Teamwork Behaviours in Autonomous Cross-functional Teams

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Abstract

Background: Software development are a collaborative process where people from multiple different practices are involved. It has become more and more common to structure people as teams focusing on producing a specific parts of a system as one fully functional whole. Having those teams work as effectively and sustainable as possible should be a goal for any business owner, and as such new information regarding how to facilitate better teamwork is needed.

Aim: The aim of this thesis is to investigate how teamwork behaviours appear in an autonomous cross-functional team, and how these behaviours can be considered important to such teams. Specifically the different ways teamwork behaviours is shown by team-members, and if there is a difference between behaviours shown in meetings compared to the workspace will be investigated. Potential benefits of teamwork behaviours will also be investigated.

Method: A qualitative case study was conducted in a single product development team. Data was collected by observing 15 workdays and 14 meetings, as well as conducting 6 interviews and observing the teams online chat.

Results: The results showed that 11 teamwork behaviours could be identified in the team. Differences in how behaviours were displayed in meetings compared to the workspace was found in eight of the teamwork behaviours. Five of the teamwork behaviours were found to be important for autonomous teams, each facilitating different aspects of teamwork.

Conclusion: Teamwork behaviours seem to provide a great indication of teamwork in a team, and as such seem to be worthy of attention in the field of evaluating and improving the level of teamwork.

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1 Introduction

In the world of software development there are a plethora of development methods to choose from, and project circumstances can be with hard deadlines or flexible development time. In recent years however, disregarding what methods has been chosen, organisations tend to structure their development personnel in teams, and more specifically as autonomous cross-functional teams. Such teams are designed to have all the competency within the team to completely finish the system part they are assigned to do, from creating a design to implementing the functionality needed. They also have the freedom to chose how to approach the tasks they have been assigned, and some even have the flexibility to choose their own tasks. This way of organising stands in stark contrast to the highly hierarchical plan driven teams of the past.

1.1 Motivation

The software development world have a tendency to move quickly from trend to trend, and just as the latest fashion changes from season to season, software organisations tend to jump on new trends that seems promising in its ideas. As such the notion of agile development teams who are autonomous and cross-functional was quick to be adopted as the standard in the software world. As of now there is somewhat lacking in research done on such teams, leaving us questioning what benefits such teams actually bring. The concepts are also easily mixed, where different types of teams can be mixed with different development methods, further complicating the process of evaluating how autonomous agile cross-functional teams perform in real life situations. As such there is a need for further research that details and discusses aspects regarding such teams.

No matter how teams are structured or what development methodologies are used, there is always one persistent factor present, that is the unit called the team. Software development is a collaborative effort, so unless a person are the sole developer on an entire

project, software developer will have to collaborate with others. As such the notion of teamwork is interesting, especially in the context of autonomous agile cross-functional teams. Dingsøyr and Dybå (2012) notes a few issues of team effectiveness that should be prioritised for future studies, some of which is interesting in this context. Firstly, they note the need for rigorous studies of industrial teams in their fully situated context, which could enable researchers and practitioners to provide "higher-quality context-specific guidance that complement existing theoretical models" (Dingsøyr & Dybå, 2012). Secondly, they note the need for better theories and models of teamwork and team effectiveness applicable to the realm of software development, to better represent and capture collaborative cognition in these settings. Instead of looking at the finer details of software teams, it seems appropriate to take a step back and analyse the team as a unit, investigating how different aspects are facilitated within the team. More research is needed on team structures, organisational context, communication practices and inter- and intra-team coordination mechanisms in autonomous software teams (Viktoria Stray, Moe, & Hoda, 2018), as such the teamwork behaviours in these teams are important aspects to focus on, both in meetings and in the workspace. This is the motivational background that led to the creation of this thesis.

1.2 Research Area and Questions

The research area of this thesis is an autonomous cross-functional team working as a product development team for a large Norwegian municipality. The team members work together to decide both what to do with the product they develop, and how to approach the challenge, with some coaching from their product-owner. The notion of teamwork behaviours will be studied in the context of this team.

The overall focus of this thesis will be to study the teamwork in an autonomous team, and what benefits such teamwork might provide.
The research questions are:

RQ1: How are teamwork behaviours in autonomous teams different in meetings compared to the workspace?
RQ2: How can teamwork behaviours be considered important to autonomous teams?

1.3 Approach

A case study was conducted to answer the research questions through the use of relevant theories. The data used in this case study will mainly consist of observations and interviews, and the data will be analysed in a qualitative data analysis tool called Nvivo. This analysis tool will help transform the collected data into manageable data-sets, which will be analysed and used to answer the research questions.

1.4 Chapter Overview

Chapter 2: Background provides the necessary theoretical background to understand the rest of this thesis. Background theory on *agile software development*, *agile development methodologies*, *DevOps*, *teams* and *teamwork behaviours* are all presented in this chapter.

Chapter 3: Framework of Teamwork Behaviours details the framework on teamwork behaviours to be used for the analysis in this thesis.

Chapter 4: Research Method outlines the research method, research design, data collection and validity of this study.

Chapter 5: Research Context presents an overview over the setting in which the data collection were conducted. This chapter will outline relevant information regarding the agile cross-functional team under study.

Chapter 6: Results will outline the results found in relation to the theory presented in Chapter 3.

Chapter 7: Discussion will discuss the findings from the case-study to answer the research question presented in Section 1.2.

Chapter 8: Conclusion and Future Work presents a conclusion to the thesis as well as pointing to relevant directions for future studies.

2 Background

This chapter will present the background and theory that is relevant to this research. First, a presentation of background on *agile software development* and *agile development methodologies* such as Scrum and Kanban. Second, background on *DevOps* and *BizDevOps* will be presented. Then I will present background on *teams* with topics such as autonomy and cross-functionality, together with theory on *team classification*. Lastly, background on *teamwork behaviours* will be presented, which leads into the next section presenting an integrative framework of teamwork behaviours.

2.1 Agile Software Development

Although the software community talk a lot about agile in the context of software development, it is often misinterpreted due to popular agile methods like Scrum. A product group can do concrete practices that encourages agility, but they can only really be agile (Larman & Vodde, 2008, p.140). When talking about agile in the context of software engineering, it is important to properly define what the word agile actually stands for (Larman & Vodde, 2008, p.140). Neumann and Fink (2007) defines agility as "the ability to respond operationally and strategically to changes in the external environment. The response has to be quick and effective for the organization to be considered agile".

Methods for agile software development emerged as a reaction to the old traditional plan-based methods, which claims that problems are fully specifiable and that there exist an optimal and predictable solution to every problem (Dybå & Dingsøyr, 2008). These traditional methods usually promote extensive planning, codified processes, and rigorous reuse to make development an efficient and predictable activity. A goal of such plan-driven models is to plan early in the project as to identify design flaws before they can develop, becoming a larger problem (Munassar & Govardhan, 2010). In contrast to this agile processes embraces that the world is unpredictable, and tries to address this un-

predictability by "relying on people and their creativity rather than on processes" (Dybå & Dingsøyr, 2008). This highlights the fact that agility is all about the people, not the processes. Another definition of agility is defined by Erickson, Lyytinen, and Siau (2005, p.89) as follows: "agility means to strip away as much of the heaviness, commonly associated with the traditional software-development methodologies, as possible to promote quick response to changing environments, changes in user requirements, accelerated project deadlines and the like".

2.2 Agile Development Methodologies

As detailed in Section 2.1, there is a distinct difference between agile and agile methods, with agile being a concept and not something you can do. This subsection will detail some relevant development methodologies that promote agility.

2.2.1 Scrum

Scrum is an iterative and agile framework targeted mainly at software development. Scrum implements a time-boxed approach, and divides it's development into iterative segments called Sprints. These Sprints works as a development cycle, whereas each cycle is no longer than 30 days at a maximum.

At the start of each Sprint, the development team chooses a number of tasks from a prioritised list of tasks, where the goal is to complete all the chosen tasks by the end of the Sprint. The Sprint is never extended, even if not all of the chosen tasks are completed, and the chosen tasks are never changed during the duration of the Sprint. The team gathers for a daily meeting, where the goal is to inspect the progress, and plan how to adjust to complete the remaining work on time.

At the end of the sprint, the team presents what has been accomplished as well as reviewing the Sprint together with the stakeholders. Feedback from this meeting is used

when planning for the next Sprint, such that the next sprint can target issues or adapt to stakeholder criteria uncovered in the feedback.

A main idea in Scrum is to "*inspect and adapt*" (Sutherland & Schwaber, 2007). For each sprint one evaluates both the resulting product and the efficiency of current practices, then adapt the product goals and processes to best achieve sustainable development. This "*inspect and adapt*" is repeated for as long as the ongoing development lasts, and highlights the agile idea of sustainable development that can be practised indefinitely.

The Scrum framework is comprised of roles, events and artifacts. Based on (Sutherland & Schwaber, 2017) they are as follows:

- **Roles**: Product owner, Development team, Scrum master
- **Events**: The Sprint, Sprint planning, Daily Scrum, Sprint Review, Sprint Retrospective
- **Artifacts**: Product Backlog, Sprint Backlog, Increment

Scrum Team

The three Scrum roles: the Product Owner, the Development Team and the Scrum Master is what makes up the Scrum Team. The Scrum Team is autonomous and cross-functional, meaning that they are self organising and consist of people with all the knowledge needed to complete any task given to them (see Section 2.4).

Product Owner

In Scrum, there is only one Product Owner. The Product Owners role is to maximise the value of the product resulting from the Development Teams work (Sutherland & Schwaber, 2017). Maximising the value is done by identifying product features and turning those into a prioritised list of tasks for the Development Team to complete, as well as continuously refining and re-prioritising the list through the project lifetime.

Development Team

The Development Team consists of professionals who is responsible for delivering an increment of "done" and potentially releasable code at the end of each Sprint. It is only the Development Team that can deliver such increments (Sutherland & Schwaber, 2017). The Development Team should create what the Product Owner indicates in however way the Development Team see fit, as the Development Team is self organising.

Scrum Master

The Scrum Master is responsible for the appliance of Scrum to the development project. The Scrum Master is not some sort of project leader, but instead a servant to the Team, protecting the Team from outside interference and guiding the Team in the skilful use of Scrum (Sutherland & Schwaber, 2007). The Scrum Master can not be the same person as the Product Owner, although a Development Team member can be assigned the role of Scrum Master.

Sprint

"*The heart of Scrum is a Sprint, a time-box of one month or less during which a "Done", usable, and potentially releasable product Increment is created*" (Sutherland & Schwaber, 2017). The Sprints in Scrum are to have the same duration trough the development process, and acts as a container for the other Scrum Events as well as the development work. Once a Sprint is concluded, a new Sprint is started immediately.

Sprint Planning

Every Sprint is started with a Sprint Planning meeting, with the goal to create a plan for what to accomplice by the end of the upcoming Sprint. The whole Scrum Team participates in this meeting, and the plan is made as a collaboration between all the members. Sprint Planning will answer two questions; "*What can be delivered in the Increment resulting from the upcoming Sprint?*" and "*How will the work needed to deliver the Increment be achieved?*" (Sutherland & Schwaber, 2017).

Daily Scrum

The Daily Scrum is a is a short 15 minutes meeting that is held daily, at the same time and place each day to reduce complexity. It is up to the Development Team how the meeting should be structured, and should include a set of questions each Development Team member can answer to put forward their situation. Scrum lists the three questions as follows (Sutherland & Schwaber, 2017):

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

A study conducted by V. Stray, Moe, and Sjoberg (2018) of 15 software teams in five countries concludes that the focus of these meetings should be on solving problems and planning for the future, rather than on reporting what was done yesterday. Other notable findings include having the meeting before lunch as not to abruptly interfere with the teams work, as well as having all participants standing for the whole duration of the meeting to keep within the time-limit.

Sprint Review

When a Sprint has ended, a meeting called the Sprint Review is held. The Sprint Review is a key inspect and adapt activity for the product, where the "done" increment is inspected and the product backlog is adapted if needed (Sutherland & Schwaber, 2017).

Sprint Retrospective

Where the Sprint Review is all about evaluating the product, the Sprint Retrospective concerns itself with evaluating the process. The Sprint Retrospective goal is for the Scrum Team to evaluate itself and generate a plan for improvements to be made for the next

Sprint (Sutherland & Schwaber, 2017). The Sprint Retrospective meeting is essentially a meeting to figure out what is working and what isn't.

Product Backlog

The Product Backlog is an ordered list of tasks that is needed to complete the product, and it is the single source of requirements for any changes that are to be made to the product (Sutherland & Schwaber, 2017).

Sprint Backlog

The Sprint Backlog consists of the selected items from the Product Backlog selected for the current Sprint, as well as a plan for delivering the product increment and realising the Sprint Goal (Sutherland & Schwaber, 2017). The Sprint Backlog forecasts what work will be done in order to create a "done" Increment and what functionality will be delivered as part of said Increment.

Increment

"*The Increment is the sum of all the Product Backlog items completed during a Sprint and the value of the increments of all previous Sprints*" (Sutherland & Schwaber, 2017).

2.2.2 Lean Software Development

Lean, or Lean Thinking, is a way of thinking about how product development is done. At the core of Lean are two important principles, *Continuous Improvement* and *Respect for People* (Larman & Vodde, 2008, p. 43). Lean is "all about getting the right things to the right place at the right time the first time while minimizing waste and being open to change" (Raman, 1998). Anderson, Concas, Lunesu, and Marchesi (2011) also states that Lean tries to increase the efficiency value is delivered to the customer by designing out overburden and inconsistency, and by finding and eliminating waste. Poppendieck and Poppendieck (2003, p.1) highlights that *Eliminating Waste* is one of the fundamental principles of lean, and defines waste as "anything that does not create value for the customer".

This focus on removing waste is important in Lean, so much so that Poppendieck and Poppendieck (2003, p.4) "translated" the original *seven wastes of Lean* to accommodate the software industry. These *seven wastes of software development* can be seen in Table 1:

The Seven Wastes of Manufacturing	**The Seven Wastes of Software Development**
Inventory	Partially Done Work
Extra Processing	Extra Processes
Overproduction	Extra Features
Transportation	Task Switching
Waiting	Waiting
Motion	Motion
Defects	Defects

Table 1: Seven Wastes of Software Development compared to the original Seven Wastes of Lean (Poppendieck & Poppendieck, 2003, p.4)

In their book, Poppendieck and Poppendieck (2003) put an emphasis on the importance of so called pull systems in Lean, meaning that one produces only what the customer has asked for when it is requested. "The pull system in software development is short iterations based on customer input at the beginning of each iteration" (Poppendieck & Poppendieck, 2003, p.74). Anderson et al. (2011) states that Kanban (see Section 2.2.3) is a process tool that is based on the idea of such a pull system, "emphasizing a visual approach to maximize flow and spotting bottlenecks and other kinds of issues". The seven key Lean principles according to Poppendieck and Poppendieck (2003), cited from Anderson et al. (2011) are as follows: "eliminate waste, build quality in, create knowledge, defer commitment, deliver fast, respect people and optimize the whole".

2.2.3 Kanban

The Kanban process originated together with Lean (see Section 2.2.2) in the Japanese manufacturing industry in the 1950s. The Kanban process was used as a manufacturing scheduling system, controlling flow thus making the entire production system a pull system (Ahmad, Markkula, & Oivo, 2013). The Kanban process is a manifestation of Lean, and seems to be the key Lean approach in the field of software development (Anderson et al., 2011). Ahmad et al. (2013) argues that the seven key principles of Lean and the five core principles of Kanban are largely overlapping, reflecting the same grounding. The five core principles of Kanban are as follows: "Visualise the workflow, Limit Work In Progress, Measure and manage flow, Make process policies explicit, Improve collaboratively (using models and the scientific method)" (Ahmad et al., 2013).

The Kanban process also uses a board to provide visibility into the software process, since it "shows assigned work of each developer, clearly communicates priorities and highlights bottlenecks" (Ahmad et al., 2013). Anderson et al. (2011) also gives this attention by stating: "The work in process (WIP) is usually made evident to the team, and to the stakeholders, using a Kanban board. In general, we can define the Kanban software process as a WIP limited pull system visualized by the Kanban board". Figure 1 shows a simple Kanban board:

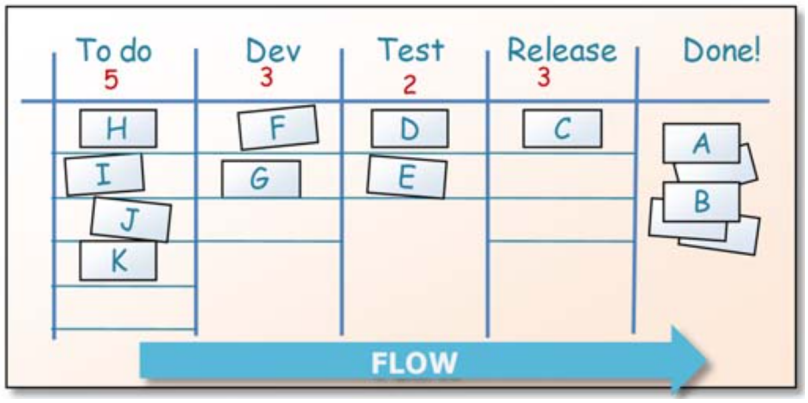

Figure 1: A simple Kanban board (Kniberg & Skarin, 2010, p.5)

2.3 DevOps

DevOps is a concept that focuses on the relation between development and operations, and how software is manged. "Its two core principles emphasize collaboration between software development and operations, and the use of agile principles to manage deployment environments and their configurations" (Lwakatare, Karvonen, et al., 2016). DevOps aims at enhancing collaboration, automation and virtualisation, as well as the tools used to bridge activities of software development and operations (Wiedemann, 2018). It is considered a relatively new phenomenon in the software world, and a reason to implement DevOps is "to shorten feedback loops and the development cycle through collaboration, automation and frequent software releases" (Lwakatare, Karvonen, et al., 2016). In many companies development and operations exists in different departments which is considered an obstacle to continuous deployment, and DevOps therefore "seeks to bridge the silos of software development and operations functions" (Lwakatare, Karvonen, et al., 2016). The concepts of collaboration and flow in DevOps are shown in Figure 2:

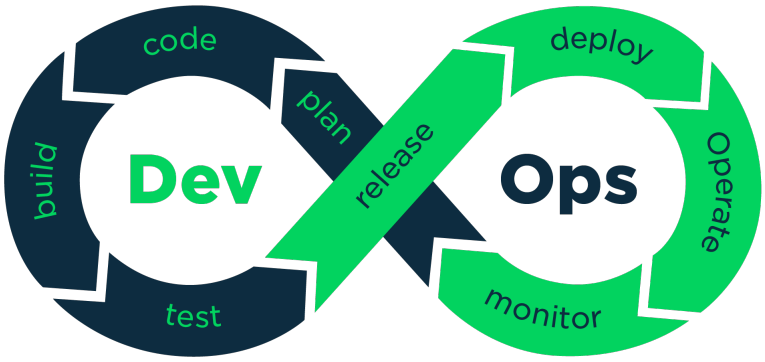

Figure 2: The different phases and flow in DevOps (Kornilova, 2017)

According to Wiedemann (2018) implementation of the DevOps approach causes the internal IT functions to change, and that these changes will be reflected in the new processes, structures and other governance mechanisms. "Incumbent companies have to rethink their IT governance mechanisms within dynamic and agile environments" (Wiedemann, 2018). In their study, Lwakatare, Kuvaja, and Oivo (2016) looks at the relationship between agile methods and DevOps. Their findings show that if a successful implementation of DevOps is to happen, agile software development principles, values and practices are required (Lwakatare, Kuvaja, & Oivo, 2016). They also found that "Effects of DevOps include the ability to release software quickly, frequently and with improved quality" (Lwakatare, Kuvaja, & Oivo, 2016). They do note however that to determine whether these effects arise from implementation of DevOps or other approaches, it is insufficient to use popular metrics such as deployment rate and cycle/lead time.

