The Way Towards
an Agile and Lean Construction Industry

What The Construction Industry Can Learn from the
IT and Agile Software Development Industry

An ethnographic mixed-method cross-industry study on the IT industry and
Construction Industry

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The scope of this thesis is quite large, which might have been the the biggest challenge, but it has been a lot of fun to conduct a cross-industry study in the aspiring field of lean and agile construction, and looking at the IT industry for acquiring a vision and inspiration has been truly fun and eye-opening. Seeing the possibilities up-front, and hearing about transformative stories make me believe that it is possible and that there is still a lot to learn still. I hope my work will be of interest in the days to come of the digital transformation of the construction industry, and that it will be of value to someone out there.

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Abstract

Background: The construction industry, characterized by its traditional and segmented processes, faces considerable challenges in communication and collaboration and is looking to become more efficient and agile. In contrast, the IT industry, particularly in agile software development, is renowned for its innovative approaches to project management and team dynamics and has implemented agile practices and ways of working to enhance coordination, collaboration, and efficiency in projects and development. This thesis lays the foundation for cross-industry learning and the potential for a more agile construction industry, with a focus on the agile methodologies prevalent in IT that could be adapted to enhance the construction industry as well as map out the current state of the construction industry in regards to collaboration, coordination, and communication.

Objective: The primary aim of this study is to identify practices from agile software development that can be implemented within the construction industry to improve its collaborative and communicative processes as well as serve as a pre work for future research on coordination and collaboration within the construction industry. The research explores the underlying principles of agile methods in the IT sector and how these can be contextualized to address the specific challenges faced by construction industry professionals. By identifying parallels between the construction and IT industries, we explore methods, concepts and tools that streamline collaboration and improve communication in software development, and look at the best practices they use that hopefully can be applied to the construction industry for it to become more agile and lean.

Method: This research employs a mixed-methods approach, gathering quantitative data through surveys and qualitative insights from interviews with professionals in the construction industry. This research also employs observations and case studies from two leading technology companies in Norway, anonymized as "Soney" and "Fuse," renowned for their agile practices to gain unique insight into the working ways of the companies. The comparative analysis aims to distill the essence of agile practices that are adaptable and beneficial to the construction context.

Results: The findings from the interviews show that there are multiple challenges in the construction industry related to communication and collaboration among parties in a construction project, and that the software development industry have seen similar challenges and have a set of methodologies and practices they implement in large scale development projects to enable agile development. The findings indicate that while the construction industry has distinct operational frameworks, there are several core elements of agile methodologies from the IT industry that could be beneficially integrated. These include iterative development, continuous feedback mechanisms, and enhanced team autonomy and communication. The study reveals that the adaptation of these practices could potentially mitigate prevalent communication barriers and foster a more collaborative environment in construction projects.

Conclusion: By gaining a higher understanding of parallels between the IT and construction industry, as well as enablers and barriers, the construction industry can reduce time and resource waste by achieving efficient communication and collaboration by implementing agile and lean methodologies that work in the software development industry. By gaining a better understanding of identified enablers and barriers, the construction industry can reduce communication barriers and improve on streamlining collaboration. Based on literature review and data collection through interviews, surveys and observations, this thesis suggests a map of improvement areas and pain points to help the construction industry become more agile and lean. The construction industry stands to gain significantly from adopting selected agile principles from the IT industry. This thesis concludes that through careful adaptation and implementation, agile methodologies can provide a framework for enhancing communication and collaboration in construction projects, leading to improved efficiency and project outcomes. The study advocates for a progressive shift towards a more integrated and flexible approach to project management in the construction industry.

Chapter 1 - Introduction

"The ever-increasing level of digitalization, automation and autonomation will change construction. And this will inevitably change the nature of Lean Construction. Ultimately, Lean Construction will result in the ultra-efficient construction site. We don't yet know what that is, but we know that we need it."

- Dr. Selim-Tugra Demir, Expert in Lean Design and Construction (2022)

Efficient coordination and streamlining collaboration have proved to be a challenge in the construction industry at large. There are many actors and parties involved in a construction project, collaborating to complete a construction project in time. The same can be said for large scale software development. The software development industry is one that has grown large and fast in the last decade and has been able to show that they are efficient in coordinating many roles and collaborate in interdisciplinary teams. Large scale software development has faced a lot of challenges regarding efficiently coordinate tasks and communicate between actors in a development projects, but have also been able to implement methodologies, tools, and processes to improve.

The construction industry still struggles with efficient collaboration and coordination and is in need of streamlining project tasks and digitalizing. This becomes even more apparent with increased complexity in construction projects . [1ap] Software development projects require a high level of coordination to manage all project participants, dependencies and tasks, and agile practice are common to tackle these issues. [2] In the competitive environment of today, "agile firms tend to be more successful" (Essila, 2019). Both large- and small-scale development projects in the construction industry are facing a lot of the similar collaboration and coordination challenges that the IT industry has faced, and many parallels can be drawn between the two fields. We're going to map out the differences and similarities between the two fields of software development and construction development and look at how the construction industry can become more agile by looking at agile software development (ASD).

However, There is little research on agile and lean methodologies in the construction industry, and how they can be applied. This begs the question, what does even agile construction or lean construction look like? We don't know, and for these reasons I will attempt to lay a foundation of research to further this research field. We don't yet know what it is, but we do know that we need it.

Through my thesis, I wish to answer calls for future research and explore the possibilities for adopting agile methodologies in the construction industry. My thesis is therefore centered on these two main objectives: First, I aim to identify the benefits and challenges experienced in agile teams in the IT industry. Secondly, I aim to map out challenges and the current state of the construction industry regarding communication, coordination, and collaboration. Thirdly, I aim to explore the possibility of adapting practices and ways of working in the IT industry to the construction industry.

1.1   Motivation

I have always had a fascination for design, smart processes, and development. During my studies, I explored all these subjects, and I was very fortunate to be allowed to work with my supervisor on research that focused on bettering processes in the construction industry.

While studying informatics, I was introduced to smart processes, and agile and lean methodologies and found myself fascinated by them. Having a natural interest in construction, urban planning, and architecture, I wanted to study the intersection of the concepts I learned during my informatics studies and explore their application in other fields. When I got the opportunity to write a thesis on efficient communication and collaboration in the construction industry, I could of course not say no.

I have always been interested in creating holistic solutions and optimizing processes, and the construction industry is definitely in need of this. Also, as I have been working part-time in a large and acknowledged technology company which I will refer to as Soney from now on, I have been able to understand the unique approaches and practices that the IT industry adopts on a day-to-day basis, and I gained an understanding for how innovation works in the technology sector and how effective the IT and software development industry is due to the adoption of agile and lean methodologies. The construction industry, on the other hand, is one of the least effective industries in Norway. How interesting it would be to explore the possibilities for adopting practices from the IT industry to the construction industry.

1.2   Research Project

The primary goal of my research was to explore how renowned IT companies apply agile methodologies to achieve efficient coordination and collaboration. I was intrigued by the agility of these companies and wished to understand the intricacies of their operations. To this end, I

immersed myself in a thorough analysis of the agile practices at these organizations, aiming to uncover the core principles that could be beneficially applied to the construction industry.

Concurrently, I sought to identify the challenges faced by the construction industry, specifically regarding collaboration, communication, and coordination. I also sought to unpack the practices, tools, and meeting cultures that underlie their success in working agile. The in-depth analysis of these themes aimed to identify core principles that could be applied beneficially within the construction industry.Through interviews with industry professionals, including interior architects, craftsmen, and project managers, I gained insights into the daily hurdles that impede efficiency and the seamless flow of information. This comparative aspect, while not the main focus, will be instrumental in my later discussions, providing a contrastive backdrop against which the agile practices of the IT industry can be examined.

The research methodology was built upon a foundation of survey data that investigated the current state of coordination and collaboration in the construction sector. This survey was pivotal in shaping the subsequent interviews and observations. By engaging with professionals from both industries, I was able to piece together a detailed picture of the communication dynamics and collaborative efforts within these fields. The insights drawn from these interactions have been critical in proposing how agile principles could be adapted to address the challenges uncovered in the construction industry.

This thesis contributes to the relatively new and growing field of Lean and Agile Construction. The need for further research in this area led me to study two large software development companies known for their agile and lean ways of working. By looking into these companies, with their cross-functional teams, the goal was to understand how they achieve such strong collaboration and efficiency. These are goals that the construction industry also strives for, especially when it comes to reducing waste and improving delivery times. The findings from these software companies offer insights that could help the construction industry work towards these objectives.

1.3   Research Questions

This research aims to explore agile methodologies in innovative and renowned IT companies, as well as understand the collaboration and communication challenges in the construction industry and what it can learn from the IT industry. I present the research questions;

- **RQ1:** How do renowned IT companies implement agile methodologies to achieve efficient coordination and collaboration within their teams?
- **RQ2:** What are the common challenges related to communication, collaboration and coordination in the construction industry?
- **RQ3:** What parallels and differences exist between the IT industry and the construction industry?
- **RQ4:** What lessons can the construction industry learn from the IT industry in regards to solving similar challenges?

1.4   Research Approach

In approaching this research, I adopted a hands-on, immersive methodology. I recognized that to draw meaningful parallels between the construction and software development industries, one must understand them from within. My part-time role in a large-scale agile organization within the private banking sector provided a unique vantage point. Serving as a consultant for an operations and incident management team, I had access to in-depth internal processes, routines, and methodologies over a considerable period as well as relations with the development teams. Cross-industry learning is considered highly beneficial, and it can be reasoned that no industry is as well experienced with agile and lean methodology as the IT industry.

This extended immersion into the company's agile environment allowed me to observe the evolution of communication tools and practices, particularly through the lens of an operational team dealing with incident management. The period encompassed the pre-pandemic era through to the post-pandemic shift, offering a rare opportunity to witness the impact of newly introduced tools and automation on communication and coordination, alongside the emergent challenges they posed. I also had the opportunity to observe a software development team within another technology company, which is renowned and known for innovative ways of working, and was able to gain insight into their ways, practices, and methods.

To ensure a comprehensive understanding, I conducted a series of interviews within the construction industry to identify communication bottlenecks and coordination challenges. Similarly, in the software development industry, I studied the operational mechanisms of two successful companies, dissecting their work ethics and methodologies to ascertain what could be deemed as best practices.

1.5   Thesis Structure

The remainder of the thesis structure is as follows:

Chapter 2: Literature Review, provides an overview and a theoretical foundation of the most essential parts of the research context.

Chapter 3: Research Method, presents the choice of methodology, data collection, and approach to data analysis. Limitations will be covered.

Chapter 4: Findings, presents and compares the findings from the data collection

Chapter 5: Discussion, compares the findings from Chapter 4 to existing research and discusses the results.

Chapter 6: Conclusion, summarizes and concludes the thesis as a whole, as well as encourages further research on the two fields discussed.

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Chapter 2 - Background

The purpose of this chapter is to provide an understanding of the research fields in which this thesis is positioned by reviewing relevant literature. The literature review aims to describe current research on lean and agile methodology in both the construction industry and software development industry. This will help us answer the presented research questions. To keep this thesis structured, we will cover the literature review on the construction industry first, and secondly, we will cover the literature review on software development.

The literature review on the construction industry will serve as a basis for understanding the current state of the construction industry, whereas the literature review on agile methodologies and lean development in software development serves as a basis for understanding how successful IT companies operate and work on a day-to-day basis.

In reviewing the literature, it was crucial to assess the existing body of work on coordination and collaboration within the construction industry. Although there is a selection of research on coordination in the construction industry, there is little to no research that explores the parallels between the construction industry and software development, and how we can apply principles from agile software development and efficient collaboration in the IT industry to the construction industry. In this thesis, I aim to bridge that specific literary gap. Therefore, the outline of this thesis must cover coordination and collaboration within both the software development and construction industries and establish a sound understanding of both industries. This dual-focused and cross-industries review sets the stage for a later comparative analysis, to create the basis for drawing parallels between the two fields and allow us to explore what the construction industry can learn from and possibly adopt from the IT industry.

The literature reviewed in this thesis was required through academic databases such as Google Scholar, Elsevier, and Researchgate. Keywords used were the following

- Agile construction industry
- Construction Industry challenges
- Construction Industry coordination
- Construction Industry communication
- Construction Industry Project Management
- *Cross-industry learning agile*
- *Organizational agility*
- Lean Construction

- Lean Software Development
- (TITLE ("Construction") AND TITLE ("Lean" OR "Agile" OR "Efficient")
- (TITLE ("Construction") AND TITLE ("Challenges" OR "Obstacles" OR "Issues")
- (TITLE ("Construction") AND TITLE ("Project management" OR "Coordination" OR "Collaboration")
- Software Development Teams
- Successful Large Scale Software Development
- Construction Development Comparison Software

Additionally, a lot of the literature was acquired through recommendations from my supervisor as well as from people within the software development industry that I met during my research.

2.1 Overview of Construction Industry

There are enormous technological progress and initiatives for digitizing all over the world, and the Norwegian construction industry is not planning on being behind in that regard (Brekke, 2023). The Norwegian government is recognizing the need for a strong investment in digitalization, and researchers underscore that "digital transformation has gone from being a technological opportunity to a pure necessity" (Kraus et al., 2022). According to Kraus et al, the event of the COVID-pandemic accelerated this phenomenon.

Several researchers also acknowledge that digital transformation aims to solve challenges concerning efficiency and effectiveness, while other researchers state that companies that do not rapidly develop and implement DT strategies are unlikely to keep pace and compete in the new digital reality (Kraus et al., 2022). There is a recognition of a great need for increasing digital competence in the construction industry, and BIM (Building Information Modeling) along with other digital tools are on their way into the construction industry to enhance coordination, collaboration, and communication in construction projects (Brekke, 2023).

The National Confederation of the Norwegian Construction Industry states (BNL) that digital tools like BIM are " tools that will streamline and ensure quality in both planning, design and implementation" (Brekke, 2023). The Norwegian industry taking a leading position when it comes to staying at the forefront of digital development in the construction industry and lies at the forefront of producing both digital solutions and environmentally friendly solutions in the Norwegian market as there will be a focus on developing and adapting digital solutions for planning, ordering, operation and maintenance within the construction industry (Brekke, 2023). Flexibility, innovation, and continuous business improvement elements become part of a strategic approach in building a competitive advantage and companies are facing the increasingly common problem of finding a way of adapting to the new, changing business conditions as classical forms of organizations are becoming increasingly dysfunctional under the influence of environmental factors that management should effectively respond to (Komazec et al., 2012).

Construction projects are unique in nature and involve myriads of interrelated activities. Project parties deal with large amounts of information derived from various stakeholders, suppliers, banks, and governmental units - thus, accessing the required information at the right time and location is rather difficult, and construction projects therefore commonly suffer from poor quality and productivity, cost and time overruns (Alaloul et al., 2016). Project completion on time, the standard of quality, and staying within the assigned budget are common goals in

construction projects, but a lack of proper coordination practices hinders the accomplishment of these goals (Alaloul et al., 2016).

2.1.1 Coordination Practices and Factors for Project Success

The construction industry has changed immensely in the past fifty years, especially in terms of project complexity as a result of industry fragmentation, which is why there is a need for effective coordination between project parties (Alaloul et al., 2016). A strong relationship between coordination processes and the success of construction projects has been highlighted by many researchers and some of the most crucial coordination factors are scheduling, quality assurance plans, and all parties' participation in plans (Alaloul et al., 2016).

Alaloul et al. even provide a ranked set of coordination factors that are crucial to the success of a construction project, ranked from most impactful on project success to least impactful. Zidane et al. also mention that there are elements that "steal" time in construction projects and bottlenecks that cause delays (Zidane et al., 2015). Zidane established the most common factors that cause the extension of a project's life cycle or making a project finish slower than initially planned in the construction industry. The research resulted in a list of the ten most common time thieves and bottlenecks in construction projects, seen from building owners, consultants, and contractors' views. According to all participants, "management and coordination" and "decision issues" were the most important delay factors. Time thieves generate delays, and delays are costly. The top five important time thieves are "management and coordination", "quality issues and errors", "administration and bureaucracy", "decision issues" and "waiting".

It has been found that the project complexity is a result of industry fragmentation, which requires effective coordination between project parties, though there is a lack of proper coordination practices among construction parties (Alaloul et al., 2016). Although the coordination practices have not been clearly defined, it is regarded as one of the critical project management factors that determine successful project completion (Alaloul et al., 2016). Alaloul places a focus on the importance of identifying coordination factors in construction projects, and in order to improve the coordination in itself, and improve efficiency by managing dependencies between activities. Alaloul also mentions how industries like computer science, unlike the construction industry, have investigated the importance of coordination, which we can see from research done by Berntzen, Hoda, Moe and Stray, where Berntzen et al. provided research on coordination mechanisms and managing dependencies (Berntzen et al., 2023), which will be explored further down

2.1.2 Lean and Agile Construction

Lean Construction is a relatively new research field. The construction industry often describes lean construction as a mix of continuous improvement, removal of waste, value creation, and focus on process and flow, whereas Bergen Academy of Art and Design (KHiB) has reimagined lean construction and methodology to better suit the construction industry (Holm et al., 2017).

The agile methods adapted were created in a project called "The KHiB-project" in which the project was translated into a series of five booklets that give insight and overview of the adapted methods, their experiences, and lessons learned with the hope of improving the construction industry. The KHiB project in itself was a systematic way of working with Lean and the entire objective of the KHiB project was to work extensively with Lean principles and mentality. (Holm et al., 2017). They later developed their own methodology, inspired by Lean, and named it "Lean Process Planning" and "Lean Design". The adapted methodology allowed participants in the KHiB project to work more smartly and correctly with the extensive planning work. Further, they developed a process named "Systematic Completion" which is a structured continuous test procedure of all the systems and functions. The methods developed in the KHiB project are still in the early stages for the construction industry, but place a focus on the involved parties entailing flow, process, and bigger picture and are part of bridging the literary gap of application of lean and agile principles to the construction industry.

