



Degree Project in Computer Science and Industrial Management

Second cycle, 30 credits

The Impact of Hybrid Work on Productivity: Understanding the Future of Work

A case study in agile software development teams

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The Impact of Hybrid Work on Productivity: Understanding the Future of Work

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Master of Science TRITA-ITM-EX 2022:134
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Det hybrida arbetets påverkan på produktivitet: Förståelsen av framtidens arbete

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KTH Industrial Engineering
and Management

Master of Science Thesis TRITA-ITM-EX 2022:134

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Abstract

Organizations has become more hybrid enabling the workers to work partially from the office and partially from home. As remote work was found to have an impact on team collaboration, communication, productivity, and performance, concerns have been raised about Agile Software Development (ASD) teams working remotely. Thus, the purpose of the study is to understand the impact hybrid work has on productivity in ASD teams. The study aims to contribute with knowledge regarding the relationship with hybrid work and productivity. A single case study was conducted, with the use of a sequential mixed method research design. The SPACE framework was utilized to define productivity in software development and was also utilized to support the distributed survey. Moreover, three dimensions of SPACE were selected; job satisfaction, performance, collaboration and communication. Additionally, a focus group interview was conducted to provide a deeper understanding of the survey findings. The empirical findings indicate the hybrid work to impact job satisfaction, and collaboration and communication positively. While the performance was high, there was a low impact of hybrid work. The empirical findings imply that investments in the tools and resources are crucial for the job satisfaction. Furthermore, meetings that involve high participation in collaboration and communication should require physical presence. By allowing for continuous meetings regarding the well-being of workers, a sustainable work-life balance can potentially be achieved. Limitations can be found in the study where the findings are restricted to the context of a single case study. Thus, further research can be conducted to enrich the findings with other settings and strategies.

Key-words

Agile Software Development, Software Development Teams, Productivity, Hybrid work



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och management

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Sammanfattning

Organisationer har blivit mer hybrida vilket gör det möjligt för arbetarna att arbeta delvis från kontoret och delvis hemifrån. Eftersom distansarbete har visat en inverkan på samarbete, kommunikation, produktivitet och prestanda i team, har det väckts rädsla om att team i agil mjukvaruutveckling (ASD), ska arbeta på distans. Syftet med studien är att förstå vilken inverkan hybrid arbete har på produktiviteten i ASD-team. Studien syftar till att bidra med kunskap om sambandet med hybrid arbete och produktivitet. En enskild fallstudie genomfördes med användning av en sekventiell forskningsdesign med blandad metod. SPACE-ramverket användes för att definiera produktivitet i mjukvaruutveckling och användes dessutom för att underbygga den distribuerade undersökningen. Dessutom valdes tre dimensioner av SPACE ut; arbetsglädje, prestation, samarbete och kommunikation. Vidare genomfördes en fokusgruppsintervju för att skapa en djupare förståelse av resultaten från undersökningen. De empiriska resultaten indikerar hybrid arbetet har en positiv inverkan på arbetstillfredsställelse, samarbete och kommunikation. Det visade sig att prestandan i arbetet var hög men att hybrid arbete inte längre påverkade dess resultat. De empiriska resultaten tyder på att investeringar i verktyg och resurser är avgörande för arbetstillfredsställelsen. Dessutom bör möten med högt engagemang i samarbete och kommunikation kräva fysisk närvaro. Genom att införa kontinuerliga möten angående arbetarnas välbefinnande kan en hållbar balans mellan arbete och privatliv potentiellt uppnås. Begränsningar kan hittas i studien där resultaten är begränsade till sammanhanget för en enskild fallstudie. Således kan ytterligare forskning utföras för att berika resultaten med andra miljöer och strategier.

Nyckelord

Agil utveckling, Mjukvaruutveckling, Team, Produktivitet, Hybrid arbete

Acknowledgements

The final report for this master's thesis would not have been possible without the support from everyone involved. First of all, I would like to thank Elina Gobena for contributing with valuable input and feedback during the process of writing the master's thesis. In addition, I would like to thank Anna Jerbrant for the well-structured seminars and the valuable feedback. Furthermore, I would like to thank all the participants at the case company involved in the study for helpful input and feedback. Lastly, I would like to thank Viktor Skånberg for contributing with helpful feedback during the process of the master's thesis.

Acronyms

ASD	Agile Software Development
PO	Product Owner
RQ	Research Question
SDG	Sustainable Development Goals
SM	Scrum Master
UA	Unit of Analysis
WIP	Work in Progress

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Chapter 1

Introduction

This chapter introduces the background to the research topic, presenting the problem statement in the context of prior research, purpose, research question and delimitation of the research. Lastly, an overview of the study disposition is presented.

1.1 Background

Since the emergence of the Covid-19 pandemic, the global economy has changed [67] and disrupted the traditional work model that requires physical presence [127]. Restrictions on the workplace forced many workers, including software development teams, to remote work. Substantial reluctance was found from managers with employees working remotely, indicating concerns regarding the impact remote work has on team productivity and performance [139]. Since agile practices in software development are based on strong communication and collaboration, remote work was found to pose a challenge for Agile Software Development (ASD) teams, as it impacted team collaboration, communication, productivity [27, 104, 114] and performance [83, 94, 96].

The lifted restrictions have allowed more teams to return to the office but instead of returning to the traditional work model, the workplaces have become more hybrid; allowing teams to work partially from the office and partially remotely [19, 78]. Indications of the future of work are found to include flexible workplaces [127]. A survey by Gartner [14] revealed 82 percent of company leaders plan to "allow

employees to work remotely some of the time” and nearly 43 percent of company leaders plan to “allow flex time”. Similar results were shown by Google [117] which found 75 percent of the respondents to believe the hybrid/flexible work to be a standard practice within their organizations in the coming three years. Consistent with these findings, several studies have accordingly indicated partial remote work to continue in the post-pandemic era [16, 45, 89, 122].

Recent research revealed changes in attitudes in the workforce, indicating less stigmatization of flexible work [20]. Researchers found, for example, that most managers have generally been supportive of home work, believing that working from home increased productivity and improved concentration, and that managers were more aware of the problems of work-life balance [20, 44]. In contrast to previous studies indicated remote work to pose as a challenge for ASD teams [27, 83, 94, 96, 104, 114], recent study revealed remote work to have a positive impact on ASD teams with increased job satisfaction and productivity [130]. Research found an inconsistency in the literature on productivity among dispersed ASD teams during the pandemic by noting multiple studies that indicated increased productivity as a result of the pandemic provided insufficient explanation. Furthermore, the research suggested future research on hybrid work during “normal times” due to an increased need to guide practitioners with an understanding of the hybrid work model in the post-pandemic era [99].

The increased interest in flexible workplaces [127] can develop new learning’s of more sustainable aspects in the new ways of working. United Nation [132] have composed 17 Sustainable Development Goals (SDG) in the movement towards a sustainable future where an increased understanding of hybrid work model can provide improvements in the development of the model as well to find the main concerns in the movement towards a sustainable future for ASD teams.

1.2 Problem Statement

Despite several studies on the impact remote work has on ASD teams, none relate it to the hybrid work model, although statistics demonstrate its growing interest [14, 117, 127]. Thus, it reveals a sparsity in the literature that demonstrates the impact hybrid work has on ASD teams in the contemporary post-pandemic era. Moreover, it is not clear what the effects of hybrid work are and how they can have an impact

on productivity in ASD teams, as several studies on productivity during remote work are inconsistent [27, 99, 104, 114, 130]. Findings revealed changes in attitudes toward flexible work [20, 44] that could potentially affect the relationship between hybrid work and productivity. Multiple studies stating the remote work to increase the productivity were revealed having insufficient explanation. In addition, further research regarding hybrid work in the post-pandemic era are suggested [99].

1.3 Purpose and Research Question

The purpose of the study is to contribute with knowledge regarding hybrid work and productivity in ASD teams. Moreover, the impact of hybrid work on productivity will be examined and the potential effects on ASD teams will be addressed. Hence, the focus of the study is to understand the relationship between hybrid work and productivity. The study aims to guide practitioners on hybrid work and productivity in the post-pandemic era. Furthermore, the study will include sustainability aspects of hybrid work by mapping the SDG composed by the United Nations [132] with the findings. Thus, the thesis will investigate the following Research Question (RQ):

RQ. How does hybrid work impact productivity in agile software development teams?

1.4 Delimitation

In order to answer the research question, there are some delimitation to the study. The context of productivity will be based on productivity at the individual and team level within software development. Additionally, the study will also scope down the ASD teams to include purely software developers, and team managers responsible for the software development teams, excluding the roles of UX designers and the roles outside the software development teams. This is due to the fact that the delineating principles of the Agile Manifesto (see Section 2.3) do not include UX designers [77].

1.5 Disposition

Chapter 1: The chapter introduces a background that covers the research topic and relevant research. The chapter further presents the problem statement and the purpose of the study, as well as the proposed research question. Lastly, the chapter presents the delimitation of the study.

Chapter 2: The chapter focuses on previous research to provide the context of similar studies and findings. The necessary terminologies of the study will be defined and explained to establish a foundation as a theoretical framework for the study.

Chapter 3: The chapter presents the methodology of the study which consisting of the research setting, research design, data collection, and analysis. In addition, the chapter presents a discussion regarding the reliability, validity and ethics of the study.

Chapter 4: The chapter presents the results and findings of the study in the form of descriptive statistics, analysis and findings from a thematic analysis. Additional illustrations in the form of graphs and tables will be presented.

Chapter 5: The chapter discusses the results and findings from the analysis in Chapter 4 to answer the research question and will be connected to prior findings.

Chapter 6: The chapter presents the conclusions that can be drawn from Chapter 5. In addition, theoretical contributions, managerial, and sustainability implications will be presented. In addition, the limitations and further research are presented for the guidance of future research.

Chapter 2

Literature Review and Theoretical Framework

The following chapter reviews the literature by defining relevant terminologies and findings from prior research on Remote Work, Hybrid Work, Agile Software Development, and Productivity in Software Development.

2.1 Remote Work

The following section will define the terminology of remote work used in the study. Moreover, presenting historical definitions of remote work in terms of understanding the origin of the coined terminology, as well as how it has been used in the context of prior literature.

Remote work has been referred to as telecommuting, telework, distributed work, virtual work, and distance work, among other labels [5, 37, 49, 97, 111]. A difference in the definition of terminology can create uncertainty in a study context. To eliminate ambiguity, the following describes the origin of the terminology and how it could be differentiated from the most common interchangeable synonyms.

The terms remote work and distributed work are often used interchangeably [97] which is explained since it is derived from the umbrella term distributed work [49]. Distributed work is defined as "the arrangement that allows employees and their tasks to be shared across settings away from a central place of business or physical organizational location" (pp. 1524-1525) [49]. The most well-known type of

distributed work is telecommuting [49], which is recognized as telework or remote work [5, 111]. Therefore, telecommuting is used interchangeably as synonyms for remote work [111]. The definition of telecommuting is conducting work from a remote location away from the traditional workplace office. Furthermore, telecommuting was originally coined by Jack Nilles [95] with the idea to move the work to the workers rather than to move workers to the work in an effort to alleviate traffic problems and reduce energy consumption [5, 11].

The terms telecommuting and telework are commonly used interchangeably, but some argue about the differences between the two. Garrett and Danziger argue that telework is a broader concept that encompasses four dimensions; work location, information technology, time distribution, and diversity of employment [54]. In addition, Ellison argues that telecommuting is more specific and refers to completing work at a remote location to decrease commuting time [37].

However, since the terms telecommuting, telework, and remote work could arguably be differentiated [37, 54], this study will refer to remote work, as an interchangeable synonym with telecommuting and telework, based on the following definitions proposed by Nilles and Fitzer [42, 95]. According to Nilles [95], telework is defined as "working outside the conventional workplace and communicating by way of telecommunications or computer-based technology" (p. 384) [12]. A similar definition proposed by Fitzer [42] defines telework as "a work arrangement in which employees perform their regular work at a site other than the ordinary workplace, supported by technological connections" (p. 336) [43]. The term remote work will exclude those workers who typically do not work from a central office.

2.1.1 The Impact and Effects of Remote Work

In accordance with hybrid work and the purpose of the study, understanding the effects and impact of remote work is crucial. Several studies are addressing the impact of remote work. The most highlighted are Job Satisfaction, Productivity, Job Performance, and Communication and Collaboration, which will be described in the following sections.

2.1.1.1 Remote work and Job Satisfaction

One of the most studied research areas in organizational research is job satisfaction [41, 82]. The relationship between remote work and job satisfaction will be presented below.

Studies suggest that not all hours spent at remote work are related in a similar way to job satisfaction [57, 59]. The relationship between remote work and job satisfaction was positively related at lower levels of remote work while satisfaction plateaued at higher levels of remote work which was estimated at 15.1 hours per week. However, further study by Gajendran and Harrison found that remote work was positively associated with job satisfaction, although the magnitude of this effect was small. In addition, the study attempted to have a deeper understanding of the processes linking remote work to job satisfaction, finding evidence on work-family conflict and the quality of the co-worker relationship acting as partial mediators of the relationship [49]. Extensive research, on the quality of the relationship between supervisor and employees to mediate the effect on job satisfaction during remote work, found that the effect on job satisfaction was heavily based on the quality of the relationship between supervisor and employee. [60]. Fonner and Roloff conducted research based on a split sample of high-frequency remote workers and standard office workers. Research found a significant mediating effect of decreasing work-life conflict, frequency of information exchange, stress from interruptions, and involvement in office politics [43].

Remote work was indicated to be carried out with costs related to the work-life balance having the world of work and other aspects of life collide and overlap [66, 84, 90]. Similar results were revealed in a study with high reports of difficulties for the remote workers to end the work day in comparison to those working from the office. The study suggested the effects of remote work may be negative for work-life balance, while beneficial for the attachment to the organization, enthusiasm for the job, and job satisfaction [39]. The most important ability to gain a positive work-life balance was the ability to manage working hours [85]. Overworking during remote work was found to induce burnout due to the difficulty in flexible work to switch off entirely from work, as well that flexibility may increase the workload [61].

The amount of technical and human resource support provided by the organization showed a positive effect on the relationship between job satisfaction and remote

work. Similarly, the trust of managers, the amount of remote work training in the workplace, and minimal interruptions from family members during work time were other factors that showed a positive impact on job satisfaction for remote workers [13, 65]. Regarding the personality of remote workers, it was reported that those with a greater tendency to seek order and a higher need for autonomy had greater job satisfaction than those with lower needs [98].

2.1.1.2 Remote work and Productivity

Inconsistency in the literature regarding the impact remote work have on productivity has been found [27, 99, 104, 114, 130]. Thus, it increases the importance of understanding and identifying the variables that have been found to moderate the relationship between productivity and remote work.

A study by Fayzieva et al. has shown that remote work has a positive relationship with employee labor productivity and the effectiveness of the entity during the Covid-19 pandemic. The study supported remote work to improve or impede firm performance depending on two main channels; a direct channel that affects the firm performance through changes in efficiency, motivation, and knowledge creation of the workforce, an indirect channel for remote work facilitating cost reductions to free up resources for productivity-enhancing innovation and reorganization [38].

Galanti et al. found variables affecting productivity both positively and negatively. Work demand and family-work conflicts at work were found to negatively impact productivity, while job autonomy and self-leadership were found to positively impact productivity. More specifically, employees having children under 14 years old experienced a negative impact on productivity in combination with family-work conflict of household chores [51]. Additionally, findings revealed that people emotionally affected by the Covid-19 pandemic were positively associated with higher levels of productivity and engagement [51, 55, 68]. Therefore, remote work was suggested to play a protective and anxiety alleviating role for workers, as it did not require physical presence [51].

2.1.1.3 Remote work and Job Performance

The relationship between remote work and job performance is an additional link that has been studied prior to the pandemic. The findings will be presented in the

following.

Gajendran and Harrison proposed that remote work was positively associated with supervisor-rated or objectively measured job performance [49]. A further study by Golden and Veiga suggested that employees who work extensively in remote locations exhibited high job performance unrelated to quality exchange with their supervisors [60]. The high job performance was suggested to be impacted from the personal benefits of remote work [63] and therefore displayed greater effort and dedication to work despite the quality of the supervisory relationship [60]. Similar results were found in study indicated that the tasks and contextual performance rated by the supervisor were evaluated as higher for remote workers than for non-remote workers [50].