2.3.1 BizDevOps

In similar fashion to DevOps, BizDev tries to connect business and development to create continuous planning and integration between the two. Fitzgerald and Stol (2017) states that "The age-old disconnect between the business strategy and technical development components is recognized in the BizDev concept which seeks to tighten this integration".

They also recognise that the scrum role of Product Owner (see Section 2.2.1) is the agile community's way of addressing the developers need for business integration, but argue that the role of Product Owner is not sufficient. Fitzgerald and Stol (2017) proposes a holistic concept of combining business strategy and planning, development and operations to foster continuous experimentation and innovation. This "BizDevOps" concept is shown in Figure 3:

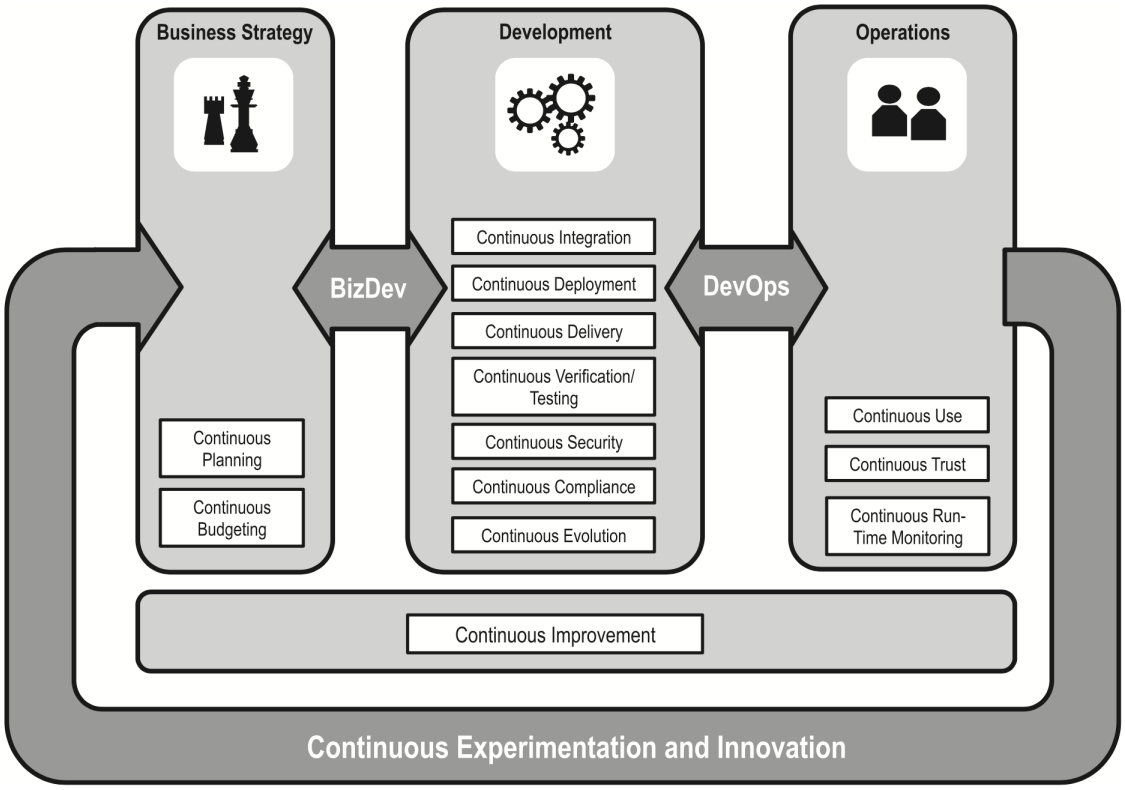

Figure 3: The different phases and flow in "BizDevOps" (Fitzgerald & Stol, 2017)

2.4 Teams

"A team is a group of people with a high degree of interdependence, geared toward the achievement of a goal or the completion of a task" (Parker, 2003, p.2). Team members conform with each other to agree on a common goal, as well as a common way of reaching that goal by working together. Groups of people with common goals can exist without being classified as a team, as interdependence and working together is an important aspect to a team. According to Parker (2003) the 3 best known types of teams today are functional teams, self-directed teams and cross-functional teams, with cross-functional teams being of great interest.

Parker (2003) states that: "Individualism is out; teamwork is in. Specialization is out; a new-style generalism is in. Rigid organizational lines are out; fluid collaboration is in. Power is out; empowerment is in. Hierarchical organizations are out, replaced by network organizations, adaptive organizations, informational organizations, and horizontal organizations". Empowering this type of change can be done through the use of cross-functional teams, "composed of experts ready to move quickly and flexibly to adapt to changing business needs" (Parker, 2003, p.1).

Denison, Hart, and Kahn (1996) states that cross-functional teams take on different forms, but that a common theme is the team is created to enable decision making at a lower level in an organisations hierarchy. Cross-functional teams share many traits with other team structures, but differ in a couple of important ways. Firstly: "they are usually representative groups in which each member has a competing social identity and obligation to another subunit of the organization" (Denison et al., 1996). Secondly: "they are often temporary task teams excperiencing abundant pressure and conflict, so the early development of stable and effective group processes is critical to their success" (Denison et al., 1996). Thirdly: "cross-functional teams typically confront a different set of per-

formance expectations than conventional work teams and are often expected to reduce cycle time, create knowledge, and disseminate organizational learning" (Denison et al., 1996). It is also important to note that "a standard cross-functional team is composed of those individuals from departments within the firm whose competencies are essential in achieving an optimal evaluation. Successful teams combine skill-sets which no single individual possesses" (Doyle, 1991, p.20).

Parker (2003, p.6) has found that "Cross-functional teams seem to be most effective in companies with fast-changing markets, such as the computer, telecommunications, pharmaceuticals, and similar industries that value adaptability, speed, and an intense focus on responding to customer needs." Although Parker mentions by name the computer-market as a good place to implement cross-functional teams, the key word is "fast-changing markets". This ties in to relation with the growing use of agile system development (see Section 2.1), which is all about adapting to change. Parker (2003, pp.12-13) have found six important advantages that effective cross-functional teams bring to an organisation that successfully implements them, as shown in Table 2:

Advantages	Description
Speed	Cross-functional teams reduce the time it takes to get things done, especially in the product development process.
Complexity	Cross-functional teams improve an organization's ability to solve complex problems.
Customer focus	Cross-functional teams focus the organization's resources on satisfying the customer's needs.
Creativity	By bringing together people with a variety of experiences and backgrounds, cross-functional teams increase the creative capacity of an organization.
Organizational learning	Members of cross-functional teams are more easily able to develop new technical and professional skills, learn more about other disciplines, and learn how to work with people who have different team-player styles and cultural backgrounds than those who do not participate in cross-functional teams.
Single point of contact	The cross-functional team promotes a more effective cross-team effort by identifying one place to go for information and for decisions about a project or customer.

Table 2: Important advantages in Cross-Functional teams found by Parker (2003, pp.12-13)

Another topic in relation to team aspects is so called autonomous-teams, which can be referred to as "self-managed teams, empowered work groups, or self-directed work teams" (Janz, Wetherbe, Davis, & Noe, 1997). Autonomous-teams are heavily related to cross-functional teams, as team members of autonomous-teams typically have a variety of skills (Janz et al., 1997). Autonomous-teams are also categorised by the fact that they themselves control work methods, scheduling of tasks, and which team member should complete what task (Janz et al., 1997). Patanakul, Chen, and Lynn (2012) describes autonomous-teams as "separate from the mainstream organization, having its own members handling development, manufacturing, and marketing", and also that an autonomous-team typically has a project leader that is the sole evaluator of the teams performance and is in control of the teams resources. It has also been found that autonomous-teams perform better than other types of teams when they deal with a high degree of technology novelty or radical innovation (Patanakul et al., 2012).

2.4.1 Teams vs. Groups

As mentioned in Section 2.4, a group of people with a common goal can exist without being classified as a team. "Despite what we call them, not all "teams" are teams. Some so-called teams are simply groups masquerading as teams, because in today's world it's important to be on something called a team" (Parker, 2003, p.1). Katzenbach and Smith (2005) defines a team as "a small number of people with complementary skills who are committed to a common purpose, set of performance goals, and approach for which they hold themselves mutually accountable". They also state that without common commitment groups will just perform as individuals, whereas with common commitment the group performs collectively. Katzenbach and Smith (2005) proposes a way to tell the difference between working groups and teams, and this is detailed in Table 3:

Working Group	**Team**
Strong,clearly focused leader	Shared leadership roles
Individual accountability	Individual and mutual accountability
The group's purpose is the same as the broader organizational mission	Specific team purpose that the team itself delivers
Individual work products	Collective work products
Runs efficient meetings	Encourages open-ended discussion and active problem-solving meetings
Measures its effectiveness indirectly by its influence on others (such as financial performance of the business)	Measures performance directly by assessing collective work products
Discusses, decides, and delegates	Discusses, decides, and does real work together

Table 3: How to tell the difference between working groups and teams according to (Katzenbach & Smith, 2005)

2.5 Teamwork Behaviours

The previous section (section 2.4) has detailed the many benefits of having a working team instead of a working group. One important aspect of working teams are the notion of teamwork, which can simply be described as how members of a team work together. There are many factors that contribute to the notion of teamwork in a group, such as team members cognitive state, their feelings and the different behaviours shown by the team members. Team members behaviours are different from other individual aspects, such as cognition and feelings, because behaviours are the observable and sometimes measurable actions of individuals (Rousseau, Aubé, & Savoie, 2006). Behaviours can affect both the physical and social environment, whereas team members thoughts and feelings must be translated into a behaviour to be able to have such an effect.

Team members behaviours in the work setting can be divided into two main categories, task work behaviours and teamwork behaviours (Rousseau et al., 2006). Task work behaviours involves the different activities to be performed by an individual that contribute directly to the accomplishment of tasks. These behaviours relate directly to the technical aspects of the tasks that exists independently of work organisation, whether the individual is working as part of a group or not. Task work behaviours are as such needed for the performance of specified tasks, and are not generalisable to other team tasks (Rousseau et al., 2006). In contrast to task work behaviours, teamwork behaviours represent the actions and verbal statements displayed by team members when interacting with each other. Teamwork behaviours are displayed to ensure successful collective actions, and can be considered a requirement for effective team performance (Rousseau et al., 2006). Team members are interdependent when it comes to the accomplishment of team tasks, and as such need to align and coordinate their individual actions towards task accomplishment, interacting and sharing resources with one another. Based on their research Rousseau et al. (2006) states that "teamwork behaviors facilitate the achievement of col-

lective tasks and consequently increase team performance".

Teamwork behaviours are a complex concept that is difficult to conceptualise. Researchers have come up with different frameworks in an attempt to conceptualise teamwork behaviours, providing a way to classify and delineate the diverse dimensions of teamwork behaviours. An example of such is the framework of team work quality (TWQ) developed by Hoegl and Gemuenden (2001). This framework tries to conceptualise the idea that one can measure the quality of collaboration in teams through the use of six teamwork behaviours, or as they call it TWQ, and their findings show this to be true as well as TWQ having a positive relationship with team performance and personal success (Hoegl & Gemuenden, 2001). In their article Lindsjørn, Sjøberg, Dingsøyr, Bergersen, and Dybå (2016) use the framework of TWQ to evaluate what effect TWQ has on team performance, learning and work satisfaction in agile teams. They also investigate if differences could be found between the effect on agile teams versus more traditional software development teams. The most interesting of their findings is that quality of teamwork is a major factor in improving team performance and the quality of the team's product (Lindsjørn et al., 2016). Other findings include the effect of TWQ on team member learning and work satisfaction to be positive, although this was only rated by the team members themselves. They did not find any proof of the notion that teamwork is more important in agile teams than traditional teams, and the effect TWQ had on agile teams was only marginally larger than for traditional teams (Lindsjørn et al., 2016).

TWQ is only one of many frameworks aimed at evaluating teamwork behaviours; other notable contributions are works such as the framework proposed by McIntyre and Dickinson (1997) that tries to conceptualise how seven teamwork behaviours form a learning loop, or the work of Salas, Sims, and Burke (2005) that tries to identify the five core components of teamwork. Although there are some commonalities between the different research on teamwork behaviours, there are a lot of differences and a lack of agreement

between the different research, making the dimensions of teamwork behaviours hard to clearly distinguish and thus hard to generalise (Rousseau et al., 2006). This is the motivation behind the work of Rousseau et al. (2006), where they conduct a literature review of different frameworks on the topic of teamwork behaviours, drawing on commonalities between the frameworks to present their own integrative framework of teamwork behaviours. This framework is presented in Section 3.

3 Framework of Teamwork Behaviours

This section will present the framework I have chosen to use for this study, as well as what dimensions of the framework that will be used. A presentation on the creation of the framework will be presented followed by a description of the framework itself. The framework uses communication as an underlying criteria for all its constructs, compared to TWQ mentioned in Section 2.5 where communication is presented as a construct itself, which I found to be an interesting aspect of this framework. During my literature review I found no one actually using this framework, and as such I wanted to investigate the framework further.

To create their framework, Rousseau et al. (2006) analysed the reviewed frameworks to identify the conceptual meaning of each behavioural dimension, using these descriptions to analyse the commonalities and differences across the frameworks. This was then used to identify conceptually distinct behavioural dimensions, enabling the identification of "representative labels and definitions that capture the underlying concepts" (Rousseau et al., 2006). The different behavioural dimensions were then categorised using a theory-driven approach, and the categorisation were done with timing and hierarchy in mind.

Using the theory from Wittenbaum et al. (2004), Rousseau et al. (2006) classify teamwork behaviours into two main categories: the performance related aspect called **Regulation of Team Performance** and the maintenance of teams related aspect called **Management of Team Maintenance**. The performance function involves the achievement of work-related team goals, where as the maintenance function concerns itself with holding team members together. The category "regulation of team performance" has four sub-categories, all of which have two or more sub-categories of their own. This will be detailed later, and an overview of the entire framework can be seen in Figure 4. For this thesis I have chosen to focus entirely on the **Regulation of Team Performance**, using this as

my framework for analysis later on. The reasoning for this is that although "Management of Team Maintenance" seems to be an important aspect of teams, it is more in the scope of organisational theory and not the realm of software development.

Management of team Maintenance

The category "management of team maintenance" has two sub categories called "psychological support" and "integrative conflict management". Rousseau et al. (2006) defines psychological support as "the voluntary assistance that team members provide to reinforce the sense of well-being of their teammates". Psychological support can show itself in many forms, such as showing care and consideration, providing encouragement and valuing others talents and contributions (Rousseau et al., 2006). Psychological support may create team spirit and morale, motivate and build confidence, and positive effects include team members feeling comfortable asking for help rather than struggling, and providing team members incentive to maintain high performance levels (Rousseau et al., 2006). Integrative conflict management refers to finding resolutions to conflicts in the team, while taking into consideration interests of the different parties involved. Intrateam conflicts can concern task, process and interpersonal issues, and can prove to be quite harmful for the team if not managed correctly or at all (Rousseau et al., 2006). Collaborating to resolve a conflict can lead to team members successfully integrating their different perspectives, which "is likely to foster good team decisions regarding conflicts and enables team members to focus on task accomplishment instead of fighting" (Alper, Tjosvold, & Law, 2000; Yeatts & Hyten, 1998)(as cited in Rousseau et al., 2006).

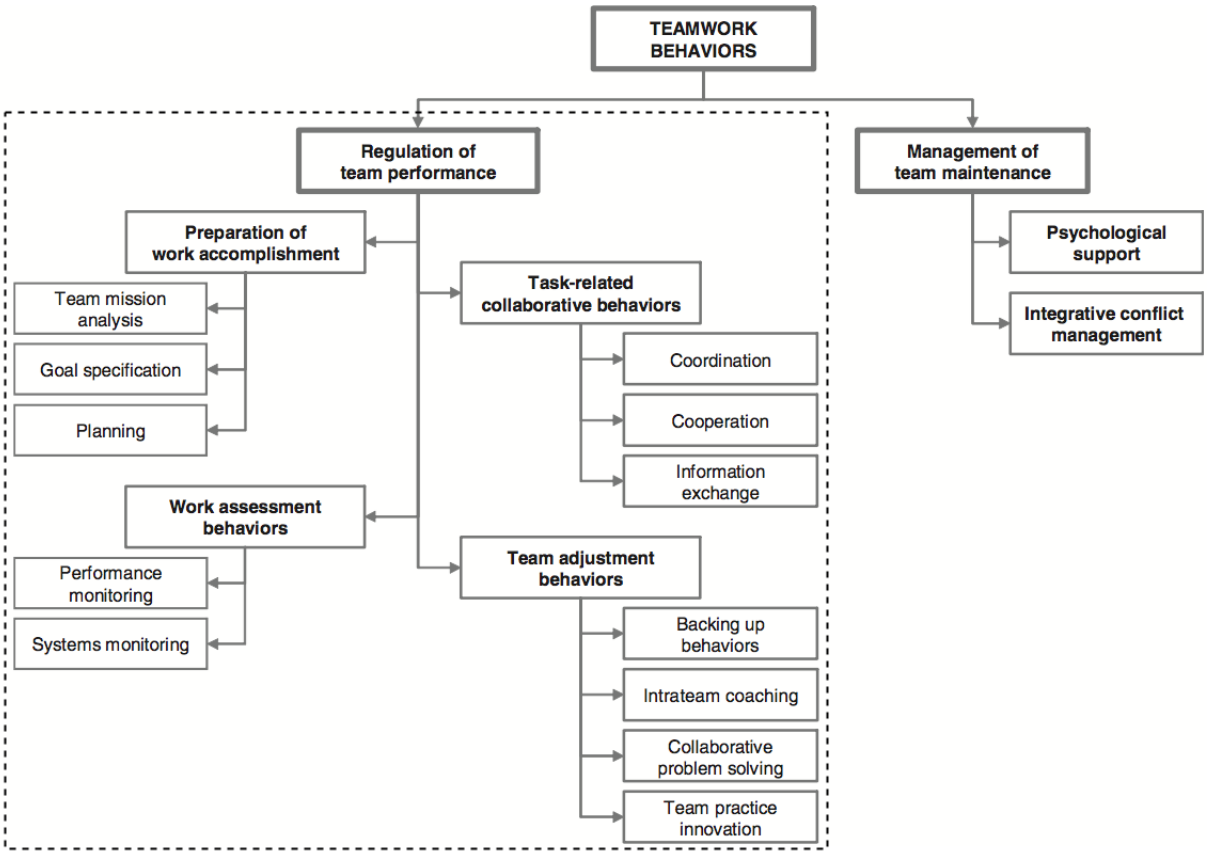

Figure 4: The different categories of the Teamwork Behaviours model (Rousseau, Aubé, & Savoie, 2006)

3.1 Regulation of Team Performance

The different sub-categories of "regulation of team performance" is derived from theory by Frese and Zapf (1994), which states that a high performance level can be achieved if the functions of preparation, execution, evaluation and adjustment is performed in that sequence (Rousseau et al., 2006). A team has to set a standard of comparison for subsequent action, execute the planned actions, evaluate if their actions has led them closer to the goal and if conditions allow them to continue, and adjust to this evaluation; all to complete a task successfully (Rousseau et al., 2006). The four phases of "regulation of team performance" is derived from the four functions above, and these will be detailed in the coming paragraphs. Figure 5 shows how Rousseau et al. (2006) propose a team would move between the phases, and the behavioural dimensions tied to the four phases are summarised in Table 4.

