2007). Testing three team training strategies in intact teams - A meta-analysis. *Small Group Res.*, 38(4), 471-488. doi: 10.1177/1046496407304332
- Salas, E., Rozell, D., Mullen, B., & Driskell, J. (1999). The effect of team building on performance: An integration. *Small Group Research*, 30(3), 309-329.

- Salas, E., Sims, D., & Burke, C. (2005). IS THERE A "BIG FIVE" IN TEAMWORK? *Small Group Research*, 36(5), 555-599.
- Salovey, P. (1992). Mood-induced self-focused attention. *Journal of personality and social psychology* 62(4): 699.
- Saunders, M. N., Saunders, M., Lewis, P., & Thornhill, A. (2011). *Research methods for business students*, 5/e: Pearson Education India.
- Saunders, T., Driskell, J. E., Johnston, J. H., & Salas, E. (1996). The effect of stress inoculation training on anxiety and performance. *Journal of occupational health psychology*, 1(2), 170.
- Shadish, W., Cook, T., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Wadsworth Cengage learning.
- Sheard, A., & Kakabadse, A. (2004). A process perspective on leadership and team development. *Journal of Management Development*, 23(1), 7-106.
- Schein, E. H. (1969). *Process consultation: its role in organization development*. Addison-Wesley Pub.Co.
- Schein, E. H. (2010). *Organizational culture and leadership* (4 ed. Vol. 2). San Francisco, CA: John Wiley & Sons.
- Schilit, B., Adams, N., & Want, R. (1994). *Context-aware computing applications*. Paper presented at the Mobile Computing Systems and Applications, 1994. WMCSA 1994. First Workshop on.
- Schilit, B. N., & Theimer, M. M. (1994). *Disseminating active map information to mobile hosts*. *IEEE network*, 8(5), 22-32.
- Serfaty, D., Entin, E. E., & Johnston, J. H. (1998). Team coordination training. In J. A. Cannon-Bowers & E. Salas (Eds.), *Making decisions under stress: Implications for individual and team training* (pp. 221-245). Washington, DC, US: American Psychological.
- Sheppard, B. H., & Sherman, D. M. (1998). The grammars of trust: A model and general implications. *Academy of management review*, 23(3), 422-437.
- Shuffler, M., Granados, D., & Salas, E. (2011). There's a Science for That: Team Development Interventions in Organizations. *Current Directions in Psychological Science*, 20(6), 365.
- Sjøvold, E. (2002a). *SPGR perspektiver, roller og adferd*. Retrieved 7 February 2017, from https://www.spgr.no/Nedlasting/SPGR_perspektiver.pdf
- Sjøvold, E. (2002b). *The SPGR manual*. Oslo: SPGR publishing.
- Sjøvold, E. (2006). Maturity and effectiveness in small groups. *Nordic Psychology*, 58(1), 43-56. doi: 10.1027/1901-2276.58.1.43

- Sjøvold, E. (2007). Systematizing Person-Group Relations (SPGR): A Field Theory of Social Interaction. *Small Group Research* 38(5): 615-635.
- Sjøvold, E. (2010). Ledelse og utvikling av høytelsesteam-et spørsmål om mestring av kompleksitet og balanse. *Scandinavian journal of organizational psychology* 2(1).
- Sjøvold, E. (2014a). *Resultater gjennom team*. Oslo: Universitetsforlaget
- Sjøvold, E. (2014b). Introduction to the Special Issue: Leadership and the Group. *Small Group Research*, 45(4), 367-375. doi: 10.1177/1046496414534475
- Smidighetsprofilen. (2017). SPGR. Retrieved 6 February 2017, from <https://www.spgr.no/Nedlasting/smidighetsprofilen.pdf>
- Smith, H. W. (1975) *Strategies of Social Research: The Methodological Imagination*. Englewood Cliffs, NJ: Prentice Hall.
- Smith, K. & Hancock, P. A. (1995). Situation awareness is adaptive, externally directed consciousness. *Human Factors: The Journal of the Human Factors and Ergonomics Society* 37(1): 137-148.
- Smith-Jentsch, K. A., Zeisig, R. L., Acton, B., & McPherson, J. A. (1998). Team dimensional training: A strategy for guided team self-correction. In J. A. Cannon-Bowers & E. Salas (Eds.), *Making decisions under stress: Implications for individual and team training* (pp. 271-297). Washington, DC, US: American Psychological.
- Stanton, N. A., Chambers, P. R. G., & Piggott, J. (2001). Situational awareness and safety. *Safety Science*, 39(3), 189-204. doi: 10.1016/S0925-7535(01)00010-8
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research* (Vol. 15). Newbury Park, CA: Sage.
- Stålsett, K. (2017). *At the frontline: enabling teams to adapt to uncertainty and ambiguity. (2017:25)*, Norwegian University for Science and Technology, Faculty of Economics and Management, Department of Industrial Economics and Technology Management, Trondheim.
- Torrance, E. P. (1954). The Behavior of Small Groups Under the Stress Conditions of "Survival". *American Sociological Review*, 19(6), 751-755.
- Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British journal of management*, 14(3), 207-222.
- Trochim, W. (2006). *Quasi-Experimental Design*. Retrieved 10 February, from <http://www.socialresearchmethods.net/kb/quasiexp.php>
- Tuckman, B. W., & Humphreys, L. H. (1965). Developmental sequence in small groups. *Psychological Bulletin*, 63(6), 384-399. doi: 10.1037/h0022100