Administrative work focusing on repetitive tasks with a defined time schedule was found to be not compatible with remote work. Administrative work was found to contribute with high performance when done in person in comparison to remote workers adding different communication media to obtain and coordinate tasks information with different people. In addition, the added layers of coordination and communication increased the lead time to get work done. The job performance however, did not lose efficiency as workers continued to perform their responsibilities, but the cost of efficiency was lost in increased lead times, as well as quality of life and physical and mental health [105]. Shared leadership among team members could encourage team members to effective coordination, knowledge sharing and conflict management. Moreover, shared leadership could give each team member the authority to deal with issues instead of relying on other team members to the decision making. In the situations with high uncertainty, similar to the pandemic, fast response will be critical [9].

2.1.1.4 Remote work and Collaboration and Communication

Collaboration and communication between workers are important parts of work to share information with one another [15]. Physical separation may impede such collaboration and communication. As knowledge sharing depends on the level of trust between co-workers [3], trust is more likely to be developed via an interaction face-to-face than electronic communication [108]. Hence, remote work may threaten knowledge sharing within the organization [128].

The technological support and frequency of face-to-face interactions were found to moderate the relationship between trust and knowledge sharing. The increasing age of the workers was associated with lower productivity, which was suggested to be explained by the difficulties that these employees may have with technological tools and their lower ability to adapt to changes [51, 58, 119]. Digital technologies for communicating were found to partially mitigate the isolation experienced by workers in comparison to physical presence where the social interactions can naturally be encountered [43]. However, technology can foster collaboration between team members and bring team spirit [9]. Technological innovations with informal visual observations [8] and real-time visual feedback from team members [22] was found to increase awareness and could thus mitigate the negative effects of remote work [9]. Team managers can as well reduce the adverse effects of isolated remote work by fostering ties among the team by conducting meetings between members using media-rich communication channels [80].

There is a sparsity in research that has addressed the impact of remote work on knowledge sharing between teams [58]. However, Golden and Raghuram conducted a study on remote workers for 6 months. Those remote workers that reported an increased trusting relationship within their team, stronger interpersonal bonds, and greater organizational commitment also reported greater knowledge sharing later in the 6 months [58].

Task interdependence refers to the degree to which team members identify with each other and intend to help each other both through their actions and through the provision of resources to effectively perform their tasks [70]. A high level of interdependence requires a high level of coordination and interaction with others [5]. Thus, a concern is that distributed work, such as remote work, can make this coordination difficult which could adverse the positive effects of remote work, such as flexibility and freedom [59].

2.2 Hybrid Work

As hybrid work is a focus of the study, a review of the differences in the model and the effects it has on the workers is crucial for understanding the purpose of the study. The hybrid work model is defined as the combination of partial remote work and partial in-person working such as presence at the office [19, 78].

According to Lenka there are three types of hybrid work models: remote first model, office occasional, office first - remote allowed. In the remote first model, most of the employees, and management team would generally work remotely. However, if there is an urgent requirement for physical presence, some employees have the opportunity to work one or two days a month in the office. There would be physical office space for employees who need it; however, the use of the office space would not be very frequent. The office occasional model is where organizations allow employees to be present in the office two or three days a week. The concept is suitable for organizations with local employees as they have to be in the office occasionally including the management and higher authority. Those who cannot attend the office could work remotely. The concept of an office occasional model could have some drawbacks; for instance, employees who are working remotely may feel insecure and think of themselves as second-class citizens. Since working remotely may separate those who work physically in the office and those who work remotely, leaving the remote employees on the sideline if those in the office would be given more importance. Combining the models of remote-first and office occasionally describes the last model, the office first - remote model. Organizations that utilize this model have most of the employees working occasionally remotely. Many of the employees including the management team attend the office regularly and the ones who opted for remote work are kept in the loop and in addition briefed on the important discussions. There are potential drawbacks to this concept, such as it can cause remote employees to feel out of place and can also decrease communication between employees. [78].

Hybrid work models require clarity about job roles, since it is necessary to decide which tasks are best suited for remote work and office work. In addition, it is advisable to use asynchronous form of communication to include team members with necessary information regarding work [72].

2.2.1 Opportunities and Challenges with Hybrid Work

The hybrid work model includes both opportunities and challenges. The greatest challenge with the hybrid work model is teamwork, as it requires coordination between team members and strong communication that could affect work performance and productivity. The hybrid work model could reduce employee engagement as well since employees do not see each other. If a problem occurs, it becomes virtually difficult to solve it. Remote workers can become bored at some point, decreasing communication

and disengagement [78]. Hybrid work can in addition make remote employees feel isolated and deprived in terms of social interaction [72].

Working hybrid requires tools to be up-to-date due to remote work becomes difficult when tools are not up-to-date or there are connectivity or internet issues that could cause pending work, poor communication, and affect performance and efficiency. Additionally, a hybrid work model could cause reduced employee visibility due to the challenge of tracking employee work. This introduces a problem to the management since there is a lack of information regarding the progress of employees which could cause an impact on employee performance appraisal, career development and promotion [19, 78].

Furthermore, there is evidence that working hybrid causes concerns about missing out on conversation and office interaction in a situation of isolation[19]. Therefore, employers must carefully manage the transition of hybrid work carefully to realize the maximum benefit and avoid creating a two-tier workforce. Communication will be key since uncertainty over the future of work is one of the main causes of anxiety [20].

On the other hand, there are opportunities as well with the hybrid work model. The hybrid work model contributes towards cost savings for both the employer and employee [19, 78]. Moreover, hybrid work provide the opportunity for companies to save expensive office maintenance costs [72]. Employees could have the flexibility to work whenever, saving time in commuting, and being able to work in a comfortable environment of their own choice which could increase happiness and focus. Thus, being able to perform better and increase efficiency level. Furthermore, the hybrid work model could allow employers to attract more geographically dispersed talent [20, 78].

Hybrid work model is suggested to provide the opportunity to recruit the best talent from all over the world since the model reduces the physical barriers of locations. From the employer's perspective, it improves the company's performance and gains a competitive advantage. Additionally, the hybrid work model could increase employee safety since employees with symptoms could work remotely and prevent the spread of certain viruses [78]. Furthermore, the overall experience of hybrid work was positive and effective compared to the traditional office environment [19].

2.3 Agile Software Development

The meaning of agile is to move quickly and without effort, which is a method to develop software rapidly and accept changes. As ASD teams have been found to be challenged during remote work, it is crucial to understand the definition of agile and its development from the time it was coined to the most frequently used methods. The agile method in software development is defined by four core values, and twelve principles, defined in the Agile Manifesto [17]. While the Agile manifesto describes what ASD is, it does not explain how managers should implement and follow them. Thus, several agile frameworks have been developed over time to meet this need. The most popular frameworks in ASD are Scrum, Scrumban and Kanban [33], which will be described in the following sections, but before introducing the different methods, ASD will be described.

2.3.1 Defining Agile in Software Development

The Agile Manifesto was articulated in 2001 and lays a foundation for the methodologies in ASD. The fundamental idea behind the creation of the Agile manifesto was to create a uniform philosophy for Agile methodologies in software development [17]. The four core values that stem from the Agile manifesto are presented in the following;

1. Individuals and interactions over processes and tools
2. Working software over comprehensive documentation
3. Customer collaboration over contract negotiation
4. Responding to change over following a plan

The methods used in ASD can be seen as a reaction to the plan-based or traditional methods which emphasize "a rationalized, engineering-based approach" claiming that if the problems are fully specifiable that there exists an optimal and predictable solution for every problem [35, 93]. In contrast to "traditionalists", to make development efficient and predictable, extensive planning, codified processes, and rigorous reuse are instead advocated [23].

In an unpredictable world, agile processes address the challenge by relying on "people and their creativity rather than processes" [35, 93] where an ideal team

size comprise of 5 to maximum 10 people [143]. Additionally, Abrahamsson et al. define the characteristics of ASD with four key characteristics: incremental, cooperative, straightforward, and adaptive. Software development is agile if there are small software releases in short cycles (incremental), while having constant work with customers and developers with close communication (cooperative). The agile method itself should be easy to learn and modify as it is well documented (straightforward) and the development should allow last moment changes (adaptive) [1]. Moreover, Beck describes ASD as efficient, flexible, low-risk, and predictable [17].

2.3.2 Defining Scrum in Software Development

Scrum is primarily used to manage projects in situations where it is difficult to plan ahead, with mechanisms for "empirical process control"; where feedback loops constitute the core element [115]. The team in the Scrum methodology, which is usually self-organizing, consists of developers who perform the work, a Product Owner (PO), and a Scrum Master (SM). Each team should be small, and preferably fewer than 10 people, and it is sufficient if each member has cross-functional skills. The role of PO and SM does not need to be a designated full time role, in which means a developer can take on both the role as a PO and developer. However, the role of PO and SM should respectively be filled by a single person. The PO is accountable for maximizing the value of the product that is the result from the work of the team. Thus, the PO is responsible for prioritizing the team backlog and communicating with all stakeholders, in which the backlog should represent the needs of many stakeholders. The SM on the other hand is responsible for establishing the Scrum methodology by helping everyone in the team to understand its theory and practice, both within the team and organization. Thus, the SM is responsible for the effectiveness of the team to work in an agile way and to follow the Scrum framework.

The software is developed in increments called sprints, which are usually 2-4 weeks long [116]. Each sprint starts with planning and ends with a retrospection, to plan what to do in the following weeks and to reflect on how the team can improve themselves and take action accordingly. After each sprint, the team has a demo for the stakeholders of the project, showing what has been created in the sprint. The features that will be implemented in the system are recorded in a backlog. The PO is the one who decides on the items that will be developed in the next sprint, where the items in the backlog are ordered according to their importance. Work coordination among team members

will primarily be done through daily stand-up meetings where one team member, the SM, is in charge of solving problems that hinder the team from effective work [115, 116].

2.3.3 Defining Kanban in Software Development

Kanban was first described in a book by Anderson in 2010 [7] and is a method that helps design, manage, and improve software development workflow systems. The name Kanban comes from the use of Kanban as visual signaling mechanisms to control Work in Progress (WIP). Kanban is applicable in situations where work arrives in an unpredictable mode and/or the work should be deployed as soon as it is ready instead of waiting for the other work items. In this methodology, there are no predefined roles. Instead, the work starts off with the current processes and thereafter improves over time.

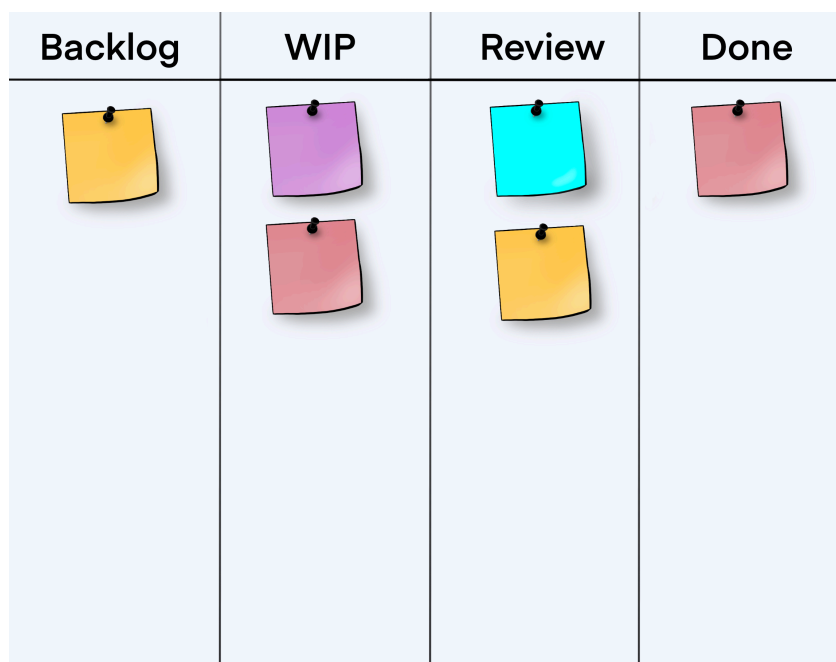


Figure 2.3.1: An example of a Kanban board

The main values that the Kanban methodology advocates are transparency and limiting the WIP. To create transparency, the methodology uses a Kanban board to visualize the work, such as the one shown in Figure 2.3.1. Additionally, the Kanban board utilizes multiple columns to represent the state of the work items, where the flow usually starts from left to right on the board. The left-most column represents an input queue that contains the work items to be processed while the right-most column represents items that have been pushed to production. Transparency remains as long as the board is

visible to all stakeholders and the team, providing immediate information on the work status of items, the responsibility of an item, and the current work status of each item. Furthermore, limiting the WIP can also be accomplished through the utilization of the Kanban board, where each column has a limit on the number of work items that can be placed simultaneously. Additional work items can be added when a column is not full, meaning work items cannot be placed in the full column until some of the items is moved to the next column. Through the use of limiting work, it protects the teams from a simultaneous overload of work [7].

2.3.4 Defining Scrumban in Software Development

Scrumban is a combination of the two methodologies Scrum and Kanban [76]. The advantage with Scrumban is that it utilizes the planning on-demand technique in contrast to the sprint planning in Scrum. Instead, there is continuous work with backlog items that can be pulled in at any time, while there is no need to wait for the next sprint. In addition, the team plans only when there is a demand, which saves time and allows the team to focus on quality control of existing work items in the process. In addition, Scrumban utilizes inter-process buffers and flow diagrams to show weaknesses and opportunities of the process which provide the opportunity to eliminate non-value-adding work items to the customer.

2.4 Productivity in Software Development

Defining productivity in software development is rather challenging, as the measurement is depending on continuous changes in the organization, the complexity of the tasks and the processes involved [136]. Therefore, the definition of productivity in the study is critical to understanding the context of the study. By understanding the definition, measurement and prediction of software development and productivity could enable organizations, managers and developers to produce higher quality software efficiently [47]. Investments in research activities can additionally provide high-tech firms, such as software development companies, to improve their productivity [124] and to benchmark their data [87]. The terminology of productivity is referred to the ration between output and input across disciplines and domains. This way of measuring productivity can pose a challenge, such as the evaluation of productivity with what the output should consist of in terms of quality

and quantity, and among other dimensions. As the most important component in software development is people, the quantification of people's qualities and abilities is therefore very difficult to quantify [136]. Other factors such as the increase in team size was found to decrease productivity in ASD teams [88]. Therefore, extensive research has been conducted on what can affect productivity in software development [136]. Therefore, the recent article by researchers from GitHub, the University of Victoria, and Microsoft has proposed a new framework to define, measure and predict software development productivity [47] will be presented in the following sections to define the terminology of the study.

2.4.1 SPACE

SPACE is a framework used to define, measure, and predict software development productivity. SPACE stands for Satisfaction, Performance, Activity, Communication, and Efficiency. According to the authors [47], each of these dimensions captures the key to understanding and measuring productivity. Additionally, for each of the dimensions, there are different levels that could be applied, including individual-, team- or group- and system-level. However, it is not advocated to utilize all of the metrics at once, rather to carefully select a reduced set of metrics suggesting at least three different metrics. A further suggestion is that at least one of the metrics include perceptual measures such as survey data. Including perceptions based on people's lived experiences provides a more complete picture of productivity. In addition, the perceptual data may provide more accurate and complete information in comparison to an observed instrumenting system behavior alone [46]. For this thesis, this framework will solely take into account the three dimensions; Satisfaction, Performance, and Communication, since these dimensions were the most highlighted in the findings of remote work (see Section 2.1.1).

2.4.1.1 Satisfaction and Well-being

In the context of the SPACE framework, satisfaction is described as how fulfilled developers feel within their work, team, tools or culture whereas well-being is how healthy and happy they are and how their work impacts it. Measurement of satisfaction and well-being can be used to understand productivity [125] and potentially for prediction [92]. For instance, there is a correlation between productivity and satisfaction, in which satisfaction may serve as a leading indicator of productivity.

A decline in satisfaction and engagement could signal future burnout and reduced productivity [86].

For example, the shift from mandatory remote work during the pandemic resulted in many increases occurring in some measures of productivity, e.g., code commits and time to merge pull request [56] yet it has been shown through qualitative data that some people were struggling with their well-being and work-life balance[26]. This framework captures several aspects of productivity, highlighting the importance of balanced measures by painting a more holistic picture and showing that productivity is personal. Satisfaction and well-being are best captured through surveys. To assess this dimension, the following assessments should be included [47]:

- **Employee satisfaction:** The degree of satisfaction among employees, and whether they would recommend their team to others.
- **Efficacy of the developer:** Whether developers have the tools and resources they need to get their work done.
- **Burnout:** Exhaustion caused by prolonged and excessive workplace stress.