The booklet places a focus on Building Information Modeling (BIM) for ease of access to visual information such as plans and overviews, transparency for building trust within participants in the construction project, a shared understanding of the bigger picture, and support for all parties involved. Early involvement of subcontractors and suppliers was also emphasized. BIM allowed for simplified and continuous communication flow and reduced the defects and damages that typically occur in the construction phase. BIM allowed for continuous access to each other's discipline models and were able to keep up to date with the most recent documentation produced.

There lies the interplay between Lean construction and Agile principles as "construction projects might also benefit from some Agile principles to improve the chances of success through high-level customer involvement and reduce waste and non-value added by Lean construction." (Lalmi et al., 2022) However, research in this field is limited and is still in its young stages, but it has been hypothesized that hybrid project management, using Traditional, Agile and Lean approaches might increase the chances of successful construction projects. (Lalmi et al., 2022)

2.2 Overview of the IT industry

The IT and software development industry is well known for being innovative and having a high degree of digital transformation and innovation, often aided by agile practices and lean principles. The rapid pace of innovation that has happened in the last decades has produced new technologies, services, and methods that drive towards change and progress. IT plays a crucial role in the digital transformation of businesses, industries, and organizations, and has been able to adapt to a digital landscape. Cloud computing, artificial intelligence, and digital platforms are a few of the grander themes that have come out of the IT industry.

Agile software development (ASD) gains in popularity in today's business world due to enabling immediate changes in the direction of product development and requires flexible approaches which often are enabled by agile methodologies and human-centered design activities to enable a value-driven approach to product development (Schön et al., 2017), whereas lean software development is the application of principles of the Toyota product development system to software development and has the ability to result in high-quality software that is developed quickly and at the lowest possible cost (Poppendieck, 2007).

Agile software development is highly interlinked and enabled by autonomous teams. Autonomous teams work closely together, often across different locations, to come up with solutions that can keep up with the fast pace of technological change. Companies in the IT industry that work on software development have been renowned for streamlining processes and creating highly collaborative and innovative environments, which is often due to the adoption of agile methodologies and practices. Communication and coordination is a field they are mastering, and the IT industry really shines compared to other industries. With tools like Slack, MS Teams, and Google Meet it is simple to share updates, ask questions, and collaborate on documents in real time. It is not just about technology, but about the mindset that a lot of successful technology companies instill; to find better ways to work and continuously improve.

2.3 Lean and Agile Methodology

In the field of software development and IT, "Lean" and "Agile" are indeed often mentioned together, and they share many principles and practices. However, they are distinct concepts with different origins and emphases. Lean methodology originated in manufacturing with the Toyota Production System and focuses on the efficient use of resources, elimination of waste, and optimization of the production process to maximize value for the end customer. Its main concern is to streamline processes, reduce costs, and improve quality. Agile, on the other hand, emerged directly from the field of software development as a response to the limitations of traditional, plan-driven project management methods. Agile emphasizes flexibility, iterative development, customer collaboration, and the ability to adapt to changing requirements throughout the development process.

Agile is more about adaptive planning and continuous improvement in highly uncertain and changing environments, particularly in software development. Lean focuses more broadly on continuous improvement but with a strong emphasis on process efficiency and waste reduction. In practice, many IT firms combine principles from both Lean and Agile, adapting them to their specific context. This combination is sometimes referred to as Lean-Agile or Agile-Lean, acknowledging that they complement each other and can be blended together effectively. However, it's important to understand their distinct origins and primary focuses to appreciate how they contribute uniquely to the efficiency and effectiveness of an organization's processes.

2.3.1 Lean Software Development (LSD)

Lean Software Development (LSD) is the application of principles of the Toyota Product Development System to software development. Lean initiatives have led to dramatic improvements in cost, quality and delivery time, especially in software development (Poppendieck, 2007). Lean thinking is focused on the seven following principles;

- P1: **Eliminate Waste**
- P2: **Build Quality In**
- P3: **Create Knowledge**
- P4: Defer COmmitment
- P5: Deliver Fast
- P6: Respect People
- P6: Optimize the Whole

As global competitiveness has increased in the last decades, especially in the software development industry, Lean har emerged as a method and is grounded in decades of work understanding how to make processes better. Lean thinking focuses on giving customers what they want, when and where they want it, without a wasted motion or wasted minute (Poppendieck, 2007).

2.3.2 Agile Software Development (ASD)

The Agile methodology was introduced through the Agile Software Development Manifesto in 2001 (Beck & Beedle, 2001). The central values presented in the manifesto is a collection of frameworks and practices based on effective communication in a team, while also focusing on efficiency and business value. Agile software development is an ever-changing collaborative process. The Manifesto uncovered the following values;

- V1: **Individuals and interactions** over processes and tools
- V2; **Working software** over comprehensive documentation
- V3; **Customer collaboration** over contract negotiation
- V4; **Responding to change** over following a plan

Effective coordination of activities and management of dependencies are crucial for successful outcomes, as *Software development is a complex activity, and the larger the project, the more dependencies there are likely to be because most development work is conducted in parallel by several teams. In the large-scale agile context, dependencies constrain action across teams, requiring inter-team coordination as a means to manage these dependencies*. Coordination mechanisms are used at both the team and inter-team levels to address these challenges and ensure collective performance, and examples of inter-team coordination mechanisms may be meetings, standups, retrospectives, and collaboration tools (Berntzen et al., 2023).

Autonomy and Autonomous teams

Autonomy is the essence of having independence or freedom, meaning that one has the ability to self-govern and have the will to act upon one's actions. Autonomous teams are known as self-managed teams which are often described as teams given freedom by management that take on the responsibilities of supervisors, and are composed of people with a variety of skills to effectively tackle the variety in their external environments. These teams allow for an efficient and effective way of having high productivity, innovation, fast-decision making and handling accuracy of problem solving (Moe et al., 2019).

Team topologies (platform teams+horizontal teams)

Team topologies is a way of structuring teams such that it reduces the cognitive load and solves bottlenecks in growing organizations. It provides a way of addressing the inherent communication structure of an organization that can be correlated to the way organizations design their systems, also known as Conway's law (Melconway, n.d.). It is done by identifying that a team-first approach has to be taken in the organization where the boundaries between teams are identified between four different categories: stream-aligned teams, enabling teams, complicated subsystem teams and platform teams. Each of the teams play a role such that each team knows how to interact with each other and there are three modes of interaction: collaboration, X-as-a-service and Facilitating. By having a clear boundary of how to communicate, the teams can focus on the same values that make autonomous teams efficient (Skelton et al., 2019).

Leadership in autonomous teams

Leaders have an important role in the life of autonomous teams. Leadership in autonomous teams is broadly distributed among a set of individuals instead of being centralized in the hands of a single individual acting in the role of a superior (Stray et al., 2018). For teams new to autonomy, leaders need to set the direction for the team and help establish team norms and learn to be lean. Traditional managers may be unaware of such a leadership role (Stray et al., 2018).

2.3.3 Agile Practices

At the core of the agile practices lies the idea of autonomous, self-managing, or self-organizing teams whose members work at a pace that sustains their creativity and productivity (Stray et al., 2018). Autonomous agile teams offer potential advantages over traditional managed software teams. However, team performance is complex, and an autonomous agile team's performance depends not only on the team's competence in managing and executing its work but also on the organizational context (Stray et al., 2018).

Retrospectives
Retrospectives is a standard agile meeting practice that helps teams - even great ones - to improve and adapt by reflecting and tuning their processes. (Andriyani et al., 2017). During retrospective meetings, teams are able to identify and discuss obstacles, feelings, analyze previous and future action points and generate plans. It is a common practice for agile teams to

achieve better focus and higher levels of reflections, and is a forum for discussing dependencies and unfinished tasks that may hinder the team in progressing on work tasks.

Daily Stand-Up

Daily stand-up meetings is one of the most common agile meeting practices that improves communication in teams and projects, and became popular with the introduction of agile methods like Scrum in which meetings are a mandatory practice (Stray et al., 2016). Daily stand-up meetings are brief gatherings of team members to collaborate and exchange information, usually lasting around 15 minutes (Stray & Moe, 2020a)

Monday Commits and Friday Wins

Monday commits and Friday Wins are practices that have been introduced as a part of the objectives, keys and result (OKR), and specifically to a method called "Radical Focus", where the importance of having effective goal setting by aligning the team on mondays and celebrating the achievements on fridays provides a iterative approach to mapping out if the desired goals will be met (Niven & Lamorte, 2016).

Pair Programming

Pair Programming is a key agile practice that is believed to improve team performance as it supports effective teamwork through monitoring and feedback. In a pair programming session, two developers sit side-by-side at one computer, continuously collaborating on the same design, algorithms, code or test (Tkalich et al., 2023). Pair programming can be practices both on-site or in remote sessions.

Mob Programming

Mob programming is an extension of pair programming where the participants of a programming session are more than two people. It is a way of improving the team performance and is often used as a tool to have continuous collaboration on the same design, algorithms, code or test (Tkalich et al., 2023).

Kanban Board and Jira

A kanban board is a tool that provides a visual signal where teams have separated out every work item and it is represented as a card on the board. The main purpose of representing work as a card on the kanban board is to allow team members to keep track of their progress of work through its workflow. It allows for a visual way to ensure tasks have been completed, and Jira is a tool for managing work tasks and is often used with a visual tool such as a kanban board. Jira provides automated tooling to help the team move tasks along the kanban board as they have solved the task (Dalton, 2019).

2.3.4 Coordination Tools for Agile Teams

Slack
Slack is a real-time, cloud-based collaboration tool and communication platform that is designed for team communication. It is also categorized as an Enterprise Social Networking tool that is very common in the software development industry. The tool launched in 2014 and features real-time messaging, file sharing, video calls, integration capabilities, and alerts (Stray et al., 2019). Slack has also been seen to support the building of stronger and more autonomous teams by increasing team awareness and constant information sharing, facilitating network building (both external and internal), increasing the awareness of who knows what which is essential for high-performing teams, and reducing the need for e-mail and other challenges (Stray et al., 2019). Slack enables streamlined communication between teams and team members with the creation of channels to discuss topics, events, and incidents, which can be either public or private channels. Slack is available both on the web, desktop applications, and mobile devices.

MS Teams
Microsoft Teams (MS Teams) is a communication tool that enables video meeting solutions and enables file sharing and scheduled meetings that integrate with calendar software. Teams allow for the creation of channels where team members can collaborate, share files and screens, and communicate. Microsoft Teams supports both video and audio conferencing, allowing team members to hold scheduled or non-scheduled virtual meetings. Microsoft Teams supports integration with various Microsoft Office apps (Office ecosystem), allowing team members to work on Office documents within the Teams platform. (Microsoft, n.d.)

With a calendar integration feature, a meeting host can send out scheduled meeting invitations as a digital calendar invitation. A meeting can be scheduled as physical or digital, allowing invitees to choose whether to join the meeting at an agreed physical meeting place or virtually. Participants get easy access to the virtual meeting through a link in the calendar or Outlook mail. Microsoft Teams has a broad selection of collaboration tools such as task management, document collaboration, and team channels.

Google Meet
Google Meet is similar to Microsoft Teams, as it is also a video conferencing tool that supports enhanced communication and collaboration. File and screen sharing, scheduling possibilities, and calendar integration work the same for Google Meet, but through the Google ecosystem "Goole Workspace" instead of the Microsoft Office 365 ecosystem.

The biggest difference between Google Meet and Microsoft Teams is that Google Meet lacks extensive collaboration tools that can be found in MS Teams, such as task management, document collaboration, and team channels. This makes MS Teams a more extensive collaboration tool with a more complex interface. Google Meet is however designed specifically for video meetings, and the interface can be experienced as simpler and cleaner in comparison to MS Teams.

Confluence and backstage

Confluence is a multi-user web-based documentation and content organization tool, that is used for both documenting and collaborating. It provides a platform to share, create and discuss content, which makes it important for many software development businesses' internal communication and knowledge-sharing processes. Confluence serves as a repository for organizations and teams to store and share knowledge, best practices, and plans within an organization. It is very common in software development businesses to create and maintain documentation and centralize knowledge. Organization and team members can create and access documents and share them within teams and groups within an organization.

Confluence features word processing, image, and file sharing, as well as code sharing. Confluence enhances team collaboration through comments and @-mentions, allowing team members to work and share feedback on each other's work. Confluence also allows administrators of a page to manage user permissions and access to said page, which enables control over who can view, edit, or create content on a page.

Backstage is a way for developers to centralize their software catalog where all applications are registered and documented to provide a standardized way to streamline the development environment from end to end (*Backstage*, 2023).

Visual Collaboration Tools

Miro is a visual collaboration tool that allows participants to use a digital whiteboard that has an infinite canvas size. By minimizing the window with mouse scrolling, the canvas stretches out and creates more space. It is a tool that enables teams to visually plan and design faster in teams.

Humio

Humio is a tool for gathering real-time information from events that occur in a system, this is known as logging. With Humio's comprehensive logging, it captures every action within a given system or service, ensuring that all customer interactions, successful or non-successful otherwise, are recorded. This level of detail allows teams to conduct thorough investigations, querying customer audits to determine the root cause of a service and system failure, as well as

create real-time dashboards that display data that are necessary for the team members to act accordingly and with enough information during incidents.

2.4 Cross-Industry Learning

Cross-industry learning entails the process of learning from other industries processes and best practices. Cross-industry learning recognizes that traditional practices of one's own industry may be limiting and aims to discover how other industries achieve high levels of performance and innovation. Komazec et al. highlight and argue the case that there is often something in other industries that could be beneficial and add value to other companies' practices, processes, standards, and business models (Komazec et al., 2012), and that cross-industry learning can be a factor to sustainable organizational development.

Chapter 3 - Research Method

3.1 Research Context

The research was carried out in companies from the IT industry and the construction industry. For the IT industry, research was done in two companies, Fuse and Soney, while for the construction industry, it was conducted on a variety of professionals from multiple companies as can be seen in table 1.

Table 1: Industry Overviews

Industry	Company	Sector	Team Observed	Interviews Conducted	Role as researcher	Employees
IT	Fuse (IT dept.)	Online Marketplace	Team Auto	3	Observer	< 300
IT	Soney (IT dept.)	Digital Banking	Team Opsie	1	Participant observer	< 600
Constr.	Comp A	Large scale construction	-	1	Interviewer	550
Constr.	Comp B	Large scale construction and private projects	-	2	Interviewer	31
Constr.	Comp C	Private projects	-	2	Interviewer	5
Constr.	Comp D	Large scale construction and private projects	-	1	Interviewer	141

Fuse is a company that has gained acclaim for its innovative culture, attracting top talent who aspire to push the boundaries of technology and design, and is recognized as being early adopters of agile practices and agile transformation. Fuse is also a company that is committed to fostering a dynamic and creative work environment, and has made its benchmark for success in the IT industry and agile software development. It is also looking to scale its operations to the rest of the Scandinavian countries, which is why the company has undergone a lot of transformations and needs to develop, operate, and maintain products and services to be able to

actualize its future goals of Nordic expansion. The IT department at Fuse has around 300 employees, working both in-house employees and hired consultants.

Soney is a company that has one of Norway's largest in-house development departments in Norway and develops services and products used by over 1 million customers. The focus of Soney's IT and development department group is to be leaders in user experiences, and creators of customer value and competitiveness, by developing and creating the best digital solutions in the banking sector. The development group at Soney has around 600 employees, working as in-house employees or hired consultants.

All in all, both Fuse and Soney are some of the largest technology companies in Norway, with innovative, professional, and creative environments familiar with large-scale agile software development. Both Fuse and Soney value competence development both individually and in professional forums, and the sense of team and team spirit is both strong, prevalent, and important for the way these companies work on a day-to-day basis.

As for the construction industry, I conducted in-depth interviews with professionals from 4 different companies, varying in scale and the types of projects they take on. The details of these companies are displayed in table 1. As the practices in the construction industry vary a lot in regards to company size, the types, and scale of projects taken on by the companies, experience, and competence, I found it important to cover a width of candidates to find similarities in challenges experienced by professionals in the industry - in regards to communication and collaboration, practices and principles - despite the varying and wide nature of the industry.

Case Description - Fuse - Team Auto

During my research, I specifically observed a single team within Fuse that works as a platform team, specializing in payment services. From here on out, this team will be referred to as **Team Auto**. As they are a platform team, it means that other teams rely on its services. This team operates within the broader structure of the company, emphasizing the development of innovative products. They are an integral part of Fuse's operations and work with a high degree of autonomy. My observations focused on this particular team's meeting culture, work processes, communication flow, and how they integrated agile principles into their daily work life. Access to internal informants allowed for in-depth interviews and follow-up discussions, providing a detailed perspective on how this specific team operates within the wider context of Fuse, contributing to the implementation of agile methodologies in this leading technology product company.

Table 2: Team Auto (Members and roles overview)

Team Auto (Members and roles overview)			
Role	**Description**	**Priority**	**Number**
Team lead (Engineering manager)	Oversees team health, leads the team meetings. Enables the agile practices. Developer experience is not prerequisite.	Leadership Evaluator	1
Product Manager	Oversees the product. Specialist in the product the team owns. Has responsibilities in regards to the product and decides what tasks to do, and team priorities. Developer experience is not prerequisite	Leadership User-oriented	1
Tech lead	Decides on technology. Need to have experience as a developer. Has the same responsibilities as developers, but with additional responsibilities and decides what tasks to do and what technology to use. For team Auto, the team wanted to test out having 2 tech-leads.	Leadership Task-oriented	2
Developer	Develops	Task-oriented	6 / 8
Designer	Designs Oversees the product, researches user needs and assists in potential new feature development.	User-oriented	1
Total			11 / 13

Case Description - Soney - Team Opsie

The operations and support team within Soney holds a pivotal responsibility in ensuring the ongoing stability and functionality of the bank's systems even though they are not developers themselves. Their daily tasks involve monitoring system performance, detecting and managing system events, and upholding overall system availability. The participant observations I conducted within this team shed light on their work processes, communication flows, and their specific approach to handling system events.