- Van de Ven, A. (2007). *Engaged Scholarship: A Guide for Organizational and Social Research*: Oxford University Press.
- Volpe, C. E., Cannon-Bowers, J. A., Salas, E., & Spector, P. E. (1996). The impact of cross-training on team functioning: An empirical investigation. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 38(1), 87-100.
- Ward, A., Jones, A., & Hopper, A. (1997). A new location technique for the active office. *IEEE Personal Communications*, 4(5), 42-47.
- West, M. A. (1990). The social psychology of innovation in groups. In M. A. West & J. L. Farr (Eds.), *Innovation and creativity at work: Psychological and organizational strategies* (pp. 309-333). Chichester: John Wiley & Sons, Ltd.
- Wheelan, S. A. (1994). *Group processes: A developmental perspective*. Boston: Allyn & Bacon.
- Wickens, C. D. (1996). Designing for stress. *Stress and human performance*: 279-295.
- Whitener, E. M., Brodt, S. E., Korsgaard, M. A., & Werner, J. M. (1998). Managers as initiators of trust: An exchange relationship framework for understanding managerial trustworthy behavior. *Academy of management review*, 23(3), 513-530.
- Williamson, O. E. (1993). Calculativeness, trust, and economic organization. *The Journal of Law & Economics*, 36(1), 453-486.
- Yin, R. (2014). *Case Study Research. Design and Methods*. Fifth, Thousand Oaks, California: Sage Publications.
- Zaccaro, S. J., Rittman, A. L., & Marks, M. A. (2002). Team leadership. *The Leadership Quarterly*, 12(4), 451-483.
- Zakay, D., & Wooler, S. (1984). Time pressure, training and decision effectiveness. *Ergonomics*, 27(3), 273-284.

Appendix

We have chosen to attach the two interview guides in Norwegian, as the interviews were held in Norwegian.

Appendix 1 - Intervjuguide, runde 1

Innledning

- Intervjuet vil anonymiseres og opptakene slettes når vi har behandlet dataen.
- Vi kommer til å bruke båndopptaker. Er det greit?
- Sende ut et informasjonsskriv om intervjuet på forhånd? - Noen spørsmål til det?

Hvem er du og teamet?

- Innledningsspørsmål for å varme opp:
 - Hva driver dere med?
 - Hvordan går det for tiden?
- Stilling og ansvarsområde
- Utdannelse og erfaring
- Hvor lenge har teamet jobbet sammen?
- Har du noen annen teamerfaring?

Teamet

- Hvor ofte har du kontakt med teammedlemmene?
 - Daglig, ukentlig, månedlig?
 - Er det ansikt-til-ansikt eller over nett?
- Hvilke oppgaver utfører dere vanligvis som team?
- Hvilket mål har teamet?
- Hva er deres sterkeste side som **team**?
- Hva er deres svakeste side som **team**?
 - Har dere prøvd å forbedre dette/disse?

Formålsnivå/Gruppedynamikk

- Hvordan jobber teamet sammen?
 - Hvordan jobber dere for å nå de målene dere har satt dere?
- Har dere en leder internt i teamet, og hvordan vil du eventuelt beskrive lederen og dens lederstil og rolle?
 - Hvis ikke: Er det noen som tar mer lederansvar enn andre?

- Eksemplifiser
- Hvilke roller mtp gruppeprosess (annen type rolle enn dine ansvarsområder i lys av din stilling) finnes i deres hverdag som team? (feks. leder, administrativt, pådriver, kritiker, visjonær, emosjonelle, omsorg, ideer osv)
 - Er det alltid disse rollene som er tilstede når dere arbeider sammen?
 - Tar noen ofte en gitt type rolle?
 - Hvis ja, er dette tildelte roller?
 - Evner teammedlemmene å ta flere roller? Ev. skifte mellom roller?