2.4.1.2 Performance

Performance is described as the result of a system or process, which is difficult to quantify, as it can be difficult to identify a direct link between individual contributions to the results of the product. For example, it is not clear whether a developer who is producing a large amount of code is writing with high quality. Furthermore, high-quality code may not deliver customer value as features may not always result in positive business outcomes. By considering these reasons, performance is arguably best evaluated as outcomes instead of output. Therefore, examples of metrics to capture performance dimensions could include [47]:

- **Quality:** Reliability, absence of bugs, ongoing service health
- **Impact:** Customer satisfaction, customer adoption and retention, feature usage, cost reduction.

2.4.1.3 Communication and Collaboration

Communication and collaboration are together the dimension that captures how people and teams communicate together. In the

context of software development, which requires collaboration, extensive and effective communication, and coordination within and between teams [48], an effective team is based on high transparency [31] and awareness [34] of the activities of the team members and the priorities of the task. Additionally, an effective alignment and integration of work within the teams need available coordination of where to find information and documentation.

A more diverse team performs better than a team with fewer diversity [135] since these teams are more likely to successfully brainstorm new ideas and choose better solutions from all alternatives. On the contrary, work that contributes to a team's outcomes may come at the expense of an individual's productivity and state of flow. Therefore, to measure such invisible work [126] and articulation work [113] for coordination and planning, is hardly difficult and complicated. The following are examples of metrics that may be used as alternatives to measure communication, collaboration and coordination [47]:

- Discoverability of documentation and expertise
- How quickly work is integrated
- Quality of reviews of work contributed by team members
- Network metrics that show who is connected to whom and how
- Onboarding time for and experience of new members

Chapter 3

Methodology

In this chapter, the conducted methodology is discussed, in terms of the chosen research setting, the research design, data collection and analysis. In addition, the chapter is followed by a discussion of research quality and ethics. The entire study was conducted from January 2022 to June 2022.

3.1 Research Setting and Case Description

The research setting for the study was set within ASD teams working hybrid. A case study was conducted at the company Mentimeter, at their headquarter in Stockholm, Sweden. Mentimeter is a scale-up with approximately 251 employees. The company provides an interactive presentation software that is used by 14 million presenters. Mentimeter was chosen as a suitable case company for the study since their software development teams use agile methods and there is an established hybrid work model in practice. Thus, enabling the study to be set in a real-life setting [112]. Since the study is delimited to investigate the software development teams and their corresponding team managers, only the technology department of the company was considered. Thus, the software development department of Mentimeter consists of 7 teams in total, with around 43 people in what will be referred to as the Unit of Analysis (UA). Furthermore, the standard hybrid work model at Mentimeter comprises 2 working days remotely from home and 3 working days at the office where the arrangements are discussed within the teams. Thus, the hybrid work model utilized by the company describes the office occasional model presented by Lenka [78]. All teams at the technology department utilize a Kanban board from Trello, which is a collaboration tool to

organize projects into boards to visualize for instance the WIP [10]. Each team has their own way to track the WIP, but each team has stand-up meetings and retrospection as described by the Schwaber and Sutherland [116]. Other communication tools such as Slack, Google meetings, Zoom, and Github are used. Slack is used for the teams to communicate between teams and different departments of the organization, for instance organizing communication for every project, topic or team [121]. Google meetings, and Zoom are applications used for having video meetings, whereas Github are used for publishing the software development work of the company product.

3.2 Research Design

This study conducted a sequential mixed method research design using a single case company with the focus of understanding the relationship between hybrid work and productivity. With regards to the purpose of the study, a case study was considered suitable to set the research context in a real life setting [112]. A case study is considered to allow for a holistic view of the case and provides an understanding of the life cycles of the events that occur, providing the researcher with a wide range of evidence such as interviews and surveys [141].

Furthermore, Siggelkow [120] argues that the existence of a phenomenon can be well described by single case studies. Single case studies can provide a deeper understanding of the subject since more careful study can be made [36]. In regards to the benefits of a single case study, and the time constraints of the master thesis, a single case study was arguably the most suitable choice of methodology. Moreover, a single case study enabled the production of theory during a shorter amount of time as opposed to a multiple case study. Thus, a single case study was arguably more time efficient, as the researcher could carefully study a single case [36], which is an important aspect in regards to the time constraint of the study. Additionally, as the study's context was based on only one specific group of people, the UA, a single case study was recommended [138].

Furthermore, a sequential mixed method research design was chosen to enable the researcher both to examine and understand relationships between variables and to elaborate the initial set of findings [112]. A mixed-method approach was chosen as fundamental since it provides a holistic view of the research problem examined [129]. The utilization of both quantitative and qualitative method was suitable for the study

since it enabled the researcher to initially capture numerical characteristics, and could be enriched by a qualitative method for the capture of in-depth information. Thus, the mixed-method was undertaken in a sequential order.

The case study started off using an deductive approach. A deductive approach builds upon a theory that is often developed from the academic literature, and designs a research strategy to test the theory. The study collected data and relevant theories during the literature review to be used as a foundation for the data collection, mainly to initiate the quantitative method. After the collection of quantitative data, the study conducted instead an abductive approach. The abductive approach enabled the study to continuously improve the link between theory and empirical by modifying existing theories through the ongoing addition of data. Thus, it enabled the study to iterate back and forth between theoretical knowledge and empirical data [21]. Additionally, neglect-spotting was used to find overlooked areas in the literature [110] and with the combination of an abductive approach enabled the researcher to iterate the research problem and literature during the collection of data. The whole process can be visualized in Figure 3.2.1.

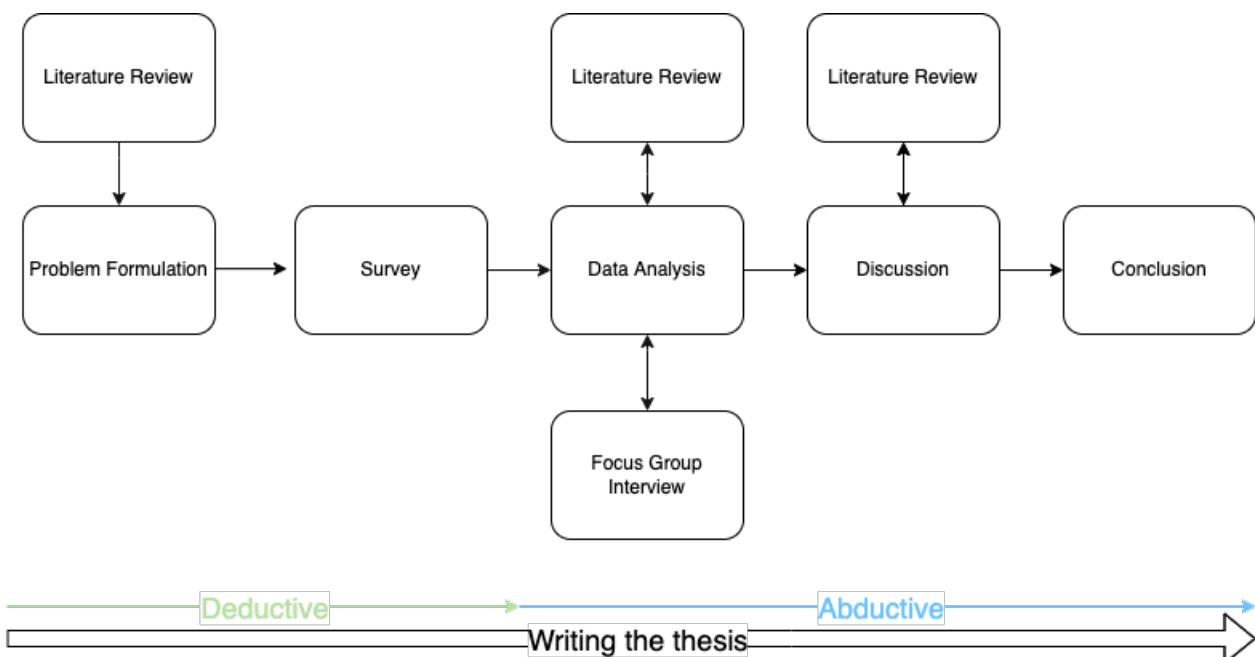


Figure 3.2.1: A visualization of the process of the master's thesis

3.3 Literature Review

The conducted literature review was the initial inquiry of data collection. As the study started off as mainly deductive, the review of the literature was crucial to obtain collective evidence as a foundation to a theoretical framework for nuanced perspectives within the research area. Additionally, the literature review to map the study to prior research relevant to the scope, as well as evaluating the scope [123]. Besides increasing perspectives and knowledge from prior research, the literature review aided the research to identify gaps in prior literature and position the study in relation to current and prior research [30]. Therefore, a literature review was needed since there were divergent views or a lack of consensus on the research area [24, 62].

A search engine that searches a variety of journals and other sources was desired to avoid any bias by publishers [140]. Example of such search engines includes Web of Science, Scopus and Google Scholar [53]. The literature was primarily retrieved from Scopus due to its trustworthiness in providing peer reviewed literature, and Google Scholars to have access to a higher range of literature due to the sparsity within the research area. Additional quality checks were conducted to ensure the literature to be reliable by manually controls for peer reviews and citations. Since the keyword "remote work" was defined as an interchangeable synonym to "telecommuting" and "telework", they were included in the search queries. The same implied for the keyword "productivity", were the SPACE dimensions [47]; "job satisfaction", "performance", and "communication and collaboration" were used. The search queries used can be found in Table 3.3.1. In addition, forward snowballing was applied recursively to find more relevant literature [140].

Search words
("remote work" OR "telework" OR "telecommuting") AND ("productivity" OR "job satisfaction" OR "performance" OR "communication and collaboration")
"hybrid work model"
"agile software development"
"agile software development teams" AND ("remote work" OR "telework" OR "telecommuting")
"productivity" AND "software development"

Table 3.3.1: Search queries used to retrieve the literature

A narrative literature review was conducted to keep track of the historical concept

of remote work as it was recommended for the purpose of a literature review [40]. Articles, books and journals were considered relevant if they were published during the pandemic but the study included literature prior to the pandemic as well due to the sparsity in the literature. This was considered crucial for the nuance of the problem formulation since the study regarded the contemporary practice of hybrid work related to prior findings of remote work. Conference proceedings were as well included but used with more caution. The literature review also included gray literature, since it can be argued that it is important for software engineering research to include not only scientific literature for accurate results [53]. For instance, Digital.ai annually distributes numbers from a large survey on agile status in different organizations [33]. The report from the survey helps this study to answer the current state of agile such as the most common agile methods and their development over time.

3.4 Data collection

Through informal discussions and observations of the employees at the case company, a formed understanding of the organization was captured to guide the researcher to find relevant literature and to set a foundation for the data collection and the description of the case company throughout the study [112]. As primary data are research data generated from an original source, such as study experiments, questionnaire survey, interviews, or focus groups [30], this study collected primary data through the use of surveys and a focus group interview. Surveys could be distributed when sufficient data was captured and survey questions formulated. Further, after sufficient data was captured from the survey, the focus group interview was conducted to elaborate the answers from the survey. The following sections will present the data collection from the survey and interview in more detail.

3.4.1 Surveys

Quantitative data was retrieved through self-completed questionnaires, also referred to as surveys [112]. The survey was conducted in an approach of collecting numerical characteristics that could be used to understand the relationship between hybrid work and productivity by asking participants to answer close-ended questions on a Likert scale [109]. A survey was chosen to enable statistical analysis, suggesting possible reasons for particular relationships between variables and to produce models of these

relationships [112]. Thus, a survey was suitable for the study to investigate the relation between hybrid work and productivity. In addition, a survey allowed data collection to be efficiently retrieved and eliminated the need for direct observation and allowed responses to remain anonymous between teams [112]. Anonymity was considered crucial in the survey since it considered productivity at both individual and team-level which could be sensitive information to the respondents [47].

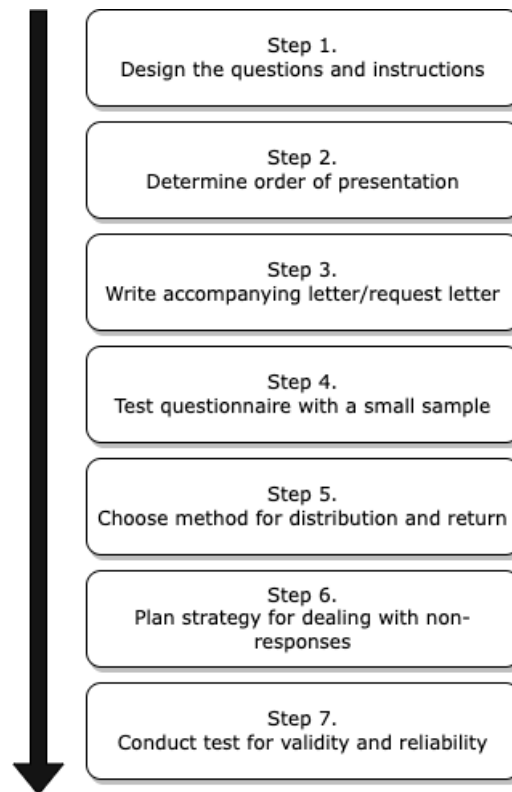


Figure 3.4.1: Overview of the Procedure for Designing a Questionnaire

The survey design was mainly guided by the design steps of a questionnaire proposed by Collis and Hussey [30] (see Figure 3.4.1). During the design stage of the survey, the validity and reliability were considered in terms of the questions and answers making sense. Prior to the official distribution of the survey, a test survey was conducted to a small sample of 5 individuals of the UA and supervisors to ensure that each question was clearly worded and valid [30]. Moreover, the small sample of the UA did in addition participate in the official distribution of the survey, whereas the feedback from the supervisors were there to assess the comprehension of the questions from an external point of view. The test survey was in addition utilized to find out the amount of time spent to complete the survey, the clarity of instructions, and feedback on the composition of the survey. Thus, the development of the survey questions was conducted in an iterative manner.

The survey comprised 25 questions in total, with 9 meta questions (Q1-Q6, Q8-Q10) and 16 main questions (Q7, Q11-Q25), see Appendix A. Each question in the survey was the same for each participant. The meta questions were developed from prior research, such as age, marital status, number of children, and organizational tenure [142]. Furthermore, the number of children [51] family-work conflict [51], and team size [88] are demographics that were found to have an impact on productivity, thus were chosen to be included in the study. A control question was included in the survey to validate the role of the participant, excluding participants who were not in alignment with the role of the developer or team manager. Furthermore, the main questions regarding the impact of hybrid work on productivity (Q7, Q11-Q25 in appendix A), were developed from utilizing the three dimensions of the framework SPACE [47]; satisfaction, performance, and collaboration and communication.

Since family-work conflict was found to have an impact on productivity [51], the topic was included in the survey in the form of the impact the workplace has on the experience of hybrid work. Thus, the questions related to hybrid work included the time spent on hybrid work, the number of days spent on remote work, and the impact of the workplace on the experience of hybrid work.

Furthermore, a 5-point Likert scale was used in each of the main questions, which is a commonly used survey instrument designed to measure employee performance on the job [101]. As there are numbers of different Likert scales used in research, it was necessary for the validity of the study to identify existing debates such as whether to include a midpoint in the scale or not [69]. A midpoint in a Likert scale allows respondents to express a neutral opinion between disagreement on one side and agreement on the other. Research has shown that respondents do not always interpret and use a midpoint for its intended purpose, instead introducing satisfying behavior and social desirability bias [74, 103]. The presence of a midpoint was found to increase the number of responses compared to the absence of a midpoint [64]. Based on this finding, it was plausible that some of the people who selected the midpoint did not use it for a true neutral meaning, which poses a potential threat to instrument validity and reliability. However, there were other studies that did not find the presence and absence of a midpoint that affected the validity and reliability of the study [2, 75, 79]. Hence, there is inconsistency of evidence on the impact of inclusion of a midpoint on validity and reliability.

The study adopted the five-point Likert scale to include a midpoint for simplicity and as it was an advisable option as the optimal number of anchors that provide the greatest communication of information within the scale [29]. Additionally, from informal discussions with the employees at the UA, a Likert scale was suitable since the employees were already familiar with using it [100]. Furthermore, each anchor of the scale was labeled to delimit the answers to be misinterpreted and improve reliability [6, 137]

The population of this study involved the UA in the case company with a sample of 30 valid respondents to the survey. The participants in the study were a sample in which any member of the population could voluntarily participate. To allow a wider range of respondents to respond to the survey, an online survey was conducted [112]. An introductory text regarding the study purpose, amount of time spent to complete the survey, confidentiality and anonymity were conveyed with a link to the survey through the company used communication platform Slack. Google Forms was chosen as the survey distributor since the UA was familiarized with the tool from prior surveys. The respondents had a time frame of 2-weeks to respond to the survey, with 3 evenly distributed reminders.