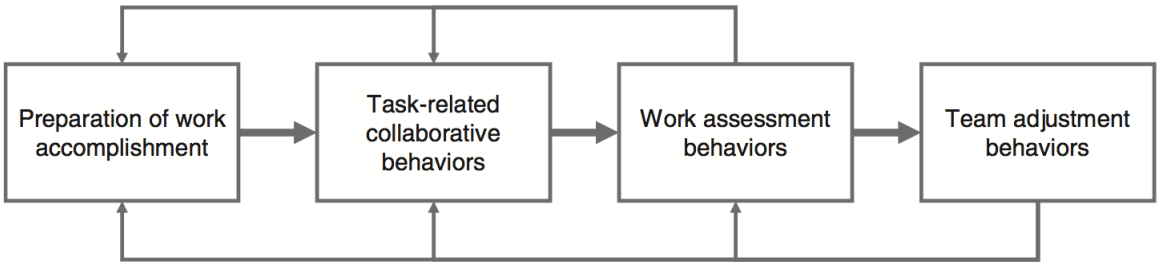

Figure 5: The sequence of the subcategories of "Regulation of team performance" (Rousseau, Aubé, & Savoie, 2006)

1 - Preparation of work accomplishment	
Team mission analysis	Collective interpretation and evaluation of the team's purpose, including identification of its main tasks and the operative environmental conditions and team resources available for carrying out the mission.
Goal specification	Identification of the level of performance that team members have to achieve. Main team goals can be decomposed into several partial goals.
Planning	Development of alternative courses of action for task accomplishment.
2 - Task-related collaborative behaviours	
Coordination	Integrating team members' activities to ensure task accomplishment within established temporal constraints.
Cooperation	Two or more team members work together on task accomplishment.
Information exchange	Extent to which team members share task-related information among themselves.
3 - Work assessment behaviours	
Performance monitoring	Tracking progress toward goal attainment and determining what needs to be accomplished for goal attainment. Indicates that team members keep track of fellow team members' work while carrying out their own.
Systems monitoring	Tracking team resources and environmental conditions as they relate to task accomplishment.
4 - Team adjustment behaviours	
Backing up behaviours	Extent to which team members help each other perform their roles.
Intrateam coaching	Exchange among team members of constructive feedback regarding the task accomplishment.
Collaborative problem solving	Removing impediments to task accomplishment by collectively finding and implementing a solution that brings actual conditions closer to the desired conditions. Includes extent to which team members offer constructive suggestions for change.
Team practice innovation	Team members' activities designed to invent and implement new and improved ways of doing their tasks.

Table 4: Teamwork behaviours: Summary of "Regulation of team performance" phases and its behavioural dimensions (Rousseau, Aubé, & Savoie, 2006)

3.1.1 Preparation of Work Accomplishment

The first phase is the preparation phase, which is when team members focus on analysing and planning activities as to guide them towards task accomplishment. The behavioural dimensions in this phase is: "Team mission analysis", "Goal specification" and "Planning".

Team mission analysis refers to the "collective interpretation and evaluation of the team's purpose, including identification of its main tasks and the operative environmental conditions and team resources available for carrying out the mission" (Rousseau et al., 2006). The team seeks out information regarding what they have to accomplish under what conditions, and identify their preferences and what each team member can contribute with. All of this is to ensure that all team members have a shared vision of the team purpose, and as such can focus their efforts on what is really important. In short, team mission analysis is about figuring out the teams reason for existing.

Goal specification refers to the "identification of the level of performance that team members have to achieve" (Rousseau et al., 2006). Main team goals can be decomposed into several sub-goals, and all goals must be specific, challenging and accepted by team members to be effective. If all team members are committed to reach a goal, setting goals can have a positive effect on performance, and specific goals ensures team members know exactly what is expected from them, enabling better team alignment. Goal specification gives team members incentive to work together.

Planning refers to "development of alternative courses of action for task accomplishment" (Rousseau et al., 2006). Planning as an activity will produce a performance plan that leads to a specific outcome when executed. This performance plan describes distribution of work, order and timing of task-related activities, and what methods to use to

integrate team members actions (Rousseau et al., 2006). Planning could be referred to as a discussion and formulation of strategy.

3.1.2 Task-related Collaborative Behaviours

The second phase is the execution phase, which is team members putting into motion what has been planned, as they now know what is required from them. The behavioural dimensions in this phase is: "Coordination", "Cooperation" and "Information exchange".

Coordination refers to "integrating team members' activities to ensure task accomplishment within established temporal constraints" (Rousseau et al., 2006). In work teams the end results is based on numerous contribution by all team members, and as such the work of one team member are dependent on correct and timely contributions by other team members, which requires mutual adjustment. Failure to do so could impede the team from further advancements. "By coordinating their actions, team members ensure that tasks are sequenced, synchronised, integrated, and completed within established temporal constraints without duplicating or wasting efforts" (Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995; Spreitzer, Cohen, & Ledford Jr, 1999)(as cited in Rousseau et al., 2006)

Cooperation is defined as "two or more team members work together on task accomplishment" (Rousseau et al., 2006). By working together, team members can complete tasks and reach goals that may prove difficult for one person to achieve alone, and as such the result might be held to a higher standard of quality.

Information exchange can be defined as "the extent to which team members share task-related information among themselves" (Rousseau et al., 2006). Whenever new task-related information is acquired by a team member, a quick evaluation of the information and whom it should be transmitted to is of importance for achieving task accomplishment. Information may concern such tings as resource availability, customer demands, manage-

ment information or production delays; can be transmitted through different means such as messages, mails, meetings, written reports or face to face; which is considered optimal for reducing information loss.

3.1.3 Work Assessment Behaviours

To ensure the team members contributions are moving the project in the correct direction, team members need to monitor their own performance and the environment they are working in. This is done in an evaluation phase, which consists of two behavioural dimensions: "Performance monitoring" and "Systems monitoring".

Performance monitoring refers to "tracking progress toward goal attainment and determining what needs to be accomplished for goal attainment" (Rousseau et al., 2006). Team members can monitor the performance by keeping track of fellow team members, both in regards to their work accomplishments and if they follow procedure correctly and in a timely manner. By monitoring their performance, team members can identify mistakes and performance issues, and evaluate if their actions have moved them closer to goal achievement. Performance monitoring is a type of self-adjustment, to ensure correct reactions to identified issues.

Systems monitoring is defined as "tracking team resources and environmental conditions as they relate to task accomplishment" (Rousseau et al., 2006). Systems monitoring can be both internal and external, where internal is monitoring of team resources such as personnel and equipment, and external is monitoring environmental conditions relevant to the team such as market requirements and organisational changes. Systems monitoring is done so the team can apply appropriate strategies and respond in a timely fashion to changes that occur as they perform (Rousseau et al., 2006).

3.1.4 Team Adjustment Behaviours

Based on their evaluation, team members may realise that things are not going according to plan, and as such they will have to make adjustments. Such adjustments may involve both non-teamwork behaviours and teamwork behaviours (Cannon-Bowers et al., 1995; Goodman, Devadas, & Griffith Hughson, 1988)(as cited in Rousseau et al., 2006). Examples of such non-teamwork behaviours could be increasing effort in task work behaviours or acquiring additional resources, where as teamwork behaviours could be changing goals, increasing coordination and improving or reworking the plan. The behavioural dimensions in this phase is: "Backing up behaviours", "Intrateam coaching", "Collaborative problem solving" and "Team practice innovation".

Backing up behaviours refers to "the extent to which team members help each other perform their roles" (Rousseau et al., 2006). This implies that team members have the time, resources and capacity to provide task-related help to team members that are struggling to reach the goals defined by their role. Team members may provide different types of back-up, such as helping someone that is behind schedule complete their task, filling in for a team member who is unable to fulfil their role, helping a team member correct performance-related mistakes and providing resources or supplies (Rousseau et al., 2006). This framework also emphasises the distinction between cooperation behaviour and back-up behaviour, stating that "cooperation is shown when team members work together (at the same time) to accomplish collective tasks, whereas backing-up behaviours are displayed when a team member helps another member to carry out his or her own tasks" (Rousseau et al., 2006).

Intrateam coaching is defined as "the exchange among team members of constructive feedback regarding the task accomplishment" (Rousseau et al., 2006). Coaching can be done by providing advice, suggestions, guidance and instructions, and it is important

that members that break norms are confronted and their errors are corrected. Team members should be open to receive and take into consideration this type of criticism from their teammates, as this "allows team members to learn from each other to improve their performance" (Rousseau et al., 2006).

Collaborative problem solving means that team members collectively find and remove impediments to task accomplishment by implementing a solution that "brings actual conditions closer to the desired conditions" (Rousseau et al., 2006). Team members should collaboratively make a decision to resolve a problem, by gathering relevant information to the problem, identifying alternatives, selecting and implementing the best solution. Rousseau et al. (2006) also suggest that the extent to which team members offer constructive suggestions for change should be included in this behavioural dimension. When team members solve problems collectively multiple perspectives are offered, resulting in a broader evaluation of the situation, and as such decreasing the likelihood of implementing erroneous or incorrect solutions. Collaborative problem solving might also increase team members understandings of each others ideas, enabling them to construct understandings they did not have prior to the collaborative experience (Rousseau et al., 2006).

Team practice innovation is defined as "team members' activities designed to invent and implement new and improved ways of doing their tasks" (Rousseau et al., 2006). To address changing task demands team members should take the time needed, work together and share resources to develop and apply new practices that innovate their way of doing work, enabling them to maintain or increase their performance. In dynamic work environments task accomplishment may require continuous improvement, which can be done by facilitating the introduction of new working methods, enabling the team to respond more adequately to changing requirements (Rousseau et al., 2006).

4 Research Method

This chapter will outline the method used in this study and why it was chosen, as well as detail the research design and evaluations conducted in relation to this. First the research method will be discussed. Then *data collection* and *data analysis* will be detailed. Lastly an overview of concerns to the validity of this study is presented.

4.1 Qualitative Research

When conducting a study, it is important to evaluate what research method to use. Taking the first step however is to decide overall how to approach the research (Creswell & Creswell, 2014). "Research approaches are plans and the procedures for research that span the steps from broad assumption to detailed methods of data collection, analysis and interpretation" (Creswell & Creswell, 2014, p.3). Approaches to research can be qualitative or quantitative, or a mix of methods. Creswell and Creswell (2014, p.3) states in their book that the distinction between quantitative and qualitative research are often made as a rigid type of distinction, but argues that they instead represents each end of a continuum, with the mix of methods receding in the middle.

Quantitative research is described by Creswell and Creswell (2014, p.4) as an approach for testing objective theories by examining the relations between variables. The variables can be measured and the numbered data can be analysed using statistical procedures. Researchers conducting this type of research often have assumptions about the research, as well as the findings can be generalised and are easy to replicate.

Qualitative research is described by Creswell and Creswell (2014, p.4) as an approach for exploring and understanding the meaning of individuals or groups in the context of a social or human problem. The qualitative research process includes creating questions and procedures, collecting data from the participant setting, analysing the data induc-

tively and the researcher interpreting the meaning of the data.

As the research questions of this study involves examining how real world individuals interact with one another in their natural setting, a qualitative research approach seem to be the best fit for this study. Robson and McCartan (2016) states that research design can be categorised into two types, fixed and flexible. A fixed research design requires all the features of the design to be decided before the study is conducted, while a flexible design can be changed even during the data collection phase (Robson & McCartan, 2016, p.101, p.146). As this study had a certain amount of uncertainties tied to it, a flexible research design seemed to be the best fit. Flexible research designs are also most common when taking a qualitative approach. Within the category of flexible research design there exists three commonly used types; case studies, ethnographic studies, and grounded theory studies (Robson & McCartan, 2016, p.146). For this study the approach of case study was chosen, and the next section will explain why in more detail.

4.1.1 Case Study

Assessing the research context and the research questions, the method of case study was found to be a suitable match. In his book, Yin (2014) compares the method of case study against other types of research methods, and details how to choose an appropriate research method. A case study is best suited if the researcher wants to answer a "how?" or "why?" question, when control of behavioural events is not possible and focusing on contemporary events is important (Yin, 2014, Chap. 4, Sec. 2). This description fits with the research context of this study, and is why it was chosen for the approach.

The overall design of this case study is a single-case holistic approach, meaning there is one case and only one unit of analysis (Yin, 2014, pp.125-126). The unit of analysis is a group of people composed as a product development team, working on a product in their open office space setting. More details regarding the research context is given

in Section 5. Qualitative data was collected on different aspects of the team, and the different methods of data collection is detailed in Section 4.2.

4.2 Data Collection

The conclusions in this thesis is based on the data collected through participant-observation, semi-structured interviews and chat logs. The data collected using these methods provides the main source of evidence for this thesis. When collecting the data, the four principles of data collection presented by Yin (2014, pp.240-259) was followed, and is presented in table 5. The principles were followed to increase the validity of this study, detailed in Section 4.4.

Principle	My Approach
Use Multiple Sources of Evidence	Participant-observations, interviews and chat logs were used as data sources.
Create a Case Study Database	The raw data were collected and inserted into a tool for analysing qualitative data. Short notes detailing relevant information regarding the data was also created.
Maintain a Chain of Evidence	All the raw data was organised by type of data and date collected. Within observations and chat-log entries date and time of events were recorded. The coding of the data was also done with traceability in mind. The chain of evidence has also been maintained by making a distinction between results and discussion of the results.
Exercise Care When Using Data from Electronic Sources	A healthy dose of scepticism was used when collecting data from the chat-logs, trying to keep everything to the context it was meant.

Table 5: Four principles of data collection put fourth by Yin (2014)

4.2.1 Observations

A major part of the data collected for this thesis was through the use of participant-observations. Insight into company structure, how the teams operated and the scope of the project conducted by the observed team was enabled by conducting this type of observation. Yin (2014) distinguishes between "direct observation" and participant-observation, where in the former the observer is not to interact with the subjects at all. The reason for classifying the observations conducted as participant-observations and not "pure observations" is because the observer were socially engaged with the observed team members, such as participating in small talk or joining the team members for lunch. Such aspects that might affect the validity of the study will be discussed later in Section 7.5.

This study has observed the team members working in the open work area where they are seated, as well as different type of meetings. In total **15** workdays and **14** different meetings were observed through the course of this study. The observations conducted were guided by an observation protocol based on Viktoria Stray, Sjøberg, and Dybå (2016), and can be viewed in Appendix C. When observing meetings, notes were taken both during and directly after the meeting to ensure nothing would be forgotten. General information such as number of participants and meeting length, as well as what was spoken and by whom were what was written in the notes during the observed meetings. The number of meetings attended is detailed in table 6.

The team members were also observed during their normal workdays in the open work area, and informal discussions between the team members themselves or other relevant people were often conducted during this setting. Observations conducted in the open work area were not as confined as the meetings, thus it might be information that was missed by the observer.

Observations	Team Alpha
Daily Standup	**6**
Weekly Meeting	**4**
Planning Meeting	**2**
Pre-Planning Meeting	**1**
Status Meeting	**1**
Total:	**14**
Work Days	**15**

Table 6: Table detailing the meetings observed

4.2.2 Interviews

The interviews conducted provided a deeper insight into how the team members perceived the different practices in use. Data collected through the interviews therefore provided valuable information into the case, enabling the observer to see things from a different angle. Interviews were in theory confined to a time-limit of 45 minutes, but varied between **28** and **47** minutes. The different interviews conducted are listed in table 7.

All the conducted interviews were semi-structured as to cover most of the relevant topics, as well as keeping a certain flexibility such that other topics could be discussed as the interviewee would see fit. To keep a general direction during the interviews an interview guide was created and followed, which can be viewed in Appendix A.

Before the interviews were conducted, an application was sent to the "Norwegian Centre for Research Data"(NSD) asking for permission to conduct interviews of this type, and the application was approved. All interview-objects were given a written agreement schema detailing what they committed to with the interviews, which can be viewed in Appendix B. The interview-objects were notified that they could in any point and time

withdraw from the interviews without providing a reason as to why, and this notification were given both verbally and in written form as part of the agreement schema. With the agreement of the interview-object, the interview data was made anonymous and stored at a secure server.

Most of the interviews were recorded on a tape-recorder, with the permission of the interviewees. In the case when a interviewee would not give permission to be recorded, the interview were written down in a document instead. After the interviews were conducted, the recorded interviews were transcribed to improve the data processing. The interviews were conducted in Norwegian, so when transcribing the recordings the interviews were simultaneously translated to English.

Interviews	From	When	Duration
App Developer	**Team Alpha**	**March 2019**	**47min**
Tech Lead Developer	**Team Alpha**	**March 2019**	**39min**
Hardware Developer	**Team Alpha**	**March 2019**	**46min**
App Developer	**Team Alpha**	**March 2019**	**42min**
Frontend Developer	**Team Alpha**	**March 2019**	**36min**
Designer	**Team Alpha**	**March 2019**	**28min**

Table 7: Table detailing the interviews conducted

4.2.3 Chat Logs

To provide better support for the evidence collected through observations and interviews, data was collected from an online chat application the team was using. The application in question is called Slack [1], which is an online chat application targeted at businesses.

[1]Slack is an online chat application. https://slack.com

Details about team aspects is presented in Section 5.2.

The type of data collected from the chat logs were data that seemed of relevancy to the themes identified in the observations and interviews. Screenshots of the entries would be added into the analysis tool, and sorted by time and date, then coded to relevancy. This type of data was used to support the findings from the observations and the interviews, providing the researcher with a better perception of relevant team aspects. In accordance to the fourth principle of data collection, as stated by Yin (2014), caution was exercised when this type of data was collected and used.

4.3 Data Analysis

Before any conclusions could be made in this study, the raw data had to be analysed. The data would be grouped into relevant groups: interviews, workspace observations and meeting observations, and then analysed respectively and combined after analysis. This was done as to make a distinction to the setting the different results appeared in.

My analysis build on the theories on teamwork behaviours presented in Section 2.5. To get an overview of how teamwork behaviours appeared in the agile team, the framework by Rousseau et al. (2006) presented in Section 3 was used. The results from the data analysis is presented in Section 6, and is organised according to the framework by Rousseau et al. (2006).

To aid with the data analysis, the raw data was uploaded into a software program called Nvivo. This software is a so called "computer assisted qualitative data analysis software"(CAQDAS), and is designed to analyse qualitative data by coding. The coding technique called "Descriptive Coding" by Saldaña (2013) was followed, which aims at summarising the topic of the selection as a word or short phrase (Saldaña, 2013, p.88). This coding style is appropriate for all qualitative studies, but as noted by Saldaña (2013)

it is particularly useful for beginning qualitative researchers learning how to code data as well as studies with a wide variety of data forms (Saldaña, 2013, p.88), which is the reason it was chosen for this study. An example of how the data was coded in this study can be seen in Figure 6.