Tillit

- Hva forstår du med begrepet tillit i teamsammenheng?
- Hvordan mener du at tillit kommer til syne mellom teammedlemmer i diskusjoner og teamarbeid?
 - Eksemplifiser
- Kan du huske en situasjon hvor du måtte overveie om du hadde tillit til et teammedlem?
 - Eksemplifiser

Psykologisk sikkerhet

- Hva skjer dersom en ansatt/kollega gjør feil?
 - Eksemplifiser
- Hvordan er det å ta opp vanskelige tema og stille kritiske spørsmål i teamet?
- Hvordan er det å spørre andre i teamet om hjelp?
- På hvilken måte kommer det til syne at teamets medlemmer respekterer (eller ikke respekterer) hverandre?

Delte mentale modeller

- Ofte har teammedlemmer ulik forståelse og oppfatning av oppgave og kontekst.
 - Er dette noe du kjenner deg igjen i?
 - Har du opplevd en slik situasjon du kan fortelle om?
 - Hvordan tror du dette påvirker tillitsnivået mellom teammedlemmene?
- Legges informasjon frem på en slik måte at alle forstår og alle har mulighet til å komme med innspill? *Snakker dere "samme språk"?*
 - Forklar og eksemplifiser
- Føler du at teammedlemmer ofte misforstår hverandre?
 - Eksemplifiser
- Hvordan løser dere konflikter/diskusjoner/uenigheter i teamet?

Tilpasningsdyktighet til oppgave

- Føler du at teamet lett kan tilpasse hvordan måten de jobber på alt etter hvilken oppgave dere prøver å løse?
 - Eksemplifiser
- Er dette noe dere er bevisst på?

Avslutning

- Er det noe mer du ønsker å tilføye?

Tusen takk for din tid!

Appendix 2 - Intervjuguide, runde 2

Innledning

- Samme som sist:
 - Intervjuet vil anonymiseres og opptakene slettes når vi har behandlet dataen.
 - Vi kommer til å bruke båndopptaker. Er det greit?

Treningsprogrammet

- Hvordan opplevde du å bruke modellen i praksis?
 - Hva utfordrende?
 - Hva var positivt?
- Har du lært noe i løpet av perioden dere har drevet med trening?
 - Om deg selv?
 - Om teamet?
- Vil du anbefale andre team å gjennomføre et lignende treningsprogram?
 - Isåfall hvorfor?
- Har du forslag til forbedringer av treningsprogrammet?
- Hvordan var det å bruke modellen i denne workshopen i forhold til den forrige?

Formålsnivå/Gruppedynamikk

- Opplever du at samhandlingen har endret seg i den perioden dere har gjennomført trening?
 - På hvilken måte?
 - Opplever du at gruppedynamikken/samhandlingen har endret seg i situasjoner hvor dere ikke bruker treningsprogrammet?
- Opplever du at du har endret deg som teammedlem?
 - Evt endret din rolle i teamet?
- Opplever du at lederens stil og rolle endret seg?
 - Kom gjerne med eksempel
- Har du oppfatning av at teammedlemmenes rolle har endret seg?
 - Hvordan?

Tillit

- Føler du at tilliten i gruppen har endret seg?
 - Hvordan? Eksempel?
- Hvordan mener du at tillit kommer til syne mellom teammedlemmer? (i diskusjoner)
 - Eksemplifiser

Psykologisk sikkerhet

- Hva skjer dersom en ansatt/kollega gjør feil?
- Hvordan opplever du det å ta opp vanskelige tema og diskutere problemstillinger i teamet nå?
- Hvordan er det å spørre andre i teamet om hjelp?
- Hvordan opplever du at teamets medlemmer respekterer hverandre?

Delte mentale modeller

- Er det noen forskjell fra tidligere når det gjelder hvordan teamet sikrer at dere har felles forståelse av den oppgaven teamet står ovenfor?
 - Eksemplifiser
- Legges informasjon frem på en slik måte at alle forstår og alle har mulighet til å komme med innspill? Snakker dere "samme språk"?
 - Forklar og eksemplifiser
- Hvordan løser dere konflikter/diskusjoner/uenigheter i teamet?
 - Har dette endret seg ved bruk av modellen?
 - Evt. hvordan?
- Har bruk av modellen endret antallet misforståelser?
 - Evt hvordan har modellen vært til hjelp/hvorfor har ikke modellen vært til hjelp?
- Føler du at du har fått en bedre forståelse av hvordan dere jobber sammen som team?
 - Eksemplifiser
- Føler du at din oppfatning av din egen rolle i teamet stemmer overens med oppfatningen de andre har av deg?

Tilpasningsdyktighet

- Føler du at teamet lett kan tilpasse hvordan de jobber alt etter hvilken oppgave dere står ovenfor?
 - Eksemplifiser
 - Hvordan har dette endret seg siden sist intervju?

Avslutning

- Er det noe mer du ønsker å tilføye? Tusen takk