3.4.2 Focus Group Interview

An hybrid focus group interview was conducted, interviewing team managers in the UA. A qualitative approach allowed the study to put emphasis on words and perspectives to generate insight [112]. Furthermore, since the study relied on human experiences and perspectives, interviewing team managers allowed the study to gather a more in-depth perception compared to the numerical characteristics of a survey. A hybrid focus group interview was suitable since there was a clearly defined and precise topic where the focus was to enable and record the interactive discussion between the participants [25, 28] and in addition enabling remote workers to participate. There were a total number of 7 team managers in the UA, and in terms of a focus group interview a minimum of 4 people was recommended [18, 71]. Thus, only a single focus group interview could be conducted. Moreover, the group interview consisted of 4 voluntary team managers, where the researcher believed had the most information when managing teams during hybrid work [25]. A requirement to be selected in the focus group interview was the experience managing the team during hybrid work.

Formal arrangements were made prior to the interview, such as a set time, place, purpose and preferred medium. All participants gave consent to be video recorded during the interview where the benefit of a video recorded interview was to retrospect and transcribe the interview later. Participants were informed that their answers would be anonymous to protect the integrity of the participants. Additionally, in terms of confidentiality, the researcher ensured that the participants would be notified after the interview was recorded and that the data would only be used for the purpose of the study. Further, Google Meet was chosen as the preferred medium since the participants had prior experience with utilizing it. The interview was conducted over a time frame of approximately 45 minutes.

The status and experience of the participants were important factors to consider for a natural and trusting setting for a focus group interview [112]. Therefore, all participants in the group interview were team managers and had experience managing teams during hybrid work. The focus group interview was facilitated with the guide by Krueger and Casey [73] of how to conduct focus group interviews by following the pattern of including an introducing welcome, overview of the topic, ground rules of the discussion and interview questions. The interview was semi-structured, including predefined questions based on the responses retrieved from the survey and open-ended questions to broaden the scope (see Appendix B). Moreover, the predefined questions based on the responses to the survey were in accordance with the dimensions of SPACE; Performance, and Communication and collaboration. However, the dimension Job Satisfaction of SPACE was intentionally excluded from the questions, since the framework describes the dimension to convey satisfaction among developers and not the perspective of management. Data from the interview was obtained through the recording and transcription by the researcher. Additional notes were taken by the researcher during the interview to ensure that important topics were captured.

3.5 Data Analysis

3.5.1 Analyzing the Survey

The quantitative part of this study utilized a descriptive statistical analysis of the collected data from the survey since the method is considered relatively simple and

easy to understand [109]. Descriptive statistics enabled the researcher to describe and compare variables numerically and potentially highlight the relationship between the studied variables [112]. Moreover, the median and cross tabulation was used. The median, or middle value was a good measure of center since the analyzed data was found to be skewed [102]. Cross tabulation was used to examine the relationships between the number of days working remotely and the impact of the SPACE dimensions, and the rated SPACE dimensions with its corresponding impact of hybrid work [133]. The hours spent on working remotely was found to impact the relationship between job satisfaction and remote work [57, 59], thus the study aimed to analyze the impact the number of days spent on remote work to impact the other dimensions of SPACE as well with the use of cross tabulation. In addition, the cross tabulation for the relationship between the impact of the SPACE dimensions and its corresponding rating had to aim to visualize the distribution of positive and negative impact. Graphics were also introduced to visualize the findings with Microsoft Excel. A finalized version of the survey, respondents and corresponding median is found in Appendix C.

Statistical analysis on reliability and findings was performed through SPSS Statistics and Microsoft Excel. To enable an analysis in SPSS Statistics, each question was coded with a variable name and options were coded with respective labels, except the open-ended questions regarding team size, number in household and number of children. The used codes and respective labels for the survey can be visualized in Appendix D. There was one question that was optional and only applicable for those who had children, thus a dummy variable was used to fill the empty cells.

3.5.2 Analyzing the Focus Group Interview

In contrast to quantitative data, qualitative data is considered more varied, elastic, and complex [112]. Thus, a central aim of data analysis is to reduce the data [107]. According to Krueger and Case [73], in order to minimize bias introduced by analyzing and interpreting focus group data, the analysis should be systematic, sequential, verifiable, and continuous. Thus, the study followed the Framework Method, also termed as thematic analysis [52] developed by Richie and Spencer [106]. The aim was to seek patterns and themes based on the responses from the interview and furthermore contextualize them to facilitate answering the research question [112]. The Framework method includes five key stages; familiarization, identifying a thematic

framework, indexing, charting, mapping, and interpretation. The following will describe the procedure conducted.

3.5.2.1 Stage 1: Familiarization

The first stage was to initial familiarize with the collected data. All data had been collected through video recording, notes taken during the interview, and interview transcription. The study initialized the familiarization of the data when listening to the recording of the interview, reading the transcripts several times and reading the notes taken during the interview.

3.5.2.2 Stage 2: Identifying a Thematic Framework

A thematic framework could be identified letting the data dictate the themes and issues that emerged from the interview. Thus, the themes were identified in the familiarization stage buried in the discussion regarding certain points and issues.

3.5.2.3 Stage 3: Indexing

In the indexing stage, the themes obtained from the previous stage were applied to the transcribed interview. Each theme was assigned coherent codes to identify different segments of the data (see Table X). Discussion that did not seem to provide an answer to the question were dismissed.

3.5.2.4 Stage 4: Charting

In the charting stage, the transcript of the themes could be summarized using a matrix, where each column corresponded to a theme and each row a segment of the transcript. The segments of the transcript were sorted and compared with each other by its appropriate thematic content. Redundant transcripts were grouped together.

3.5.2.5 Stage 5: Mapping and Interpretation

Lastly, the final stage of mapping and interpretation involved making sense of the findings and identifying the relationship between the highlighted transcripts and the links between the data as a whole.

Theme	Code
Work-life Balance	Work-life Balance Work Flexibility Mental Health Well-being
Disengagement	Feeling Disconnected Communication Feeling Isolated Onboarding
Team Coordination	Visibility of Work Coordination Performance Agile
Organizational Adaptation	Work Maturity

Table 3.5.1: Presentation of the identified themes and corresponding codes

3.6 Research Quality

Mixing methods should lead to greater validity and reliability than a single method approach, providing they all reach the same conclusions [32]. A mixed method approach enabled the study to compare the results attributed in different types of data, which is called methodological triangulation [30]. The study aimed to establish a high research quality by taking into account the aspects of internal validity, external validity, reliability and objectivity [81].

3.6.1 Internal Validity

Internal validity in a study refers to how well the study is conducted and how confidently it can be concluded with the changes in the relationships between variables. Moreover, a study is internally valid if it is able to determine whether a causal relationship exists between variables [81]. Internal validity in relation to the survey refers to the ability of the survey to measure what it was intended to measure. To ensure content validity in the survey, a test survey was distributed to a small panel of individuals to assess whether each question in the survey was necessary or not [30]. The feedback from the panel was collected by the researcher to refine the survey. Since the survey would be used as a basis to set the context for the focus group interview, it was important that the survey questions represented the concepts and findings of

the literature review and the SPACE framework. Thus, it was important that each question was clearly worded by using terms that were familiar and understandable to the respondents [112]. Furthermore, internal validity was ensured in the evaluation of the focus group interview using triangulation to improve the analysis through numerous perspectives [141]. Furthermore, peer debriefing was used throughout the study to ensure impartiality [118]. Through peer review seminars, valuable feedback and perspectives were retrieved to improve the scope of the study. Additional insights from supervisors were obtained to broaden the scope of the research through impartial discussions and feedback.

3.6.2 External Validity

External validity describes the ability to generalize the results of a study in different settings [131]. To ensure external validity in terms of the survey was to receive a high response rate [112]. A considerate amount of time was put in the introductory text of the survey to inform respondents of the purpose and expectations of participating. Furthermore, the findings from the study are sought to be applicable in additional case companies with ASD teams. In addition, since the research scope regards hybrid work and productivity, certain findings may be of interest to other research settings. However, there is a trade-off between internal and external validity due to their conflicting definitions. Internal validity requires one to maintain a cautious approach that may lead to results that are not generalizable in all situations.

3.6.3 Reliability and Objectivity

The reliability of a survey concerns its robustness, in particular that it produces consistent findings at different times and under different conditions [112]. One of the most common approaches to assessing reliability, according to Mitchell [91] is internal consistency.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.605	.618	25

Figure 3.6.1: Overview of the Cronbach's Alpha

The most frequently used method for calculating internal consistency is Cronbach's alpha [112]. Cronbach's alpha measures the consistency of responses to a set of questions (scale items) that are combined as a scale measuring a particular concept, represented with an alpha coefficient. The alpha coefficient has a value range between 0 and 1, which has a value of 0.7 or higher indicating that the questions combined in the scale measure the same thing [91]. A general rule is that a Cronbach's alpha between 0.6- 0.7 is an acceptable level of reliability, while 0.8 and above are very good. However, a Cronbach's alpha above 0.95 is not necessarily good since it may indicate redundancy [134]. Moreover, the Cronbach's alpha was used in the study to identify the reliability of the survey. Through utilizing SPSS Statistics, the coefficient for the Cronbach's alpha could be retrieved (see Figure 4.1.1). The coefficient of the Cronbach's alpha was shown to be 0.605, exceeding the threshold of 0.6. Thus, indicating satisfactory reliability of the survey [134].

Furthermore, reliability for the entire study refers to the dependability, consistency, and accuracy [81]. A precondition for validity in a study is its reliability since an unreliable measure cannot be valid. Thus, transparency in the study was important to enable the study to be replicated. The confidentiality of the respondents were protected by the researcher through anonymity and secured internal files. Lastly, objectivity is described as the belief that the world exists independently of the individual viewing it [81]. Thus, it was important during the selection of the UA and interviewees to include individuals whose opinions were correlated with each other and thus increased impartially of the findings from the study.

3.7 Research Ethics

Research ethics emerges during the collection of data concerning the rights of those who become the subject of the study, or those affected by it [112]. The study followed the four policies stated by The European Code of Conduct for Research Integrity [4]; reliability, honesty, respect, and accountability. Good research practice ensures reliability in terms of the quality of the research, design, methodology, analysis, and usage of resources. Honesty could be ensured by performing transparency during development, undertaking, review, reporting, and communication. Through all stages of data collection, there has been open communication and transparency to inform all study participants about the purpose of the study. All inquiries for clarity have been

answered with transparency. The study has been cautious of the needed information from the participants, to ensure respect for the colleagues and participants. Moreover, the selection of participants has always been voluntary to provide the option for the participants to decide whether or not to participate in the study. Additionally, consent requirements were always clear and mandatory for participants to participate in the study. The recordings of the focus group interview were deleted after the transcription of the interview was done. Furthermore, every participant was ensured to remain anonymous both in the survey responses and the transcription of the interview for the respect of the integrity of each participant and confidentiality. Furthermore, to ensure the study's accountability, the study was cautious of following the agreement of confidentiality, transparency, respect, and reliability throughout the study.

Chapter 4

Results, Findings and Analysis

The purpose of this mixed method study is to understand the impact hybrid work has on productivity in ASD teams. This was done by utilizing the method of a survey and focus group interview. In the following section, the findings from a thematic analysis will be presented, followed by the survey results representing more detail of the data in the form of descriptive statistics and analysis, as well with illustrations in graphs.

4.1 Findings from the Focus Group Interview

The focus group interview consisted of four participants, representing four out of seven team managers, and will be referred to as interviewee A, B, C and D. The questions included in the focus group interview were semi-structured based on the responses from the survey and with additional questions proposed at the interview. The responses to the interview included the perspective of the team managers and the team. Furthermore, the identified themes were found in a thematic analysis based on the points and issues that was raised during the interview and will be presented in the following sections; Work-life Balance, Disengagement, Team Coordination, and Organizational Adaptation.

4.1.1 Work-life Balance

There is a clear agreement among all the interviewees upon the opportunities hybrid work provides, especially the offering of flexibility to work. In addition, hybrid work

offers flexibility among employees from different countries to include employees from all over the world to travel to their countries during holidays. Interviewee B believes that the flexibility from hybrid work has its perks when the every-day life is not as predictive.

"I think flexibility from day to day is a lot better, and also especially for those who have family and kids that can ease the everyday puzzle" -

Interviewee B

Interviewee D agreed with the above statement and provided additional perspectives of the work-life balance from a professional perspective. In addition, personal space and motivation impact a lot on professional work. The hybrid work model not only offers employees flexibility in work, but also contributes to motivation to work. As stated by interviewee D:

"I think a lot of people have more motivation knowing that they don't have this division of their personal and professional life, whenever if there is a need to be at home or the need to take care of their children etc. which can reflect and be motivated toward work" - Interviewee D

Interviewee A, provided further insights regarding the impact hybrid work has on mental health. How hybrid work is composed, providing employees the opportunity to work from home certain days and work from the office the other days, can be an important proposition for people struggling with mental health such as in form of social anxiety. Thus, hybrid work provides employees with the option to stay at home, enabling them to continue with their work and avoid being social at the office.

However, flexibility in remote work does not always seem to be a positive contribution to productivity. For instance, the flexibility in work can make remote work harder for workers to balance the professional and personal life since there are no strict line that can offset the workers from switching to personal life. In the discussions about flexible work, there is a clear agreement that working remotely draws a vague line between work and personal life. Interviewee B also discusses the opportunity to switch environments when in the office versus at the same office at home. Furthermore, as stated by interviewee B:

"For me it is about ending the day, but also during the day. I get very stuck in work when I am home and instead of switching meetings with

just a click I can actually go to another room and meet other people in a different environment” - Interviewee B

In contrast to working remotely, being at the office includes the change in the environment and social interactions with other employees, which is a potential impact on focus time at work. When being at the office, the dynamic environment can help the employees to switch the focus on something else whereas it becomes more difficult for those working remotely to change the focus when there are no distractions or changes in environment. Interviewee A agrees with the challenge with work-life balance during hybrid work with the tendency to overwork during remote work.

4.1.2 Disengagement

Some of the key challenges with hybrid work is the communication among the teams. Interviewee C states how the differences between working fully remote and hybrid are impacting the team alignment:

” I feel like there is a difference between working fully remote and hybrid. When working fully remote, I think the alignment with the communication was a bit easier. And now with hybrid work, some things can fold more easily between cracks. However, some people who are more in the office are probably more aligned and easier to communicate. It is easy for some of the more remote people to get a bit out of the loop actually.” - Interviewee C

Communication was stated to be slightly easier during fully remote work than in comparison with hybrid. Moreover, there is a slight outcome of information loss with communication within the team. People working remotely may get out of the loop. Interviewee B believes that another challenge is to include everyone in the team to the same extent as well as to get to know everyone in the team. Furthermore, interviewee B describes how inclusion is important during introduction to new teams and people. Moreover, both with the communication and the relationship between the team-members. Interviewee B makes sure that the team feels included but does not know if the team-members working mostly remote feels excluded which was expressed in the following:

”I do not know if the team feel more excluded when not being at the office that much, but since we have the 3-day in the office it feels like we always

see each other at least one day per week. Although, it would be easier if it is either or with the communication ” - Interviewee B

Furthermore, interviewee D states that during hybrid work, group discussions tends to become more difficult in terms of the contributed effort. For instance, the group discussions during hybrid work has been demonstrated and the outcome of it is the difficulty of knowing the reactions of people. During hybrid work, there is clear adversity in understanding how information is perceived. In addition, there are often times interruptions during meetings which may hinder some people to not speak up. In result, may cause a feeling of exclusion for those working remote which is another challenge that needs to be tackled. Moreover, interviewee B further adds from a stand point of a developer that there is an increased effort that has to be put in order for the developer to receive help from other developers since the communication in a hybrid setting is dispersed. For instance, the wait time to get a response from a team-member in comparison to the office setting can be longer due to the opportunity of direct communication among the team-members when being physically present in the same room. Interviewee D agreed with the above statement and further points out the increased effort in communication with the following statement:

”You need to actively seek a lot of communication versus when you are together in person. A lot of it happens organically. In this case you need to make sure you are thinking that you need to communicate it or ask about it. Otherwise, you don’t get the answers or the information that you needed at the right time.” - Interviewee D

Interviewee D expresses how the energy consumption from working at the office is different than working remotely. There is a preference of working at the office since it provides more energy to put on work in comparison to feeling less energized during remote work. In addition, the impact of the lack in communication during hybrid work has led to frustration among some of the teams. Interviewee B mentions that internal discussions have been held regarding communication in the team during hybrid work. Moreover, team-members have been expressing the disengagement from working remotely, feeling less encouraged to speak up and frustration when the pipeline gets blocked due to lack of communication.