Through participant observations, informal discussions with team members, Slack and Confluence artifacts, I gained further insights into the practical operations of Soney's operations and support team "Opsie". Analyzing their approach to system management and event handling will contribute to a comparative understanding of various aspects of IT operations and incident management.

3.2 Research Design

I conducted a mixed-method study in the Norwegian construction industry and agile software development industry. The nature of this research is one of comparative nature,

The study was designed as a comparative mixed-methods research to understand the dynamics of communication and collaboration in two distinct industries. The qualitative method was chosen due to its effectiveness in exploring complex social phenomena within their context, allowing for a nuanced understanding of the practical realities that quantitative data often overlook. The qualitative and quantitative nature of this research makes it a mixed-method research, but it also becomes a mixed-method ethnography due to the addition of participant observations.

This research can be categorized as a mixed-methods applied ethnography, as I am not only describing cultures and practices within the IT and construction industries, but also seeking to apply the insights from one industry (IT) to improve practices in another industry (construction). One can say that the core of the study is ethnographic due to the participant observations and interviews, which both are qualitative methods, which allow for immersive exploration and are aimed at understanding the social dynamics and cultural practices that underpin communication and collaboration within the industries, in their natural setting. The inclusion of both qualitative and quantitative approaches makes this study a mixed-methods study, and allows for a more comprehensive understanding of the research problem.

This approach has allowed me to enrich the in-depth contextual findings from my ethnographic work, and using survey data to identify patterns allowed me to explore more in depth through qualitative approaches such as in-depth and informal interviews. This approach allows me as a researcher to understand not just what practices lead to efficient communication and collaboration, but also why they work within the context of the software development industry. It's provides both a worm's-eye and a bird's-eye view, which each provide valuable insights that are both practical and analytical.

An ethnographic study seeks to capture how a group or organization lives and make sense of their world (Robson & McCartan, 2018), and is usually conducted through participant observations or in contexts where the researcher can immerse themselves in that group's setting. A case study is a research approach that involves an in-depth investigation of a single case, such as an event, company or group, where the purpose of the study is to explore the case in depth and gain insights and intensive knowledge of this specific case (Robson & McCartan, 2018). From a practical standpoint - a case study may be more focused and controlled, whereas

an ethnography allows the researcher to deep dive into the social dynamics, culture and practices of a group which can be useful to gain cultural insights.

The ethnographic component of this research was characterized by a combination of participant observation, observations and in-depth interviews. This approach provided a rich, contextual understanding of the agile methodologies within the IT industry and the traditional practices within the construction industry.

Quantitative Method

Survey: Prior to the in-depth interviews, a structured survey was distributed to professionals, including interior architects, craftsmen, and project managers within the construction industry. The survey aimed to gather statistical data on the usage and of communication and collaboration tools and practices. Insights from this survey were instrumental in tailoring the interview guides and creating refined interview questions, as they highlighted key areas of interest and potential gaps in the existing collaboration frameworks within the industry.

Engaged Scholarship

To an extent, I have also conducted an engaged scholarship which is an academic approach that emphasizes collaboration and partnership between scholars and practitioners for the purpose of generating new knowledge that can address real-world problems (Mathiassen, 2017). I conducted surveys and interviews with professionals in the construction industry, and focused on real-world problems such as communication, coordination and collaboration as well as exploring the potential for practical application of findings in the IT industry to the construction industry. The findings were also shared with both academic and industry practitioners, which further aligns with the principles of engaged scholarship that knowledge is co-created and applying it to work towards real life solutions.

Integration of Methods

The survey's quantitative insights provided a preliminary mapping of the landscape of collaboration and communication in the construction industry. The survey data were pivotal in developing a targeted interview guide, ensuring that subsequent qualitative interviews could delve deeper into areas identified as critical by the survey respondents. The questions were designed to unlock information on pain points experienced in the construction industry in regard to communication and collaboration, as well as map out processes, tools, and practices within the industry.

The iterative process between survey results and interview questions reflects the dynamic nature of this research, allowing each method to inform and refine the other. The ethnographic approach, with its emphasis on cultural immersion and contextual understanding, was thus supported and enhanced by the quantitative data, leading to a more nuanced and informed qualitative analysis.

By intertwining ethnographic practices with quantitative surveys, the research design is uniquely positioned to provide not just an analysis of what collaborative practices exist, but also a deeper understanding of how and why they are integrated into the daily fabric of professional life in both industries.

3.3 Data Collection

3.3.1 Timeline and Stages of Data Collection

For the following section, I have split the research timeline into three parts to make the overview simpler. This thesis has collected data in two software development companies, as well as in the construction industry. I therefore present a set of three timelines

- T1 for data collected from the construction industry
- T2 for data collected at Soney
- T3 for data collected at Fuse

Figure 1: Timeline T1

October	Desktop research on the Construction Industry
October	Creating table on most common software
November	Crating role map on participants in construction project
December 2nd	Initial meeting with Interior Architect
December 4th	Refining interview guide for project managers in construction
2023	
January 25th	First interview: Project Manager in Construction Industry
February 1st	Refining interview questionnaire form
February 21st	Sending questionnaire to int. arch, project managers, craftsmen
February 21st	Reviewing answers from questionnaire
February 21st	Refining interview guide for interior architects
February 25th	Research on BIM & CRM
Selvaag Project	
March - April	Observing Selvaag Rehabilitation Project
April	Informal interviews
April	Access to documentation & emails
Extension &Summer Break	
September	Booked interviews
September	Conducted interviews
September	Research on BIM & CRM
September	Booked interviews

Figure 2: Timeline T2

31

December 6th	●	Observation: Retrospective
December 6th	●	Informal interview with team members
January 16th	●	Access to Slack, Confluence, Jira & MS Teams
January 9th	●	Starting Meeting Observations: Monday Meet + Friday Wins
February 28th	●	"Smidigkurs" with Bouvet
February 21st	●	Sending out Questionnaire to interior architects, craftsmen and project managers
Extension & Summer Break		
August	●	Booked interviews
September	●	Conducted interviews

Figure 3: Timeline T3

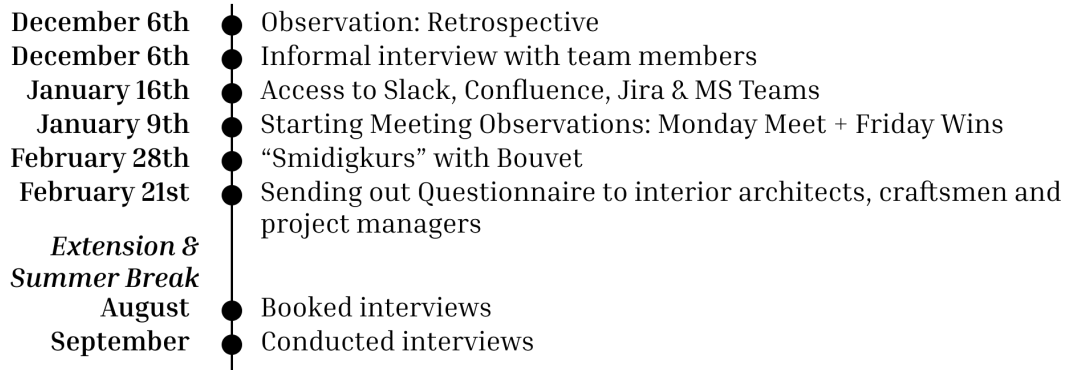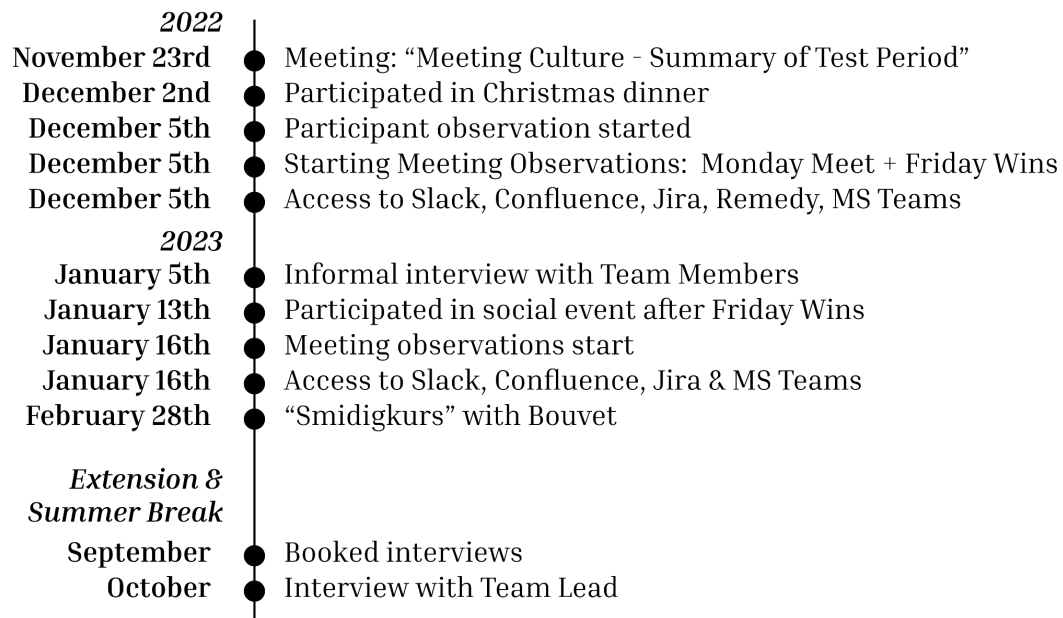| *2022* | | |
November 23rd	●	Meeting: "Meeting Culture - Summary of Test Period"
December 2nd	●	Participated in Christmas dinner
December 5th	●	Participant observation started
December 5th	●	Starting Meeting Observations: Monday Meet + Friday Wins
December 5th	●	Access to Slack, Confluence, Jira, Remedy, MS Teams
2023		
January 5th	●	Informal interview with Team Members
January 13th	●	Participated in social event after Friday Wins
January 16th	●	Meeting observations start
January 16th	●	Access to Slack, Confluence, Jira & MS Teams
February 28th	●	"Smidigkurs" with Bouvet
Extension & Summer Break		
September	●	Booked interviews
October	●	Interview with Team Lead

The study was split into two stages. The ***first stage*** and the ***second stage***. In the first stage of the data collection, I conducted initial explorations of the research questions through informal interviews, initial observations, and surveys. The insights from the first stage of data collection guided me in identifying patterns and creating interview guides with directed questions for all of the semi-structured interviews that were conducted in the second stage of the data collection. The data from the **first stage** also allowed me to gain a broader understanding and get some key insights that would help me formulate questions for the **second stage** of data collection, which would help me answer the research questions of this thesis. For the second part of the data

collection, I conducted semi-structured interviews with professionals in the construction industry. This study focused on data collection primarily through individual semi-structured interviews with informants who worked as employees and leaders from both the construction and the agile software development industry. The overview of these can be seen in table 1: Industry Overview.

Being a participant observant at Soney, it was easy to gain access to communication and collaboration tools, as well as follow up with questions as I already had team trust from before. It also helped keep a relaxed relationship between me as a researcher and my team members, as I was able to have an open dialogue on-site with my team members to explain the purpose of the research.

Having a key informant at Fuse, also helped me to gain access to team artifacts and gain further insights on the team and the working culture and team dynamics at Fuse. Having a key informant at Fuse was valuable as the informant could provide depth and context to observations I made at the start of the observation phase, and had the opportunity to clarify observations, ask for explanations, and gain insights into the team's dynamics that were not visible through observations of meetings alone.

For the company Fuse, I conducted 4 interviews, as well as a two month long observation, and gained a view into the communication and coordination tools, agile practices and meeting culture. I also conducted follow-up interviews and had informal interviews with the team members, in addition to also having access to an informant that have been working at the team for almost 3 years and was crucial in the role of scaling up the team. Access to this informant made me able to go back for follow-up questions, gaining further insights into the teams working methods and how they had evolved, as well as gaining access to internal documentation and Slack artefacts.

For the company Soney, I conducted a single semi-structured interview, and supplemented with informal conversations with the team members, as well as observations. The observations were in a way more extensive, as I have been working at Soney part time for the last six years in the evenings, and had full access to, as well as previous experience, with their main communication and collaboration tools, as well as practices, internal resources and working methods. The observations of the meeting culture.

For the construction industry, I conducted interviews with interviewees that were from four different companies, which allowed me to gain insight into different tools, practices as well as see similarities across companies.

3.3.2 Observations

Here I provide an overview of the meetings I observed at Team Auto in Fuse.

Table 3: Observations of meetings at Fuse

Tag	Date	Type	Meeting Type
F-M1	January 6th	Friday Wins	Virtual
F-M2	January 9th	Monday Commit	Virtual
F-M3	January 13th	Friday Wins	Virtual
F-M4	January 16th	Monday Commit	Virtual
F-M5	January 26th	Thursday Win	Virtual
F-M6	February 6th	Monday Commit	Virtual
F-R1	February 9th	Retrospective	Virtual
F-M7	February 10th	Friday Wins	Virtual
F-M8	February 13th	Monday Commit	Virtual
F-M9	February 17th	Friday Wins	Virtual
F-R2	*missed date*	Retrospective	Virtual

HereI provide an overview of the meetings attended during the observation period at the Soney.

3.3.3 Participant Observation

I conducted participant observation at Soney. The ethnographic approach of this research is due to the use of participant observation which allows for immersion and a deeper insight into how organizations and communities live. The use of participant observation is particularly useful in new, applied areas where there is a lack of theory and concepts to describe and explain what is goin on (Robson & McCartan, 2018), which aligns with the motivation and purpose of this research is positioned - which is that of applying the insights from one industry (IT) to improve practices in another industry (construction) - making it quite a fitting approach and choice of methodology.

Table 4: Observations of meetings at Soney

Tag	Date	Type	Meeting Type
M1	December 5th	Monday Commit	Virtual
M2	December 9th	Friday Wins	Physical
M3	December 12th	Monday Commit	Virtual
M4	December 16th	Friday Wins	Physical (I attended virtually)
M5	January 10th	Tuesday Commit	Virtually
M6	January 20th	Friday Wins	Physical
M7	January 30th	Monday Commit	Virtual
M8	February 3rd	Friday Wins	Physical
M9	February 6th	Common Meeting	Virtual
M10	February 13th	Monday Commit	Virtual
M11	February 17th	Friday Wins	Physical
M12	February 20th	Monday Commit	Virtual
M13	February 24th	Friday Wins	Physical
M14	March 8th	Common Meeting	Virtual

McCartan also mentions how a key feature of participant observation is that the observer seeks to become some kind of member of the observed group, which was already fitting as I have been employed at Soney for quite a few years, and did not need to spend time building trust with team members - "you already have links with the group, there may be pre-existing trust which gets you in" (Robson & McCartan, 2018).

My employment at Soney facilitated participant observation, granting an insider's perspective into the operational and communicative practices of an agile IT environment. Field notes were meticulously recorded along with metal notes, capturing both practices and the tacit knowledge that underlies daily operations. The field notes were collected during meetings, whereas for time spent doing actual operations and management work, I took both mental notes and some field notes. During the Friday Wins, which usually were conducted at office locations, I spent time talking to and observing the team members working for around an hour to two hours each time.

A challenge of conducting both participant observation and regular observations is the potential to produce biases such as selective attention, selective memory and interpersonal factors, and the event of capturing field notes and keeping your attention widely and evenly to help reduce and manage biases (Robson & McCartan, 2018).

Getting feedback from informants: The informant within Fuse provided a gateway to observe agile practices in a different context, granting observational data during team meetings and retrospectives, which were invaluable for comparative analysis. Having an informant also allowed for continuous follow-up interviews that were of informal nature. Getting feedback from informants is a useful relationship between researcher and informant, as it provides feedback about the findings. It also provides an invaluable means of corroborating them (Robson & McCartan, 2018).

3.3.4 Semi-Structured Interviews

Interviews are considered some of the most important methods for data collection as most case studies are about human affairs or actions (Yin, 2018) and are commonly categorized as either structured, semi-structured or unstructured interviews (Robson & McCartan, 2018). I chose to conduct semi-structured interviews, as less structured approaches allow the interviewee to respond more freely and responsively (Robson & McCartan, 2018). Strengths of semi-structured interviews include the potential discovery of unknown issues and require less training time than unstructured interviews, which I deemed to be very beneficial when conducting interviews with professionals from the construction industry (Wilson, 2014).

Interviews can be used as the primary or only approach in a study, though they usually lend themselves well to be combined with other forms of methods, creating a multi-method approach. For case studies, they might employ a relatively formal interview to complement observation (Robson & McCartan, 2018).

The semi-structured interviews were conducted with a variety of stakeholders. For the construction industry, they were conducted with interior architects, project managers and building project managers. Some of the interior architects were also familiar with project management, such as Interviewee i3, as she was the owner of an small interior architect company C. For the IT industry, I had the opportunity to conduct interviews with two team leads (both experienced and relatively inexperienced), an IT manager combined agile coach who has been a key player in agile transformation, and a developer with experience in scaling and building agile teams. The initial insights from participant observation and surveys informed the semi-structured interview guides, ensuring a comprehensive exploration of communication and collaboration practices.