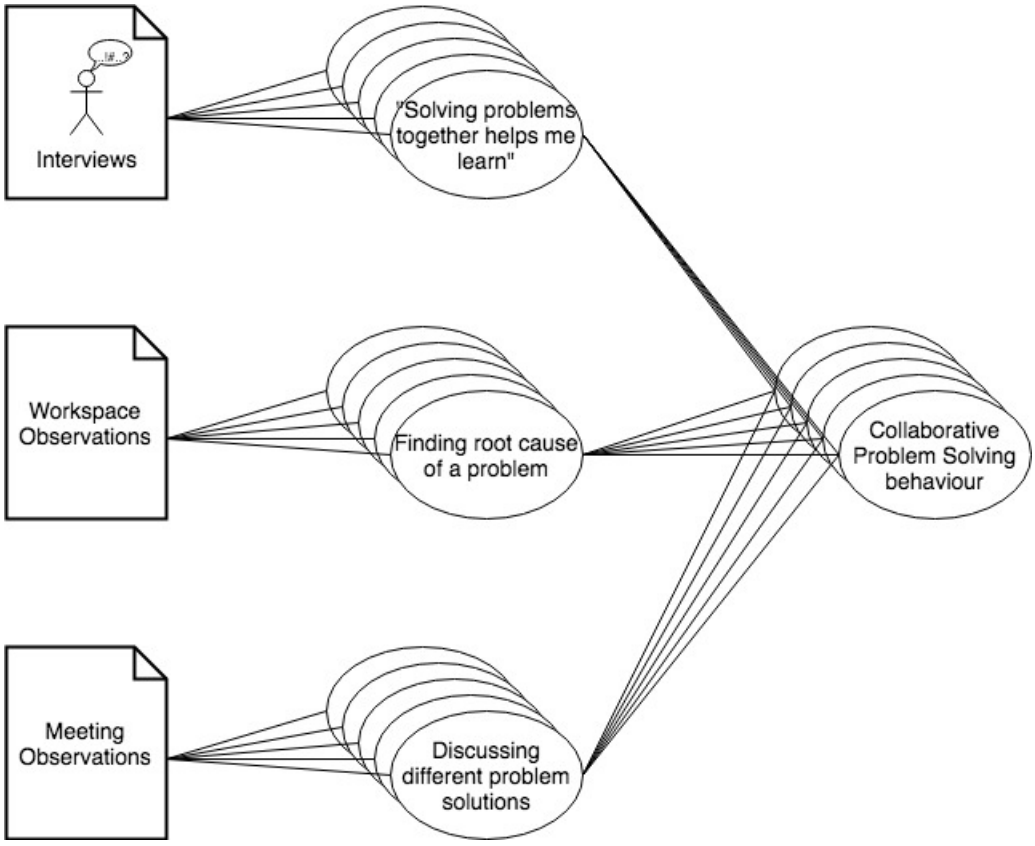

Figure 6: An example of how data was coded in this study

4.4 Validity

The previous sections have outlined the research method, data collection and data analysis of this study. A relevant question is then how good the of this study is. The term for this according to the literature is validity, and Runeson and Höst (2009) describes validity as: "The validity of a study denotes the trustworthiness of the results, to what extent the results are true and not biased by the researchers' subjective point of view" (Runeson & Höst, 2009). When conducting a qualitative study there are multiple threats to the validity of said study. It is therefore in my interest to increase the value of this thesis by minimising threats to the validity. The approach for increasing the validity of this case-study is outlined in Section 7.5. Validity can be divided into four different aspects, and both Runeson and Höst (2009) and Yin (2014) presents these four distinctions; *construct validity*, *internal validity*, *external validity* and *reliability*. These four distinctions are presented below:

Construct validity

The construct validity of a study concerns itself with whether the researchers subjective judgement has affected what has been researched, and in accordance to the research questions (Runeson & Höst, 2009). Three tactics that can increase construct validity is; *use multiple sources of evidence*, *establish a chain of evidence* and *have the draft case study report reviewed by key informants* (Yin, 2014, p. 121).

Internal validity

Runeson and Höst (2009) states that internal validity is of concern when causal relations are examined, and Yin (2014) states that internal validity is "mainly a concern for explanatory case studies, when an investigator is trying to explain how and why event x led to event y" (Yin, 2014, p.121). Since this case study is not explanatory, assessing the internal validity of the study is not relevant.

External validity

The external validity of a study concerns itself with the generalisability of the study's findings beyond the immediate study (Yin, 2014, p. 122), and "to what extent the findings are of interest to other people outside the investigated case" (Runeson & Höst, 2009). The intention for case-studies is to enable analytical-generalisation where the results of the study are of relevance to cases with similar characteristics (Runeson & Höst, 2009). In single-case studies, such as this one, Yin (2014) highlights the use of theory as important for achieving a high degree of external validity.

Reliability

The reliability is concerned with the replicability of the study, meaning if another researcher would conduct the same case-study, similar conclusions would be reached (Runeson & Höst, 2009). Minimising errors and bias should be the goal of reliability (Yin, 2014, p. 124), and using a *case study protocol* and developing a *case study database* are tactics to overcome such shortcomings in a case-study (Yin, 2014, p. 124). The overall idea behind these tactics is that it should be easy to follow the steps of the researcher to recreate the study.

5 Research Context

This chapter will present the research context and the environment the case study was conducted in. First, a presentation of the organisation followed by the team and their structure.

5.1 Organisation

The organisation under study is one of the IT-departments of Norway's largest municipality, with around 40 employees. The main task of this department is the digitisation of the municipality, or more specifically the services provided by the municipality. Currently the municipality is divided into different agencies, for example "Health and care", "School and education" and "Buildings and property". The idea for the digitisation is for all of these agencies to come together as one, and to share information with each other. As such the residents of the municipality will view the municipality as one whole, instead of different departments.

This organisation was chosen as the research-location due to having multiple different projects and teams to select from, enabling the researcher to find a suitable team to observe. The organisation also proved to be very willing to participate in this study, which is always helpful.

The digitisation of the municipality is divided into two categories. The first is to combine the existing computer systems of the different agencies, as to establish a common service-platform for all the municipality's agencies and businesses. The second is that the digitisation is to enable more experimental ways of developing new services for the municipality. This is to be done in dialog with the residents that are to use the services being developed.

The team that was chosen for the observations belongs to this second category, developing a new and helpful service for the residents of the municipality to use.

5.2 The Team

The team observed consisted of seven team members as well as two team leads. The team was tasked with the development and maintenance of a new system that could be used to give citizens of the municipality access to a range of different buildings and services outside of the regular opening hours. Examples of this is giving access to the city's unmanned sanitation stations, or grant access to libraries after the employees have gone home for the evening. The product was developed in such a way that it could be classified as a platform, where new clients could use the system to their needs, broadening the offerings presented to the end users.

Creating and maintaining such a system requires the team members to be able and willing to participate with other businesses around the city. As such, the team members together with the team leads are the ones deciding what business-cases to pursue, and how to prioritise the implementation of their system. The team is also responsible for the operations of their product, ensuring things are running smoothly and correctly at all times. As such, the team can be classified as a BizDevOps team, as detailed in Section 2.3.1. The difference between the BizDevOps construct and how this team is organised is that there are no separate people for business, development and operations respectively. The team members have their own areas of expertise, but they are jointly responsible for the business, development and operations aspects. The business decisions are shared between the team and their two team leads, where one of those are a so called business developer. They are there to help the team follow the guidelines set by the organisations, such that the team can operate as freely as possible within certain constraints.

5.2.1 Team Members

The different roles the team members have are detailed in the coming paragraphs. Details regarding their tasks and responsibilities are listed.

During the observation period there were two designers working in the team. It was explained to the observer that this was just a temporary overlap situation, where the one designer was new to the team, and the other were to transfer to another team later on. The reasoning behind this overlap-period was so the existing designer could share, with the new designer, his knowledge on inter-team relations and responsibilities, as well as what it meant to be a designer on this team. This transitional period were to last for approximately three months.

The Team

Roles	Description
Designer	Responsible for the design of the app and how the user perceives the end result. Is also responsible for other design aspects such as flyers and illustrations such as on-boarding processes, as well as being responsible for conducting user tests.
Tech Lead Developer	Responsible for the design and operations of the backend, that it is secure and running at all times. Is also responsible for how the system is built and deployed.
Frontend Developer	Responsible for development of the teams frontend and web solutions.
App Developer 1	Responsible for the development and maintenance of the app.
App Developer 2	Responsible for the development of the app, as well as implementation of UI elements and bug fixing in the app.
Hardware Developer	Is responsible for the development of the teams hardware solutions, as well as the communication between the backend and hardware.

Table 8: The different roles in the team and their area of responsibility

5.2.2 Seating

When the researcher first met the team, they were seated in a small room that barely could fit the team members. In fact, there was not enough space for the Hardware Developer and as such he had to be seated somewhere else. This had obviously been taken into consideration, since when the researcher returned to conduct the observations, the team had been allocated to a new office space in the same building.

The new office space were a large room and the placement of the different team members are displayed in Figure 7. There was supposed to be two different teams seated in this office space, the other team however had some contractual obligations and could not be moved before the observations were finished. This is the reasoning behind why the team is only allocated in the upper part of the space. The team had also strategically seated themselves in a circle to promote better team communication, as stated by one of the team members:

> "*That's the reason for why we have seated ourselves in a circle, so that we only need to turn around to talk to each other.*"

This is an important aspect of the team, they are co-located and as such communication within the team is simplified. The space also had three white boards that the team members used frequently, as well as a TV used by the team to monitor the operation of their system.

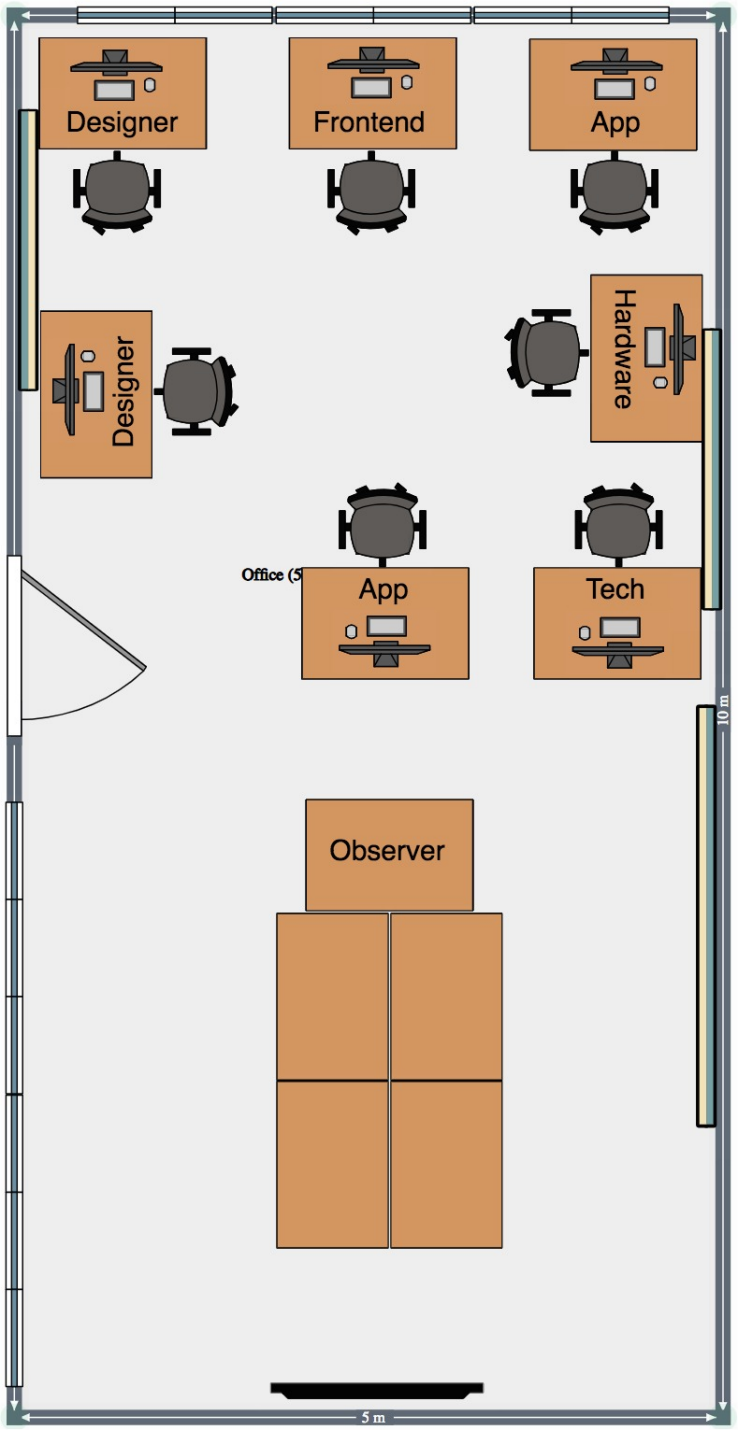

Figure 7: The office space

5.2.3 Processes

The team had an overall Lean (see Section 2.2.2) development approach and can be said to use the method of Scrumban, which is a combination of both the Scrum method and the Kanban method, both presented in Section 2.2.1 and Section 2.2.3 respectively. Scrumban is loosely defined, but the way the team used Scrumban was to implement the development methodology of Kanban and supplement with some of the meetings and evaluation-methods from the Scrum framework. The different meeting types they used is presented below.

Daily standup

The daily-standup was mostly used by the PO to get an overview of the teams current situation. Topics for the daily-standup were such things as what each team member was working on, if they had run in to any problems, or if they had some vital new information to share with the rest of the team. The PO would also share information regarding what she was working on, that would concern the team. The meeting was held daily just before lunch time, without any time limit such that the team members could speak their hearth without feeling limited. The team members seemed to not hold the daily-standup when the PO did not show up.

Weekly meeting

This weekly meeting was held as a more detailed meeting, intended to align the team and enable team members to share information, as well as allow the team to discuss further development. This meeting was intended to last approximately one hour, but the team placed no such time limit on the meeting as to enable meaningful discussions.

Retrospective meeting

The team members stated that they also held retrospective meetings roughly every second month. This meeting was to facilitate evaluation of work methods and changes to those

accordingly.

Status meeting

The status meeting was the highest order of meeting observed. Topics for the one status meeting observed was how the team would move from their agreement of collaboration with other organisations towards the release of new functionality. The status meeting was held in December, and the release was scheduled late in March. This meeting provided the team an opportunity to plan and get an overview of the important milestones for the coming period.

Planning meeting

The team would hold different types of planning meetings. The common theme for these planning meetings were they would be used when needed, and was not a regular occurrence. The one type of planning meeting the team had was with representatives from one of their collaborative partners. This meeting detailed how the team would integrate their partners system into their own, and plans were made for this.

The other type of planning meeting was an intrateam planning meeting. The team would hold this type of meeting to better align their own actions, and prioritise the tasks for the coming future.

5.2.4 Tools

Except from the tools specific to different development cases, the team was using Github and Slack. Github is a tool for tracking work committed to the overall code-base, and enables effective logging of errors. Slack is an online chat tool that allows organisations to create their own chat room with multiple sub-chats, that can both be open or privatised. The use of such a tool also allows team members to invite customers to private chat rooms to facilitate customer communication.

6 Results

This chapter will present what was found in the data analysis, and will be discussed in relation to the framework presented in Chapter 3. Results for whether or not the analysed team can be classified as a team is presented at the end of this chapter.

The results derived from the data analysis is structured in accordance with the theory presented in Section 2.5, which classify 12 different teamwork behaviours and divides them into four groups, and an overview of this can be found in Table 4. Each teamwork behaviour will be discussed in relation to the workspace and the meetings, showing the differences in how the behaviours appeared in these two settings, as well as detailing what was found in relation to each behaviour in the interviews. The behaviours will also be presented in relation to each other, and the overall behavioural groups.

6.1 Teamwork Behaviours

Based on observations in both the workspace and team meetings, the results present how teamwork behaviours were shown in both of these settings. It is important to note that meetings refers only to scheduled-meetings, and that ad hoc meetings held by the team during their work days are included in the workspace description. The number of observed occurrences of shown teamwork behaviours in both the workspace and the meetings are displayed in Table 9. The findings show differences both in frequency and how teamwork behaviours are shown by team members in the two settings. An overview of frequency differences between the four categories of teamwork behaviours in the workspace and the meetings are displayed in Figure 8 and Figure 9. The most used teamwork behaviours overall was shown to be "Information Exchange", "Coordination", "Planning", "Collaborative Problem Solving" and "Systems Monitoring", which are compared in Figure 10. Some findings from each behavioural category are presented in Table 10.

Category	Behaviour	Observations in workspace	Observations in meetings	Total
1 - Preparation of work accomplish-ment	Team mission analysis	21	5	**26**
	Goal specification	14	3	**17**
	Planning	44	73	**117**
2 - Task-related collaborative behaviours	Coordination	87	42	**129**
	Cooperation	32	0	**32**
	Information exchange	162	93	**255**
3 - Work assessment behaviours	Performance monitoring	1	9	**10**
	Systems monitoring	18	38	**56**
4 - Team adjustment behaviours	Backing up behaviours	25	0	**25**
	Intrateam coaching	0	0	**0**
	Collaborative problem solving	57	6	**63**
	Team practice innovation	0	2	**2**

Table 9: Number of behaviours observed in the workspace and meetings for each category from the theory on teamwork behaviours (Rousseau, Aubé, & Savoie, 2006)

The theory states that teams likely move between the four different phases depending on where they are in the project, as shown in figure 5. Although team members sometimes

would display signs of adhering to this sequence, this was not observed clearly enough to be generalised to state that teamwork behaviours always appear in the suggested sequence.

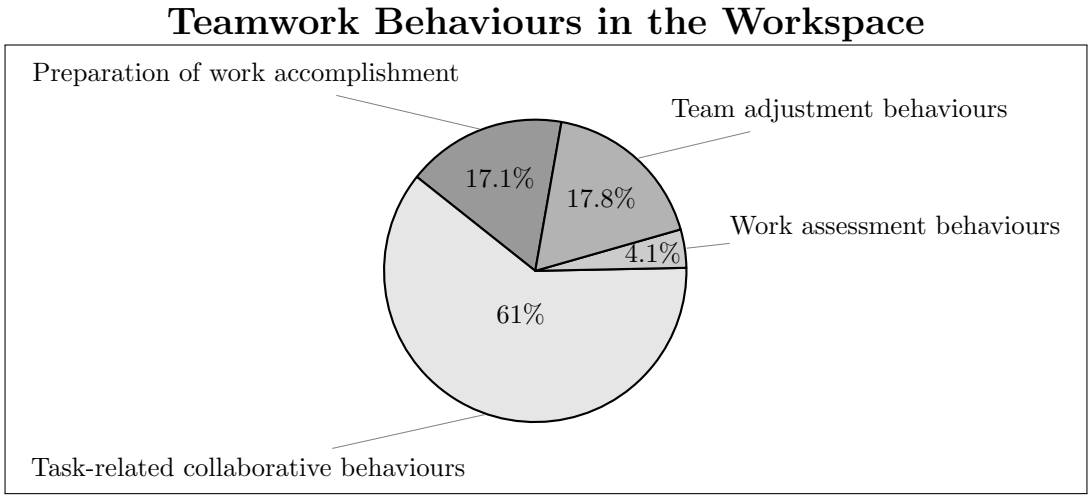

Figure 8: Comparison of overall teamwork behaviours observed in the workspace

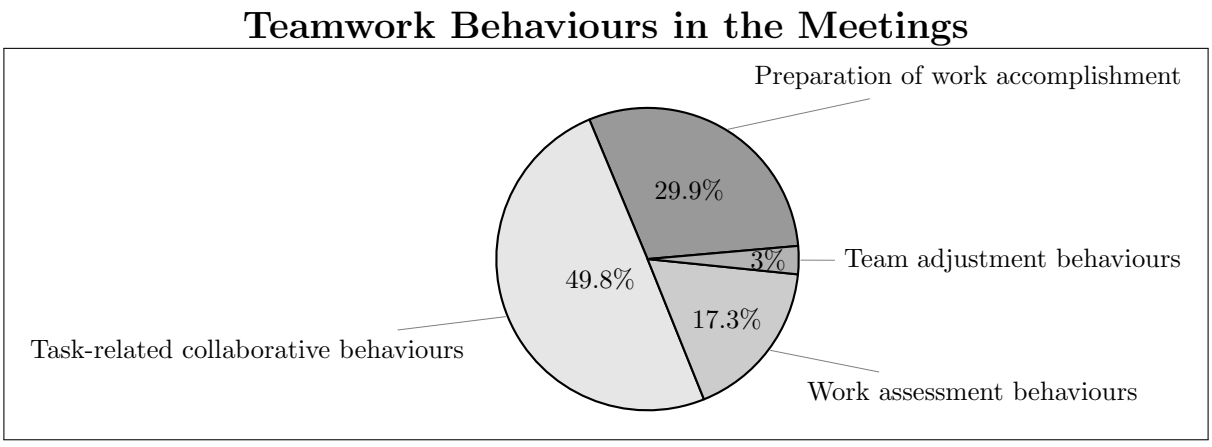

Figure 9: Comparison of overall teamwork behaviours observed in the meetings

Teamwork Behaviour Findings	
Behaviour	**Findings**
1 - Team Mission Analysis	• Team members sharing new product ideas with one another • Team members evaluating new product areas together
1 - Goal Specification	• Team members creating, discussing and specifying main goals • Team members decomposing a main goal into achievable sub-goals and discussing aspects regarding those
1 - Planning	• The team discussing strategy for goal achievement and partner relations • The team evaluating task solutions and team member contributions
2 - Coordination	• A team member addressing other team members needs before doing taskwork • A team member addressing other team members availability as to schedule collaboration
2 - Cooperation	• Team members working together on task completion • Team members working together to improve the quality of each others work
2 - Information Exchange	• A team member sharing newly discovered information to other team members • A team member contributing with relevant information to a discussion
3 - Performance Monitoring	• Team members discussing accomplishments and progress on individual tasks
3 - Systems Monitoring	• Team members evaluating whether current system solutions and tools in use are sufficient for the longevity of the product • Team members evaluating their partners needs in regards to system implementation
4 - Backing up Behaviours	• A team member helping another team member progress their work
4 - Intrateam Coaching	• Team members addressing another team member making him abide team coding convention
4 - Collaborative Problem Solving	• Team members find the root cause of a problem together • Team members discussing multiple solutions to a problem • Team members implementing a problem solution together
4 - Team Practice Innovation	• The team evaluating task tracking and deciding on an implementation of a Kanban board together

Table 10: Findings on how the different teamwork behaviours are displayed by team members

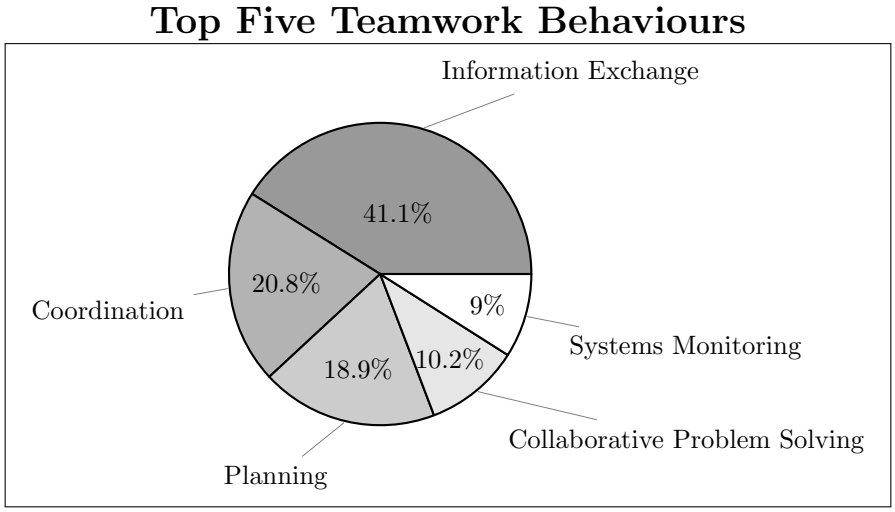

Figure 10: The top five displayed teamwork behaviours

6.2 Preparation of work accomplishment

In the first group I found that planning was the most shown behaviour in the team, both in the workspace and in meetings. Planning was substantially more used in the meetings compared to in the workspace. The comparison of behaviour frequency in the workspace and meetings is presented in Figure 11 and Figure 12.