Additionally, there has been some external factors that has been affecting the experience of hybrid work. Technical factors such as unreliable wi-fi connection is

crucial for developers to perform at their own workplace at home. Interviewee A expresses the frustration of having unreliable wi-fi since it interrupts meetings and the experience of hybrid work. Interviewee C states that another factor that influences the experience of hybrid work is the interruptions of the other partner having meetings at the same time.

4.1.3 Team Coordination

Interviewee D depicts that the team does not currently utilize any performance estimations in terms of agile methods and therefore could not state how the work of the team has been impacted in a hybrid setting. The team of interviewee A works with the Kanban board. Interviewee A expresses the difficulty in coordination within the team due to the lack of documentation that is put on the Kanban board, which is a recurring problem that has been due to hybrid work. The information that has been observed by the developers has not always ended up documented on the Kanban board, nor does it always end up communicated. This is expressed as follows:

”If someone is working from home and they are not working together at the office, they tend to work on a card and maybe not document every single thing since they might come to the office and talk to the person.

However, that coordination might not always happen, so we find ourselves in a stand with cards that have no info just a title” -

Interviewee A

Consequently, the information that is not documented often gets lost and impacts the coordination and planning within the team. Moreover, interviewee A expresses that the outcome of information loss makes it difficult to track the performance and the synchronization. Additionally, interviewee B presents an example that is due to the lack in communication:

”From the perspective of a developer, if you get blocked after stand up and people are in meetings, I have heard some kind of frustration and the feeling like they can’t work on their current task since they can’t reach someone. And instead they grab on a new work item which sometimes increases the lead time due to an increased WIP” - Interviewee B

Thus, there is agreement on the importance of teams documenting work with relevant information that can be communicated and coordinated to other team-members in

order to improve the team performance and visibility of WIP during hybrid work. Furthermore, the team of interviewee B uses general agile methods such as backlog refinements. They have had an internal discussion in the team discussing that they like having people in the same room during meetings that require communication and collaboration within the team such as sprint planning, and backlog refinements. Those meetings become more efficient when everyone in the team is physically present in the same room. Moreover, enabling multiple discussions at the same time in contrast to a hybrid work setting where people working remotely have a harder time to interrupt someone during the meeting or feel the timing is not right to express their opinion.

The recurring meetings that requires the team to be highly involved is expressed to be mostly impacting the performance of the team. Interviewee D depicts the differences with having those meetings hybrid versus in person. When having those meetings in person, the performance of these meetings are more fluid and the team gets a lot more done in one hour in comparison to a hybrid work setting. The performance during hybrid work is mostly impacted by the friction in communication where people do not speak up or there is indecisiveness. There has been an agreement that friction in communication among the teams impacts the team performance during hybrid work. Interviewee C reflects on the flexibility with hybrid work to allow developers and team lead to work from home more efficiently by the following statement:

“One thing that I have learned is if a developer or a team lead needs to focus on something. They can take a day at home and get things done in a more efficient and easy way ” - Interviewee C

4.1.4 Organizational Adaptation

According to interviewee D, the reason why the survey showed numbers of low impact on the planning and coordination among the teams during hybrid work was due to the time frame of when the survey was distributed to the teams. Moreover, ever since remote work was introduced to the company around 2 years ago, more employees in the organization have been getting used to the practice. The impact has thus been reduced over time since the work has matured in a hybrid setting:

“I think at the beginning when we were getting used with remote work it was different, but now I know people getting used to it so the impact is a

lot less because we have matured in a hybrid work” - Interviewee D

Additionally, it is noted that only recently a year ago, the teams were working within areas of the software development product. Interviewee A explains that there has not been much synchronization among the different teams upon recently which was the same time the teams started to learn about hybrid work.

Interviewee D agrees upon the above statement and further mentions the changes in coordination over time with the following:

”When things change, probably the coordination also changes. We still haven’t seen much with the changes in coordination during hybrid work but it’s a new challenge to discover. Also, to discover how to coordinate even in person.” - Interviewee D

Interviewee A mentions that the team of interviewee A have not yet mastered to work in cross-functional collaborations at all, neither in a remote, hybrid, nor physical setting. Thus, with the above statements, it is clear that there has not been much of a change in the coordination in the organization upon recently and the teams are still in the learning process of working hybrid. Interviewee B depicts that diversity in planning may decrease with hybrid work. More specifically, that at some point the decrease in spontaneous collaboration may not be an impacting factor to the performance in hybrid work.

4.2 Results and Analysis of the Survey

The results and analysis of the survey were laid as a foundation for the questions in the focus group interview. Thus, the following sections presents the results and analysis of the survey, in which provides the findings with more detail; Descriptive Statistics, and Descriptive Analysis.

4.2.1 Descriptive Statistics

The survey was initialized with meta questions regarding the team characteristics, followed by the main questions of hybrid work and productivity by utilizing the framework SPACE. Furthermore, the survey question; *What is your role in your team?* was used as a control question to include only the respondents with the role of developer and team manager. The survey received a total of 37 responses, where 30

were valid responses, comprising 27 developers and 3 team managers. The following will present the descriptive statistics from the distributed survey (see Table 4.1.1).

Question	Respondents
How old are you?	18-24 = 2 (7%) 25-34 = 20 (67%) 35-44 = 6 (20%) 45-54 = 2 (7%) 55-65 = 0 (0%) 65 and over = 0 (0%)
What is your marital status?	Single = 12 (40%) Married or co-habitation = 18 (60%)
How many people live under your household?	1 = 9 (30%) 2 = 16 (53%) 3 = 3 (10%) 4 = 2 (7%)
How many children do you have?	0 = 23 (77%) 1 = 3 (10%) 2 = 4 (13%)
*If you do have children, Do you have children below age 14?	Yes = 6 (86%) No = 1 (14%)
Do you have an undisturbed workplace at home when working remote?	Yes = 22 (73%) No = 8 (27%)
What is your role in your team?	Developer = 26 (87%) Product Manager = 3 (10%)
What is the size of your team?	3 = 1 (3%) 4 = 1 (3%) 5 = 2 (7%) 6 = 5 (17%) 7 = 10 (33%) 8 = 9 (30%) 9 = 2 (7%)
How long have you been in your team?	0-6 months = 10 (33%) 6-12 months = 10 (33%) 1-2 years = 9 (30%) More than 2 years = 1 (3%)

Table 4.2.1: Overview of the meta questions describing the respondents

* Question was only mandatory for those stated having children. Thus, the distribution of the respondents is based on those with children.

It is noteworthy that the sample of the study are considered young, where 67% of the respondents are between the age of 25-34 years. Furthermore, 40 % of the sample are singles whereas 60% are in a marriage or co-habitation showing an almost equal proportion of the two marital statuses. Majority of the respondents (53%) lives in a household of 2 people, indicating not all respondents who were married lived with their partner and a high rate of respondents (77%) having no children. It is in addition noteworthy that the sample mostly consisted of respondents within a team size of 7 (33%) and 8 (30%) people. Similar numbers were found in the team tenure, where

33% had been in the team for 0-6 months and 33% had been in the team for 6-12 months.

4.2.2 Descriptive Analysis

The following section will go through the results of each question that was composed to answer the research question. A descriptive analysis was conducted from the lens of the SPACE dimensions used in the study, illustrated in graphs and cross tabulation. A full presentation of the results from the survey can be presented in the Appendix C.

In Q7: *What impact does the workplace at home have on the experience of hybrid work?*, 4 respondents (13%) stated that the workplace at home did not have an impact at all on the experience of hybrid work, 4 respondents (13%) were slightly impacted, 5 respondents (17%) were sometimes impacted, 12 respondents (40%) were frequently impacted, and 5 respondents (17%) were impacted all the time. The median of the respondents stated the workplace to be frequently impacted by hybrid work.

In Q11: *How long have you been working hybrid within your team?*, 10 respondents (33%) had experienced hybrid work within 0-6 months, another 10 respondents (33%) had experience of 6-12 months of hybrid work, 9 respondents (30%) had experienced 1-2 years of hybrid work and 1 respondent (3%) had experienced hybrid work for more than 2 years. The median of the respondents had experience with working hybrid during a 6-12 month period.

In Q12: *On average, how many days per week have you been working remote?*, 2 respondents (7%) stated 0 days per week, 19 respondents (63%) stated 1-2 days per week, 8 respondents (27%) stated 3-4 days per week, and 1 respondent stated to be remote 5 days per week/ every day. The median of the respondents works remotely 1-2 days per week.

In Q13: *How would you rate your job satisfaction since working hybrid?*, there were none that responded strongly dissatisfied, 1 respondent (3%) was dissatisfied, 6 respondents (20%) were neither satisfied nor dissatisfied, 15 respondents (50%) were satisfied and 8 respondents (27%) were strongly satisfied. The median of the respondents stated to be satisfied with their job.

In Q14: *What impact have hybrid work on your job satisfaction?*, 3 respondents (10%)

stated no impact at all, 8 respondents (27%) stated slightly impacted, 8 respondents (27%) stated sometimes impacted, 7 respondents (23%) stated frequently impacted, and 4 respondents (13%) stated impacted all the time. The median of the respondents stated the job satisfaction to be sometimes impacted by hybrid work.

In Q15: *How would you rate your satisfaction with your work tools and resources since working hybrid?*, no respondents were strongly dissatisfied, 4 respondents (13%) were dissatisfied, 9 respondents (30%) were neither satisfied nor dissatisfied, 13 respondents (43%) were satisfied, and 4 respondents (13%) were strongly satisfied. The median of the respondents stated their satisfaction with the work tools and resources to be satisfied.

In Q16: *How would you rate your well-being since working hybrid?*, no respondent rated not good at all, 3 respondents (10%) rated slightly good, 8 respondents (27%) rated reasonably good, 11 respondents (37%) rated good, and 8 respondents (27%) rated very good. The median of the respondents stated their well-being to be good since working hybrid.

In Q17: *What impact have hybrid work on your well-being?*, 2 respondents (7%) rated no impact all, 5 respondents (17%) rated slightly impacted, 11 respondents (37%) rated sometimes impacted, 6 respondents (20%) rated frequently impacted, and additional 6 respondents (20%) rated impacted all the time. The median of the respondents stated hybrid work to sometimes impact the well-being.

In Q18: *How often have you felt exhausted due to excessive and prolonged workplace stress since working hybrid?*, 4 respondents (13%) stated never, 17 respondents (57%) stated rarely, 9 respondents (30%) stated sometimes, and there were no respondents that stated frequently nor all the time. The median of the respondents stated their exhaustion to be rarely.

In Q19: *What impact have hybrid work on your exhaustion due to excessive and prolonged workplace stress?*, 11 respondents (37%) stated no impact at all, 13 respondents (43%) stated slightly impacted, 5 respondents (17%) stated sometimes impacted, 1 respondent (3%) stated frequently impacted, and there were no respondents stating impacted all the time. The median of the respondents stated the impact on exhaustion to be slightly impacted.

In Q20: *How often have you successfully completed work-related deadlines*

since working hybrid?, there were no respondents that stated never nor rarely, 4 respondents (13%) stated sometimes, 15 respondents (50%) stated frequently, and 11 respondents (37%) stated all the time. The median of the respondents stated to be frequently successfully completing work-related deadlines since hybrid work.

In Q21: *What impact have hybrid work on your performance to finish the work-related deadlines?*, 12 respondents (40%) stated no impact at all, 8 respondents (27%) stated slightly impacted, 5 respondents (17%) stated sometimes impacted, 4 respondents (13%) stated frequently impacted, and 1 respondents (3%) stated impacted all the time. The median of the respondents stated no impact at all on the impact hybrid work has on performance to finish the work-related deadlines.

In Q22: *How would you rate the communication and collaboration during team meetings since working hybrid?*, there were no respondents that rated not good at all, 4 respondents (13%) rated slightly good, 13 respondents (43%) rated reasonable good, 6 respondents (20%) rated good, and 7 respondents (23%) rated very good. The median of the respondents stated the communication and collaboration to be reasonable good.

In Q23: *What impact have hybrid work on your communication and collaboration during team meetings?*, 4 respondents (13%) stated no impact at all, 7 respondents (23%) stated slightly impacted, 8 respondents (27%) stated sometimes impacted, 10 respondents (33%) stated frequently impacted, and 1 respondent (3%) stated impacted all the time. The median of the respondents stated the impact on communication and collaboration to be frequently.

In Q24: *How would you rate the coordination and planning of the team tasks since working hybrid?*, there were no respondents rated not good at all, 3 respondents (10%) rated slightly good, 9 respondents (30%) rated reasonable good, 12 respondents (40%) rated good, and 8 respondents (20%) rated very good. The median of the respondents stated the coordination and planning to be good.

In Q25: *What impact have hybrid work on your coordination and planning team tasks?*, 7 respondents (23%) stated no impact at all, 11 respondents (37%) stated slightly impacted, 6 respondents (20%) stated sometimes impacted, 5 respondents (17%) stated frequently impacted, and 1 respondent (3%) stated impacted all the time. The median of the respondents stated hybrid work to be slightly impacting the coordination and planning.

4.2.2.1 Analysis through the Lens of SPACE Dimensions

The following presents findings from the descriptive analysis conducted on the questions regarding the three dimensions of the SPACE framework covering productivity. Moreover, the dimensions of *job satisfaction*, *performance*, and *communication and collaboration*. The results will be illustrated in the form of bar charts and cross tabulations. The illustrations in bar charts presents the impact hybrid work has on the three dimensions, with an y-axis representing the number of respondents. The aim with the bar charts is to convey the distribution of the respondents in each dimension. The cross tabulations illustrates the number of days working remotely in relation to the impact hybrid work has on the dimensions, and the cross tabulations of the rated dimensions in relation to the impact hybrid work has had on the dimensions. The aim with the cross tabulations is to visualize the number of days spent on remote work to impact each dimension of SPACE respectively, and the distribution of positive and negative impact for each dimension. Based on the results from the survey, the respondents indicate the communication and collaboration to be the dimension that is being impacted the most during hybrid work, followed by job satisfaction, and lastly the performance.

4.2.2.1.1 Hybrid Work on Job Satisfaction

The results indicated that 90 % of the respondents felt a slight impact or greater of hybrid work on job satisfaction (see Figure 4.2.1) indicating a highly frequent impact of hybrid work on job satisfaction. However, illustrated in the figure, there is a somewhat evenly spread of respondents stating the hybrid work to have a slight impact, sometimes impact, and frequent impact on the job satisfaction indicating some inconclusiveness in the degree of impact. However, a median were somewhat impacted.

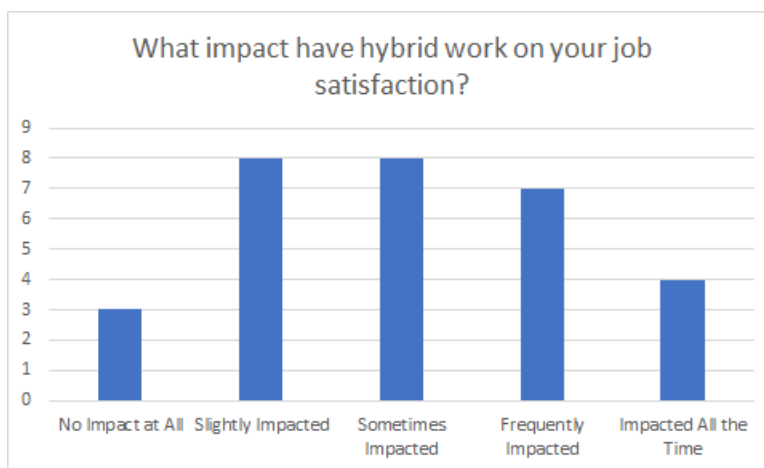


Figure 4.2.1: Impact of hybrid work on job satisfaction

The cross tabulation of Q12 and Q14 presents the average number of days working remotely and the impact hybrid work has on the job satisfaction (see Table 4.2.1). The respondents working remote 0 days per week had 1 respondent (3%) stated hybrid work to have no impact at all on job satisfaction and 1 respondent (3%) stated slightly impacted. The respondents working remote 1-2 days per week had 1 respondent (3#) stated no impact at all, 5 respondents (17%) slightly impacted, 5 respondents (17%) sometimes impacted, 7 respondents (23%) frequently impacted and 1 respondent (3%) stated impacted all the time. Furthermore, respondents working remote 3-4 days per week had 2 respondents (7%) stated it to have slightly impacted, 3 respondents (10%) stated sometimes impacted, and 3 respondents (10%) stated impacted all the time. There was 1 respondent working remote 5 days per week/ every day (3%) who stated it to have no impact at all. Overall, a majority of the distribution was found in the respondents working remote 1-2 days per week where 7 respondents (23%) stated hybrid work to frequently impacting job satisfaction.