Table 5: Overview of all semi-structured interviews

Interview	Role	Industry	Years exp.	Date	Duration (h:m:s)
i1	Project Manager	Constr.	8	Winter 2023	50:12
i2	Interior Architect Ania	Constr.	13	Autumn 2023	1:40:25
i3	Interior Architect & CEO	Constr.	15	Autumn 2023	1:14:45
i4	Interior architect	Constr.	8	Autumn 2023	1:14:45
i5	Interior Architect, Project Leader & CEO	Constr.	10	Autumn 2023	51:31
i6	Interior architect, CEO & Partner	Constr.	19	Autumn 2023	1:13:54
i7	Engineering Manager & Team Lead	IT	15	Autumn 2023	52:44
i8	IT Manager & Agile Coach	IT	15	Autumn 2023	1:38:17
i9	Developer	IT	5	Autumn 2023	1:48:57
i10	Team Lead	IT	4	Autumn 2023	50:54
Total: 11 people	5 interior architects 1 project manager 3 team leads 1 developer	6 in Constr. 4 in IT		**Total time: Avg. time**	**656 min 73 min**

Table 6: Interviews in construction industry

Interview	Role	Industry	Years exp.	Date	Duration (min)
i1	Project Manager	Constr.	8	Winter 2023	50 min
i2	Interior Architect Ania	Constr.	13	Autumn 2023	104 min
i3	Interior Architect & CEO - i3a	Constr.	15	Autumn 2023	82 min
	Interior architect - i3b	Constr.	8	---	---
i5	Interior Architect, Project Leader & CEO	Constr.	10	Autumn 2023	52 min
i6	Interior architect, CEO & Partner	Constr.	19	Autumn 2023	74 min
Total: 6 people 5 interviews	5 interior architects 1 projet manager	6 in Constr. 4 in IT		**Total time:** **Avg. time**	**362 min** **72 min**

Table 7: Interviews in IT industry

Interview	Role	Company	Years exp.	Date	Duration (min)
i7	Engineering Manager & Team Lead	Fuse	15	Autumn 2023	53 min
i8	IT Manager & Agile Coach	Fuse	15	Autumn 2023	99 min
i10	Developer	Fuse	5	Autumn 2023	108 min
i11	Team Lead	Soney	4	Autumn 2023	51 min
Total: 4 people	5 interior architects 1 project manager 3 team leads 1 developer	2 companies		**Total time:** **Avg. time**	**656 min** **73 min**

3.4 Data Analysis - 2 sider text, 1 side bilde

The interviews were audio recorded and transcribed with Autotext, a software developed by the University of Oslo to automatically transcribe interviews. All of the interviews, with exception to one, were conducted in Norwegian. The transcribed interviews were then also translated into English with Autotekst.

Yin (2018) suggests four data collection principles to improve the validity and reliability of the research: 1) use multiple source of evidence, 2) create a case study database, 3) maintain a chain of evidence and 4) exercise care when using data from social media sources. Table 6 summarizes my approach to these principles. *insert database***

The key features of much structured observation are the development of a coding scheme, and its use by trained observers. (Robson & McCartan, 2018)

Figure 4: Snapshot of creating topics and sorting them

3.5 Ethical Considerations

Research processing qualitative data must be conducted carefully, and with care and sensitivity. It was especially important to gain informed consent from all of the people that were part of this study, to protect the privacy and confidentiality of those who participate. Therefore, an application was sent to the Norwegian Center for Research Data (NSD), now known as Sikt (Norwegian Agency for Shared Services in Education and Research) before starting the process of collecting any data. Consent forms were also approved by NSD/Sikt, which stated the rights of the interviewees in regards with the General Data Protection Regulation (GDPR). These forms were signed by all interviewees before starting the interview process and the voice recordings.

It is also worth noting that it is important to be aware of the Hawthrone effect that may arise during observations and interviews, which is where research participants can change their behavior in a setting because of the presence of the researcher (Iphofen & Tolich, 2018).

3.6 Analytical Perspective

The data collection method employed in this study is comprehensive and sets a solid foundation for comparative analysis. The interview spectrum across various levels in the construction industry is poised to have captured a broad perspective on communication and collaboration processes. In tandem, observations within the IT industry, especially the insider experience at "Soney" and the systematic observations at "Fuse," provide depth to the understanding of agile methodologies in practice.

This blend of qualitative data from the interviews and observations is poised to allow for drawing meaningful parallels between the two industries' approaches to project management and teamwork. The participant observation is of particular value, offering a nuanced understanding of the culture and everyday operations within "Soney." Such first-hand experience underpins the research with rich, contextual insights that pure observational or interview data might not yield as effectively.

Through thematic analysis, aspects such as the flexibility of processes, the role of technology in facilitating communication, and the management styles contributing to a lean and agile environment will be explored. The study's findings are anticipated to identify best practices from the IT industry that could be transposed and adapted for the construction industry to enhance efficiency and collaborative efforts.

The comprehensive nature of data collection, the strategic selection of interviewees, and the depth of participant observation furnish this study with the necessary tools to not only describe but also prescribe potential improvements for the construction industry. It acknowledges the current state of practices and points toward a future where the industry can evolve by integrating successful IT strategies, thus moving towards a more lean and agile operation.

Chapter 4 - Findings

This chapter presents the findings of this research, and it will be divided into two main sections to keep a structured overview of all the findings. Here I present the findings from the agile software development industry (Fuse and Soney) and the construction industry. The chapter is divided into two main sections, as we have collected data from two different industries, namely the IT industry and the construction industry. As we collected data from two companies in the IT industry, we will again split this chapter into two sections; Findings from Fuse and findings from Soney.

Figure 5: Overview of findings
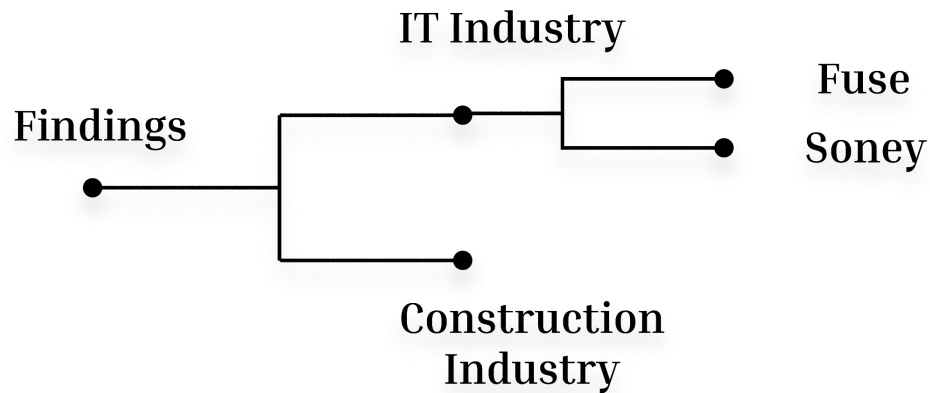
4.1 Findings from Fuse

This subchapter presents the findings from the investigation carried out at Fuse, a prominent Norwegian technology company renowned for its innovative approaches to software development, innovation and organizational digital transformation. The observations and data collected from Fuse offer a window into the practical application of agile methodologies that have positioned the company at the forefront of the IT industry.

The opportunity to engage with internal informants has provided valuable in-depth interviews and discussions, offering a clearer view of Fuse's practical application of agile methodologies. The focus of this inquiry has been on the organizational structure, particularly the dynamics and functionality of autonomous teams within this technology-focused environment, as well as the tools the team uses and how they apply them in their daily work lives.

4.1.1 Fuse Case Context

Fuse's organizational structure is that of a typical business organization hierarchy, split into sales, finances and technology. This thesis will only focus on the structures and dynamics in the technology-part of the organization. The technological-part of the company in Fuse is focused on agile product development, which is the reason for the division being further split into different markets. The different markets provide different products and services, and the company has a team that is focused on developing and maintaining a singular product. As such, the teams are structured around the concept of autonomous teams. Autonomous teams are allowed to choose their own methods of working, and this approach is empowered by the company as explained by the IT-manager who has been an integral part of Fuses' journey towards agile transformation and becoming a highly competitive agile software development company.

> *"To put it mildly, we have tuned the organisation in a way that the teams are very free to choose the method themselves. Some work on a Scrum basis, others use Kanban, or other more convenient processes. If you manage to get the autonomy and ownership, then you should perhaps also be allowed to have ownership over your own process." - (Interview i8)*

Fuse has implemented a significant reorganization to enhance its agile methodologies and iterative development processes. Recognized for its commitment to innovative product development, the company's structure is characterized by autonomous teams. These teams are

central to Fuse's operations, granting autonomy to a degree that facilitates a responsive approach to product development.

The company's ethos is built around continuous improvement and delivery, adhering to agile principles. Observations of how meetings are conducted, work is processed, and communication is managed have shed light on the operational integration of these autonomous teams. The interplay between the company's meeting culture and the independence afforded to the teams is significant, contributing to Fuse's operational effectiveness.

> "Agile is about producing value faster, delivering faster, delivering more - not to mention, continuously and straight up. [...] You have to be able to correct all the time." (Interview i8)

Within the technological domain, Fuse's team configuration is modeled on the 'team topologies' concept, which is a systematic, methodical approach to team organization. This model aligns teams with specific products and areas of expertise, ensuring a clear focus and direct accountability. At Fuse, teams are categorized as either platform teams, which provide shared services and tools for other teams; vertical teams, which are aligned with customer-facing features or services; or horizontal teams, which support common technical capabilities across the organization.

Fuse works with team topologies, which is a framework designed for optimizing team interactions and each team has a specific role. In follow questions with Interviewee i9, teams at Fuse are categorized as either (1) Stream-aligned team (Vertical teams), (2) Platform teams (3) Enabling Teams (Horizontal teams). According to Team Topologies, there are usually four types of teams identified, but Fuse only works with these three mentioned types, which indicates the flexibility and adaptability Fuse instills, as they have adapted the concept of team topologies to suit their needs instead of a rigid adaptation of the concept. These teams are assigned to work within their specific role and assigned responsibilities, to optimize business flexibility, team interdependencies and enhance collaboration, allowing for a more streamlined and effective workflow. It fosters an environment where teams can operate with a high degree of efficiency and autonomy, yet remain interconnected enough to support overarching company objectives.

4.1.2 Autonomous Teams in Fuse

Autonomous teams at Fuse are self-managed entities, where team members have their respective roles and responsibilities, designed to tackle projects, tasks and goals with efficiency and a high degree of agility, enabled by autonomy. Within these teams, developers, designers, product managers, tech leads and team leads, work together, each bringing a unique set of skills

and perspectives, as well as having defined roles. This cross-disciplinary approach is not by chance but by design, facilitating a holistic approach to agile product development.

The autonomy granted to these teams is not absolute, meaning the teams still operate within the parameters set by the overarching strategic goals of the company. This balance between independence and guidance allows teams the flexibility to innovate and iterate swiftly while still remaining aligned with Fuse's broader objectives and the company vision. The fluid interaction among team members, coupled with the clear description of roles and responsibilities, creates an environment where creativity flourishes, decisions are made swiftly, and products evolve continuously.

The interplay between autonomy and ownership is continuously highlighted throughout the interview with the IT-manager and agile coach at Fuse, stating that *"autonomy and ownership are closely linked" (Interview 8)*. Autonomous team structure at Fuse not only enhances the company's agility but also serves as a catalyst for employee empowerment and satisfaction. In the eyes of the IT-management of Fuse, *"Autonomy is about ownership. Ownership to their own code. They have been given responsibility, and they're allowed to manage that responsibility" (Interview 8)*. Interviewee i9 also highlights that *"the focus for us as an autonomous team is that we have full control and control of what we want to do, how we want to do things (Interview 9)"*.

> *"It's not like someone comes in from outside and dictates how things should be done. Or just destroys, writes in their code base. Because that's how it was back in the day. If you've done something, and you've made a mistake, then others will follow suit instead of you getting the chance to do it yourself. That takes away both responsibility, and pride, and ownership. So autonomy is part of creating... The developers' self-respect. The team feeling" (Interview 8).*

Ownership to a code base that the team and its developers knows well, also leads to better solutions and increased customer value deliveries as they are *"domain experts in what we work in (i9)"* and being included in the start allows teams to *"realize that something (a task) might take a lot longer than it should, and you can re-prioritize things"* (Interview 9)

> *"The team that owns the solution, they have pride and ownership and responsibility around their solution. They do not want to have errors in the production over time" (Interview i8).*

Interviewee i9 reflects on a time, before coming to Fuse, when working with little to no degree of autonomy in plan-driven development. *"Everything that had to be done, was already pre-defined for us. So there was no need for any technical expertise in how to solve a problem, we were just there to write the code."* and *" everything is planned in advance by experts who are not part of the project"(Interview 9)*. He also reflects on a projects where everything was pre-determined and inflexible as project

planners were *"not involved in the whole process of estimating, calculating and knowing what needs to be done and how things should be done."*, leading to projects, in the worst cases, *"closing the project and saying it was a fail"* due to wrong estimations and not involving developers early enough, or giving them enough flexibility, in decision making and working processes.

Autonomy and ownership also leads to stronger familiarity between developers and their work (codebase), which also allows for quicker error handling and implementing fixes to the codebase. *"If you have an error, you stop the line, fix the error and move on. Because an error that gets you to live, just generates more trouble over time" (Interview 8)*. The relation between ownership, autonomy and fast error handling is closely related.

Each autonomous team consists of a specific set of roles which we detail in the next section. These autonomous teams are also known as "Core", or "Atomic", teams because the removal of either of the roles of the team would cause the team to be suboptimal. Fuse believes that the concept of these core teams help the team members to have a clear set of roles, tasks and focus areas. Where autonomy is at the center of each team.

4.1.2.1 Team Structure, Team Roles and 3D-groups

At Fuse, the composition of each team is deliberately structured to foster a collaborative and multifaceted work environment. A typical team features a dynamic mix of roles that includes a combination of *developers*, *designers*, *product manager*, *tech lead*, *and team lead*. This combination ensures a well-rounded approach to product development, where technical expertise, creative design, strategic oversight, and leadership converge.

Table 8: Team Roles in Autonomous Team at Fuse

Team Roles in Autonomous Teams at Fuse			
In 3D Group?	Role	Description	Responsibility (Focus)
YES	Team lead (Engineering manager)	Oversees team health, leads the team meetings. Enables the agile practices. Developer experience is not pre-requisite.	Leadership Agile enforcer Coaching
YES	Product Manager	Oversees the product. Specialist in the product the team owns. Has responsibilities in regards to the product and decides what tasks to do, and team priorities. Developer experience is not pre-requisite	Leadership User-oriented
YES	Tech lead	Decides the technology. Need to have experience as developer. Has the same responsibilities as developers, but with additional responsibilities and decides what tasks to do and what technology to use.	Leadership Task-oriented
No	Developer	Develops	Task-oriented
No	Designer	Designs Oversees the product, researches user needs and assists in potential new feature development.	User-oriented

Every team member is able to contribute uniquely. Developers bring their developing and problem-solving skills, while designers contribute with user-centric design and innovation. The product manager acts as a visionary, aligning the team's output with customer needs and business goals. The tech lead provides technical guidance, ensuring that the team's solutions are robust and scalable. Finally, the team lead orchestrates the efforts of all members, fostering unity and steering the team towards cohesive performance and productivity, as well as enforcing agile practices.

Together, these roles are pivotal in driving Fuse's success, allowing each team to operate as a driving force of the company's broader ethos of agility and excellence. We provide a table of the roles that make up an autonomous team in Fuse, and their respective role responsibilities. Below we present a figure that illustrates the structure of an autonomous team at Fuse.

Figure 6: Illustration of an autonomous team x at Fuse
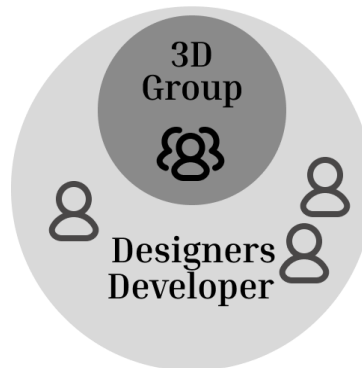
Here I provide a simple illustration of the team structure. As we can see, autonomous teams in Fuse are made up of designers, developers, and an inner core known as the *3D-group* or *leader group*. The 3D-group consists of the team lead, product manager and tech lead(s). The 3D-group members have tasks and responsibility related to creating goals and milestones for the team, and prioritizing tasks that the team need to work on. These are activities that happen every Friday during the leader group meetings, also known as the 3D-group meetings. The 3D-group meetings can be classified as a coordination mechanism that happens every Friday and lasts for 30-60 minutes on average.

Figure 7: Illustration of 3D-group
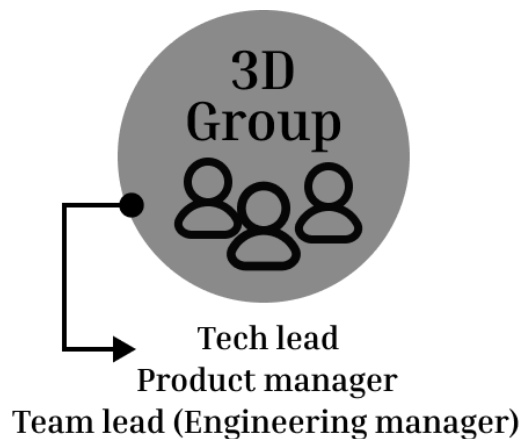
The task priorities are determined at the end of each working week, which would normally be every Friday. The choosing of tasks and ranking the task priorities happens during a meeting every Friday called "*Leader Group Meetings*". The leader-group meetings typically last from 30 to 60 minutes on average. They often extend beyond the 30-minute mark, but this largely depends

on how much the members of the leadership group need to discuss. If there is a wider range of tasks to choose from, which need to be discussed and decided upon, they usually exceed the 30-minute mark. Interviewee i7 notes that *"The three roles (the three of us), we have a slightly different perspective in the discussions and a slightly different area of responsibility. But there are also a lot of things that overlap between the roles."* Team A's team lead recalled in an interview that the 30-minute mark is usually exceeded, as they usually have quite a bit to discuss in the meeting, as they choose and prioritize tasks that the team needs to work on.