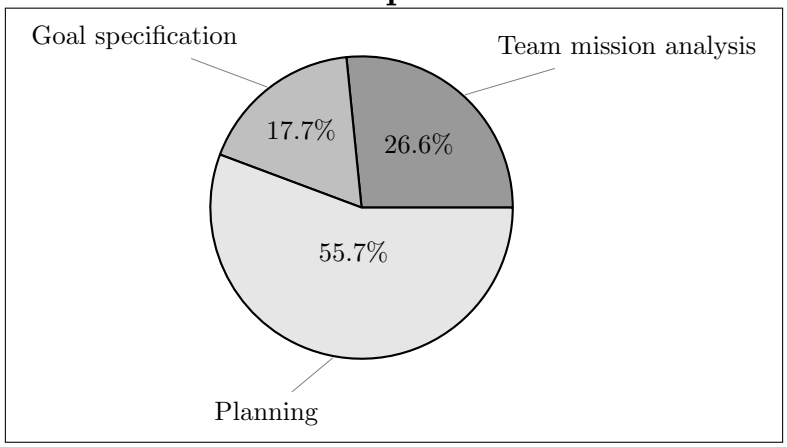

Figure 11: Comparison of "Preparation of Work Accomplishment" behaviours in the workspace

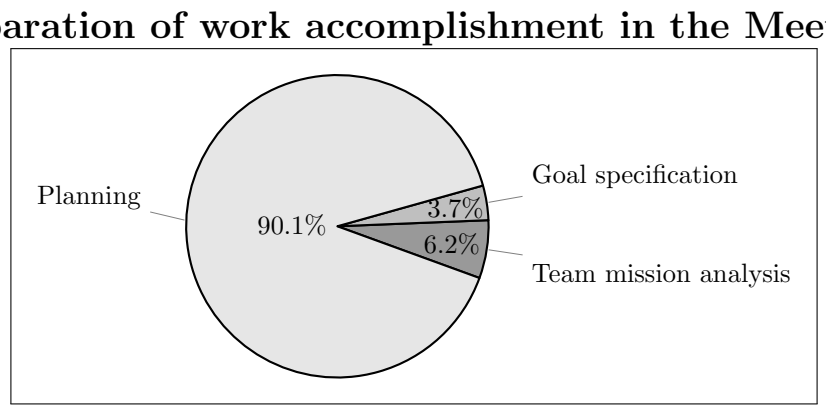

Figure 12: Comparison of "Preparation of Work Accomplishment" behaviours in the meetings

6.2.1 Team mission analysis

Since the observed team was a product development team, most of the "team mission analysis" behaviours observed came in the form of team members sharing new ideas for the product, or evaluating new possible areas for the product to branch into. Ideas for the product would be in the form of ideas not specific to any clients, that would broaden what the product could offer to potential future users and clients. Evaluation of new possible areas for product branching however showed to be the most frequent behaviour in this category, where team members discussed interesting cases to pursue and evaluated all aspects and considerations in regards to that specific case. The frequency of "team mission analysis" behaviours were moderate in the overall picture, it is worth noting however that the frequency is mostly made up of behaviours shown in a session two team members held together, where they were discussing a multitude of new possible areas for the product, as well as evaluating what considerations had to be made for each case.

In the meetings "team mission analysis" behaviour presented itself in other forms. In one instance the team had a discussion regarding brand recognition, and how they would present themselves to the different businesses, as well as how they would present their vision such that they could be prioritised in those businesses. They also had discussions

regarding the appearance of the team within the business, and if their purpose should be expanded to be a knowledge sharing team inside the organisation. The team was also observed discussing new personnel coming to the team in the future, addressing what additional resources the team would have in the coming development period.

When asked about the team purpose most of the team members had a defined idea for why they existed as a team, and what their overall mission was. Some of the team members did confuse team purpose with team goals, but overall the team was unified in what their product was to accomplish, and that they could contribute to this by making their product as good as possible. The organisation had recently implemented a process called OKR [2] that all teams were to participate in, and the team members stated that this process was to evaluate team purpose and team goals, and this event was held every three months. One of the team members also stated that they sometimes did such an evaluation themselves to discuss their vision for the product. When asked about the importance of team purpose evaluation the team members were divided in their answers. Some of the team members said that they did not feel the need to evaluate the team purpose as they already knew what they were working towards, where as others felt that an evaluation of the teams purpose was extremely important in the case of confusion inside the team regarding this. As stated by one of the developers:

> ”*You do not consider the overall team vision when you are facing small concrete choices regarding the implementation. So you do not think about it that often. However in the case of hitting a crossroad it is good to have a round to evaluate the team purpose, so you have discussed it and agree on the direction as a team.*”

6.2.2 Goal specification

As stated by the theory presented in Section 3, goals can be decomposed into multiple sub goals, and as such the behaviour of ”goal specification” was mostly observed in situ-

[2] Objective Key Results is a framework for defining and tracking objectives and their outcomes

ations where team members discussed the need and specification of sub-goals. The team members would discuss how they would go about and achieve something, then make suggestions as to what they needed to do in that regard and discuss it further. An example of this was a discussion regarding a main goal defined as "We need to comply with the new European GDPR laws", where the team members would discuss and create sub goals such as "Give the user insight into own data and the option to edit or delete said data", as a means to achieve the main goal. Sometimes such discussions would also lead to the alteration of their goals, either broadening or narrowing certain goals.

In the meetings "goal specification" behaviour was not any different compared to the workspace, it was however observed that the goals discussed were higher level than in the workspace. An example of this was the discussion and definition of goals such as "Our product implemented in 13 locations for this partner by the end of 2019".

When asked about team goals all the team members showed a unified understanding of what the team was to achieve in the coming time period, as well as what the different sub goals were. They also seemed to have a good understanding of what the team expected from them on an individual level in terms of achieving the team goals. When asked about the frequency of goal evaluation in the team most of the team members stated that they did not do goal evaluation that often. Some of them also tied it in with the OKR process, and this was scheduled to be done every three months, whereas others stated they did goal evaluation every month or every second month. Some of the team members stated that the team evaluated goals continuously, or at least in the cases they felt the need for it. As one team member stated:

> "*We had this one partner that seemed interested, but after a while that collaboration was put on ice. Then this new partner showed up and wanted to connect quickly, so the whole team put in effort to make that happen. Our goals changes dynamically in such situations. It changes often, so the goals we have now*

does not necessary last all that long and that is the reason for us working more evenly."

All the team members stated that evaluating team goals is really important for aligning the whole team, such that they all work on things needed to move the product in a certain direction. As one team member stated when asked about the importance of well defined goals:

"*It is absolutely essential! If you do not figure this out you are just fumbling blindly, it is really important that you have a reason for the things you do, instead of doing things just to do something.*"

Some of the team members also stated that defining team goals was important for them as a motivational factor as it gave them a reason for doing their work. Having measurable goals was also mentioned to be an important motivational factor, as it enabled the team to evaluate their progress more easily. One of the team members also stated concern for setting goals without evaluating if the team achieved their previous goals, and said that it is important to evaluate their goals from time to time. As stated by that team member:

"*It is important to evaluate it each time, if not there is no point in setting the goals to begin with, then you create them just for fun.*"

6.2.3 Planning

This behavioural dimension was shown by the team in multiple different ways, whether they were discussing how they could go about completing a tasks, what the best solution would be, discussing the need for different contributions or discussing the order and time frame of different activities. In most cases, planning was shown by the team members discussing how to approach the implementation of a feature, addressing how it could be done and who should do what. In some cases the team members had multiple possible solutions, and in those cases the discussion would be which of those solutions would be the best choice, or if a combination could be in order. Team members would also use this

opportunity to share with the others activities or implementations they thought important for the completion of the task, and the team would then evaluate those activities or implementations to be of importance or not. Planning was also shown to be the most frequently occurring behaviour in the preparation group of behaviours, as well as having events that spanned the largest time-frames per event. It is also the behavioural dimension from this group present in most of the workdays, being present multiple times on 11 different work days.

In the meetings "planning" behaviour was displayed at a higher level than compared to in the workspace. In the meetings planning was observed to be done in regards to what has to be done to achieve certain goals, by whom and by when it should be done. The team would also discuss strategy for certain partners and how to achieve a beneficial collaboration with those partners. On some occasions the team would also plan how to acquire information the team themselves did not posses. Planning in meetings was observed to be used frequently as to align the whole team regarding different tasks, ensuring all team members understood what the strategy was going forward. Planning behaviour was the second most observed meeting behaviour, and was used almost twice as much in meetings than in the work space.

When asked about team plans the team members seemed to agree on what was the plan going forward, as well as stating the Kanban board was used to display what they had planned. They stated that plans are created when the team gets together to prioritise the most important tasks, and that this was something done when they felt the need to do so instead of being a scheduled activity. This way the team members could agree on what is important to focus on for the coming period. As stated by one team member:

> "*A plan does not need to be formal, but there need to be a common understanding regarding what has to be done at what time, if not things will not work out.*"

Some team members also stated that planning could occur as a discussion in the workspace, if a team member discovered something new or felt that the prioritisation of a task was incorrect. One team member stated that the team had a tendency to be more or less prototype driven, meaning they would start development and test if a feature was necessary, without evaluating that beforehand. This team member felt that this was an improvement point for the team, as he felt the team should evaluate such things beforehand as not to waste resources. He noted it as something positive as well, saying that team members did not have to be demotivated by getting a feature rejected, and instead having the team member interested in that feature being able to test it out and push for its implementation. Two of the team members felt that they did not need to plan because the team dynamic was so good. The other team members felt planning to be important, and two of them highlighted planning as a way to coordinate amongst themselves, enabling every team member to know what the others are doing. This would ensure that team members had a certain idea of the order tasks had to be done, enabling them to integrate the system more efficiently. As one team member stated when asked about the importance of planning:

> "*I do not know what the alternative could be, you somehow need a certain overview of what you are supposed to do, especially when other actors are involved. You need to have a certain understanding of what order things has to be done.*"

It was also stated that a plan was of the uttermost importance when the team was under a deadline, to ensure the team would accomplish what they had committed to by the time they had committed to. As one team member stated:

> "*It is especially important when you have a deadline to do the most critical tasks and that one ensures the tasks that has to be prioritised are completed first. For example with the things we are doing going forward .... we will evaluate if we can save some time by doing things in a certain order.*"

6.3 Task-related collaborative behaviours

In the second group I found that "Information Exchange" was the most prominent teamwork behaviour, both in the workspace and in the meetings. This group was also the found to be the group that was overall the largest, with two of the three behaviours being the two most shown behaviours overall. The comparison of behaviour frequency in the workspace and meetings is presented in Figure 13 and Figure 14.

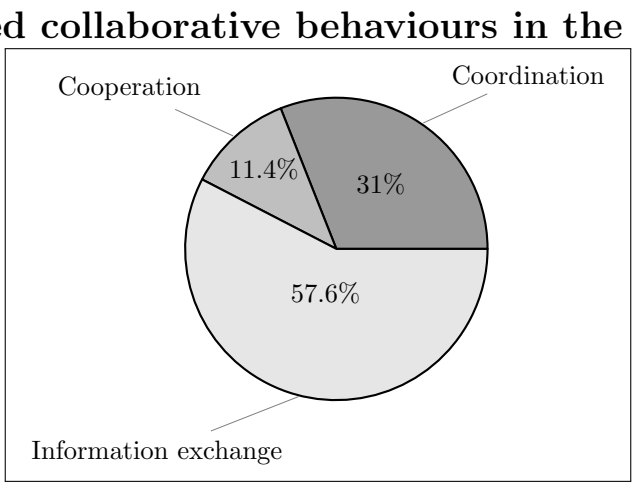

Figure 13: Comparison of "Task-related collaborative behaviours" behaviours in the workspace

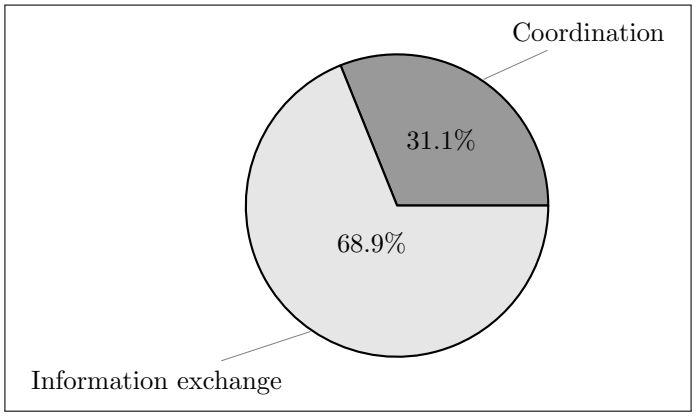

Figure 14: Comparison of "Task-related collaborative behaviours" behaviours in the meetings

6.3.1 Coordination

Coordination as a teamwork behaviour were displayed by team members addressing each other for confirmation whether or not actions should be completed, as well as confirming specific implementations needed by other team members. Coordination was also displayed when team members asked each other when they would be available to attend a meeting, discussion, evaluation or similar events. When confirming whether or not an action could be completed, a team member would ask another team member they knew were dependent on their work, if it would interfere if they implemented changes and if they should wait or not. Team members would also ask other team members if they could implement features they needed to continue their work, so this type of coordination appeared both when team members were asking to implement their own features or asking if others could implement their features. The team would also display coordination in certain situations, where the timing of some members tasks would affect the tasks of others. An example of this was when two of the team members were going to complete a user test, and wanted to make sure no of the other members pushed changes that could crash or alter the system in such ways that it would inhibit the user tests to be completed. The team members would frequently coordinate amongst each other, and besides from the workspace they also used a lot of coordination in their online chat. The coordination behaviour showed to be the second most used behaviour, both overall and in the execution category.

In the meetings "coordination" behaviour was mostly shown when the team discussed who should do what tasks, or when team members wanted to know which team member were working on a specific task. The team was also observed discussing when they should work on certain tasks together, and if they would postpone it or not. The team would also coordinate when to have meetings or events, where at one time the PO was going to have a meeting with some of the partners, the team requested they could use five minutes with the team before the meeting as to enable the team to share what had been done so

far. In this sense coordination behaviour was observed relative frequently in the meetings, and the team would use the opportunity of a meeting to do so, as such "coordination" behaviour was observed in almost every meeting held by the team.

In some form or another the team members stated that their own work were dependent on the work of other team members: The frontend developer needed the design from the designer to be able to implement the idea, and the hardware developer was dependent on the backend developer creating connection points for him to use. However they did state that this type of dependencies had not hindered them in completing their own work, as this had not been a huge issue due to successful team alignment. When a team member was asked weather or not they knew what the other team members were working on, all of them were able to specify exactly what all the other team members were working on. When asked how they were able to keep this overview the resounding answer was talking to each other. The team members were all located in the same room, and they stated that this enabled them to just ask each other whenever they needed something from another team member. This enabled them to coordinate continuously with each other, and most of the team members stated that they acquired information regarding the other team members multiple times per day. Most of the team members stated that it was really important to know what the other team members were doing, but some not so much. As stated by one team member when asked about the necessity of knowing what the others were doing:

> "*For me it is mostly for fun since I am a bit independent. When people talk about what they are doing, especially things I do not know much about, it is really educational and I learn how they work.*"

They also stated that it also was really dependent on what task they were working on, how tightly they needed to coordinate with each other. Sometimes they were working on a task with 3 other team members involved, and sometimes they were working on a task

all by themselves. As stated by one team member:

> "*If there is a task I am working on that depends on other team members, then it is important to have an overview, otherwise it depends on what I am going to do. It is really nice to have an overview when I am going to pick a new task, such that I do not pick a task that is being worked on by someone else.*"

One of the team members stated that he kept track of what the others were doing in case he had to work on that section of the system later on, and as such wanted to understand the reasoning behind every change to the system. As stated by that team member:

> "*I try to keep an overview of what is done to the app, as I know I am going to be working with the app later, and I like to check that things are done correctly such that unnecessary faults I know we could have avoided does not appear. When it comes to the backend I keep an overview because I need to know how it operates and works right now, such that I do not experience errors in my own work that I do not understand.*"

Some of the team members also stated that knowing what the others were doing was really educational, and helped them better understand the importance of each others work.

6.3.2 Cooperation

Cooperation appeared in the traditional sense of two or more team members working together to achieve a task, but also in the form of one team member asking another to check what he already had completed, then continue working together to improve on the task. The team members seemed willing to spend both their time and effort to improve the quality of other team members work. Team members seemed to almost always be available for this type of help, being observed to interrupt or change their own work to collaborate with another team member. The use of communication tools such as an online chat enabled the team members to reach out to one another for collaboration, then the other team member could postpone the collaboration until they had the time to do so.

Sometimes team members would also collaborate remotely, working on their own parts of the system, then integrate it with another team member to complete a feature. During this type of work team members were observed continuously communicating with each other from their own work spaces. The use of online tools to share assets was also part of the cooperation aspect, and this was observed mostly when team members collaborated remotely.