What impact have hybrid work on your job satisfaction?					
Days Worked Remotely	No Impact at All	Slightly Impacted	Sometimes Impacted	Frequently Impacted	Impacted All the Time
0 days per week	1 (3%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)
1-2 days per week	1 (3%)	5 (17%)	5 (17%)	7 (23%)	1 (3%)
3-4 days per week	0 (0%)	2 (7%)	3 (10%)	0 (0%)	3 (10%)
5 days per week/ every day	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 4.2.2: An Overview of the Cross Tabulation of Q12 and Q14

Furthermore, the cross tabulation of Q13 and Q14 presents the job satisfaction and the impact hybrid work has on job satisfaction among the respondents (see Table 4.2.4). There was 1 respondent (3%) stated being dissatisfied and that the hybrid work had a frequent impact on the job satisfaction. The respondents with job satisfaction to

be neither satisfied nor dissatisfied had 1 respondent (3%) stating no impact at all, 2 respondents (7%) stated slightly impacted, and 3 respondents (10%) stated sometimes impacted. The respondents with satisfied job had 5 respondents (17%) stated to be slightly impacted, 5 respondents (17%) stated sometimes impacted, and 5 respondents (17%) frequently impacted. Furthermore, the respondents with strongly satisfied with their job had 2 respondents (7%) stating no impact at all, 1 respondent (3%) stating slightly impacted, 1 respondents (3%) stated frequently impacted and 4 respondents (13%) stated impacted all the time. In general, the majority of the respondents stated that they were satisfied with their job, with an evenly distributed spread of a total of 15 respondents (50%) where 5 respondents (17%) stated hybrid work to have slightly impacting job satisfaction, 5 respondents (17%) stating sometimes impacted and 5 respondents (17%) stating frequently impacted.

Job Satisfaction	What impact have hybrid work on your job satisfaction?				
	No Impact at All	Slightly Impacted	Sometimes Impacted	Frequently Impacted	Impacted All the Time
Strongly Dissatisfied	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Dissatisfied	0 (0%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)
Neither Satisfied nor Dissatisfied	1 (3%)	2 (7%)	3 (10%)	0 (0%)	0 (0%)
Satisfied	0 (0%)	5 (17%)	5 (17%)	5 (17%)	0 (0%)
Strongly Satisfied	2 (7%)	1 (3%)	0 (0%)	1 (3%)	4 (13%)

Table 4.2.3: An Overview of the Cross Tabulation of Q13 and Q14

4.2.2.1.2 Hybrid Work on Performance

Furthermore, 60 % stated the hybrid work impacting performance to finish work-related deadlines by slightly impacted or greater (see Figure 4.2.2) indicating a much lower impact of hybrid work on the performance in comparison to job satisfaction. Further comparison with the figure on job satisfaction (see Figure 4.2.1) shows a higher consensus of the impact in terms of the response distribution. Moreover, median of the respondents stated that hybrid work had no impact at all on performance.

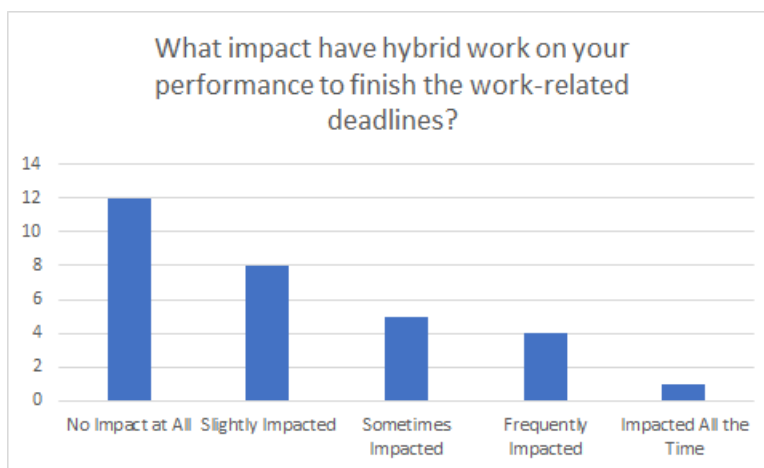


Figure 4.2.2: Impact of hybrid work on performance

The cross tabulation of Q12 and Q21 presents the average number of days working remotely and the impact hybrid work has on the performance to finish work-related deadlines (see Table 4.2.2). The respondents working remotely 0 days per week had 2 respondents (7%) stated hybrid work having no impact at all on the performance. The respondents working remote 1-2 days per week had 5 respondents (17%) stated it to have no impact at all, 6 respondents (20%) stated slightly impacted, 3 respondents (10%) stated sometimes impacted, 4 respondents (13%) stated frequently impacted and 1 respondent (3%) stated impacted all the time. Furthermore, the respondents working 3-4 days per week had 4 respondents (13%) stating no impact at all, 2 respondents (7%) stated slightly impacted, and 2 respondents (7%) stated sometimes impacted. There was 1 respondent (3%) working remote 5 days per week that stated no impact at all. Overall, a majority of the distribution was found in the respondents working remotely 1-2 days per week where 6 respondents (20%) stated hybrid work impacting the performance slightly.

What impact have hybrid work on your performance to finish the work-related deadlines?					
Days Worked Remotely	No Impact at All	Slightly Impacted	Sometimes Impacted	Frequently Impacted	Impacted All the Time
0 days per week	2 (7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
1-2 days per week	5 (17%)	6 (20%)	3 (10%)	4 (13%)	1 (3%)
3-4 days per week	4 (13%)	2 (7%)	2 (7%)	0 (0%)	0 (0%)
5 days per week/ every day	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 4.2.4: An Overview of the Cross Tabulation of Q12 and Q21

The cross tabulation of Q20 and Q21 presents the performance to finish work-related deadlines and the impact hybrid work has on the performance among the respondents (see Table 4.2.5). The respondents who performed sometimes had 2 respondents (7%) that did not have an impact at all, 1 respondent (3%) who said they were

slightly impacted and 1 respondent (3%) stating frequently impacted. Furthermore, the respondents with frequent performance had 5 respondents (17%) stated no impact at all, 6 respondents (20%) stated slightly impacted, and 4 respondents (13%) stated sometimes impacted. The respondents performing all the time had 5 respondents (17%) stated no impact at all, 1 respondent (3%) stated slightly impacted, 1 respondent (3%) stated sometimes impacted and 3 respondents (10%) stated frequently impacted. Overall, the majority of the respondents were found to be in frequent performance, where 6 respondents (20%) stated that hybrid work had a slight impact on performance.

What impact have hybrid work on your performance to finish the work-related deadlines?					
Performance	No Impact at All	Slightly Impacted	Sometimes Impacted	Frequently Impacted	Impacted All the Time
Never	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Rarely	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Sometimes	2 (7%)	1 (3%)	0 (0%)	1 (3%)	0 (0%)
Frequently	5 (17%)	6 (20%)	4 (13%)	0 (0%)	0 (0%)
All the Time	5 (17%)	1 (3%)	1 (3%)	3 (10%)	1 (3%)

Table 4.2.5: An Overview of the Cross Tabulation of Q20 and Q21

4.2.2.1.3 Hybrid Work on communication and collaboration

There were 67 % who stated the hybrid work to impact the communication and collaboration during team meetings by slightly impacted or greater (see Figure 4.2.3) indicating similar numbers with the impact hybrid work has on performance. However, in contrast to performance, hybrid work has a higher impact on the communication and collaboration due to the median to be frequently impacting the communication and collaboration during team meetings.

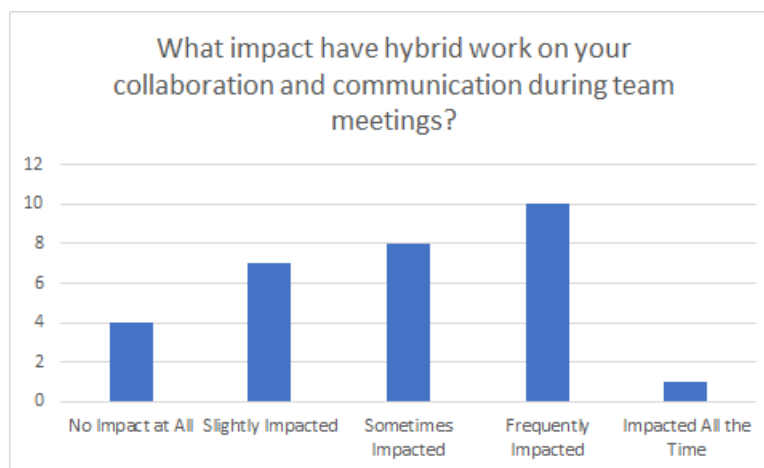


Figure 4.2.3: Impact of hybrid work on communication and collaboration

The cross tabulation of Q12 and Q23 presents the average number of days working remotely and the impact that hybrid work has on communication and collaboration during team meetings (see Table 4.2.3). Respondents working remotely 0 days per week had 1 respondent (3%) who stated that hybrid work had no impact at all on collaboration and communication and 1 respondent (3%) who stated that it was frequently impacted. The respondents working remotely 1-2 days per week had 1 respondent (3%) stating no impact at all, 3 respondents (10%) stated slightly impacted, 7 respondents (23%) stated sometimes impacted, 7 respondents (23%) stated frequently impacted, and 1 respondent (3%) stating impacted all the time. Furthermore, respondents working 3-4 days per week had 1 respondent (3%) stated no impact at all, 4 respondents (13%) slightly impacted, 1 respondent (3%) sometimes impacted, and 2 respondents (7%) stated frequently impacted. There was 1 respondent (3%) who worked remotely 5 days a week and said that they had no impact at all. Overall, a majority of the distribution was found within the respondents working remotely 1-2 days per week where 7 respondents (23%) stated that hybrid work sometimes impacts collaboration and communication, and 7 respondents (23%) stated that hybrid work frequently impacts collaboration and communication.

What impact have hybrid work on your communication and collaboration during team meetings?					
Days Worked Remotely	No Impact at All	Slightly Impacted	Sometimes Impacted	Frequently Impacted	Impacted All the Time
0 days per week	1 (3%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)
1-2 days per week	1 (3%)	3 (10%)	7 (23%)	7 (23%)	1 (3%)
3-4 days per week	1 (3%)	4 (13%)	1 (3%)	2 (7%)	0 (0%)
5 days per week/ every day	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 4.2.6: An Overview of the Cross Tabulation of Q12 and Q23

The cross tabulation of Q22 and Q23 presents the communication and collaboration, and the impact hybrid work has on the communication and collaboration (see Table 4.2.6). The respondents stating the communication and collaboration to be slightly good had 4 respondents (13%) stating it was frequently impacted. The respondents stating communication and collaboration to be reasonably good had 2 respondents (7%) stating no impact at all, 1 respondent (2%) stated slightly impacted, 7 respondents (23%) stated sometimes impacted, and 3 respondents (10%) stated frequently impacted. The respondents with good communication and collaboration had 3 respondents (10%) stated slightly impacted, 2 respondents (7%) stated frequently impacted, and 1 respondent (3%) stated impacted all the time. Furthermore, respondents with very good communication and collaboration had 2 respondents (7%) stating no impact at all, 3 respondents (10%) stated slightly

impacted, 1 respondent (3%) stated sometimes impacted, and 1 respondent (3%) stated frequently impacted. Overall, the majority of the respondents found the communication and collaboration reasonably good where 7 respondents (23%) stated the communication and collaboration to be sometimes impacted of hybrid work.

What impact has hybrid work on your communication and collaboration during team meetings?					
Collaboration & Communication	No Impact at All	Slightly Impacted	Sometimes Impacted	Frequently Impacted	Impacted All the Time
Not Good at All	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Slightly Good	0 (0%)	0 (0%)	0 (0%)	4 (13%)	0 (0%)
Reasonable Good	2 (7%)	1 (3%)	7 (23%)	3 (10%)	0 (0%)
Good	0 (0%)	3 (10%)	0 (0%)	2 (7%)	1 (3%)
Very Good	2 (7%)	3 (10%)	1 (3%)	1 (3%)	0 (0%)

Table 4.2.7: An Overview of the Cross Tabulation of Q22 and Q23

Chapter 5

Discussion

In the chapter, the empirical findings and analysis of the survey and focus group interview will be discussed in relation to the reviewed literature aiming to answer the posed research question: How does hybrid work impact productivity in agile software development teams? The SPACE framework will be applied to guide the discussion with the following areas of the framework: Satisfaction, Performance, collaboration and communication. Lastly, discussing the sustainability aspects with hybrid work.

5.1 SPACE: Job Satisfaction

The section aims to discuss the dimension of satisfaction and well-being utilized in the SPACE framework to increase understanding of productivity. Moreover, connecting the literature regarding job satisfaction with empirical findings and analysis.

5.1.1 Understanding the Impact of Different Hybrid Settings

A potential signal of future burnout and reduced productivity is the decrease in satisfaction and engagement [86]. By measuring satisfaction and well-being, a greater understanding of productivity can be utilized [125]. Moreover, identifying the job satisfaction among the software development teams is thus crucial to understand productivity. Empirical findings indicate that hybrid work has an overall positive impact on job satisfaction, despite widespread use among employees. In general, compared to the other dimensions of SPACE, job satisfaction is the only dimension

that has the greatest spread. To have a deeper understanding of the effects that hybrid work has on job satisfaction, the findings from the prior literature have therefore been taken into account to strengthen the findings from the study, in addition to increase the understanding of the potential effects of hybrid work on job satisfaction.

Job satisfaction is one of the most studied research areas in organizational research [41, 82]. Research shows that not all numbers of hours spent on remote work indicate a high job satisfaction among the workers [57, 59]. Thus, the study mapped the impact of hybrid work has on job satisfaction with the number of days working remote, with the aim to increase an understanding of the impact hybrid work has on job satisfaction. Moreover, most of the employees in the case company are in alignment with the office occasional model [78], by working 2 days remote and 3 days at the office even though there were some occurrences of employees working more or less remotely the impact was positive. Furthermore, it was found that most of those who worked fully remote or fully in the office were shown to have no impact at all on job satisfaction. Those employees working within the office occasional model had a greater spread in the impact hybrid work has on job satisfaction in comparison to those those working fully remote or fully at the office.

A median of the employee sample stated the job satisfaction to be satisfied during hybrid work. In alignment with this finding, the relationship between remote work and job satisfaction was shown to be positive at lower levels of remote work. Moreover, studies showing similar results where the relationship between remote work and number of hours spent on remote work to plateau when working remotely 15.1 hours per week [57, 59]. Thus, the study strengthens this finding with indicating similar results as a majority of the employee sample was found to work similar numbers of hours and were satisfied with their job during hybrid work. However, it is noteworthy that some employees working fully remote or fully at the office indicate hybrid work to have no impact at all on job satisfaction. Indicating small occurrences of employees having adapted the hybrid work to one's advantage. Since the results were based on the respondents rating the job satisfaction and the impact of hybrid work on job satisfaction, a potential ambiguity could have provided misleading assumptions regarding the impact to convey a negative or positive impact and not the amount of affection that was caused by the hybrid work.

5.1.2 The Effects of the Workplace

To increase the understanding of the effects hybrid work has on job satisfaction, Gajendran and Harrison found evidence on work-family conflict and the quality of coworker relationship to impact the relationship between remote work and job satisfaction [49]. Moreover, the workplace at home, total number of people in the same household and marital status were some of the factors that were of interest to this study. Thus, the study aimed to cover this understanding of how these factors could impact the relationship between job satisfaction and hybrid work.

The workplace at home was found to have a frequent impact on the experience of hybrid work where a majority of the employee sample had access to an undisturbed workplace at home during remote work. With regard to the findings indicating positive impact hybrid work has on job satisfaction, the workplace is indicating to contribute with this finding having the positive effects of hybrid work to adverse the negative effects. Those negative effects related to the workplace at home were found to be the interruptions from a partner having a meeting at the same time, bad wi-fi connection, balancing work and personal life, disengagement, and the less dynamic environment for the workplace at home. Thus, the positive effects that may adverse those negative ones were the hybrid work to provide flexibility, anxiety-relieving, environment change, and focus time. These positive effects are as well similar findings from the literature regarding remote work to provide focus during work [13, 65], anxiety-relieving [51], flexibility to work whenever, saving time in commuting, and being able to work in a comfortable environment of their own choice which could increase happiness and focus [20, 78].