> *"We also have a fixed session every Friday where we try to plan a bit for the coming weeks and any things that will come further in time. But here, there are more decisions to be made, priorities and the like. There are no solutions to how we should do things - we try to take more of that when it arises. So we don't have a set time for that. When those challenges come up, just "Okay, now we need to solve it, then we sit down and do it" (Interview 7).*

The leader-group-meetings works as a mechanism that enables the designers and developers to stay task-oriented, instead of spending time on thinking about which tasks to prioritize. This in turns creates less distractions for the developers and designers in a team, and creates more focused work.

> *"We developers are involved when tasks are ready to be implemented, not in the planning and idea stage" (Interviewee i9, Follow-up interview).*

There is already an extensive cognitive load on the team due to other meetings and the 3D-group is responsible that when the tasks are assigned to the developers and designers, they are actually ready to be implemented and have come out of the planning and idea stage. The planning and idea stage of tasks can involve one or more 3D-groups, stakeholders and external participants, such as third-party vendors, interests agents , customers and service providers can also be included in the idea and planning stage. It is a relatively new concept at Fuse.

> *"At the time, there was no 3D-group in the team, it is part of the reorganization that happened right after I started at Fuse in 2021" (Interviewee 9, Follow-up interview).*

Team Size and Coordination Issues

During a team Auto retrospective, a developer presented the concern that the team might be too big - which other team developer members seemed to agree on - as it caused difficulties in coordinating tasks and having clear responsibilities, as well as overview of what other team members were doing. The team had expanded the past year during the start of my observations, and one developer shared in a retrospective that it was too much to do in the sense that

following up tasks with other team members were taking up more time than expected. This can also be seen in the light of the following views, indiating that smaller teams are easier to coordinate, and it is easier to ensure that every team member is on par with what needs to be done and future plans (Interview 9);

> *"The larger the team is in a iterative process, the slower it goes because there are too many people working on the same thing in the same area. The communication overhead becomes too much. To reduce that, you usually divide teams into smaller parts. Smaller teams, then have a very specific task to do."*

4.1.4 Coordination Mechanisms at Fuse

Here I present the multifaceted coordination mechanisms at Fuse that enforces them to work agile and how they use collaboration tools to with high degree of efficiency. The coordination mechanisms allow Fuse to seamlessly collaborate and communicate, and consists of virtual tools, meeting, documentation and agile practices such as pair and mob progrmming to stay in sync and work efficiently together.

Table 9: Coordination Mechanisms at Fuse

Coordination Mechanisms		
Slack	Internal Team Channels	More social, personal and engaging. Channel activity every or every other hour.
	External Team Channels	More professional, short and seldom communication. Channel activity every other day.
	Organization Channels	For aligning and informing the employees in the company of upcoming events, goals and achievements
Meetings	Monday Commit	The team members commits for the week
	Friday Wins	The members forum for presenting success stories form the week
	Daily standup (2x a week)	Meeting for checking in with team members and getting help. Usually tuesday and Wednesday
	Retrospectives	For creating better practices, discuss what is working and what is not working
	Townhall Meetings	Meetings that update the organization on upcoming events, goals and achievements
	3D-group meetings	Meetings for team members with leadership responsibilities
Tools for hybrid meetings	Google Meet	Virtual meetings and meeting scheduling for calendar
	Slack Huddle	Quick virtual meetings and voice calls. With or without camera
Collaboration tools	Miro	Tool for retrospective meetings. Sticky notes, timers, and shared whiteboard
	Team Retro	Virtual visual whiteboard with limitless canvas for co-planning, designing, working
Documentation	Jira	Keeping track of tasks and creating tasks
	Confluence	Documenting team information that seldom changes and longterm goals
	Backstage	Automatic documentation for developers
Pair+Mob Programming	In office or virtually	Programming sessions between two or more developers
Social Events and Games	Meetups, trips, parties	Cultivates culture, Enables employee satisfaction, team cohesion

4.1.4.1 Slack for optimal coordination, channel structure, and information documentation

Slack is the most used and most important communication and coordination tool for Fuse and its teams. Slack enables inter-team communication, as well as communication across all the teams in the company. Slack has replaced email for all internal communication in the company, and in addition it functions as a documentation, lookup, and logging tool. If something has been written in Slack, it will be searchable through its built-in search engine given the communication was done in a public channel. For these reasons, it serves a purpose as a knowledge base as well.

When asking the engineering manager and developers from team Auto if Slack was an important tool in a workday, it was a common opinion that Slack is essential for completing tasks in a workday and coordination with team members. A workday is not completed if one is not logged into Slack.

> *"Yes, absolutely. It is a definitive must-have" - (Interview 7)*
> *"Slack is something that is used all the time. That is something I would not have managed to work with without" - (Interview 9)*

The way Slack is set up in Fuse, can be said to reflect the internal communication in the organization; there is both an external and internal chat for all teams in the Fuse organization. For both the developer and team lead interviewed, mail and MS Teams were used as main communication tools previous to working at Fuse, where the developer had negative experiences

> *"I was not happy about it - mostly because Teams requires that you have logged into the VPN and that you only can have one Teams channel open. If you have Teams for different projects or different places, it means that you have to log out and in and do a lot of extra work" (Interview 9).*

Asking further about MS Teams, he had the following to say;

> *"Teams in itself is not a nice, simple app to use. It has a lot of bad features, and a very unstructured way to gather different discussions and conversations - Slack is better because they have a better way to structure their channels - You can link channels under different categories that are relevant to you. For example - I have channels related to me and my team in a channel called "Teams". And I have sorted all external third-party solutions through communication as "External", and I have other channels related to Fuse in a category called "Fuse. "It is a way for me to separate what is relevant to the Fuse organization, what is relevant to people who need to communicate with us as a team, and what is important internally in our team" (Interview 9).*

Developers in the team also structure tasks from the Jira board into Slack. When creating a Jira Epic, the team creates a Slack channel for the specific Epic - allowing the team members to quickly communicate and coordinate in the Epic-specific channel. Because of this structure, the Slack channels work as an archive for the Jira epics, with all relevant communication inside the Slack channel. *"It is easy for me to jump back and find out why we chose to do the choices we made. It gives us a bigger picture of why things were done. The worst situation you can be in is to look at a situation where you don't have any information"* (Interview 9).

4.1.4.2 Pair and Mob Programming

During my observations of the team meetings, I noticed that the junior developers or newest onboarded team members were the most reluctant to have a pair programming session, even if it was recommended by the team lead or more experienced team members. Even though the team lead or other more experienced developers were encouraging pair programming, the onboardees or juniors were hesitant and explained that they would like to try solving challenges by themselves before having a pair programming session. Slack logs showed that the same members were using the internal team channel the most, indicating that it may be more

Table 10: Occurrence of pair-programming events

Occurrence of Pair-programming matrix			
	Less experienced Dev	Experienced Dev	Highly experienced Dev
Less experienced Dev	Sometimes	…	…
Experienced Dev	Seldom	Often	…
Highly experienced Dev	Never	Seldom	Never

On the other hand, the more experienced developers enjoyed pair programming and saw it as an efficient way to share knowledge and come to a solution quicker. There may be a correlation between experience and willingness to participate in pair programming, and people with the

same experience were more likely to have a pair-programming session than if the level of experience were different as I observed that the instances of pair programming happening was usually between developers of similar levels of experience and knowledge.

One developer mentioned that practicing mob programming was easier than pair programming, when the event of pair programming was between less experienced developers and experienced developers. Having a mob programming session allowed the team members to have longer breaks in between the event itself. With the event of three participant, ie. one experienced developer and two junior developers, the experienced developer felt like he could take longer breaks in the session itself to recollect himself, whereas for the two junior developers they were able to learn together and feel more comfortable.

Pair programming had proved efficient when working on tasks together, but new team members could be reluctant to do pair programming as it could come off as a bit intimidating. One of the effects from having autonomous teams is that the team members are free to choose how they like to work, which in can be both positive and negative in light of the team leads eyes ;

> *"I'm trying to encourage pair programming a bit more, as we use, a bit. I would love to use it all the time if it were up to me. But I don't want to force people into something they don't want." - (Interview i7, Engineering Manager at Fuse team)*

Even though pair programming was highly recommended in the team, and senior and experienced developers were open to inviting junior developers to pair programming sessions as I observed in daily commits and Friday Wins-meetings, the junior developers seldom wanted to do it. The introduction of mob programming however, seemed to engage the junior developers more, as having another junior in the session seemed to create a more comfortable experience for the junior developers

Virtual Meetings
Virtual meetings also serve as an efficient coordination mechanism for teams at Fuse, especially during hybrid or home office work. Virtual meetings are preferred when Slack messaging is not sufficient enough. *"If you have to dig deep into the code and solve very specific needs, then writing everything down and spending half a day writing back and forth can't be productive. So you often set up a Google Meet and a video call to sit down with other people and work through a problem."* (i9)

The team lead shared similar views, noting that at times when Slack-threads get very long, especially between only two members, that it is necessary to use virtual meetings to collaborate as Slack may not be efficient enough for situations where two developers need to sit and hash things out.

Documentation Tools

Fuse gives the responsibility and authority of all aspects of applications to the autonomous teams themselves to document and share with other teams through common platforms how these applications work and hang together. However, Confluence is nowhere near as commonly used as Slack. *"It can take several months before I go into Confluence (i9)."* It is prevalent across the team members that they spend little time documenting, and rather rely on smart tools like Backstage to automatically document for them. Confluence is rather used as an "Information platform" according to i7, to share information about the organization and company, such as information on the teams and their responsibilities and domain expertise, as well as serving as documentation space for keeping track of goals that the teams are aiming to achieve.

4.1.5 Meeting Culture at Fuse

There are five key meetings that make up the meeting culture at Fuse, and that allows them to work efficiently and coordinate together. Here I provide an overview of the meeting types, their purpose, and their usual occurrence and duration.

Table 11: Meetings at Fuse

Meetings at Fuse				
Meeting Type	**Purpose**	**Usual Duration**	**Occurrence**	**Type**
Monday Commits (Team centered)	Get the team ready for the week. Let each other (the team members) know what they will be working on and hoping to achieve	30-45 minutes	Weekly (Every Monday)	Virtual
Friday Wins (Team centered)	Announce accomplishments from the week Team wraps up the week together and wish each other a good weekend	15-30 minutes	Weekly (Every Friday)	Virtual
Daily Standup (Team centered)	Get a status on where the team members are in their work. Able to use this meeting to ask for help or get other team members to help each other.	10-15 minutes (max)	2x a week	Hybrid or Physical
Retrospectives (Team centered)	Forum for retrospective thinkin, bettering and discussing work processes	60 minutes usually 120 minutes max	Every 3 months (Can occur more often if needed)	Virtual
Town Hall meetings (Company centered)	For keeping people in the company up to date on coming events, future plans, celebrations and achievements. New type of meeting after 2021 organization restructuring	60 minutes	Monthly (1x a month)	Hybrid

The team had decided on a hybdrid-solution for the team meetings. For a hybrid-solution, and as an after effect of corona, all team members need to be at the office on a specific set of days during the week. For Team Auto specifically, it was decided that the team members were allowed to show up in the office on Tuesdays and Thursdays, whereas all team members would be working from home on Mondays, Wednesdays and Fridays. This in turn caused all Monday

Commits and Friday Wins to be virtual meetings, and the Daily Stand-ups would be hybrid-solutions or completely in office meetings.

Daily Stand Ups - A Forums for help (feedback loops)

The stand-ups work as a place for the team to check in on each other and share what they are currently working on. *"On Wednesdays, we have a check-in shortly in the morning, where we talk about what we are doing. The main goal of this check-in is to keep the team together, so that people know what the rest of the team is doing [...] The other is that we have a forum to say if we are stuck with something, and need help from someone"* (Interview 7). A developer from team Auto enforces this view with the statement that the standups "gives the opportunity for others in the team to jump on and help you with your work tasks" (Interview 9)."

Team belonging is also important, and dailys serve to enforce this by keeping a focus on the human aspect. Team lead of team Auto notes how dailys make sure that the dailys *"[...] we have seen each other's faces and heard our voices"* (Interview 7). which is important for creating a sense of team belonging. During my observations I also noticed that if team members shared feelings of being stressed or needing help, that team members were able to uplift the mood and the other team members, as well as reaching out a hand to help and praising other team members for their good work *"Great work yesterday"* (F-M5).

Friday Wins and Monday Commits - Positive team morale, Feedback Loops, Team Cohesion and Coordination

Team lead of team Auto underscores that they *"Start the week with a meeting on Monday where we discuss what we want to achieve this week, based on the goals we have for a longer period. We also use this opportunity to inform the team members on things we (the team) believe is relevant that our colleagues know about [...] For example, if we are going to have a few days off this week, or something else that can affect the cooperation this week"* (Interview 7). This statement also aligns with the field notes i conducted, as team members often shared events such as dentist appointments, "might turn in a sick-leave tomorrow" or "I'm picking up the kids early tomorrow".

The meetings worked as a good start to the week, getting team members up to speed and positively instilled for the week. Most commonly during the meetings, the tone in the meeting was cheerful and uplifting.

Figure 8: Snapshot of field notes from F-M5
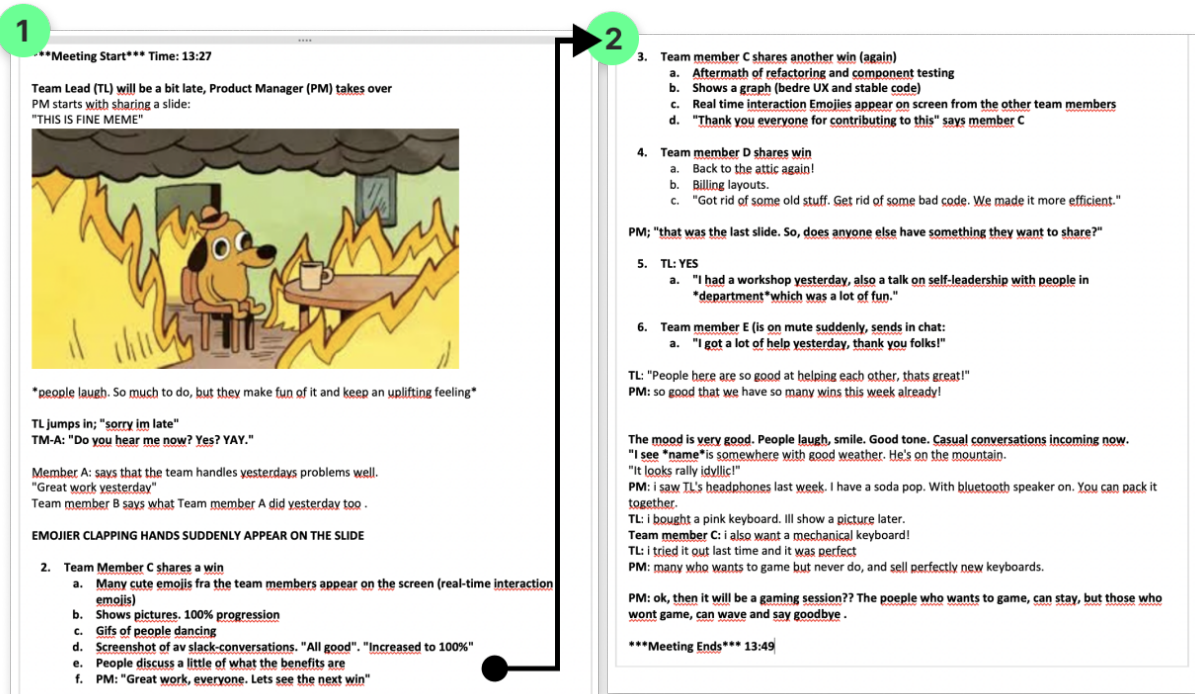
 The team lead was the one who usually led the meetings, but in some instances (such as seen in figure 8), the product manager took the lead of a Thursday Win F-M5, as the team lead was late to the meeting. The one leading the meeting makes sure that everyone speaks out of turn and prompt the team members to share, by making sure that everyone had shared something at the end of the meeting. The team leader's role is that one of cheering on team members, instilling a positive team morale and working culture, as well as creating an open and comfortable space to share. The direction of the meeting was determined by the energy and participation of the engineering manager. A cheerful and inviting attitude seemed to work positively on the team members.

A benefit of Friday Wins was that everybody who wanted to share could share an accomplishment they had during the work week.

> "Does anybody want to share any good stuff from this week?" (Team Lead, Meeting M1)
> "A lot of payouts have been resolved, all stuck payments have been resolved." (Developer, M1)

Figure 8, showing some field notes, illustrates that Friday Wins served as a place for the team to share achievements they had accomplished through the week as well as plans for the weekend. It worked as a social hub as well, as the engineering manager or product manager showed interest in the individual team members and their plans for the weekend. It was not uncommon to share memes or jokes, and it made the team finish the week in a lighthearted and positive tone. The engineering manager, who usually led the Friday Wins, could drop a question at the end of the meetings and invite all members to answer.

Friday Wins, as well as daily stand-ups, served as a forum for inviting team members to play online games together which in turn crated team building, team trust and team cohesion. Building team trust, organizational trust and a community that increases employee satisfaction, pride and a sense of belonging. This view is supported by a long-standing agile coach and IT-manager at Fuse; *"We've chosen to celebrate things. The team can celebrate their success. The team might have done a great job, and then it's up to them to celebrate what they've done. Or what they're satisfied with. So the consequence of autonomy is probably increased pride"* (Interview 8).

4.1.4.5   Social events, belonging and pride

Fuse places further importance on social events and activities. "We invite the UX community to come here and get pizza and beer and a lecture. When we do things like that, we do it partly because our employees, our UXers, they always want to do it, they're proud of the work they do. But it's also because of that that we position the company as an attractive place, a place that values its people and their talents. My feeling is that you get a lot of positive synergies" (Interview i8).