When it comes to cooperation there was a split amongst the team members. Some of the team members stated that they did not need do collaborate with other team members on task accomplishment, and the only way they did so was to integrate their own solutions with the solutions of others. As one team member stated:

> "*It is not that often that we work together on the whole task, it is more like 'Do you have two minutes?', such that you can discuss the solution before writing something big. If you write something big and there is a pull request, ... , then you might have wasted two days for nothing.*"

The other team members stated that they needed some degree of collaboration with other team members, although not for the entire task. They stated that what they needed was an evaluation of the solution they worked on such that it would integrate properly with what the others had made, and as such they would collaborate on the implementation of part of the task. Those team members who had special competence stated that they usually did not collaborate with others, only in special occasions. The other team members said they did so occasionally, and two team members stated they did so every day. When asked about the importance of collaborating the team members stated that they thought it to be of great importance, but strictly not for task accomplishment. They said that they could always complete a task by their own, but being able to collaborate helped them share ideas and ultimately create a better feature together. As stated by one of the team members when asked about the value of collaboration:

> "*Discussions regarding these things are alpha and omega. .... You always achieve a better solution than if you think alone, and you might forget X number of things that should have been handled in the same task. .... There are a greater probability that such things appear if two people discuss together.*"

Being able to share ideas regarding task implementation seemed to be held in high regards by the team, and the team members stated that they felt the others were always available to do so. Some of the team members also said that collaboration enabled them to learn so much they otherwise would not have been able to.

6.3.3 Information exchange

Information exchange behaviour was observed to be a crucial part of the teams everyday workdays. Sharing of information happened mostly orally, but also through the use of the online chat, although the numbers presented here are those behaviours observed in the workspace. Information exchange could happen in different ways, either team members sharing information that seemed relevant, or team members seeking out information they needed. Team members sharing information would happen if they discovered something new or faulty in the system or acquired information from other sources. They would then share the newly acquired information with the relevant team members and sometimes the whole team. Sharing of information would also happen during team discussions, when a team member would provide some relevant information to further the discussion, or when a team member overheard a conversation and would add some relevant information. There was also observations of team members seeking out information, either to help them progress with task accomplishment, or to further their understanding of the system, work of others, or the reason for system changes. All of the team members were frequently observed asking other team members how they were doing, getting information regarding task accomplishment and other interesting details from their peers. Information exchange was the overall most observed behavioural dimension, with almost twice as many appearances as the second behavioural dimension. It is also the only behavioural

dimension present every day, no matter how many of the team members were present in the workspace. The team members were frequently communicating during their work days, and as such sometimes during these conversations relevant information would be shared amongst one another.

In the meetings "information exchange" behaviour was observed to an even higher degree than in the workspace. Although information exchange happened in similar fashion as in the workspace, there were some differences including information was shared mostly orally, and only in some occasions was information shared through chat in the meetings and only to team members not present. Information shared in the meetings were in regards to discussed topics, team members work or problems encountered. Sharing of such information would most of the times lead to new discussions.

When asked about the information flow in the team all of the team members felt that their communication were extremely good. All of the team members actively communicated with each other during their work days, and they said they felt the communication happened very organically. The communication channels used by the team were face-to-face and online chat, and this was rated as a highly effective combination by all of the team members. People on the team always shared information they thought relevant for others to know, whether it was a single person or the whole team. The team members were always available online during the work day, and one team member stated that it was so easy to get a hold of other team members online, that way they could answer whenever they had the time to do so. Another team member stated that information shared in the group could sometimes be missed, so having a online chat helped keeping information readily and available. That way he could also read newly shared information whenever he had the time to do so, thus not interrupting him in his work if someone needed something from him. As stated by that team member:

" *The advantage of sharing information online is that it is historical, so you can*

get a message to update something, but since you are not working with that now you can wait a little. If someone had shared that same information in the room you kinda would have to do it then and there, stopping your work to fix that then go back to working again, which can be disturbing."

The team also had other communication channels, but they had chosen to ignore these for their preferred combination. All of the team members agreed that information sharing was of vital importance for the team to function optimally, but stating that overall sometimes the information shared to the whole team could be trivial for them personally. As stated by one team member when asked about the value of information sharing:

"*It is absolutely essential for a team, especially a cross functional one, to be able to function together at all.*"

6.4 Work assessment behaviours

In the third group I found that teamwork behaviours was more prominent in the meetings compared in the work space. In the overall setting these types of behaviours were shown the least by the team. The comparison of behaviour frequency in the workspace and meetings is presented in Figure 15 and Figure 16.

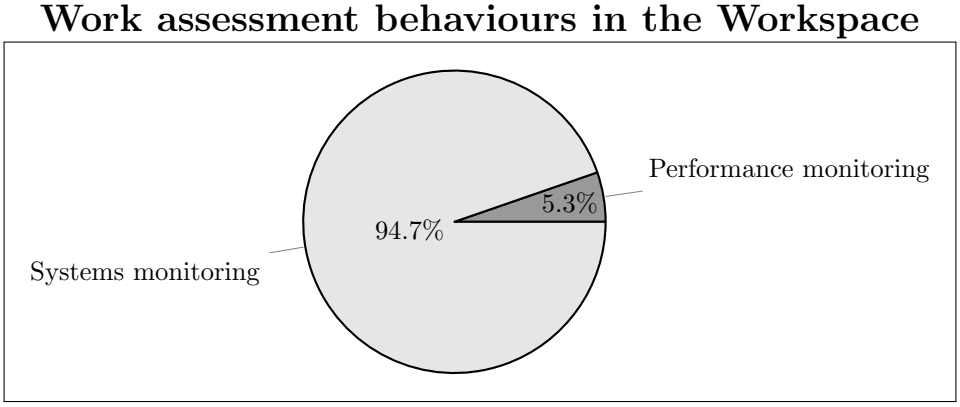

Figure 15: Comparison of "Work assessment behaviours" behaviours in the workspace

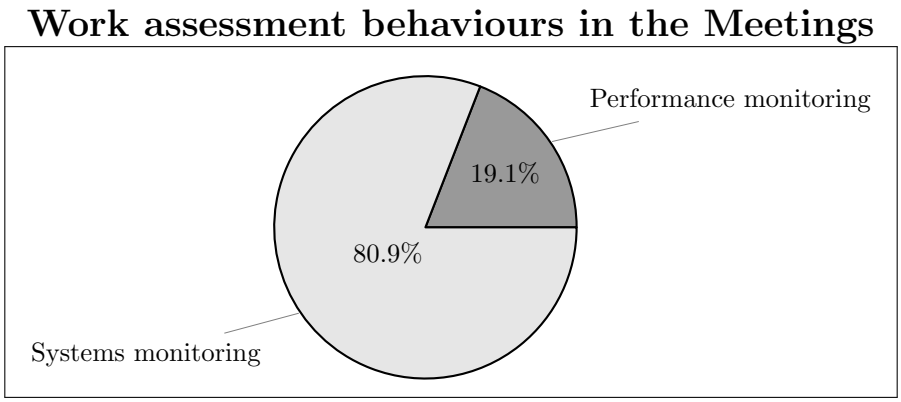

Figure 16: Comparison of "Work assessment behaviours" behaviours in the meetings

6.4.1 Performance monitoring

The behavioural aspect of performance monitoring was only ever observed once in the workspace, where one of the team members checked on the work progress on another, as he was relying on it being ready for him to use for his own work. The team did on one occasion however decide to hold an extraordinary meeting for the team to evaluate how they were doing and what to do going forward, which counts as a planned meeting.

"Performance monitoring" behaviour was shown more in the meetings than in the workspace. Team members would discuss accomplishments and progress on individual tasks, sharing information that could be vital for other team members to know. The PO was also very interested in this information, enabling her to keep track of how tings were going in the team. Team members would discuss what had been done since last meeting, and what they were prioritising to do after the meeting.

When asked about how they evaluated progress most of the team members stated that this was done in the weekly meetings as well as in the stand-up meetings to some degree. Some of the team members also felt that conversations in the workspace sometimes were about what people had achieved on their tasks, which provided an overview of how they

were doing, at least for the people seated in the same workspace. As stated by one team member:

> "*It is the small discussions that continuously appear in the room, that at least for us sitting in the room provides an indication of how far we have come regarding task accomplishment, which gives us an overview.*"

Most of the team members stated that the team sometimes had run into issues regarding task accomplishment, and that they in some of these situations had made either small changes to tasks or completely ignored what they were doing to work on something more important. The use of a Kanban board was highlighted as a method to easily evaluate how they were doing. One of the team members did highlight that the team usually planned very short term, and as such could do small changes if needed. Another team member highlighted the importance of evaluating progress toward goal attainment, stating doing this continuously enabled them to make an overall evaluation of what needed to be done as to achieve their goals, although he felt they did goal evaluation to seldom to be used to make concrete decisions. As stated by that team member:

> "*We have retrospectives and that is a great opportunity to reflect how this period went and if we have reached the goals we set or not. It works well but might be a little seldom to be used more concretely.*"

The team overall felt that evaluating their progress was important, but made the distinction between short term and long term. Being able to plan and do appropriate changes short term were highlighted as important and useful, but long term seemed to be more problematic. As stated by one of the team members:

> "*If you run into larger problems with the architecture or the model or something similar you have to make huge changes to accommodate for this, and that is just how it is. Such things are difficult to include in a plan.*"

6.4.2 Systems monitoring

According to the theory the behavioural dimension of systems monitoring can be both external and internal, and the team was observed doing both these types of assessment. For the most part internal monitoring happened in regards to evaluating their equipment, in the form of system resources. An example of this is the evaluation of different system aspects and whether or not that was appropriate or sufficient enough for the teams usage. The team also evaluated internal resources such as knowledge access, when in one case the team was discussing solutions with another employee of the organisation. When it comes to the external monitoring, the team was mostly observed evaluating aspects relating to their partners or potential partners. In regards to the existing partners they mostly addressed their needs, such as when representatives were visiting the team, testing the solution and providing feedback, or when they contacted their partners to clarify aspects regarding implementation. Sometimes new partners or cases had been identified, and the team would then evaluate the requirements of those. Other external monitoring was monitoring of external systems the team was reliant on, and changes to those.

In the meetings "systems monitoring" behaviour was shown by evaluation of both internal and external factors, just as in the workspace. The difference in this evaluation was the attendance of the PO, which enabled this facilitation to be done more efficiently. The PO was responsible for contact with the partners, and as such she would share relevant information with the team in regards to what she had discussed with their partners. The team would use this opportunity to discuss the information acquired from the PO and what it meant for further development. Having the PO present enabled the team to discuss what they needed from their partners, getting the PO to discuss those aspects with the relevant partners. The team would also use the meetings to discuss and evaluate internal factors, mostly regarding technical aspects of the system.

Due to how "systems monitoring" behaviour was observed in the team, the team members were asked about how they kept an overview over their existing and potential partners. All of the team members were in agreement that this overview were kept by their two product-owners, and that communicating with them was the way to acquire relevant information about their partners. In the overall sense the product-owners handled such information, some team members however noted some exceptions to this. When dealing with a business with a certain degree of technical competence, the team would establish a communications channel directly with the technical branch of this business. That way the team could contact their partner directly regarding technical aspects of the implementation, enabling them to move faster than communicating through the product-owners would allow them to. As stated by one team member:

> "*If it is a technical group then we create a Slack channel together with them so we can communicate, as it provides great usefullness if we have a tight collaboration with them.*"

Another exception was when the team were working more closely with a partner, then they would communicate trough email with the ones responsible in that business. This was done to ensure that there were no faults made to the system according to their partners specifications or needs. As one team member stated:

> "*When collaborating with a partner at a certain point in time, ... , I have contact directly with a person from that business. That works well since I can get information regarding what they need directly from them, ... and then I can filter out some of that information and we will figure out how to do the solution.*"

The team members stated that their frequency for acquiring such information were dependent on the situation in the project, sometimes it was multiple times a day and sometimes once a week or less. All of the team members noted that having the product-owners do this job was of great help to the team, enabling them to focus more on their task at hand,

instead of having to navigate their relative environment. As stated by one team member:

> "*I feel it is great that I do not have to acquire such information myself, and that I instead can go to the PO to get my answer there. In that regard she is sort of our guard. We would never be able to do anything if these service owners would come directly to the team and start chatting with random people, so it is really nice that our PO can be the centre of attention regarding those aspects.*"

Most of the team members also stated that information regarding their partners were mostly of vital importance to their product, and without the information the team would be rendered unable to finish the part of their product made in collaboration with their partner.

6.5 Team adjustment behaviours

In the fourth group I found that the behaviours was mostly represented by team members helping each other or problem solving together. Team adjustment behaviours were the least shown behaviour group in the meetings. "Intrateam Coaching" was the only teamwork behaviour not observed either in the workspace or in the meetings. The comparison of behaviour frequency in the workspace and meetings is presented in Figure 17 and Figure 18.

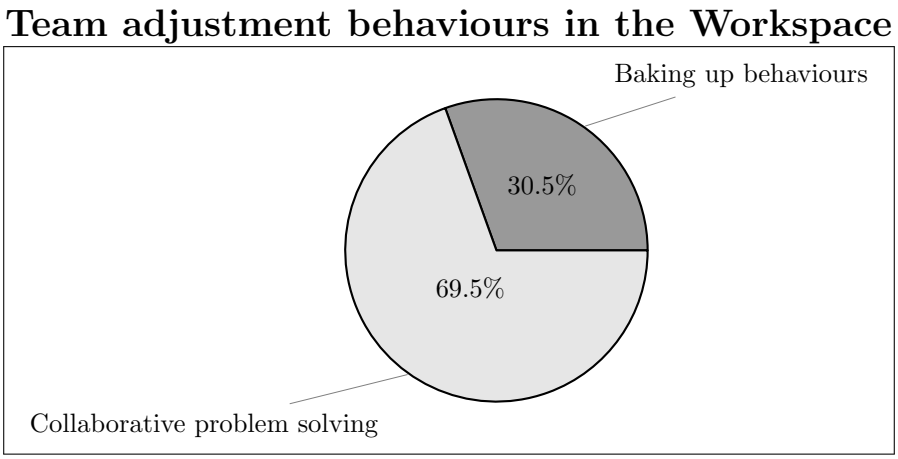

Figure 17: Comparison of "Team adjustment behaviours" behaviours in the workspace

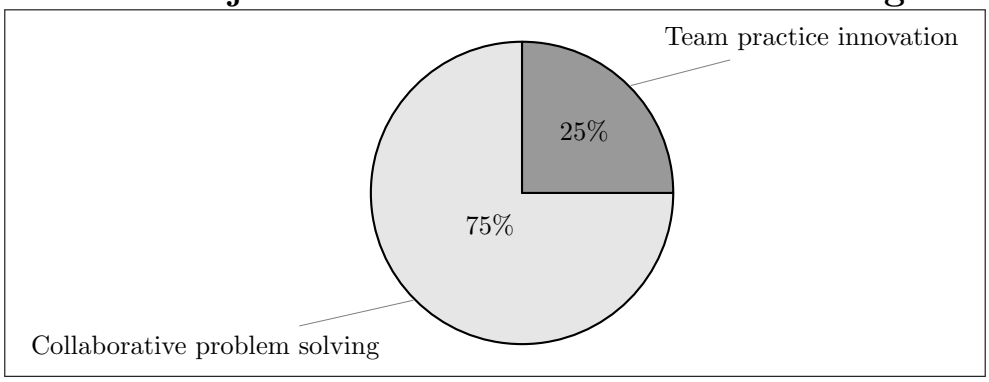

Figure 18: Comparison of "Team adjustment behaviours" behaviours in the meetings

6.5.1 Backing up behaviours

As stated by the theory backing up behaviours concerns itself with the extent team members help each other perform their roles, and the observations of such behaviours consisted mostly of team members providing help or resources to struggling peers. There were no observations of team members filling in for others completing their tasks or helping correct other severe performance related issues, instead the observed back up behaviours were team members helping each other when unable to progress their own work. This

could be in the form of team members needing information regarding how the system works, get help doing something they do not know how to do themselves or if they do not understand what they might have done wrong. Sometimes team members would do alterations to their tasks to accommodate and help other team members complete their tasks more efficiently. The team members seemed to be readily available at almost any time, and were observed to be eager and willing to help their fellow teammates out of a pinch.

When asked about to what extent they have needed help to finish their own tasks, all of the team members answered that this had never been the case while working in this team. When asked more specifically if someone had completed part of their task as to help them, one of the team members stated that they designed their tasks to be intentionally small, such that the task would not take more than 2 days to complete, and as such the developers would continuously integrate their work. This team member stated the following when asked if someone had ever done part of a task he was working on:

> "*No, but that is because the tasks are made small so you deliver tiny pieces at a time instead of one large chunk. This means that your task should not take two weeks to accomplish, and instead two days at max, maybe not even that long.*"

Some of the team members also noted having a specialised role, such that no other team members would be able to fill in for them if needed. It was however noted by one of the team members in the interviews that their tasks were not necessarily designed for a specific role, and noted that it had happened that he had been working on a feature he knew someone else were more capable at completing, and had asked them to take over the task. As stated by that team member when asked if he ever needed help to finish his tasks:

> "*Yes that happens, if I am working on something someone else knows better than me and I cannot quite get the hang of it they are likely to offer help by*

doing it themselves. I like that, and I do it myself relatively often."

Although the team members stated that they rarely needed someone to completely take over their tasks, most of them stated that getting small amounts of help from other team members as a quality assurance, was of great help to ensure the task was finished to standard. As stated by one of the team members:

"*Sometimes things are not up to spec, then you will rewrite some of that code, but I would not count that as taking over someone else's task, although it is sort of similar. It is however a very natural part of development.*"

6.5.2 Intrateam coaching

There were no observations of intrateam coaching behaviour in the workspace or in the meetings. All the team members seemed to abide by team norms and deliver their work on time and with the quality expected by their fellow teammates. Team members were observed giving feedback on the work of others, however this could not be classified as constructive feedback as it was only signs of appreciation for their efforts, and not of the suggestive nature.

When asked about constructive feedback, most of the team members stated that they had both received and provided constructive feedback regarding their work or the work of others. The team members stated that it did not happen that often, and one team member stated that he wished for more constructive feedback in the future. The team said they provided feedback on the work of others, but giving feedback on the work methods of others were something they said they had not done. Multiple team members stated that this is not necessary, as none of the team members break the norm, and as such they try to keep the criticism at a technical level instead of at a personal level. As stated by one team member:

"*We do have technical discussions, and we need those, but we try not to criti-*

cise someone personally, and as such we ensure the discussion is regarding the solution."

One of the team members had an example, where he had been doing an implementation correct on a technical level, but incorrect according to the coding conventions chosen by the team. He had then received feedback from two other team members working in the same area telling him that what he was doing was technically correct, but sub-optimal in the team setting, and as such the team member changed his way of coding to abide by the team conventions. All of the team members said they welcomed constructive feedback with open arms, stating that such feedback is an invaluable way to learn and self improve. As stated by one team member:

"*It is really useful, it is when you have done something and get feedback whether or not what you have done works, that is when you have a great opportunity to learn something. Never getting feedback regarding your tasks and how it worked for different people is not very educational.*"

One of the team members also noted that he thought it to be important to get constructive feedback in both the case of others being satisfied or unsatisfied with his work, and the reasons why. This way he could dissect what was problematic and what worked in his contributions to the team.

6.5.3 Collaborative problem solving

This behavioural dimension was observed as a common phenomenon in the team. Team members would often sit together trying to fix problems occurring in the system. Collaborative problem solving could happen in a multitude of ways such as: team members working to identify the source of a problem, find relevant information regarding the problem, figuring out a solution to the problem, discussing the best possible solution to a problem, and implement a solution to the problem, all while working together. Team members were also observed asking other team members if they could test out something

for them, as this would highlight if the problem had been solved or not. Offering constructive suggestions for change is also considered as part of this behavioural dimension by the theory, and the team was observed doing so as well. Team members were sometimes observed scrutinising aspects of the system, evaluating the longevity of that particular solution, suggesting and discussing possible changes to accommodate better their vision for the future. The team members seemed willing and almost eager to provide help to solve a problem, making both the frequency and coverage of problem solving so high. Overall collaborative problem solving was one of the most time consuming activities performed by the team, when not considering individual work.

In the meetings "collaborative problem solving" behaviour was show by team members either discussing possible solutions to a problem or different aspects regarding a solution in progress. The team would share their thoughts as to what they thought the team needed to consider when discussing the different solutions.