It is noteworthy that the employee sample consisted of what is considered an equal amount of singles, and a low number of people living in the same household and had no children. Thus, the work-family conflict may not have reflected in the job satisfaction among the employee sample similarly to the study by Gajendran and Harrison [49]. Moreover, there are indications found from the empirical findings and analysis that if the employees had family with children, the experience with hybrid work would be different which this study cannot show evidence on but with certain indications.

5.1.3 Satisfaction with the Tools, Resources and Inclusion

The amount of technical and human resources support provided by the organization showed a positive effect on the relationship between job satisfaction and remote work [13, 65]. Most of the employees were satisfied with their work tools and resources. However, there are some managerial challenges during hybrid work that can be revealed from the empirical findings and analysis, such as the inclusion of everyone in the team to the same extent and getting to know everyone in the team. This was found from the team managers to be prominently considered during the introduction to new teams and people to strengthen the inclusion within the team. Literature found the hybrid work model to enable employers to attract more geographically dispersed talent [20, 78]. Thus, stressing the importance in the inclusion of geographically dispersed talents during hybrid work.

Similar findings showed concerns from workers of missing out on conversation and office interaction [19]. Therefore, reinforce the importance of the managers to include people to the team. Furthermore, findings from the literature depict a need from the employer to carefully manage the transition of hybrid work and thus avoid creating a two-tier workforce [20]. Moreover, a manager depicted the importance of inclusion but raised a concern about the difficulty to understand the feeling of inclusion among the team-members working mostly remotely.

An increase in the age of the workers was associated with lower productivity explained by difficulties with the technological tools and the ability to adapt to changes [51, 58, 119]. In relation to the study, it should be noted that the median age of the employee sample is considered young, thus suggesting positive satisfaction with the work tools and resources. Additionally, Lenka found remote work to be challenging when the work tools are not up to date, and when there are internet issues [78], aligning with the findings of the empirical study. Furthermore, the use of digital technologies was revealed to partially mitigate the isolation experienced by the workers [43] which from the empirical study was in addition expressed as a challenge that remains in hybrid work that should be considered.

5.1.4 Well-being and Balancing Work and Professional Life

Well-being is described as to how healthy and happy people are and how their work impacts it [47] and is part of the measurement to understand productivity [125].

From the transition to mandatory remote work, some people were found to struggle with their well-being and work-life balance [26]. The empirical findings and analysis reveal the changes in attitudes since the transition, and most of the employees stated their well-being to be good and sometimes impacted by hybrid work. However, since work-life balance was found to be one of the themes in the thematic analysis, it is an indicator of an ongoing challenge that persists during hybrid work. Thus, an underlying agreement was found regarding the line between work and personal life to be vague.

Furthermore, the challenges regarding work-life balance that were raised with the team managers were mainly focused on the experience during remote work from home. Challenges such as the tendency to overwork, the static workplace, and feeling stuck at work were some of the concerns that were discussed for the remote work setting in hybrid work. From the literature, remote work was indicated to carry out with costs related to the work-life balance having the world of work and other aspects of life collide and overlap [66, 84, 90], in which are similar findings from hybrid work. In addition, a study revealed high reports of difficulties for the remote workers to end the work day in comparison to those working from the office and suggested the effects of remote work to be negative for work-life balance, while beneficial for the attachment to the organization, enthusiasm for the job, and job satisfaction [39]. However, most of the employees stated to be rarely exhausted due to excessive and prolonged workplace stress with a slight impact from the hybrid work. Hence, could be an indicating factor as to why the well-being among the employees were found to be good and thus indicating instead enthusiasm for the job and organization found from empirical findings and analysis [39]. The ability to gain a positive work-life balance was found to be the ability to manage working hours [85], thus indicating impact on hybrid work to be the different depending on people's ability of balancing work and personal life. From the literature on remote work, overworking was found as one of the factors to induce burnout due to the difficulty in the flexibility in work to end the day, thus may increased the workload [61]. Since work-life balance is an important aspect that is evidently found to impact the employees in hybrid work, there is an increased need to tackle this issue for a sustainable work life in the coming future of a new way of working.

Mental health was found in the empirical findings and analysis to be impacted during hybrid work. Moreover, the hybrid work was found to enabling employees with social

anxiety to go along with their work remotely, enabling families to take care of children during work time, having the option to change workplace environment, and potentially increase motivation to work. In contrast to these findings, one of the main causes of anxiety during the earlier days of the pandemic was uncertainty about the future of work [20]. Instead of feeling anxious about the future, there was evidence of social anxiety in the sample of the study which indicate a new issue that has to be tackled along with the findings of work-life balance.

5.2 SPACE: Performance

Another dimension of the SPACE framework is performance. The section aims to discuss performance among ASD teams by connecting the literature regarding performance with the empirical findings and analysis, as well to increase the understanding of the relationship between performance and hybrid work.

5.2.1 The Organizational Adaptation

The performance was captured through identifying the reliability of the employees finishing work-related deadlines. Most of the employees stated that their performance in completing work-related deadlines was frequent with no impact at all and slightly affected by hybrid work. As most of the employees at the case company work 1-2 days remote, it was also shown that those employees had the greatest spread of how hybrid work impacted the performance. The employees who were working fully remote or in the office had hybrid work that did not impact performance at all. Similar findings were found from the literature indicated extensively remote workers exhibited high job performance due to the personal benefits of working remote [63] and therefore displayed greater effort and dedication to work despite the quality of the supervisory relationship [60]. The positive impact of remote work on the performance is suggested to have a positive impact on the hybrid work model, at least for this sample in the study performing work in the office occasion model. Similar findings in a study with supervisor-rated task or objectively measured job performance exhibiting a positive impact of remote work on job performance [50].

Based on the discussions with the managers, it contrasts with the teams stating the coordination and planning of the team tasks to be good with a slight impact of hybrid work. One manager depicted the numbers of low impact was due to the

organizational adoption of hybrid work over the last 2 years. Moreover, the adaptation to these changes have reduced the impact hybrid work has on the employees and thus influencing the ability to coordinate and plan.

A potential indicator to the maturity of hybrid work setting can be found in the empiric were some employees who work fully remote and fully at the office stating that the hybrid work to have no impact at all on the performance. Furthermore, as opposed to the challenges with the coordination and planning of the team tasks, one manager depicted the flexibility with hybrid work to enable developers and team lead to take a day remotely to focus at home. This could explain why the high performance among the teams is "more efficient and easy" during hybrid work since it enables the employees to have the option to work remotely when needed. In addition, strengthening the literature on hybrid work to enable work in a comfortable environment of their own choice, which could increase happiness and focus. Thus, it would result in better performance and increase the efficiency level [20, 78].

5.2.2 Coordinating Agile Work

Discussions with the managers showed not all teams were utilizing any performance estimations in terms of agile Scrum methods. All teams utilizes a kanban board (in Trello) to visualize the WIP. However, there are some teams utilizing the Scrumban such as including sprint planning, backlog refinements, and other general agile methods. The discussions with the team managers reveal challenges with the lack of documentation of the WIP. Hence, impacting the coordination and planning of the team tasks by blocking team-members or increasing the lead time of the WIP if the team-member decides to work on something else. As the communication and collaboration are dispersed during hybrid work, finding information was found to be increasingly important that may affect the performance among the employees. Managers depicted the difficulty to track performance and synchronization within the team, which are concerns that were raised in the discussion. Similar to the literature, teamwork was found to be the greatest challenge with the hybrid work model. In addition, teamwork and coordination were found to be some of the impacting factors that may affect work performance and productivity [78].

As the performance to finish work-related deadlines was found to be high among the employees during hybrid work, it was found to carry some cost on the coordination of

WIP. Similar findings are found from a study on remote work, where administrative work focusing on repetitive tasks was found to be not compatible with remote work. The study found the administrative workers to have high performance but with added layers of coordination and communication which increased the lead time to get work done. Increased lead times, quality of life and physical and mental health were some of the costs that compensated the high performance [105]. The dispersed communication and coordination indicates a need for shared leadership to increase the coordination, knowledge sharing and conflict management [9]. Shared leadership may provide the team with improved coordination and lead time, and provide authority to the team to deal with issues independent of other team members [9].

5.3 SPACE: Collaboration and Communication

The section aims to discuss job satisfaction and well-being as one of the other dimensions in SPACE. In addition, discussing the literature on collaboration and communication with the empirical findings and analysis aiming to contribute the knowledge regarding the dimension of collaboration and communication of productivity in software development.

5.3.1 The Hybrid Work Impact on Collaboration and Communication

An important part of work is collaboration and communication enabling workers to share information with one another [15]. Physical separation has been shown to hinder collaboration and communication [3] and in alignment with the empirical findings and analysis, most of the employees stated the hybrid work to have a frequent impact on the collaboration and communication. Moreover, most of the employees stating the hybrid work to have a frequent impact on the collaboration and communication with an experience of it to be slightly good. However, the overall consensus of the communication was it to be reasonably good where hybrid work sometimes impacts collaboration and communication. However, there were some occurrences of employees working fully in the office stating that collaboration and communication are more impacted by hybrid work than those fully remote workers. Moreover, the 1-2 days remote and 3-4 days remote per week showed the most impact on the employees.

In addition, the results can be explained through the amount of technological support, the frequency of face-to-face interactions, and the age that moderates the relationship between trust and knowledge sharing. Additionally, since trust was found to be more likely developed via face-to-face over electronic communication [108], it can potentially imply the trust and the relationship between the team-members during hybrid work to impact collaboration and communication. Thus, may threaten knowledge sharing within the organization [128]. It should be noted that most of the teams were quite novel, as well as the communication within a hybrid work setting, which may indicate an impact on trust within the teams. Thus, the hybrid work may have limited the amount of physical interaction within the teams and therefore limiting the depth of the relationships between team members affecting the collaboration and communication within the teams. As technology is found to foster collaboration between team members and bring team spirit [9], it is crucial for teams working hybrid to consider what technical tools that can be used to strengthen the team spirit and collaboration [80]. Moreover, informal visual observations [8] and real-time visual feedback [22] were found to increase awareness and could mitigate the negative effects of remote work [9]. Team managers could as well reduce the effect of isolation during remote work by fostering ties among the team by conducting meetings between members using media-rich communication channels [80].

5.3.2 Disengagement in Meetings

As hybrid work provides flexibility to work remotely and in the office, some managers expressed the preference for physical presence during high involvement in meetings that require collaboration and communication of team-members. Meetings such as sprint planning and backlog refinements were one of the agile methods in which physical presence was preferred. One factor that could contribute to efficiency and engagement was physical presence to enable meetings with several discussions at the same time. Similar evidence can be found by Lenka [78] presented results with reduced employee engagement due to limited physical presence between the team-members. Disengagement were in addition found to impact the problem solving during hybrid work. A potential effect can be found in remote work to contribute the employees to feel isolated isolated and deprived in work including social interaction [72].

Furthermore, communication was depicted by the managers to be easier when fully remote in comparison to a working hybrid. The effort put on communication is

depicted to increase during hybrid work, where needed information has to be inquired in advance to receive the response in time. Furthermore, one manager expressed the difficulty to understand how information is perceived and the reactions of people. Thus, a potential contributor to increased effort is the high level of interdependence that is required when communication is dispersed [5]. Additionally, there are meetings getting interrupted, increased response time and some team-members not speaking up which are furthermore some impediments in the communication during hybrid work. On the contrary, job autonomy and self-leadership were variables shown to increase productivity for remote workers [51].

Additionally, team size could be an indicator to why some managers found the communication in the meetings to be challenging. An increase in team size has been shown to decrease the productivity in ASD teams [88]. Therefore, increasing the size of the team increases the number of people in meetings. Thus, it may add some potential friction to the communication in meetings in forms of interruptions. A consequence of such friction can potentially hinder people to speak up which in addition may cause a feeling of exclusion in the form of social isolation, affecting productivity negatively [51]. In the sample, most of the team sizes are considered to be within the ideal team size of an agile team, within the range of 5 to a maximum of 10, with a few exceptions outside the range [143]. Thus, from the empirical findings and analysis, the team size should be aligned what is considered an ideal team size in ASD teams.

Chapter 6

Conclusion

Based on the discussion, the following chapter will present conclusions that can be drawn to motivate the purpose of the study. Moreover, to understand the relationship between hybrid work and productivity, with the aim of answering the proposed research question. Thus, presenting a summarizing section of productivity in hybrid work, theoretical contribution of the study, managerial implications, sustainability implications, limitations and suggesting future research.

6.1 Summarizing Productivity in Hybrid Work

The research question that the study is aiming to answer is the following: *How does hybrid work impact productivity in agile software development teams?.* By discussing the impact hybrid work has on the three dimensions of productivity; Job satisfaction, Performance and Communication and collaboration, some conclusions can be drawn that answers this posed research question. First and foremost, there is a clear positive impact of hybrid work on the job satisfaction among the ASD teams, where most of the employees stated to be contempt with the workplace, well-being, and work tools. However, balancing work and personal life is a challenge that need to be tackled to a sustainable work life.

There is a clear positive impact of hybrid work on the performance among the ASD teams, where the impact was found to be quite low due to the organizational adaption of the work practices during hybrid work. However, challenges with the documentation of work was indicated to impact the experience with hybrid work and thus the efficiency

of how work is performed and its coordination. The communication and collaboration among the teams was found to have been slightly positive impacted by hybrid work. As trust and knowledge sharing affects the quality in communication and collaboration, it could have impacted the results in this sample due to the novelty of some teams. Disengagement was found to impact the quality of the hybrid meetings, where the effort that is put on communication is increased during hybrid work that can put employees in the position of not speaking up or interrupting discussions due to communication technicalities.

The positive effects of hybrid work on these three dimensions indicate no doubt that the future of work may include hybrid work. The study aims to increase the understanding of the relationship between hybrid work and productivity. However, there are still some things that we need to learn more about such as the coordination of work and to understand work-life balance in terms of a sustainable future of work.

6.2 Theoretical Contribution

The findings derived from the study contribute to the literature on hybrid work, and productivity in ASD teams. In addition, this study presents a comprehensive explanation of the relationship between hybrid work and productivity. Thus, theoretical contributions are provided to understand the relationship and, in addition, suggest findings relevant to the adoption of the hybrid work model.

The hybrid work model has evidently proven a positive impact on job satisfaction. The findings confirm that 2 days remote per week provides positive job satisfaction among the employees. The findings further expand the literature on the workplace to have a frequent impact on the experience of hybrid work, which may indirectly have an impact on job satisfaction. Consistent with the literature on remote work, the hybrid work model confirms similar effects of flexibility, anxiety relief, environment change, and improved focus time. Positive job satisfaction can in addition be explained by satisfaction with the tools and resources provided during hybrid work. The findings also suggest the challenges of work-life balance and disengagement from remote work to continue in hybrid work.

The findings reveal that the employees working within the office occasional model exhibit high job performance. Therefore, evidence suggests that the reason for the

high performance among ASD teams and why performance is no longer impacted by hybrid work is organizational adaptation of the hybrid work model. The organizational shift to hybrid work has over time reduced its impact on coordination and planning. A potential indicating factor to the maturity of the hybrid work model can be found in the small occurrences of people working fully remote and fully in the office stating the hybrid work to have no impact at all on the performance.

Furthermore, the findings confirm the literature on hybrid work flexibility to allow ASD teams the option to work from home when necessary to increase focus and efficiency. Thus, the study suggests the flexibility to increase performance among ASD teams. However, the findings confirm the literature on the challenges of coordination and teamwork due to be increased during hybrid work since the lack of documentation of the WIP may block the other team-members, synchronization and tracking of WIP, in which may increase the lead time to finish work.