Retrospectives for Continuous Improvement

Retrospectives have been shown in Fuse to be an extremely useful tool for team improvement. The engineering manager from interview i7 shared that one most likely will continue in old habits and the team will feel that things are not working as smoothly as they could, as there would be no appropriate time to discuss opinions on how things are working.

> *"Without retros? I think you quickly continue in old habits, or in the old rut you've gotten into. Maybe everyone will feel that "Oh, this doesn't quite work", but you don't quite have the right forum to speak out, perhaps." (Interview 7).*

The developer from the same team shared a similar thought; *"Because there is so much going on all the time, that it is a good way to get some of the problems and conflicts and things that happen along the*

way. And when I say conflicts, I don't mean the conflicts between other employees - I mean the problems that arise along the way in the project" (Interview 9).

Plainly put, retrospectives serve as a forum for retrospective thoughts - it is the place where team members get the ability to reflect upon the last month or two months, and share their opinions on what is working (practically and methodically) ant not. A developers even mentions that the best agile practice, was retrospectives;

> *"If i were to summarize the Agile practices [...] I think the one that gives the most value, for me as a developer, is what you call retrospectives. The focus is to reflect on the work that has been done and how the performance has been in the projects, and try to map what was good, what was bad, and what changes we can make - here and now - to improve our workflow in the future"* (Interview 8).

The level of preparation required for retrospectives could vary. Sometimes the engineering manager made team members write down thoughts on stickies or notes, and have them ready before the retrospective starts, while at other times they were created in the meeting itself. The notes serves as topics team members can vote on, and the topics with the most votes are the ones that the meeting will focus the discussion on.

> *"Sometimes we use the first part of the retrospective to allow you to sit and think for yourself. While at other times I have asked people to think ahead and write up their notes before we enter the meeting"* (Interview 7).

When the team members notes were ready beforehand, the team was more prepared and the discussion started immediately at meeting start, and the engineering manager had gotten feedback that this type of pre-made notes made the retrospective more efficient and provided more value to the team.

4.1.6 Best Practices for Coordination Mechanisms - Communication matrix

Effective communication is something that the team lead always works on bettering, and even though there are tools that work well and make the team coordinate quite satisfactory, challenges still arise. *"I try to facilitate good communication, because I know that communication is very difficult" (Interview 7),* which prompted the team lead to develop a matrix to enforce best practices and serve as a guideline for efficient communication in the team.

Table 12: Team Autos' Communication Matrix

Communication Matrix (A guideline for more effective communication)					
E=effective E*=effective+descr PE= partly effective NE= not effective	Quick question	Discussion / Brainstorming	Team decision making /kick off meeting	Working together on deliveries	Information sharing
Instant Messaging between 2 people (Slack)	E* (but be aware only you two will see it)	PE	NE	E* (but be aware only you two will see it)	NF
Internal Slack channel	E	PE	PE* (with a Slack summary)	E (in the groups slack channel)	E
Pull Request	E	NE	NE	E	PE
Slack call/ Google Meet	NE	E* (with the right people)	E* (with a Slack summary)	E	PE
Video Conference	NE	E* (with the right people)	E* (with a Slack summary)	E	PE
Physical Meeting/Sitting together	E	E* (with the right people)	E* (with a Slack summary)	E	PE

Even though the coordination tools are in place at Team Auto, how one uses the tool may also be as important according to the team lead. To make the team coordinate and communicate even better, the team lead created the communication matrix together with the team members in a

workshop session on communication and coordination. As we can see in table 11, Team Auto's communication matrix shows an overview of the effectiveness of the different communication channels, as well as describing in what instances the communication tool was the most effective (as experienced by the team members).

> *"We made a small communication matrix together, where we talked about in which cases we should talk together on video - Like, in which cases is it enough for us to just chat back and forth? When chats starts to contain quite a few messages, then it is perhaps a sign that we need to talk together with the voice" (Interview 7).*

In the matrix we can see that instant messages between two people were considered effective for quick questions, but that the disadvantage would be that only the two in the chat would be able to see and absorb the information. On the other hand, quick questions on in the internal Slack channel were just as effective, but without the disadvantage of the information visibility limitation.

The communication matrix also serves as a guideline for the team members on how to use the communication channels in the best way possible. This was especially helpful for new team members, and made the onboarding process smoother and easier.

The team lead at team Auto underscores that the key to having good meetings is that "The right people have to be there" and "If you want to make a decision, there has to be a goal - a meeting agenda" (Interview 7). It is also underscored that having meetings for the sake of talking and without a meeting agenda, is also fine, but people should be informed on that to be able to stay task focused.

4.1.7 Dynamics between Autonomous Teams and Meetings

The statements from Interview 9 show that there is an important dynamic between the autonomous teams and the meetings. Trust lies at the corner of these autonomous teams, and the meetings are a not only meant to discuss work, but also to connect with team members and create sense of team trust, team belonging and bonds with one's team members.

> *"You are much more willing to help each other if you actually care about the others and know them. (Talking about autonomous teams) You have to put a little energy and love into getting people to know each other, and care about each other in a team"* (Interview 9).

There is a clear relationship between the meetings and the team. This combination works in a symbiosis that allows for the team to operate the way it is intended to be. The developer from (Interview 9) also reflects on the meeting culture when he was working in a non-autonomous team and independently along side other developers in a pran-driven development project. He reflects on the relationship between meetings, autonomous teams and autonomy;

> *"You can't expect that the team culture or the team works well without the meeting culture and that the meeting culture doesn't mean much if you don't have the opportunity to be in an autonomous team [...] One thing I noticed is that when we had stand-ups in project-based development - people just had stand-up as a requirement. You met up, had a a stand-up, and usually say "I did the same thing yesterday", "Okay then, cool, bye". It was not a forum where the stand-up actually brought any value. It was just a place where you had to be"* (Interview 9).

This indicates that meetings like standup does not provide much value unless you get the ability to ask for help or if one is not already working in a collaborative way with other developers.

4.1.5 The Way Towards Agile for Fuse

The journey towards Agile transformation within Fuse is a testament to the evolving landscape of software development and project management in the IT industry. Based on the interviews it becomes clear that the company's pivot towards Agile methodologies has been both deliberate, reflective and at times painful. Fuse's commitment to Agile was not just a procedural change - it was largely also a cultural shift, redefining how teams collaborate, projects are managed, and products are developed.

Through the unique perspective and long standing experiences of i8, having been part of the agile transformation of the company, I learned about the leadership aspect of agile transformation. The adoption of agile methodology was more than just a change in methodology; it was about instilling a mindset that values iterative development, customer collaboration, and responding to change over following a plan as well as getting top management on board to be able to transform at all. This shift has been central to Fuse's reorganization, which aimed to enhance its iterative development processes. As i8 likely discussed, the Agile transformation at Fuse involved empowering teams, promoting cross-functional collaboration, and integrating agile ceremonies and artifacts into their daily workflows. The journey towards becoming agile required getting the company at large and the management on par with the journey, and the adoption of agile methodologies like Scrum is not only about process changes but also about a deeper, organizational mindset shift. i8's insights reveal that Agile transformation at Fuse is as much about people management and cultural change as it is about technical adjustments to project management styles.

According to i8, the exposure to agile methodology was also a factor in the start of the journey towards adopting agile methodology. He reflects on a time when he and another colleague from the technology department went to a seminar, held in 2005 by Mary Poppendieck, on agile and lean methodologies, and reflects back on the seminar as an "Eureka-moment".

> *"We had to go to seminars with her to get the awakening in the company that we had gained by being on seminars with her. What we did right there was to admit that you have to get a transition that is very much about how the teams should work, but you have to genuinely understand and want to make a transformation" (Interview 8).*

In the seminar, Mary Poppendieck pointed out a set of pain points that i8 felt hit the nail on issues related to software development and organizational structures, and had to champion the views up to the management.

> *"When she presented Agile methodology, she put her finger on so many pain points that we had in our organization. We two who had attended that seminar - We came back and just admitted that we had to get the whole technology management in the company onto this" (Interview 8).*

Interviewee i8 talked about how mistakes in production and the need for additional releases as a significant challenge faced in the past, and the wish to progress away from it

> *"We had three to four months between each release. Those who worked in the operations department, the ones who did the release of Fuse, which had to happen at night and the whole Fuse had to be taken down in eight hours. "It meant that we had to change our work processes. But it also had the consequences that some of the functions we had operated on became redundant. For example, people who had worked out of*

the window with being testers. I do not think it was that people lost their jobs, but they had to either get
other types of tasks, or a post-graduate education that made them get other qualifications than they had
from before” (Interview 8).

A common theme across the Fuse interviewees was the challenge of redefining roles and responsibilities within teams. The interviews reflect a learning curve where teams adjust to more autonomous yet collaborative ways of working. This autonomy, as emphasized by i8, fosters a sense of ownership and pride in work, crucial for innovative product development. However, it also requires a new level of trust and communication between team members, a shift from the traditional, top-down management approach.

Interviewee i7 speaks to the challenges of adopting Agile, particularly in terms of communication and decision-making. They note the difficulties in maintaining traceability and comprehensive documentation, a common challenge in the construction industry now being navigated in the tech space. This challenge is exacerbated by reliance on email for decision-making, leading to information gaps and delayed inclusions of key personnel. Conversely, i9, a developer on the same team, underscores the dynamic nature of project management within Agile frameworks. The ability to swiftly address challenges as they arise, without rigidly pre-scheduled meetings, illustrates a significant departure from traditional methods.

The process of adopting agile practices as well, was a challenge in itself, such as for the meeting practices. Interviewee i9 underscores how *“You can't expect that the team culture or the way we work - the autonomous teams - works without the meeting culture. The meeting culture doesn't mean much, if you don't have the opportunity to be autonomous”*, pointing to how the interplay between autonomy and the meeting practices is a significant factor in successful implementation of agile practices. Agile coach and IT-manager also shared similar views, and reflects on how they may have misunderstood how to conduct meetings and were more rigid and not flexible at the start in the agile journey ;

> *“You had to have a meeting, you had to have a daily, you had to have a report, and we had to sit down for*
> *four hours to get a correct report. You had to reflect on how things were going during the last three or four*
> *weeks which were a bit tense. Because we didn't really know how to do it, We perhaps misunderstood a*
> *bit, or we were a bit lost.” - (Interview i8)*

4.2   Findings from Soney

4.2.1 Soney Case Context

Soney is a prominent financial institution in Norway and develops systems and products within digital banking services. This makes them a product development company. The development group in the company have their very own dedicated operations and support team that is responsible for the monitoring and management of the bank's system events. This particular team, although not specifically a development team, plays a critical role in maintaining the bank's operational integrity and plays an integral part in incident management related to the features and systems of the company. Soney is recognized for its innovative technological solutions in addition to its traditional banking services, and places importance on self-development, as a significant portion of Soney employees' time is set off for self-improvement, equating to 20% of working hours - for such purposes.

4.2.2 Team Observed at Soney - Team Opsie

Team Opsie is an operations team that handles incident management and system support. This also happens to be the team I work in at evening shifts, but I had the opportunity to observe the team during daytime as I have access to Soney's resources and free access to office locations.

The Opsie is an important team in the development department at Soney, as they handle incident management and system support for the entire organization. Communication practices, routines and tools lie at the foundation of this team to be able to operate and function quickly and accordingly to incidents that happen, and manage them in a swift and effective manner, making sure to keep all aspects of the Soney company informed of such matters - at absolutely all times. The team in itself is a sort of coordination mechanism, as it serves to coordinate vendors, incidents, external and internal parties. Team Opsie is not only tasked with providing technical assistance and remediation but also with ensuring comprehensive communication with all stakeholders during system and service disruptions, and has a tight network with all of the development teams and customers at Soney. They are also known to be the "junction point" or "hub" in the IT department.

Adherence to the Service Level Agreement (SLA) governs the team's service provision and response times, holding Team Opsie to a high standard of performance and accountability which is reflected in the meetings which will be presented further down. The team is composed

of individuals with a broad spectrum of expertise, reflective of the diverse and complex nature of the tasks they perform.

4.2.2.1 Autonomy, Responsibility and Leadership for Empowering Teams

The team operates with a high degree of autonomy, and such is the case for most teams at Soney. The team shares his leadership philosophy in which *"For me, a leader shouldn't be above them. I'm supposed to be on the same level. I'm supposed to be the one who supports them the most" and that his leadership style is motivated by enabling the team members autonomy. They know the tasks, they know how to manage things themselves, they know all the routines. I don't have to be above them" (Interview 10)* which is a fundamental approach for fostering self-managed teams, allowing team members to manage tasks and routines themselves. The team lead also emphasized the importance of working well together across different teams and departments, suggesting a balance between autonomy and inter-team cooperation.

4.2.3 The Critical Role of Team Opsie in Soney's Ecosystem

Soney's operational excellence is a direct reflection of the standards upheld by Team Opsie. The team's efficiency, adherence to robust routines, and proactive incident management approach are not just internal metrics but also define the quality of service experienced by Soney's customers and the work environment for its employees.

The performance of Team Opsie has a significant impact on the company's overall functioning. Any delays or oversights in resolving incidents can trigger a series of issues that extend beyond mere operational disruptions. Such lapses may lead to service interruptions for customers and create obstacles for employees who rely on internal systems and tools for their daily tasks, being detrimental to other teams and the companies agility. The priority for Opsie's operations is to address incidents swiftly, maintain a clear log of events and incidents for traceability, and adhere and improve established routines. These routines are critical in ensuring that no information or solutions are misplaced and that operational standards are consistently met.

Team Opsie's diligence and efficiency are pivotal to Soney's reputation for reliable service and smooth internal operations, enabled by a high degree of autonomy through letting the team members manage the routines themselves. Their ability to manage, monitor, and improve the health of systems extends beyond departmental objectives; it is a foundational element of the company's overall success and standing in the industry.

4.2.4 Day to Day Operations at Team Opsie

As explained on Soneys' Confluence site for defining Team Opsie's responsibilities, they "encompass a variety of operational and support roles, including but not limited to":

- **Anomaly Resolution**: Addressing and rectifying operational irregularities within Soney's IT systems.
- **Technical System Support**: Offering specialized support to banks for system-related inquiries and issues.
- **Operational Tool Development and Maintenance**: Creating and sustaining operational and statistical tools to enhance service efficiency.
- **Automation of Support and Incident Handling**: Streamlining support processes and incident management through automation, reducing manual effort and speeding up response times.
- **Technical Project Assistance**: Providing technical guidance and support for ongoing projects within the organization.
- **IT Service Monitoring**: Vigilantly monitoring IT services to preemptively identify and address potential issues.

Through these multifaceted roles, Team Opsie ensures the smooth functioning of IT operations, embodying the organizational commitment to excellence and reliability in user support.

The team operates on a day to day basis, and every week there is a rotation. The "guards"-rotation serve as a way to decide and rotate on which team member is on duty, and the one on duty has primary responsibility for incident management and handling. All of the guards rotate on the main responsibility of incident management and responsibility to report and inform all relevant parties.

Table 13: Team Opsie Guard Rotations

	Duty window	Employee	Rotation duration	
Day guard	08:00 - 16:00	Full-time	1 week	Monday - Friday
Evening guard	16:00 - 23:00	Full-time	1 week	Monday - Sunday
Back guard	23:00 - 07:00	Part time	Every day	Rotating every day

When a Day guard starts their watch, it lasts from Monday to Friday between 08:00-16:00. As of the end of the day, the Evening guard steps in to keep team Opsie going when the daytime employees leave for the day, and opertes between 16:00-23:00 alone. Assistance from the Back guard will be possible during this time, if necessary. There are however a lot of smart tools implemented and a lot of information documented for the evening watch to work independently. Between 23:00-08:00, the Back guard has main responsibility for keeping Soney operational in case of any major or critical incidents. This is however quite uncommon, and has become increasingly more uncommon with the introduction of Slack, Slackbot and Humio in the past years.

4.2.5 Operational Efficiency Through Routines in Team Opsie

Team Opsie's effectiveness in managing incidents at Soney relies on well-established routines and a clear understanding of their operational landscape. The ability to rapidly identify and address issues, particularly those that affect critical customer-facing services, is an enforced practice. For instance, anomalies in payment processing or disruptions in the transaction visibility within Soney's website and mobile applications must be detected and resolved ideally before the customer becomes aware of any issue and within SLA requirements. "We operate on routines [...] The routine is that the day watch, or everyone on the team, should be able to handle and oversee the events" (Interview 10). As such, team Opsie has alerts and tools implemented to monitor such events. Should such events happen, team Opsie needs to map out the criticality of the incident, inform all relevant parties and reach out to the according internal development team or external vendor that owns and develops the service.

The integration of Humio into Team Opsie's routines is an advantage. With its comprehensive logging, Humio captures every action within a given system or service, ensuring that all customer interactions, successful or non-successful otherwise, are recorded. This level of detail allows Team Opsie to conduct thorough investigations, querying customer audits to determine the root cause of a service and system failure, as well as create real-time dashboards that display data that are necessary for the team members to act accordingly and with enough information during incidents.

Expertise in SQL and database queries is a a highly regarded and necessary skill, given the complexity and volume of the data involved. Familiarity with the intricate web of services, applications, and service providers is also essential, but it is the methodical approach to troubleshooting that truly enhances efficiency. A step-by-step routine—"first check this, then this"—guides the team through a logical sequence to diagnose issues. Once a problematic service is identified, the team delves into the logs, employing SQL prowess and regular

expressions to dissect API calls, applications, and URLs to systematically trace and rectify the fault.