When asked about how they solved problems, most of the team members stated that they would sometimes try to fix the problem themselves, and sometimes they would ask another team member for help. There seemed to be a common consensus in the team that asking for help was the best way to go when stuck on a problem, as not to waste to much time pondering on the problem alone. Most of the team members seemed to run into problems multiple times every day, and stated that they would often use another team member to figure out a possible solution. As stated by one team member when asked about collaborating to solve problems:

> "*I think it is really nice, because you get the thoughts of others as an input and not just the ones you have in your own head.*"

The team members listed multiple benefits of collaborative problem solving, such as sharing ideas, learning from one another and speeding up the process. Some of the team

members also noted that solving problems together increased the quality of the product, as collaborative problem solving would ensure a multi-perspective solution to any problem. As stated by one team member:

> "*It gives me value personally in the context of me completing my work tasks and maybe I learn something as well, and in relation to the product because when people work together you usually get a better result.*"

One of the developers also said that when encountering a new problem it was likely that one of the other team members had encountered a similar problem in earlier work, and would likely have a solution readily available just from their memory. As stated by that team member:

> "*There is more often than not that someone has solved similar problems before and knows potential issues one needs to be mindful of, that you yourself would not think of.*"

6.5.4 Team practice innovation

There were no observations of the "team practice innovation" behavioural dimension in the work space. The team was however observed mentioning that they should implement a solution for automating testing of their system, such that they could verify more quickly if their changes had made a faulty impact or not. As mentioned in the "performance monitoring" section above the team decided to have an extraordinary meeting to evaluate their progress. In this meeting the team also decided to implement a new way of prioritising task, which will be discussed in the paragraph below.

In the meetings the team was observed displaying "team practice innovation" behaviour two times. In the first instance the team was evaluating how they were doing with their work progress in regards to a deadline coming up. The team decided together that they needed to have weekly evaluation of their progress, such that they could do more fre-

quent adjustments to their work plans. In the second instance one team member uttered frustration with how the tool the team used to log their task-work, and the other team members agreed to this. The team member uttering this frustration proposed to implement a physical Kanban board to help them with this problem, and as such the team went back to their workspace and started writing post-it-notes for such a board.

When asked about how they evaluated their work methods and if they made changes based on those evaluations most of the team members stated that they had a retrospective meeting in place every two months to facilitate this. They were however in agreement that although they mostly came to an agreement on how to innovate their methods during this meeting, they lacked the followup of the implementations of such changes. As stated by one team member:

> "*If we actually manage to follow up the changes then it is useful, that is where it stops for us right now. It does not help to talk about making changes if we do not commit to doing so.*"

As such the team members felt that the implementation was the responsibility of each individual rather than the group as a whole, and that they lost track of what they had agreed to after a while. Another team member stated the following:

> "*I think we could be better at remembering what goals we committed to last time. I have the feeling that in these retrospectives it is up to you to use the things you learned there, it would perhaps be useful at the end of the retrospective to commit to some changes and have a table showing us what we have committed to do.*"

The team members also stated that sometimes a team member would highlight something he thought to not be working during a work day, and that they would talk about it and make changes there and then. The team members that made this remark were all in agreement that this worked better than the retrospective meeting, and said it was because

it was easier to discuss and implement a single change quickly than to have a whole list of changes that they would have to implement over a certain time period. As such one of the team members said that he would have liked the retrospective meeting to be limited to two proposals per meeting, such that the team as a whole would be able to focus entirely on those proposals for the coming period. As stated by that team member:

> "*Ideally we create one or two changes that we can focus on implementing, which ideally we would be able measure the effect of.*"

The team found such an evaluation to be helpful, but only if they actually managed to follow up on the proposed changes. One of the team members also said that he felt that such problems raised in a retrospective actually should be raised in the team room, since if there is a problem it is better to make changes to eliminate it immediately. Some of the team members also felt that they were relatively good at evaluating continuously and raise their voice when they dislikes something, at least when it comes to minor issues that are easier to fix.

6.6 Team Classification

The purpose of this study is to analyse an autonomous cross-functional team in its own working environment. It is therefore important to know if the "observed team" analysed in the context of this study actually is such an autonomous cross-functional team or not. To answer this we can start by using the proposed theory by Katzenbach and Smith (2005) from Section 2.4.1 to evaluate whether the "observed team" is a *working group* or an actual *team*. Table 11 will display what traits the group portrays:

Working Group	Yes	**Team**	Yes
Strong, clearly focused leader		Shared leadership roles	✓
Individual accountability		Individual and mutual accountability	✓
The group's purpose is the same as the broader organizational mission	✓	Specific team purpose that the team itself delivers	✓
Individual work products	✓	Collective work products	✓
Runs efficient meetings		Encourages open-ended discussion and active problem-solving meetings	✓
Measures its effectiveness indirectly by its influence on others (such as financial performance of the business)		Measures performance directly by assessing collective work products	✓
Discusses, decides, and delegates	✓	Discusses, decides, and does real work together	✓
SUM	3		7

Table 11: Application of team classification by Katzenbach and Smith (2005)

By assessing and evaluating Table 11 we can see that the "observed team" portrays characteristics that match both a *working group* and a *team*, although the team characteristics were dominant.

The parts of the table where the team displays both characteristics should be explained.

The team would contribute to the broader organisational mission through their own specific purpose, with the team themselves deciding in what direction the project should be headed. The team had both individual work products and collective work products. Examples of individual work products were some of the promotional material the team made, such as posters and flyers. Although the team had two designers that would often collaborate or evaluate each others work, it needs to be acknowledged that the team sometimes delivered individual products in this manner. In the larger scale of things however, the team all worked collectively on the same product. The team would both delegate and do real work together. When work sometimes would be delegated, it would be through a mutual discussion of the necessity of the delegation. Although work would be individual, the team members seemed to always be flexible for collaboration if needed.

Based on the analysis presented above, it can be concluded that the "observed team" can indeed be classified as a **team** instead of a *working group*. This is important going forward because it says something about the coupling of the people working together, as well as the fact that they are working collaboratively towards the same goal. It would also be beneficial to discuss briefly if the team is also autonomous and cross-functional.

Based on the definition given by Doyle (1991) in Section 2.4, that "a standard cross-functional team is composed of those individuals from departments within the firm whose competencies are essential in achieving an optimal evaluation. Successful teams combine skill-sets which no single individual possesses" (Doyle, 1991, p.20), one can say that the team fulfils what it means to be cross-functional according to this "standard" definition. The different members of the team has distinct and unique skills, except for the designers, but as explained in Section 5.2 having two designers on the team was only for a brief transition period. Although the team members had distinct roles and unique skills, there were an overlap in skills between certain individuals inside the team. This overlap enabled the team members to work more fluently, as they had the opportunity to understand and

make changes to work done by others, as well as cooperate on difficult tasks. The team can be said to have all the competency needed inside the team to complete any task currently imaginable, to a certain degree.

Based on the description of autonomous-teams given by Janz et al. (1997) in Section 2.4, that they can be categorised by the fact that they them-selves control work methods, scheduling of tasks, and which team member should complete what task, I would argue that the team can be described as being autonomous. The team continuously and frequently have inter-team communication to asses how they should proceed, what methods to use and even what business cases to pursue. Examples of such autonomy from the observations can be when the team decided they needed an extra meeting to create a plan towards a release date, or when they decided to implement a physical Kanban-board to get a clearer picture of the task progression. As cited from an unscheduled meeting, one of the team members uttered:

> "*Can we not just create a Kanban-board with post-it notes instead? I hate Trello!*"

Summarising what has been mentioned above in this section, the team that has been observed in this study can be said to be an autonomous cross-functional team. They work collectively and collaboratively towards common goals; they have all the qualifications within the team to complete any task that presents itself; and they all work collectively deciding task priorities and methods used. It is however worth noting that assessing to what degree the team is autonomous or cross-functional is much harder than what has been presented above, and is outside the scope of this thesis. Having defined the observed team as an autonomous cross-functional team is beneficial for the contribution of this study.

7 Discussion

This section will discuss the results presented in Section 6. Specifically they will be used to answer the two research questions proposed in Section 1.2, and the discussion will be done with autonomous teams in mind. It is useful to know that the results stems from an autonomous cross-functional team, as presented in Section 6.6. First, the two research questions will be discussed. Then, implications for practice and theory, followed by a discussion of the limitations of this study.

7.1 Differences in Teamwork Behaviours

This section discusses the first research question:

RQ1: How are teamwork behaviours in autonomous teams different in meetings compared to the workspace?

In their study Viktoria Stray (2018) found that participants regularly spent more time in unscheduled meetings and ad-hoc conversations than they did in scheduled meetings. This was consistently the case in my study as well, where team members would prefer to talk to each other over participating in scheduled meetings. Berntzen, Moe, and Stray (2019) found unscheduled meetings and workspace conversations to be important drivers for high-quality communication, and this seemed to be the case for this study as well, having team members continuously engage in ad-hoc conversations. Eisenbart, Garbuio, Mascia, and Morandi (2016) found that scheduled meetings with a pre-distributed agenda led to more personal conflict, whereas unscheduled meetings led to unbiased discussions of task related conflicts, thus showing that team members' behaviours can be altered based on the setting they are in. I found several differences in teamwork behaviours based on the setting, which will be discussed below and summarised in Table 12.

Teamwork Behaviour Differences		
Behaviour	**Meetings**	**Workspace**
Team Mission Analysis	Formal discussions	Informal discussions
Goal Specification	High level goals	Lower level goals or sub-goals
Planning	Higher level and long term planning	Lower level and short term planning
Coordination	Enabled effective coordination with PO	General coordination
Information Exchange	Face-to-face information sharing only	Face-to-face and chat information sharing
Performance Monitoring	The PO can partake in assessing performance	Only team members present to assess the performance
Systems Monitoring	Effective and mostly external systems monitoring with PO	Internal and external systems monitoring
Collaborative Problem Solving	Only discussion of possible solutions	All aspects of collaborative problem solving

Table 12: Summary of differences found for teamwork behaviours

Team Mission Analysis

This type of behaviour was shown differently by the team in the two settings. In the meetings the team would discuss more decisively what to do with the team going forward, whereas in the workspace the team would briefly share ideas with each other regarding the possible future. The team has the role of product development team, and as such are responsible for the direction of the product, meaning the team has to be creative and think in new directions. It is likely the difference in formality between the two settings that creates this difference in behaviour. The meetings are more formal and under time constraint, as well as the fact that the PO are present in most of these meetings. This creates and environment where the most important topics are discussed, as such the team members cannot behave as creatively as they do in the workspace.

Goal Specification

In its essence goal specification did not appear any differently in neither the workspace nor the meetings. Goals would be defined, discussed and reworked if needed. The main difference found in goal specification behaviour was that goals discussed in the meetings appeared to be higher level goals, whereas goals discussed in the workspace appeared to be lower level goals or sub-goals. Having all team members present as well as the PO in the meetings is likely why the goals discussed were higher level, as what is discussed in the meetings concerns the team as a whole and connects the team to the rest of the organisation. In the workspace the goals discussed seemed likely to be task related or related to achievements, and as such team members would discuss how to realise their goals in different ways.

Planning

The difference in planning behaviour appeared to be in the same sense as with goal specification. Planning conducted in the meetings seemed to be at a higher level, concerning itself with planning for goal achievement and partner relations. Workspace planning in contrast concerned itself with general discussion regarding features, mainly how it should be done, by whom and by when. Planning in the meetings also seemed to be much more long term compared to that in the work space. It would not seem irrational that higher level planning would also be in relation to a much larger time frame.

Coordination

Coordination behaviour did not appear to be any different in meetings compared to the workspace. Team members would use the opportunity of meetings to confirm that actions they wanted to complete would not interfere with others, as well as confirm other members availability for cooperation or similar events. Having the PO present enabled the team members to coordinate with her as well, but there is no notable difference in the way the behaviour was displayed.

Nyrud and Stray (2017) found scheduled meetings to be mostly about reporting status and not coordinating work. This was not supported by my results, showing that both status reporting and work coordination appeared in meetings.

Information Exchange

In the interviews the team stated that they used face to face communication and an online chat as their communications channels. The nature of a meeting is that it is a real time face to face experience, and as such an online chat is not suitable to use in meetings. Some team members also stated that online chat communication enabled them to view messages when they had the time, further pushing the idea that an online chat is unlikely to facilitate real time communication well. Information exchange happened in similar fashion in the meetings as in the workspace, where people would either share, seek out or contribute with relevant information. As such the only notable difference was the lack of online communication in the meetings. An exception to this was that on one occasion the team sent some relevant information to a team member, who was supposed to be present in the meeting, through the chat application; although it appeared to be more a reminder than sharing of new information.

Performance Monitoring

Performance monitoring was mostly shown in the meetings, and there seemed to be no difference in how it was done in the meetings compared to the workspace. Team members would share their progress on personal tasks, as well as discuss the overall progress for the given time period, and the meetings enabled the PO to partake in this.

Systems Monitoring

For systems monitoring the presence of the PO in the meetings seemed to affect some aspects regarding this behaviour. As stated systems monitoring can be both internal and external, where external systems monitoring regards itself with environmental factors relevant to the team. The team members stated in their interviews that the PO was the

one handling communication with the partners, and as such having her present in the meetings seemed to enable more effective systems monitoring by the team. This could also be the reason for why systems monitoring appear much more often in the meetings than in the workspace, having the team members use the opportunity wisely.

Collaborative Problem Solving

Although collaborative problem solving by definition seems to be a behaviour tied only to task work, an important aspect of such behaviour is the discussion of possible solutions. This aspect of collaborative problem solving was the one shown in both meetings and the work space. The PO also seemed rather interested in the discussion of possible problem solutions, sometimes providing additional requests relating to this. Based on discussion of possible problem solutions in the meetings, the team members would go back to their workspace and try to implement what had been agreed on in the meeting.

Single Setting Behaviours

Some of the behaviours were only found in one of these settings, and as such I was unable to identify any differences in the appearance of the following behavioural dimensions: "Cooperation", "Backing up behaviours", "Intrateam Coaching" and "Team Practice Innovation". For this there might be several reasons. "Cooperation" behaviour concerns itself with collaborative task accomplishment, while "Backing up behaviours" concerns itself with helping other team members with their taskwork, and as such is likely reasons for why these are not present in the meetings. With "Team Practice Innovation" it seems natural that it is done in the setting of a meeting. There team members can discuss what will be changed, then go back to the workspace and implement the changes, which can be classified as taskwork behaviour and not teamwork behaviour. Lastly "Intrateam Coaching" was never observed, only talked about by one team member in the interviews. Based on his statements it is however hard to determine any difference in appearance, and my guess is that the team members are mostly happy with each other, and as such do not see small corrections as anything noteworthy.

7.2 Importance of Teamwork Behaviours

This section discusses the second research question:

RQ2: How can teamwork behaviours be considered important to autonomous teams?

Through the use of observation the different teamwork behaviours were analysed and their frequencies were found. Based on this the five most displayed teamwork behaviours were found to be: "Information Exchange", "Coordination", "Planning", "Collaborative Problem Solving" and "Systems Monitoring". The potential importance of these teamwork behaviours will be discussed as to answer RQ2. Based on their frequencies and presence in both meetings and the workspace, these top five teamwork behaviours stands out from the remaining ones, and are as such chosen for answering RQ2.

It has to be noted firstly that the behaviours themselves are most likely not that important to autonomous teams. When team members show for example planning behaviour, it is not the behaviour itself that is important, it is instead the fact that the team members are planning together that is important. I would argue that the behaviours are important in the team context as an indication that team members are doing what the behaviour indicates, as in the example above. As such I will discuss the importance of the teamwork behaviours from the viewpoint that what the behaviour indicates the team members are doing is what is important.

Information Exchange

Information exchange happened in different ways in the team, where team member would seek information, share information or contribute to a discussion with information. All of these happened very organically in the team, as seen both in observations and interviews. Team members were not shy to ask for or share information with the others.

What seemed to be important factors for information exchange as highlighted by the team members were their willingness and openness to share information with others, as well as their communications channels being face to face communication while seated in the same room as well as an online chat.

Based on interview responses it seems that the team found information sharing to be of crucial importance for the team to be able to function at all. Some of the team members also highlighted that for a cross functional team they thought information sharing to be especially important. It makes sense to assume that people from different practices working together are not aware of all the intricate details in each others work, and as such frequently sharing information with each other could help bridge that gap.

To facilitate better exchange of information there seemed to be some important factors in place for the team.

Firstly their willingness and eagerness to share information seemed to be an important factor for information exchange. Team members were observed frequently communicating with each other during the work days, and they would spontaneously share information when listening in on other conversations. This was highlighted by many of the team members in their interviews, stating that they felt no one on the team held back relevant information. When someone shared information in the team it seemed like it was always well received, and this might provide an extra motivational factor for team members to keep sharing with the others what they know.

Secondly being seated in the same room seemed to promote information exchange behaviour, as well as make face to face communication as easy as possible. Multiple team members highlighted the fact that being seated in the same room made it so easy to reach out for any team member, or getting the attention from multiple team members when

sharing information. This way information could be spontaneously shared with the rest of the team.

To supplement face to face information sharing the team also used an online chat, which seemed to cover the weak spots of face to face information sharing. Team members highlighted that having information shared in the chat had two main benefits: being able to view that information later and having the information readily available at all times. Being able to view the information when they had the time to do so helped the team members to not be disturbed in their work, enabling them to be more productive. Having the information historically available seemed to help when team members would have missed or forgotten the information had it been shared face to face.

In their study Mesmer-Magnus, DeChurch, Jimenez-Rodriguez, Wildman, and Shuffler (2011) evaluates the effect of virtuality on team information sharing, and concludes with three key findings. First, virtuality improves sharing of unique information, but hinders openness of information sharing. In my study the use of virtual information sharing seemed to increase sharing of unique information, but having an all team channel it seemed to facilitate open information sharing. My findings seems to support the first point, but not the second point. Second, unique information sharing is more important to the performance of face-to-face teams than open information sharing is (Mesmer-Magnus et al., 2011). My findings supports this partially, where in the interviews team members stated that sometimes information shared could be too general, and that they wished for more directed information sharing. They did however also state that general information was valuable, and that they could ignore what did not concern themselves. Third, moderate levels of virtuality improves information sharing, and high levels of virtuality hinder information sharing. My results supports this since the team preferred a combination of both face-to-face communication and the use of an online chat, which seemed to facilitate excellent information sharing; it does however not support the notion that the use of only

an online chat hinders teams in any way.

Another interesting aspect regarding information sharing found by Moye and Langfred (2004) is that information sharing was found to reduce the level of both task and relationship conflicts within a team. This is especially interesting in relation to cross-functional teams, as sharing information can reduce misunderstandings between practices, reducing team conflict. My results show that some team members found information that did not concern them directly to sometimes be of value, either by being educational or interesting, which can support the findings of Moye and Langfred (2004).

E. Hoch (2014) suggests that information sharing might be enhanced when shared leadership is high, leading to better use of team members diverse knowledge backgrounds. In my study the team had shared leadership roles, as stated in Section 6.6, and as my results showed the use of information sharing was relatively high. As such my results support this suggestion by E. Hoch (2014).

Coordination

Coordination seemed important to ensure team members' actions does not interfere with other team members work. If one person is dependent on the work of others, and sits around waiting for that work, that could be a huge cost to the team. Another instance that was displayed in the team was an instance where two team members were going to do a user-test. If someone would have done changes to the backend of the system those two would not have been able to complete their user-test, wasting potentially one workday total. The two team members leaving for the user-test did however coordinate with the rest of the team, making them understand that they could not do system-critical changes until the test was completed.

Coordination seemed to also facilitate scheduling for the team. Team members was fre-

quently observed asking each other if and when they had the time to do things such as meetings, collaborations, evaluations and quality assurance. This was frequently observed, and team members was observed scheduling with everything from one person up to the whole team at a time.