Findings reveal that collaboration and communication are reasonably good during hybrid work with a frequent impact of hybrid work. The effort that is put on collaboration and communication was shown in the findings to be increased during hybrid work and thus confirms the literature. Moreover, the findings showed an increase in response time, a difficulty to understand how information is perceived, and that team members did not speak up were some of the impediments during collaboration and communication. Thus, suggesting a preference for having highly interactive meetings in person, such as sprint planning and backlog refinements. Moreover, enabling several discussions at the same time. Additionally, confirming the literature of reduced employee engagement during hybrid work due to the limited physical presence between the team-members

6.3 Managerial Implications

Managerial implications are presented in the following to provide information on the implications found in the findings. Moreover, this suggests practical implications that can be considered to improve the productivity of workers. Findings from the study highlights a high satisfaction of the work tools and resources to be a potential positive impact on job satisfaction among workers. By reducing friction in the use of tools and work resources, workers should be able to perform better. The quality of tools and resources should be accessible and intuitive to all workers. Thus, an

orchestration of how and what tools to utilize should be crucial during the introduction of employees to new teams to guide the workers of the processes and technicalities of work. Workers get a better perception of the processes of the expected work and a less friction of the technicalities. Thus, suggesting organizational investments in the quality of work tools and resources, as well to the introduction of new people in the utilization of technicalities and work-related processes to improve job satisfaction and performance.

Implications advocate meetings requiring high participation in collaboration and communication to be in the office where everyone in the team should be physically present. Several discussions at the same time are considered crucial for efficiency and engagement, as collaboration and communication during hybrid meetings can often get interrupted or disengaged. Introducing mandatory meetings in the office from time to time can, in the long term, enable teams to build stronger connections. Thus, increasing trust between team members, as well as knowledge sharing. Furthermore, introducing more efficient planning of work and job autonomy which would in short term improve the coordination and engagement in the team where everyone would know what to do and be more synchronized regardless of the dispersed communication.

Further implications suggest an improvement in work-life balance among workers. The findings highlight the challenges of balancing work and personal life, which indirectly can impact job satisfaction and well-being. By including self-leadership and continuous follow-up meetings specifically for the well-being of the teams, one can potentially contribute to sustainable hybrid work among the workers. Management can get a better picture of the well-being among the teams, and the well-being of the workers can be prioritized. Thus, in the long-term it can contribute to the work-life balance among the workers.

6.4 Sustainability Implications

By understanding hybrid work and productivity, improvements in the development of hybrid work and agile methods can thus foster innovation and sustainable choices. The SDG composed by the United Nations [132] maps the main concerns in the movement towards a sustainable future. With regard to hybrid work, it maps the SDG 3: Good health and well-being, 8: Decent work and economic growth, 9: Industry, innovation

and Infrastructure, and 12: Responsible consumption and production, which will be discussed in the following.

The SDG 3: Good health and well-being, represents the goal to "ensure healthy lives and promote well-being for all at all ages". Mental health and well-being has been some of the main concerns in terms of the improvement of productivity during hybrid work. The flexibility of the hybrid work model allows workers to stay home when social anxiety has been prominent, providing workers with an alternative to relieve anxiety to continue working in a safe environment at home. Hybrid work has in addition contributed to the motivation to work among the workers, where the flexibility has enabled the workers to balance work and personal life with the extent that is necessary for the worker, by working fully remote or somewhat hybrid when, for instance, taking care of children or the maternal health.

SDG 8: Decent work and economic growth implies the goal of "promoting sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all" [132]. Moreover, the goal aligns with what the hybrid work model can provide by uniting talents from all over the world to work both remotely and on-site. Furthermore, the hybrid work model enables organizations to have a dispersed workforce and can provide employment to a wider range of talents without increasing the space of having a physical office. Thus, it could potentially contribute to economic growth since hybrid work reduces physical barriers to work by enabling the workforce to be dispersed and flexible when necessary. Moreover, reducing the cost of workspace, office furniture, work tools, transportation cost, beneficial complementary items at the office etc. In addition, the hybrid work enables a diversity in the workforce by including different talents from all over the world and furthermore include both those workers who prefer to work at the office and those who prefer the remote workplace setting.

With the findings of what the hybrid work model can suggest, improvements in the development of agile methods can thus be achieved. A part of the SDG 9: Industry, innovation, and infrastructure, are to promote inclusive and sustainable industrialization and foster innovation. Consistent with the findings of the relationship between hybrid work and productivity, there are different areas that can cover the improvement of productivity in ASD. Using the opportunities of the hybrid work model and taking into account the challenges, organizations and managers can help improve

and develop standard agile methods to align with the contemporary execution of the methods.

Furthermore, SDG 12: Responsible consumption and production can as well utilize the opportunities and challenges with the hybrid work to reduce the carbon footprint of the workforce. Moreover, the goal of SDG 12 is to "ensure sustainable consumption and production patterns". The opportunity to work remotely reduces the need to commute to work. By increasing a workforce that reduces the commuting cost to work, the increase in the impact it has on the environment. Additionally, in alignment with the SDG 8, the hybrid work enables the opportunity to reduce the cost of, for instance, workspace and thus can facilitate organizations to make sustainable decisions in terms of environmental impact and the consumption of production.

6.5 Limitations and Future Research

Limitations of the study will be presented in the choice of research methods, as well as suggested research areas to consider for future research. This study chose to conduct a single case study due to the time constraint of the master's thesis. The time constraint also affected the choice of research areas to ensure a complete review of the selected literature.

A single case study limited the number of study respondents and representatives, thus limiting the amount of data that could be reviewed and analyzed. Furthermore, only 30 respondents were included in the survey, as well as 4 representatives in the focus group interview due to the number of team managers and developers in the case company and the time constraint. Therefore, the study could include more respondents to the focus group interview to improve the quality of the study. Furthermore, a single case study limited the study to only the perspective of the hybrid work setting of the office occasional model. Thus, by introducing more case companies with different hybrid work models, a more generalized explanation could be valuable for the purpose of the study.

Findings highlight the preference of working at the office, thus a valuable approach for future research is to include a study on the work culture, for instance to improve the understanding of what kind of work culture can impact productivity in the ASD teams. In addition, future study may investigate what external factors to be considered for the

introduction of a hybrid work model, thus including more holistic frameworks that are also valuable for organizations in different industries. Since the findings highlight the hybrid work model to suit different types of needs, a future study that includes, for example, the gender of the population, maternal health, and parental leave can thus be valuable for future research with the aim to increase the understanding of the future of work and how it can be adapted to other needs than work.

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Appendix A

Template: Survey Questions

- (Q1) How old are you?
- (Q2) What is your marital status?
- (Q3) How many people live under your household? (write only in numbers)
- (Q4) How many children do you have?
- (Q5) If you do have children, Do you have children below age 14?
- (Q6) Do you have an undisturbed workplace at home when working remote?
- (Q7) What impact does the workplace at home have on the experience of hybrid work?
- (Q8) What is your role in your team?
- (Q9) What is the size of your team? (write only in numbers)
- (Q10) How long have you been in your team?
- (Q11) How long have you been working hybrid within your team?
- (Q12) On average, how many days per week have you been working remote?
- (Q13) How would you rate your job satisfaction since working hybrid?
- (Q14) What impact have hybrid work on your job satisfaction?
- (Q15) How would you rate your satisfaction with your work tools and resources since working hybrid?

- (Q16) How would you rate your well-being since working hybrid?
- (Q17) What impact have hybrid work on your well-being?
- (Q18) How often have you felt exhausted due to excessive and prolonged workplace stress since working hybrid?
- (Q19) What impact have hybrid work on your exhaustion due to excessive and prolonged workplace stress?
- (Q20) How often have you successfully completed work-related deadlines since working hybrid?
- (Q21) What impact have hybrid work on your performance to finish the work-related deadlines?
- (Q22) How would you rate the communication and collaboration during team meetings since working hybrid?
- (Q23) What impact have hybrid work on your communication and collaboration during team meetings?
- (Q24) How would you rate the coordination and planning of the team tasks since working hybrid?
- (Q25) What impact have hybrid work on your coordination and planning team tasks?

Appendix B

Template: Focus Group Interview Questions

- (Q1) By briefing back on the experience of working hybrid, What are the benefits of working hybrid?
- (Q2) What are the challenges with hybrid work and how can it be improved?
- (Q3) What agile methods are being used in your team and how has it been impacted by hybrid work?
- (Q4) The workplace at home seems to have a high impact on hybrid work. What factors at home may have an influence on hybrid work?
- (Q5) The performance among the teams seems to have been no/slightly impacted from hybrid work. What factors may have influenced the performance?
- (Q6) What communication channels are being used and what communication tools are needed in order for the teams to perform?
- (Q8) The communication and collaboration during team meetings seems to have been frequently impacted by the hybrid work. What is your experience and why do you think that is the case?
- (Q8) Hybrid work seems to have a slight and no impact at all on the planning and coordination among the teams. What is your experience and why do you think that is the case?

Appendix C

Survey Questions, Respondents, and Median

Question	Respondents	Median
How old are you?	18-24 = 2 (7%) 25-34 = 20 (67%) 35-44 = 6 (20%) 45-54 = 2 (7%) 55-65 = 0 (0%) 65 and over = 0 (0%)	25-34
What is your marital status?	Single = 12 (40%) Married or co-habitation = 18 (60%)	Married or co-habitation
How many people live under your household?	1 = 9 (30%) 2 = 16 (53%) 3 = 3 (10%) 4 = 2 (7%)	2
How many children do you have?	0 = 23 (77%) 1 = 3 (10%) 2 = 4 (13%)	0
If you do have children, Do you have children below age 14?	Yes = 6 (86%) No = 1 (14%)	Yes

**The question was mandatory for the respondents who answered to have children in prior question. Thus, the distribution is based on the total respondents having children.*

The following pages will continuing to present the table.

APPENDIX C. SURVEY QUESTIONS, RESPONDENTS, AND MEDIAN

Question	Respondents	Median
Do you have an undisturbed work place at home when working remote?	Yes = 22 (73%) No = 8 (27%)	Yes
What impact does the workplace at home have on the experience of hybrid work?	No Impact at All = 4 (13%) Slightly Impacted = 4 (13%) Sometimes Impacted = 5 (17%) Frequently Impacted = 12 (40%) Impacted All the Time = 5 (17%)	Frequently Impacted
What is your role in your team?	Developer = 26 (87%) Product Manager = 3 (10%)	Developer
What is the size of your team?	3 = 1 (3%) 4 = 1 (3%) 5 = 2 (7%) 6 = 5 (17%) 7 = 10 (33%) 8 = 9 (30%) 9 = 2 (7%)	7
How long have you been in your team?	0-6 months = 10 (33%) 6-12 months = 10 (33%) 1-2 years = 9 (30%) More than 2 years = 1 (3%)	0-6 months
How long have you been working hybrid within your team?	0-6 months = 10 (33%) 6-12 months = 11 (37%) 1-2 years = 8 (27%) More than 2 years = 1 (3%)	6-12 months
On average, how many days per week have you been working remote?	0 days per week = 2 (7%) 1-2 days per week = 19 (63%) 3-4 days per week = 8 (27%) 5 days per week/every day = 1 (3%)	1-2 days per week
How would you rate your job satisfaction since working hybrid?	Strongly Dissatisfied = 0 (0%) Dissatisfied = 1 (3%) Neither Satisfied nor Dissatisfied = 6 (21%) Satisfied = 15 (48%) Strongly Satisfied = 8 (28%)	Satisfied
What impact have hybrid work on your job satisfaction?	No Impact at All = 3 (10%) Slightly Impacted = 8 (27%) Sometimes Impacted = 8 (27%) Frequently Impacted = 7 (23%) Impacted All the Time = 4 (13%)	Sometimes Impacted
How would you rate your satisfaction with your work tools and resources since working hybrid?	Strongly Dissatisfied = 0 (0%) Dissatisfied = 4 (13%) Neither Satisfied nor Dissatisfied = 9 (30%) Satisfied = 13 (43%) Strongly Satisfied = 4 (13%)	Satisfied
How would you rate your well-being since working hybrid?	Not Good = 0 (0%) Slightly Good = 3 (10%) Reasonable Good = 8 (27%) Good = 11 (37%) Very Good = 8 (27%)	Good
What impact have hybrid work on your well-being?	No Impact at All = 2 (7%) Slightly Impacted = 5 (17%) Sometimes Impacted = 11 (37%) Frequently Impacted = 6 (20%) Impacted All the Time = 6 (20%)	Sometimes Impacted

APPENDIX C. SURVEY QUESTIONS, RESPONDENTS, AND MEDIAN

Question	Respondents	Median
How often have you felt exhausted due to excessive and prolonged workplace stress since working hybrid?	Never = 4 (13%) Rarely = 17 (57%) Sometimes = 9 (30%) Frequently = 0 (0%) All the Time = 0 (0%)	Rarely
What impact have hybrid work on your exhaustion due to excessive and prolonged workplace stress?	No Impact at All = 11 (37%) Slightly Impacted = 13 (43%) Sometimes Impacted = 5 (17%) Frequently Impacted = 1 (3%) Impacted All the Time = 0 (0%)	Slightly Impacted
How often have you successfully completed work-related deadlines since working hybrid?	Never = 0 (0%) Rarely = 0 (0%) Sometimes = 4 (13%) Frequently = 15 (50%) All the Time = 11 (37%)	Frequently
What impact have hybrid work on your performance to finish the work-related deadlines?	No Impact at All = 12 (40%) Slightly Impacted = 8 (27%) Sometimes Impacted = 5 (17%) Frequently Impacted = 4 (13%) Impacted All the Time = 1 (3%)	No Impact at All
How would you rate the collaboration and communication during team meetings since working hybrid?	Not Good at All = 0 (0%) Slightly Good = 4 (13%) Reasonable Good = 13 (43%) Good = 6 (20%) Very Good = 7 (23%)	Reasonable Good
What impact have hybrid work on your collaboration and communication during team meetings?	No Impact at All = 4 (13%) Slightly Impacted = 7 (23%) Sometimes Impacted = 8 (27%) Frequently Impacted = 10 (33%) Impacted All the Time = 1 (3%)	Frequently Impacted
How would you rate the coordination and planning of the team tasks since working hybrid?	Not Good at All = 0 (0%) Slightly Good = 3 (10%) Reasonable Good = 9 (30%) Good = 12 (40%) Very Good = 6 (20%)	Good
What impact have hybrid work on your coordination and planning team tasks?	No Impact at All = 0 (0%) Slightly Impacted = 11 (37%) Sometimes Impacted = 6 (20%) Frequently Impacted = 5 (17%) Impacted All the Time = 1 (3%)	Slightly Impacted

Appendix D

Variables and codes in survey

Variable	Label
id	
age	0= 18-24, 1= 25-34, 2= 35-44,3= 45-54, 4=55-65, 5=65+
marStat	0=single, 1=married or co-habitation
numPeople	
numChild	
child14	0=no, 1=yes, 2=no children
distWPlace	0=yes, 1=no
impWPlace	0=no impact at all, 1= slightly impacted, 2= sometimes impacted, 3= frequently impacted, 4= impacted all the time
role	0=developer, 1=product manager
teamSize	
teamTenure	0= 0-6 months, 1= 6-12 months, 2= 1-2 years, 3= 2+
hybTenure	0= 0-6 months, 1= 6-12 months, 2= 1- 2, 3= 2+
numRemo	0= 0 days, 1= 1-2 days, 2= 3-4 days, 3= 5 days/every day
jobSat	0= strongly dissatisfied, 1= dissatisfied, 2= neither satisfied nor dissatisfied, 3= satisfied, 4=strongly satisfied

APPENDIX D. VARIABLES AND CODES IN SURVEY

impJobSat	0=no impact at all, 1= slightly impacted, 2= sometimes impacted, 3= frequently impacted, 4= impacted all the time
satTool	0= strongly dissatisfied, 1= dissatisfied, 2= neither satisfied nor dissatisfied, 3= satisfied, 4=strongly satisfied
wellb	0= not good at all, 1= slightly good, 2= reasonable good, 3= good, 4= very good
impWellb	0=no impact at all, 1= slightly impacted, 2= sometimes impacted, 3= frequently impacted, 4= impacted all the time
stress	0= never, 1=rarely, 2= sometimes, 3= frequently, 4= all the time
impStress	0=no impact at all, 1= slightly impacted, 2= sometimes impacted, 3= frequently impacted, 4= impacted all the time
perfo	0= never, 1=rarely, 2= sometimes, 3= frequently, 4= all the time
impPerfo	0=no impact at all, 1= slightly impacted, 2= sometimes impacted, 3= frequently impacted, 4= impacted all the time
collab	0= not good at all, 1= slightly good, 2= reasonable good, 3= good, 4= very good
impCollab	0=no impact at all, 1= slightly impacted, 2= sometimes impacted, 3= frequently impacted, 4= impacted all the time
coord	0= not good at all, 1= slightly good, 2= reasonable good, 3= good, 4= very good
impCoord	0=no impact at all, 1= slightly impacted, 2= sometimes impacted, 3= frequently impacted, 4= impacted all the time