4.2.3 Coordination Mechanisms at Soney

4.2.3.1 Slack and MS Teams

In response to this dual challenge posed by COVID-19 and the discontinuation of HipChat by Atlassian in 2019, the Soney Development Group swiftly embraced Slack as its primary communication tool. Slack's versatile interface and diverse functionalities made it the ideal choice for maintaining seamless communication and collaboration among team members, even in a distributed work environment. At the same time, MS Teams was starting to become a industry standard for virtual conferencing. The convergence of these two pivotal events - the pandemic and the discontinuation of HipChat - accelerated the adoption of Slack and MS Teams within the organization.

It became the main duo of of daily coordination tools, enabling real-time communication, file sharing, and integration with various tools and applications. As a result, a typical workday within the Soney Development Group is inconceivable without the presence and utilization of Slack, underscoring its indispensable role in facilitating productivity and collaboration among team members, irrespective of their physical locations. "Slack and Teams are our main communication tools [...] But Teams is used to a lesser extent" (Interview 10). Within the technology department of Soney, Teams is mainly used for video conferencing when conduction virtual meetings and conversing with the few that have not yet adopted Slack.

The introduction of Slack caused a change in workflow and communication flow for all of the employees in the IT department, and the communication became increasingly centralized , accessible and transparent within in the organization. Not to mention, easy to look up. All teams have their own private (internal) and public (external) team channels. Teams can communicate as they see fit for their own internal channels, cultivating social bonds and creating a space that fits the team, and an external team channel where everyone who needs to reach out to the team are able to do so in the external channel. This also solves the issue of closed or private communication, as instead of having two employees from different teams conversing between themselves in direct messages, could move the conversations to external team channels. As such, other who may be interested in the information shared may be able to find it. Also, people who accessed the external team channels were able to do so without asking for channel permission and are able to ask a question quickly and get help quickly. It was not uncommon to

see developers joining a channel and asking if it was the correct channel, and then be directed to the actually correct channel.

Date: September 2023
Channel: ext-support-teamB (external/public channel of team B)
Topic: Team A member needs help

Team A Member: [1:10 PM]: Are you guys the ones that develops service x? We need to integrate some features with service x.
Team B Member: [1:14 PM]: No, but team C does, find them here #ext-support-team-c
Team A Member: [1:15 PM]: Ah, thank you [smile emoji]

The #-function allows Slack users to quickly refer to another channel, so that there is less lookup-time for the one in need of contacting team C, and increases the awareness of who knows what which is essential for high perfomring teams (Stray et al., 2019).

Slack also works as a lookup tool for the development group at Soney. By using the Slack search bar, a developer can insert keywords to search for specific applications and in turn find the correct team that owns said application. External team channels have become increasingly more common at Soney, as it is recognized that visible communication creates higher information availability. Whenever two different teams need to work together, it is recommended by the organization that the communication is done through the external (public) channels. If all channels were open, it may lead to information over-flow, as communication in internal channels is mostly information that is only neecssary for that specific team.

4.2.3.2 Slack Communication in Team Opsie

As seen in figure 9, we get some insight into the internal communication of team Opsies internal (private) channel, labeled as "team-opsie".

Figure 9: Slack Artifacts 1-3 Team Opsie
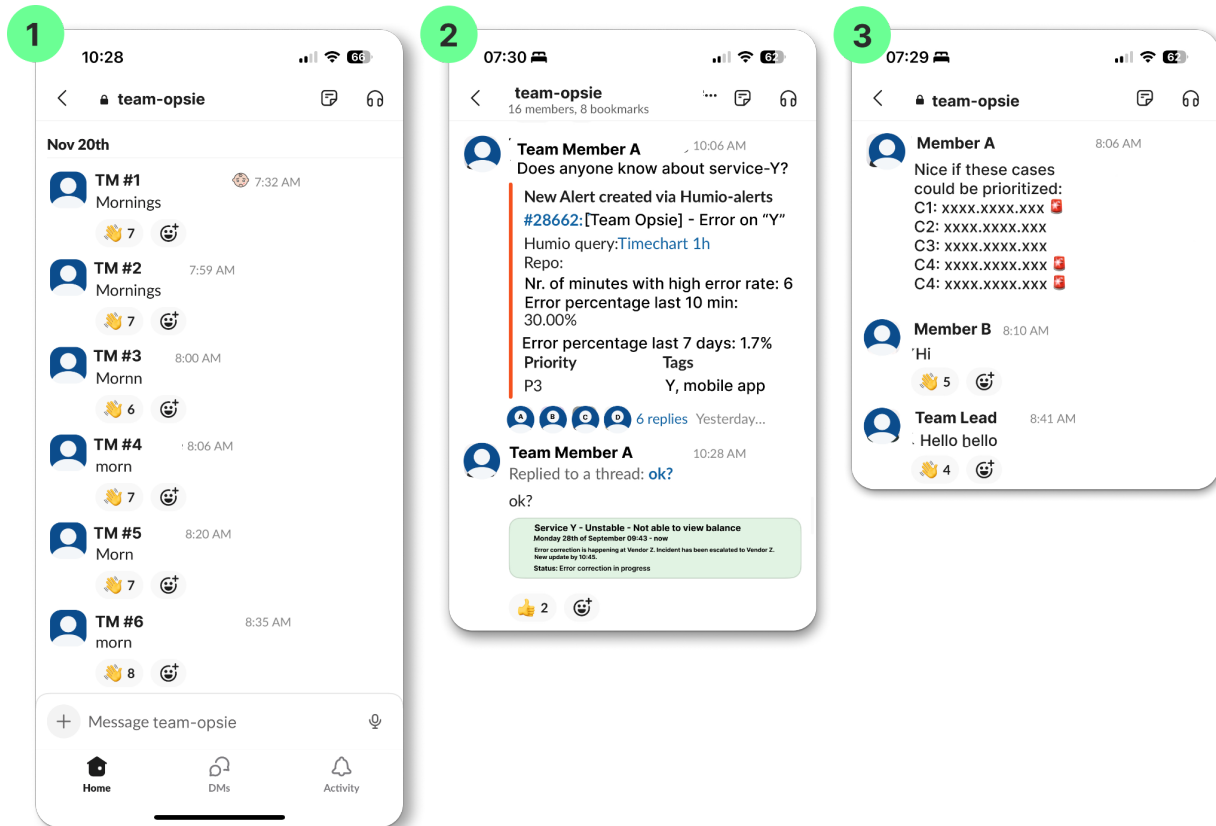
Here, the team members are able to check in with each other in the mornings as we can see on Slack artefact 1. Day to day communication varies, and team members usually check in everyday, independently of if they are in the local offices or not. For Slack artefact 2, we can see the Dayguard asking for help on understanding what a service Y is, and shares a Humio-alert (managed by Slack-bots integrated with Humio monitoring) that displays the error-rate and severity of the incident, which engages six replies from fellow team members. For Slack artefact 3, we can see the week's Dayguard assessing and sharing the important cases for the day, and marking the most critical ones (the ones with shortest SLA) with a red siren emoji.

The thread-feature of Slack which allows users to integrate conversations from other channels and from direct messages (as seen in Slack artefact 4) allow for seamless information sharing, making it easy to keep the team up to date and involved in ongoing issues. For this exact instance, a team member from team Opsie shared a conversation (thread) from the public team channel of developer team "X". The sharing of the thread from the developer team channel, created a new thread in the internal team-Opsie-chat and prompted 16 replies from the Opsie team members in the two following days of sharing the thread. Some incidents take longer time than a single day to handle, and having the options to create threads where people can discuss the same topic in the same thread, instead of prompting individual messages further down in the channel, the information becomes more traceable and clear, and discussions stay on topic.

Figure 10: Slack Artifact 4
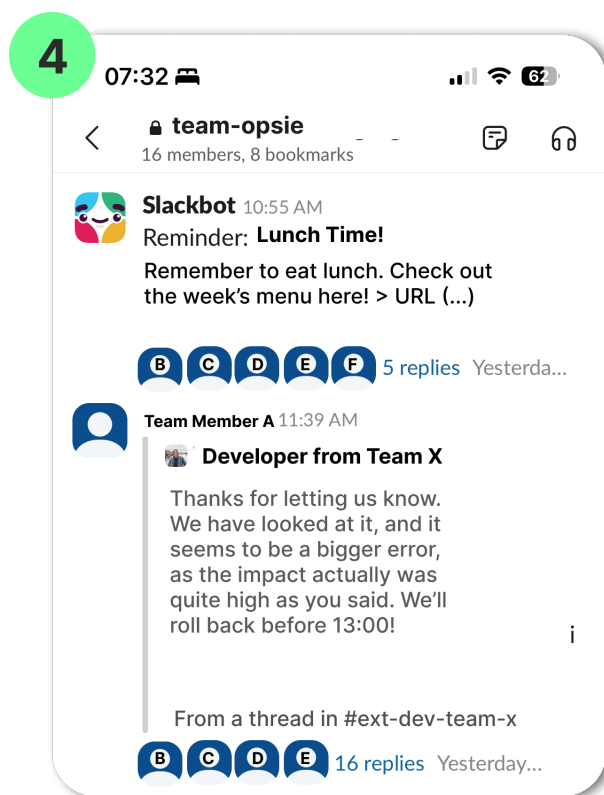
Slack also allows for channel organization through a feature called "Create Section", which is a feature that is commonly used to categorize channels that are related to each other in a single folder. Usually, a user of Slack at Soney can visit multiple channels a day, depending on the type of work that is needed, and it can get crowded and messy when looking through alert channels, external channels, internal channels and social channels if they are not organized.

As shown on figure 10, some sections are the same category, but differ between bold and light (skinny) style fonts. The sections in bold font highlight the sections with channels that have received new messages, whereas the sections with light font include channels where there are now new or unread messages. This is very helpful for keeping an overview of unread messages.

Figure 11: Slack sections
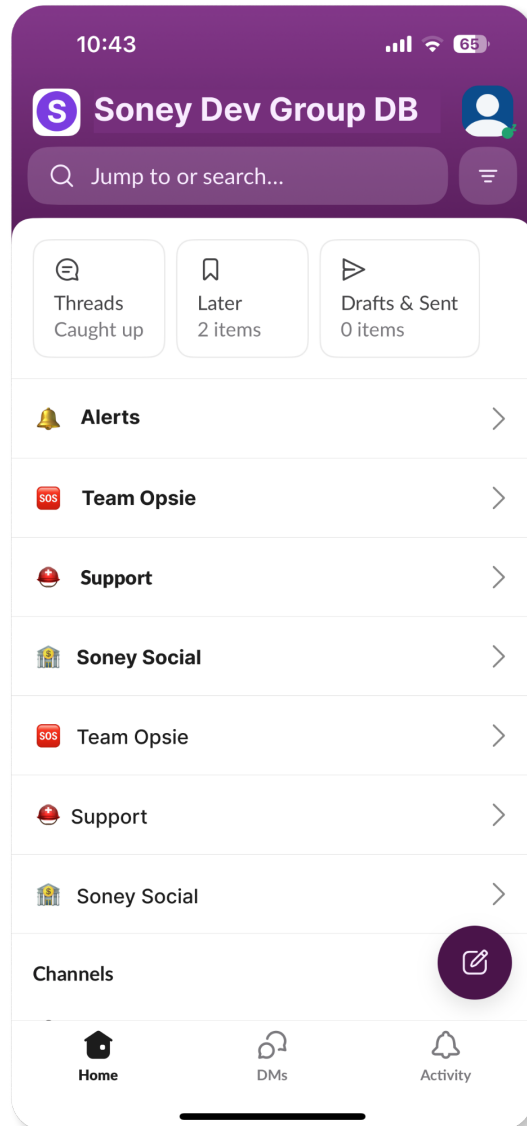
Slack also allows for integration with a wide range of development tools such as OPS-Genie, GitHub, JIRA and maybe most importantly for team Opsie, Humio. This means that code check-ins, pull requests, and build statuses can be automatically posted in Slack channels,

keeping the whole team informed. At Soney there is a dedicated channel named **#ext-deployment-prod**. This allows everyone in the organization to check in on deployments that have happened on which applications, as well as which team is the maintainer on the application.

Figure 12: Slackbot - Automated Deployment Channel
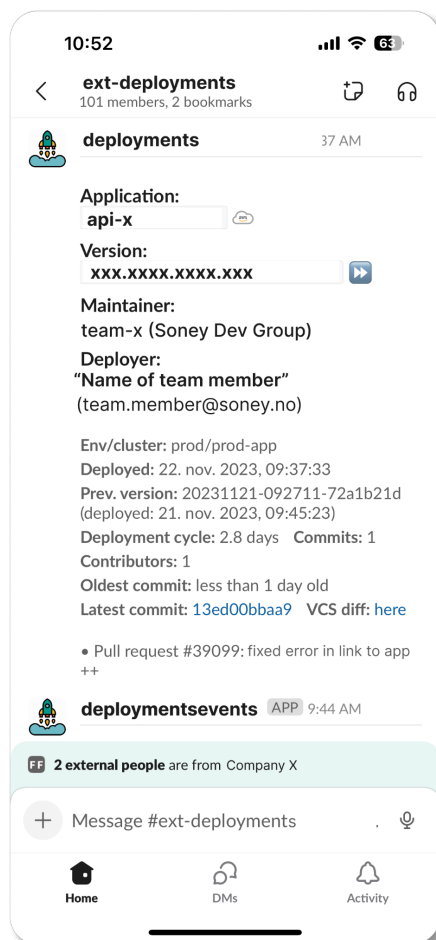
The entirety of this event is automated through Slackbots. Whenever a developer pushes out a deployment, it is automatically handled by Slack to push these details to the #ext-deployment-prod channel. If there is something going wrong with the deployment and it needs to be rolled back, it is easy to see who to contact to roll the application back. It is usually the same team member for the team in which the deployment was made by. Having this information in Slack makes the process fast and simple.

4.2.3.3 Slackbot

Slackbot is Slack's built-in automation tool that interacts with users through conversation in Slack. It's designed to respond to specific commands or messages, and it can be programmed to automate routine tasks, answer frequently asked questions, or guide users through specific workflows within the Slack platform. Some functionalities of Slackbot can be automated responses, reminders, workflows, alerts and assisted troubleshooting. On Team Opsie's Confluence page they have a dedicated section for Slackbots, an on the page the team states "to make everyday life easier at Team Opsie, we have decided to implement a slackbot that can help with minor administrative tasks such as displaying the current roster and by being a reference book for words/abbreviations, codes and useful confluence links to relevant technical information about services, applications and systems." The Slackbot is therefore a versatile tool that enables teams to increase productivity by automating repetitive tasks as well as functioning as a guidance tool. The Slackbot is integrated with Humio, and provides alerts, updates and trigger actions for the team. The slackbot also guides the team members to the right channel, person or external resource for help, documentation or humio-links.

4.2.3.4 Confluence is the most used documentation tool at Soney. Even when people are creating pdfs, powerpoints or similar documents, it is stored and shared through Confluence. Confluence works as a tool to document everything from routines to . It is not uncommon for a team member of team Opsie to visit Confluence multiple times a day. As events and incidents that the Opsie team has to handle and manage, one may look to Confluence to find relevant information to see if a similar incident has happened earlier. At a firm with such scale as Soney, routines are important and how one handles incidents should happen routinely. It is usually a documented process as well, and it is encouraged to document such information. If a similar incident is to happen later in the future, it would be useful to have such information at hand.

For a team that operates with a lot of routines, such as team Opsie does, a lot of their routines are documented through confluence with relevant contact points and further documentation. It is not uncommon to reference other documentation, wich can cause documentation inception. This can become quite unmanageable, and information may be repeated on multiple pages. This can be challenging for new team members, whereas it become common sense for team members that have stayed on for longer periods of time.

4.2.3.5 Remedy BMC
Remedy BMC is an incident management tool that team Opsie uses for logging all cases of incidents, as well as communicating with external vendors, and for logging and documenting internal work processes and Humio-logs for solving incidents and customer related cases. Communications with vendors are meticulously managed through Remedy, an incident

management tool that documents each case, its criticality, and the vendor's responsibility to resolve the issue within a timeframe, which also is logged and accounted for through Remedy. The workflow log within Remedy offers transparency, allowing any authorized team member to track incident details, user impact, and resolution progress, which often includes Humio logs and error reports.

4.2.3.6 Telephone and Email Communication

Communication through phone conversations is nothing new at Soney. Especially for team Opsie, a telephone catalog that is automatically updated every week has been specifically documented at Confluence. Phone calls work to escalate incidents after working hours or contacting external stakeholders that are not part of the Slack community. Communication through telephone is common when it is necessary to escalate a problem to an external stakeholder, or to notify stakeholders immediately about issues or incidents. There are still routines in place to have more than just telephone communication, such as sending emails to the relevant stakeholders with necessary information and logs, but alerting through phone is effective for making stakeholders aware of a situation or incident as fast as possible.

"If it is critical, it will be a call or text message" (Interview 10). As such, telephone communication is mainly used as a mean for escalating situations at Team Opsie, though it is not uncommon for team members at team Opsie to call an external stakeholder or even a system owner at Soney to inform them about an critical incident and escalate the situation, and then follow up with emails. A common disadvantage with telephone communication is that it is not a traceable or visible form of communication. The team therefore informs the team in the internal Slack channel, giving a summary of telephone conversations and people that have been contacted through telephone, in case the information will be of necessary value in the future. Logging communication is a heavy practice at team Opsie.

4.2.3.7 Humio (Daily Operations)

Humio is a necessary and important tool in the everyday life of the team members at team Opsie. Without Humio, their day to day operations would not be possible. At Soney, Team Opsie, the operations and incident management team, has woven Humio into the fabric of their day-to-day activities. The tool stands out as the most utilized among their technological arsenal, underpinning every aspect of their operational workflow. Humio's extensive logging capacity meticulously captures a full spectrum of data, from customer interactions to the inner workings of various applications.