Nyrud and Stray (2017) identifies ad-hoc conversations as the most important coordination mechanism, and this is supported by Viktoria Stray, Moe, and Aasheim (2019) who identifies ad-hoc conversations and open work area to be amongst the coordination mechanisms addressing the most types of dependencies. This seems to correlate with my findings, where team members highlighted being able to easily converse with one another as extremely important, and that being seated in the same room facilitated such conversations.

Planning

Planning was shown by the team when discussing what their best solutions would be, what activities was needed, and their strategies for goal achievement and partner relations. Through planning the team would discuss and select suitable strategies for all of the constructs mentioned above, as well as ensure all team members had a common understanding of the plan going forward, which was highlighted as important in the interviews. This can be seen as planning facilitating the creation of shared mental models in the team. Planning seemed to also facilitate task prioritisation, which was highlighted as especially important during a deadline. Effective planning seemed to be able to facilitate time saving through the use of planning.

Planning seemed to be especially important in providing the team with an overview of what they were supposed to do, and at what time they were supposed to to it. This was highlighted as important, especially in the case when multiple actors were involved. Planning seemed to ensure that no team member would become confused regarding what

they were supposed to do in the future.

Stout, Cannon-Bowers, Salas, and Milanovich (1999) found that teams with higher levels of planning had increased shared mental models regarding the informational requirements of each team member, meaning one team member knows what information another team member needs and by when it needs to be provided. They observed this during high workload periods, where team members would provide information to each other in advance of explicit requests for said information, and as such had fewer errors in periods of high workload. My results suggests that team members had a high degree of knowledge regarding their fellow team members taskwork, and seemed to have a high degree of shared mental models. Shared mental models seems to be crucial to agile teams, as highlighted by Lim and Klein (2006), who found that teams with shared mental models in both regards to taskwork and teamwork performed better than teams with less shared mental models. They also argue based on their findings that shared mental models might help teams under high stress and time pressure coordinate their work as they have a shared understanding of the situation and the actions required, and that members with shared mental models are more likely to agree on priorities and strategies. This notion is especially important to agile development teams, as their work is often classified by being uncertain and time sensitive.

Collaborative Problem Solving

Collaborative problem solving seemed to be important for multiple reasons.

Firstly team members seemed to be able to share the workload of regular problem solving task, such as problem identification, figuring out a solution, deciding how to implement the solution and implementing the solution. Team members were also able to get other team members to test the solution for them on different parts of the system.

Secondly the team was able to get multiple perspectives for the solution. Team members being able to discuss and evaluate a solution together was noted as a way to increase the quality of the end solution.

A third benefit seemed to be that team members could help each other out when stuck on a problem solution. It was also noted that someone else on the team were likely to have encountered similar problems in earlier work, so always asking if someone knows a solution seems like a way to speed up the problem solving process.

It was also noted that a benefit of solving problems together enabled the team members to learn from one another, sharing what they know regarding the specific problem and situation.

In their study, Hausmann, Chi, and Roy (2004) looks at how collaborative problem solving enables participants to learn from the experience, and analyses three ways of doing so. They found that overall collaborative problem solving has a positive effect on learning for the participants. Furthermore they found that co-construction, meaning participants contribute equally and critically assesses each others contributions, led to proportionally more generated knowledge as well as increased problem-solving performance. My results showed that team members thought of collaborative problem solving as a great way of learning from one another, supporting the findings of Hausmann et al. (2004).

Daley (1978) found that working climate and team cohesiveness was positively related to collaborative problem solving processes, whereas team size and task interdependence did not have a notable affect on collaborative behaviours. This is an important notion for the scalability of agile teams, as increasing team size does not demote the use of collaborative behaviours. In my case, the team had created their own working climate as they themselves wanted it to be, as well as they seemed to have a high degree of team cohesiveness.

The team displaying high levels of collaborative problem solving supports the notion of working climate and team cohesiveness affecting the use of collaborative problem solving positively, but does not provide any evidence for team size and task interdependence not having an effect on the use of collaborative problem solving.

Systems Monitoring

As stated in the theory, systems monitoring can be both internal and external. Although the team used internal systems monitoring to assess their system were up to specifications, their use of external systems monitoring seemed to be the most important.

Using the PO as a medium the team would attain important information regarding their partners and their status. The team highlighted the importance of having the PO act in this manner, such that the team would not be disturbed by service owners coming directly to the team. In some cases it seemed important that the team had direct communication with their partners, sometimes going as far as to add them to their online chat. Systems monitoring also seemed necessary when maintaining a partner relationship, and without it collaboration with external parties would be impossible.

Burtscher, Kolbe, Wacker, and Manser (2011) found that systems monitoring was positively related to team performance, but only in the cases where team monitoring(performance monitoring) was low. Their results showed that teams having high levels of both team and systems monitoring had the lowest performance scores. They conclude that spending to much time on monitoring subtracts too many resources from the actual task, stating that both too little and too much monitoring could have a negative effect on team performance. In my case the team used low amounts of performance monitoring and moderate amounts of systems monitoring, having the PO do most of the systems monitoring, as mentioned above. This seemed to be effective, having the team members rating it as an effective way of handling systems monitoring, and seems to support the findings of

Burtscher et al. (2011).

7.3 Implications for Practice

The results presented in this thesis provide several implications for practice, which are presented below.

The level of information sharing in a team, as well as the way information is shared should be considered. Information sharing seems to be crucial for a successful team, and the way information is shared within a team can have different effects. When a team is cross-functional, sharing information helps team members better understand each other, and as such information sharing is important for cross-functional teams. Having team members that are willing and actively participating in information sharing is especially important for effective facilitation of information sharing, and having team members know that no one in the team is holding back on information seems to increase team members trust in one another. Having information shared both face-to-face as well as in an online chat seems effective, as both methods covers the flaw of the other method. Face-to-face information sharing facilitates sharing of general information and ensures all team members get the message, whereas information sharing in a chat facilitates sharing of unique information and enables historical logging such that team members have the information available at all times. Based on my results, having team members use an online chat as well as being seated together in the same room is what is recommended to enable efficient and accurate information sharing within a team.

Teams should be engaged in proper coordination. This would ensure that team members actions does not affect other team members negatively, as well as it enables team members to schedule activities with one another. Ensuring team members actions does not affect other team members negatively is important for not wasting resources. If one team member is going to do a time sensitive task, where system stability is of the utmost im-

portance, then another team member can not do maintenance work on the system during that task. Proper coordination would also ensure that team members understand when someone is dependent on their work. Having the team coordinate properly ensures team members understand other team members needs and troubles. Proper coordination will also facilitate proper scheduling in the team, making it easier to schedule collaborations or meetings. Based on my results, having each team member know and understand certain aspects regarding the other team members needs and task work seems to help with coordination, as such increasing this type of knowledge in a team is recommended.

Teams should actively engage in continuous planning. Planning ensures the team selects the best strategies, as well as ensure that each team member has an understanding of what is to happen going forward, facilitating the creation of shared mental models. Having a team actively engage in planning ensures that team members understands each others informational requirements, which are likely to result in team members providing necessary information to one another before said information has been requested. Teams who engage actively in planning are also more likely to agree on priorities and strategies, which are especially important for teams under pressure from a deadline.

Ensure team members engage in proper amounts of collaborative problem solving. The team observed in this study were all seated in the same room with fixed seating, such that team members could be seated next to the people they were most dependent on. This seemed to be a contributing factor to facilitate collaborative problem solving, and as such is recommended to promote the use of collaborative problem solving. Collaborative problem solving helps team members share the workload of regular problem solving activities, such as identifying the problem, figuring out a solution and implementing the solution. Collaborative problem solving enables the team to get multiple perspectives on a problem, which might increase the quality and robustness of the problem solution. In the case of team members being stuck on solving a problem, having another team

member help enables the one stuck to move on instead of wasting time. Collaborative problem solving also facilitates learning in the team, enabling team members to learn valuable methods and skills from one another, as well as it enables sharing of information regarding the problem. To promote collaborative problem solving the team should be seated in a comfortable environment, and an attempt to increase team cohesion should be made.

Ensure team members have proper team awareness. Team members should know what the responsibility of the other team members are, as well as understand what their contributions does for the solution. Increasing the trust amongst team members are also important, and ensures team members feel comfortable in the team setting. The team observed in this study actively did things together, such as eat out for lunch once a week, or have social activities in the weekends such as going hiking or game nights. This seemed to strengthen the bond the between team members, which is the reason such activities would be a recommendation for anyone interested in creating well functioning teams. When team members feel comfortable in the team setting and have trust in the other team members they seem to actively participate in team activities no matter what is happening, actively joining conversations or discussions started by other team members.

7.4 Implications for Theory

This thesis has shown that theories of teamwork behaviours are applicable to the field of software development and autonomous teams in those settings. This thesis has also highlighted the fact that teamwork behaviours might appear differently in different settings, and provides examples of how teamwork behaviours appear in the meeting and the workspace setting.

Framework of Teamwork Behaviours

The framework of teamwork behaviours presented in Chapter 3 was easy to apply once

sufficient time had been spent to understand and differentiate between its constructs.

The construct of "Team Mission Analysis" showed up relatively often compared to what was originally thought to happen. This might be because the team observed acted as a product development team, being responsible for certain business aspects regarding their own product. Distinguishing between "Team Mission Analysis" and "Goal Specification" did prove to be a challenge, having some behaviours eligible for classification in both groups. To formulate more specifically, sometimes team members were discussing what seemed to be a high level goal but also seemed to concern itself with the future direction for the whole product. The team had a tendency to formulate everything as a goal or a problem, which was something they seemed to prefer.

"Coordination" and "Planning" could also sometimes be difficult to differentiate between. When team members were coordinating between each other discussing long term, that could sometimes be confused with planning.

"Cooperation" and "Collaborative Problem Solving" were the last of the behaviours proving challenging to differentiate. The only difference between the constructs is whether the team members are collaborating on new functionality or correcting existing functionality. This would sometimes go hand in hand, as when people would cooperate they would discover an error, then switch to problem solving mode.

"Intrateam Coaching" was hard to identify, although I tried my best I did not succeed at finding anyone showing such behaviour. It is reasonable to state that the team appeared as a well functioning team with little to no conflict between the team members. The team also appeared to have a high level of cohesion between its members, as such no one seemed to be dissatisfied with the behaviour of other team members.

7.5 Limitations

In this section, I present the possible limitations to this study. It is important to take into consideration the circumstances of this study, that the team observed is one type of team in a specific context, as well as the fact that the team was observed over a short period of time. Other results might occur when observing different types of teams over a different time period.

Inexperience

My inexperience as a researcher might have affected the study, however because of this I put extra effort into eliminating any inconvenience that might have resulted in. I tried to keep bias out of the equation, keeping an open mind when conducting research. I conducted a proper background check into different research methods, and tried to follow the selected methods as closely as possible, as to keep my inexperience from affecting the validity of this study.

Context

The case for this study was an autonomous cross-functional product development team, which was part of a larger organisation. There are multiple complex layers to a setting like this, and as such there might have been information missed by the researcher.

Construct Validity

To improve the validity of this study I chose to follow the principles by Yin (2014), as presented in Section 4.4. I used observations, interviews and chat logs for data triangulation, and the chain of evidence was created and kept in different documents.

External Validity

Since this case-study was of the single-case holistic type, the theory by Rousseau et al. (2006) was used to increase the external validity, as per the guidelines of Yin (2014).

Reliability

To increase the reliability of this study i created both a case study protocol and a case study database, which is recommended by Yin (2014). I have tried to detail in this thesis how I did my case study, and hopefully other people would be able to replicate my method if wanted.

8 Conclusion and Future Work

In this thesis, I have presented a case-study of an autonomous cross-functional product development team and different aspects regarding their teamwork. I have provided background information for understanding the team and their methods, as well as knowledge on teams and teamwork. A description of the research method and why it was chosen, as well as the research context have also been provided. The results acquired from the case-study as well as relevant discussion of the results is then presented. This chapter will provide a summary of this thesis, as well as present some possible directions for future work.

The first research question highlighted how some teamwork behaviours appeared differently in meetings compared to the workspace. The results show that some teamwork behaviours seems to appear as higher level constructs in the meetings compared to the workspace. Other teamwork behaviours appears differently simply because some of its aspects are not suitable for meetings.

The second research question highlights potential benefits of the top five observed teamwork behaviours and why they should be considered important for autonomous teams. These teamwork behaviours were "Information Exchange", "Coordination", "Planning", "Collaborative Problem Solving" and "Systems Monitoring"; all of which had different benefits and ways to be facilitated.

For future work there are several interesting topics to choose. The team observed in this case were free to chose a lot of their own aspects, as such an interesting study would be to evaluate teamwork behaviours in different team contexts comparing the results. A study to evaluate the effects of teamwork behaviours in teams, concluding which behaviours should be in focus for improving teamwork, could also be of interest.

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A Interview Guide

Interview Guide

Intro

- Present myself and the project
- Thank the person for their participation
- Confirm confidentiality and anonymity
- Ok to do a recording?
- ! It is your opinion that counts, no consequences for honest reply's.

Warmup

1. For how long have you been a part of the team?
2. What is your role in the team?
    - What do you work on/what is your responsibility?
    - What are you working on now?
3. What do you feel are your responsibilities?

General

4. How is the product direction decided?
    - Who are in on these decisions?
5. Do you have any methodologies or regular meetings you use?
    - What kind?
    - Who decides these?
6. Is there some other aspects regarding the product or its development that you yourselves decide?

Preparation of work accomplishment

7. What is your teams purpose?
    - How often do you evaluate the teams purpose?
    - How useful are such an evaluation?
8. What are the teams specific goals?
    - Sub goals?
    - How often do you evaluate team goals?
    - How useful are such an evaluation?
9. What is expected from you with regards to the team goals?
10. What are the teams progression plan in regards to the team goals?
    - How are these made?
    - How often do you plan?
    - How useful is planning?

Task-related collaborative behaviours

11. Are you dependent on the work of others to complete your own work?
    - Whom?
    - Has this restricted you in any way?
12. Do you know what the other team-members are working on now?
13. How do you keep an overview of what the others are doing?

- How often do you acquire an overview of what the others are doing?
- How useful is it to have such an overview?

14. Do you ever need to work together with someone else to be able to accomplish a task?
    - Reasons for this?
    - How often do you work together with someone on task accomplishment?
    - How useful is it to work together with someone on task accomplishment?
15. How do you feel the flow of information is within the team?
    - Are people good at sharing relevant information?
    - How often do you share or acquire relevant information within the team?
    - How useful is it to share or acquire relevant information?
16. In what way do team-members communicate with one another?
    - Does this work?

Work assessment behaviours

17. How do you evaluate how you are doing compared to the plan?
    - How often do you do such an evaluation?
    - How useful are such an evaluation?
    - Have you ever experienced or discovered that things are not going according to plan?
    - Do you ever implement changes based on such evaluations?
18. How do you keep an overview of existing and potential partners and their needs?
    - How often do you acquire such an overview?
    - How useful is such an overview?
19. How do you keep an overview of the teams resources?

Team Adjustment behaviours

20. Do you ever need help from some one else to complete tasks that you are unable to finish yourself?
    - Do you often need help to finish a task on time?
    - Did you get the help you needed?
    - How useful is it to get such help from others?
21. Do someone else ever need your help to complete tasks that they are unable to finish themselves?
    - Did you have the time to help?
    - Do you often help people complete their tasks on time?
22. Have you ever received criticism or constructive feedback from the others?
    - Regarding what?
    - Did you learn something?
    - Do you often get such feedback?
    - How useful is it to get such feedback?
23. Do you ever run into problems in your daily work?
    - What type of problems?
    - Do you get help to solve those problems or do you need to figure out a solution by yourself?
    - How often do you get help to solve such problems?
    - How useful is it to work together to solve such problems?

24. Do you ever evaluate the way you do things in the team?
    - Do you ever change your ways or make improvements?
    - How often do you do such an evaluation?
    - How useful is it to do such an evaluation?

Management of Team Maintenance

25. What makes you feel or not feel valued by your team-mates?
    - Does it often happen something that makes you feel this way?
26. How often do conflicts happen in your team?
    - How do you solve these?
    - Do you feel what you have to say are evaluated fairly in such situations?
    - Do you come out stronger or weaker as a team after a resolved conflict?

End questions

27. Is it something about your job that makes you extra happy or extra frustrated?
28. Is it better or worse to work in this team compared to your old work team?
    - Why?
29. Do you have anything more relevant to add to any of the topics we have discussed today?
30. Do you have any questions to me specifically?

Thank you for your participation!

B Participant Agreement Schema

Vil du delta i forskningsprosjektet

«A-Team»?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å få bedre kunnskap om smidige agile team som driver med programvareutvikling. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål
Formålet med studien er å observere og intervjue programvare-utviklere som jobber sammen i team, med mål om å få bedre innsikt i hvordan slike team organiserer seg imellom. Omfanget av Studien er å observere et til flere team i opptil 6 måneder, samt intervjue alle personene fra et team. Studien gjennomføres i relasjon til en mastergradsoppgave. Masteroppgaven skrives i samarbeid med SINTEF, og skal brukes som forskningsmateriale i et større prosjekt. Masteroppgaven skal i tillegg skrives om til en artikkel som skal publiseres.

Hvem er ansvarlig for forskningsprosjektet?
SINTEF og UiO er ansvarlige for forskingsprosjektet.

Hvorfor får du spørsmål om å delta?
Du er utvalgt til å delta i denne studien fordi du er en person av høy interesse som jobber som en del av et tverrfaglig team.

Hva innebærer det for deg å delta?
Hvis du velger å delta i prosjektet innebærer det at du blir observert ved forskjellige anledninger, samt at du stiller deg disponibel til et intervju. Intervjuet vil ta ca. 45 minutter og lydopptaker vil bli brukt etter samtykke. Spørsmålene som vil bli stilt vil omhandle dine tanker rundt hvordan dere som team samarbeider, kommuniserer og organiserer dere imellom.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykke tilbake uten å oppgi noen grunn. Alle opplysninger om deg vil da bli anonymisert. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta, uansett om du nå eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. Masterstudenten samt veileder og prosjektansvarlig ved SINTEF er de eneste som vil ha tilgang til dine opplysninger. Opplysningene vil bli oppbevart på en kryptert server hos SINTEF. All data vil bli anonymisert ved publikasjon, og det vil ikke være mulig å identifisere enkeltpersoner som har deltatt i studien.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?
Prosjektet skal etter planen avsluttes 2. mai 2019. All data som ikke har blitt anonymisert vil bli slettet når studien er avsluttet.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg,
- å få rettet personopplysninger om deg,
- få slettet personopplysninger om deg,
- få utlevert en kopi av dine personopplysninger (dataportabilitet), og
- å sende klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra SINTEF har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

- Universitetet i Oslo, Institutt for informatikk ved Førsteamanuensis Viktoria Stray
- Universitetet i Oslo, Institutt for informatikk ved masterstudent Sondre Kristensen
- Vårt personvernombud: Maren Magnus Voll (personvernombud@uio.no)
- NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen
Sondre Kristensen

Prosjektansvarlig (Forsker/veileder)	**Viktoria Stray**	Eventuelt student	**Sondre Kristensen**

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet *(sett inn tittel)*, og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta i observasjon
- ☐ å delta i intervju

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, ca. *(oppgi tidspunkt)*

(Signert av prosjektdeltaker, dato)

C Observation Protocol

Observation protocol.

Topic	Question
Space	What is the layout of the physical room?
	How are the actors positioned?
Participants	What are the names and relevant details of the people involved?
	Is someone acting as a leader or facilitator?
Activities	What are the various activities and discussions?
Objects	Which physical elements are used?
Acts	Are there any specific individual actions?
	What are the ways in which all actors interact and behave toward each other?
Events	Are there any particular occasions or anything unexpected?
Time	When does the meeting start?
	What is the sequence of events?
	When does the meeting end?
Goals	What are the actors attempting to accomplish?
Feelings	What are the emotions in the particular contexts?
	How is the atmosphere?
Closing	How is the meeting ended?
	Is there a post meeting?