For Team Opsie, Humio is more than just a logging tool. Humio is indispensable for the monitoring of Soney's systems, serving as both the first line of defense and the primary resource for investigation during incidents. When services falter or systems falter, Humio provides the

team with a comprehensive insight, allowing them to sift through data with precision to pinpoint the origins of an issue. The reliance on Humio by Team Opsie is a testament to its capability to not only collect vast amounts of data but also to make this data readily accessible and visually represented through graphs. This level of integration into their daily routine underscores the tool's significance in maintaining the operational integrity and resilience of Soney's services, and trends on graphs (such as increase in errors over a certain amount of time) and help the team in focusing on relevant issues. "As long as you start to see a trend on the graph, you can start talking about it, so I can exclude unnecessary topics to discuss with the team (Interview 10).

4.2.3.8 Opsgenie

Opsgenie is an advanced incident management platform that plays a crucial role in modern IT and operations teams by ensuring that critical incidents are promptly identified and addressed. It functions by receiving alerts from various monitoring systems and applications, categorizing them based on their importance and timing, ensuring that the most critical issues are prioritized and that the appropriate team members are notified in Slack, which enables them to to be quickly informed and take action quickly. The use of Opsgenie transforms how the team manages and responds to incidents.

> *"From Opsgenie, we have an integration with Slack. We make sure that all the warnings are sent to Slack. At the same time, we can set up a notification for the person on the phone, through Slack. This makes it easier for us to receive the warnings. In addition, if the emergency services are to receive a warning, it is defined how critical these services are"* (Interview 10).

By leveraging Opsgenie's dashboards, Team Opsie can monitor services in real-time, observing success and failure rates, and identifying any denied or failed service requests. The integration with Slack further enhances the team's efficiency by automating alerts for services underperforming against set thresholds. This automation allows the team to focus on other tasks, secure in the knowledge that they will be promptly alerted to any issues, a process that has become even more streamlined with the integration of preset Humio searches for faster troubleshooting and debugging. This combination of tools exemplifies a modern, efficient approach to incident management in a large-scale IT environment.

The dashboards are meticulously configured to log and display key metrics, offering a real-time snapshot of service performance. They track everything from success and failure rates to denied or failed service requests, presenting a comprehensive view of each service's 'health'. The efficiency of this system is further enhanced by the integration of OPSgenie with Slack. This setup ensures that any service experiencing a spike in error rates—crossing a predefined threshold—triggers an immediate alert to the team through a dedicated Slack channel. These

alerts are not just notifications; they include hyperlinks that take the team directly to the service's dashboard on Humio, showing detailed error rates and facilitating a swift response.

This modern approach marks a significant departure from the days of intensive, manual graph monitoring. Where once the team's vigilance was bound to real-time graphs in the office environment, they now benefit from the relaxed assurance provided by automated alerts. The leap in efficiency is especially notable when addressing incidents—preset Humio searches have expedited the troubleshooting and debugging processes, yielding rapid resolutions.

For new members of Team Opsie, this operational approach and toolset demystifies the daunting task of navigating complex logs and services, making onboarding smoother and more effective. For the seasoned troubleshooters, it refines their workflow, freeing up valuable time and allowing them to direct their expertise where it's most needed. Through the intelligent application of technology, Team Opsie has not only enhanced their operational efficiency but also elevated their capacity to maintain Soney's service standards in an ever-demanding digital landscape.

4.2.3.9 The Holy Trinity of Team Opsie - The dynamic between the tools
Opsgenie, Humio, and Slack can work together to create a robust incident management and response system. The integration of Opsgenie with both Humio and Slack bridges the gap between incident detection and response. Humio acts as the eyes, constantly watching for problems. Opsgenie serves as the brain, interpreting signals and directing actions. Slack functions as the voice, facilitating communication and collaboration among team members. Together, they form a comprehensive incident management solution that maximizes efficiency and effectiveness in responding to operational issues and icidents. A typical workflow of the tols can look like the following steps;

1. **Monitoring**: Humio continuously monitors the system, collecting logs and observing the performance of various services. If it detects an anomaly or an issue, such as a service outage or unusual error rate, it logs this event.
2. **Alerting**: These anomalies are configured to trigger alerts within Humio. Opsgenie, integrated with Humio, receives these alerts. Based on the severity and predefined criteria, Opsgenie categorizes the alerts and decides on the appropriate course of action.
3. **Notification**: Opsgenie then sends notifications to the responsible team or individual. This can be done through various channels, one of which is Slack. Opsgenie can be set up to send these notifications to a dedicated Slack channel that the operations team monitors.

4. **Response**: The team sees the alert in Slack, often with a direct link to the Humio dashboard or the relevant logs that detail the issue. They can quickly jump into action to resolve the incident, using the detailed information available in Humio to investigate and troubleshoot the problem.
5. **Collaboration**: Throughout the incident management process, team members can communicate and collaborate through Slack, coordinating their response, sharing insights, and updating status in real-time.

4.2.3.10 "Opsieweb"

Opsieweb is the name of an internal website developed, maintained and used by Team Opsie to inform all of Soney and Soney employees of ongoing issues, incidents and ongoing or planned maintenance events. The application is used by Opsie to inform Soney internally about operational deviations and changes in systems that Soney supports. Opsieweb is also used for workflow internally in Soney, including rosters, downtime registration and SLA calculation and statistics. The main purpose of Opsieweb sa a tool is to give the banks, Soney and its employees at large, insight into the operating status of systems that are supported by team Opsie, or that are of interest to Soney employees. Opsieweb also has features that facilitating automation and simplifying work tasks for Soney employees as well as the Opsie team themselves.

toTeam Opsie keeps the entire development group at Soney, as well as all employees at Soney, updated with the incidents and maintenance events. If a service or application is not working, it will be announced on "Opsieweb". It is single handedly team Opsie that develops, maintains and operates the Opsieweb, as it it team Opsie that is the heart of the operations of all of the systems catalog, Soney company. Even though Soney is not the team that develops or operates services, implements code or develops in general, they are the team that keeps track of how all of the services, applications and systems are doing. Often times, team Opsie will be aware that a service X for team X is doing worse than normal, or not functioning for a specific set of customers, before the team that develops and maintains said service know.

Through Opsieweb, the team members at Opsie are able to quickly push out maintenance and operational messages through a simple web interface. The alerts are pushed out to and displayed on Opsieweb, and alerts are sent to SMS and email for all Soney employees. The team members at team Opsie decide if it is necessary to push out SMS notifications, this is usually for extremely critical services and applications.

A thread in channel #ext-payment-team

Team Opsie member A: [2:12PM]: Hey, do you know why this service is

doing worse than usual? I can see through our graphs *hyeprlink to Humio dashboard* that these customers are getting rejected when requesting service trying to view their saving accounts. I can see through our logs that this problem started yesterday around 1PM.

Team Payment member B[2:14PM]:: Oh, no I had not noticed. I imagine it may have something to do with a release we pushed out yesterday. Let me check.

Team Opsie member A:[2:15PM]: [Thumbs up member A's reply].

Team Payment member B:[2:29PM]: So it seems the release was at fault. I rolled the release back, that should work for now I think.

Team Opsie member A:[2:32]: I can see the error rates for the service stabilized around 2:22. thank you! [applause emoji]

Team Opsie member A: [2:12PM]: Customer service employee: We have a lot of customers that seem to struggle with creating savings accounts for their children. Do you know about this?

Team Opsie member A: [2:12PM]: No, I can't see anymore faults than what seems to be normal. How long has it been going on?

Team Opsie member A: [2:12PM]: Customers have been calling in since 10AM. Most of them are from northern parts of Norway.

Team Opsie member A: [2:12PM]: There

4.2.4 Meeting Culture at team Opsie

4.2.4.1 Monday Commits
Monday Commits provide a weekly opportunity for team members to convene and engage in forward-looking planning and retrospective problem-solving. These brief sessions allow for the sharing of challenges encountered and the formulation of collective strategies for the week ahead. The team lead's thoughtful prompts encourage even the quieter voices to seek help, fostering an environment of mutual support.

In the rhythm of Soney's weekly operations, Monday Commits and Friday Wins create spaces for structured reflection and end-of-the-week celebrations. Similar to the practices observed at Fuse, these meetings are designed to foster a sense of community and continuity within the team. However, Team Opsie's meeting dynamics reveal nuances that reflect both the team's composition and the leadership style.

At Team Opsie, Monday Commits are virtual meetings and often concise, typically wrapping up within ten minutes, and are characterized by a quieter atmosphere, possibly indicative of the team's communication style or the newness of the team lead's tenure. Unlike the seasoned leader at Fuse with over a decade of experience, Opsie's team lead is navigating these sessions for the first time. This inexperience sometimes manifests in less directive meeting management, observed in the open-ended nature of questions like, "Did any of you guys have any difficult cases last week? That you would like to share here?" (M5) These prompts occasionally meet with silence, but there are moments when they catalyze constructive exchanges, such as when a less experienced team member's request for assistance received practical guidance from a senior colleague. This interaction underscores the value of Monday Commits as a forum for support and knowledge sharing, reinforcing the importance of structured queries in eliciting constructive dialogue.

Moreover, Monday Commits at Opsie serve a dual purpose, extending beyond case discussions. They can be of social nature, as they provide an opportunity to plan and discuss team events. The leader's encouragement of input on activities like Kahoot suggests an effort to maintain team engagement, while humorous exchanges about event attendance, such as the jest about mandatory Outlook invitation acceptances for a New Year's dinner, contribute to a lighter, more collegial atmosphere.

Such moments of levity are important, but they also hint at a potential hesitance among team members to voice opinions or suggestions. The team leader's role in these situations is crucial,

not just in facilitating operational coordination but also in nurturing a more open and interactive meeting environment.

4.2.4.2 Friday Wins

Celebratory in nature, Friday Wins offer a moment of reflection and acknowledgment of the team's hard work and accomplishments throughout the week. This practice not only boosts morale but also serves to strengthen the bonds between team members, reinforcing their sense of shared success. As the majority of the team members are in office on Fridays, the meetings are conducted physically but team members are able to join MS Teams from home.

At Team Opsie, 'Friday Wins' are not rigidly tethered to the end of the workday or week. Instead, they are dynamic and adjust to the ebb and flow of the team's workload. It's not unusual for a Friday Win initially scheduled for 14:00 to be brought forward to 12:00, should operational demands necessitate it. This flexibility reflects the team's commitment to operational readiness, ensuring that all critical work is addressed promptly, particularly as they approach the weekend when the team is keen to resolve outstanding issues.

The timing of Friday Wins is carefully chosen to coincide with the team's presence in the office. Many team members make it a point to be onsite on Fridays, not just for the collaborative work but also for the social activities that often follow. Observations indicate that these gatherings are concise, typically spanning about ten minutes of focused team interaction before transitioning into more leisurely pursuits.

After a short but spirited meeting, those not assigned to on-call duties might engage in a friendly game of shuffleboard or ping pong, an activity that lasts for about half an hour. This camaraderie often extends beyond office hours, with team members sometimes deciding to continue the festivities at a local establishment. These informal outings, whether for drinks or a meal, serve to fortify the bonds among team members and provide a well-deserved reprieve from the week's demands.

The presence of such a robust social component within the work culture of Team Opsie suggests a dual-benefit system. While the team is highly effective and maintains a professional and efficient approach to their responsibilities, they also place great value on the social ties that contribute to a positive and supportive work environment. The anticipation of these social interactions might also contribute to the preference of many team members to work from the office on Fridays, highlighting the interplay between employee satisfaction, social events and workplace relationships.

4.2.4.3 Common Meetings

The 'common meetings' are held once a month, and are more expansive in scope than the Monday Commits and Friday Wins, providing a platform for an in-depth review of the team's performance against service metrics and key performance indicators. The "Common meetings" also serves to establish a tempo for comprehensive team gatherings that supplement the regular weekly touchpoints. The team lead facilitates these sessions, which are defined by an informal yet structured approach. During these sessions, the team delves into operational analytics using tools like Opsieweb and Humio dashboards, and discusses strategies to enhance communication and service delivery. The discussions are focused on maintaining 100% SLA (Service Level Agreement), which also serves as their main metric for measuring team success and efficiency, and the pride in achieving a 100% SLA is evident, reflecting the team's synchronized efforts. *"We have achieved 100% SLA this month. Wonderful"* (Team Lead, Meeting O-M5).

These common meetings also act as a forum for social interaction and event planning, reflecting the team's recognition of the importance of social bonds in building a cohesive unit. Whether it's discussing the organization of a pre-New Year's dinner or brainstorming team-building activities, the informal yet deliberate atmosphere allows for a fluid exchange of ideas and plans.

As captured in my field notes, a typical meeting unfolds with a swift resolution to any emerging incidents with the Dayguard at times jumping out of the meetings to resolve ongoing issues, , demonstrating the team's commitment to addressing issues as they arise. Once immediate concerns are managed, the meeting transitions to reviewing key performance indicators and service metrics, such as incident case numbers and service level agreement (SLA) adherence, using the statistical tools available on their internal platform, Confluence. Discussions pivot to operational responsibilities, including the resolution of outstanding cases and the enhancement of tools like Opsieweb, Humio Dashboards and Slackbots. This internal tool's usage analytics prompts a collective effort to refine communication strategies around service status and known errors, with team members volunteering to craft and disseminate updates, exemplifying a proactive approach to internal challenges.

Operational tools, such as the 'Dayguard dashboard,' are subject to collaborative refinement, with the team proposing innovative meeting preparation techniques that encourage visual engagement. These sessions are not just about operational efficiency but also weave in social planning, like a pre-New Year's dinner, adding a layer of team-building. Team members, some of whom have been collaborating for several years, easily transition between topics, from technical troubleshooting to event planning. "And what about Christmas dinner, it's on the house?" (Meeting M2). Their ease with each other allows for a conversational flow that may appear unstructured to an outsider but is underpinned by a deep-seated understanding and shared purpose.

In essence, Team Opsie's common meetings encapsulate a dual focus: they are a crucible for operational strategizing and a cornerstone for fostering team solidarity. The blend of structured agenda items and the informal, adaptive dialogue characterizes the team's collaborative spirit and underscores the meetings' role in the team's collective efficacy. Throughout all meetings, the collaborative spirit of Team Opsie is present as team members comfortably navigate through operational and social discussions, which indicates that the team is well-acquainted and aligned in purpose.

4.2.5 SLA Adherence, Incident Management and Esalation Procedures

Team Opsie's whole approach to their work at Soney Utvikling is deeply rooted in their unwavering commitment to meeting Service Level Agreements (SLAs). These agreements outline clear expectations for how quickly the team should respond to issues, how long they should take to resolve them, and how often services should be up and running without interruption. The team is acutely aware that the efficiency of incident resolution directly correlates with customer satisfaction and service reliability. By combining a rigorous approach to incident management with a culture of continuous improvement and transparent documentation, Team Opsie ensures the reliability and resilience of Soney's services in the IT-development group. Incidents are triaged based on their criticality—categorized as "Low," "Medium," or "High"—with corresponding SLAs defining the urgency of response and resolution. This criticality system streamlines the process of incident registration, ensuring that all relevant stakeholders are looped in promptly. The team employs 'The System Base,' an internal catalog within Soney's intranet, which details applications, services, and systems, along with their respective SLAs, system owners, and escalation points.

Escalation procedures are part of the common practices, and should an incident exceed its SLA threshold, escalation protocols are activated, summoning a Major Incident Manager (MIM) who possesses the requisite contacts for further escalation among partners. Although escalation to MIM is a last resort, the process underscores the structured response strategy that Team Opsie relies upon in times of extended service disruption. For incidents categorized as "Highly Critial", MIM is always involved after an hour of service downtime.

Team Opsie is committed to continuous improvement of their SLA performance. Regular assessments during meetings help in maintaining a close-to-perfect SLA score, often reaching the high nineties in percentage terms. Instances falling below the expected SLA prompt a thorough review and refinement of existing procedures, which again, is discussed and examined during the meetings. The team proactively revises workflows, updates contact points, and optimizes routines to mitigate recurrences of frequent issues. When necessary, they collaborate

with development teams to address persistent internal service challenges, often facilitated by a Slack dialogue. The SLA is not merely a set of targets for Team Opsie; it is a measure of their collective efficacy. The team lead, responsible for monitoring SLA adherence, maintains a Confluence page that becomes the focal point for discussions in common meetings. When SLA attainment dips, the team rallies to identify the root causes and implement strategic adjustments. These discussions are pivotal for course correction and maintaining the team's high standards.

The discipline of documentation is a cornerstone of Team Opsie's approach to incident management, as all stages of incident management and case solving should be tracable. Every incident and user case managed by the team is recorded in Remedy to ensure a comprehensive trail of actions and communications. The team however prefers to store incidents and post-mortems in Slack, the team lead noting "We prefer to use Slack to store information above Confluence when possible" (Interview 10), and use Remedy as little as possible as it can be "A pain-in-the-ass-tool" (Interview 10). This diligence provides a wealth of historical data that aids in the rapid identification of recurring issues and facilitates the continuous enhancement of the team's refinement of practices and routines.

4.3 Findings - Construction Industry

The construction industry finds itself at a crossroads, seeking innovative approaches to coordination and collaboration. This chapter delves into the current state of this industry through the lens of seasoned and experienced professionals, and I will cover the daily challenges, common tools, practices and cultures in the field through information gathered from the survey and interviews. The insights gathered from interior architects, project managers and craftsmen lay the groundwork for a pivotal discussion: what can the construction industry can learn from its counterpart, the IT industry?

The survey targeted a broad range of professionals, including interior architects, project managers, and craftsmen, to obtain a detailed overview of the tools and methods they use for coordination and collaboration in their projects and day to day work life. The survey resulted in 30 answers, where interior architects were the group with the highest participation rate, followed by craftsmen and lastly project managers. This chapter delves into the findings of our survey, revealing insights into the prevalent tools, routines, and the inherent challenges faced by professionals in their daily operations. Working with both private and commercial projects was common, though commercial projects were more common than private projects.
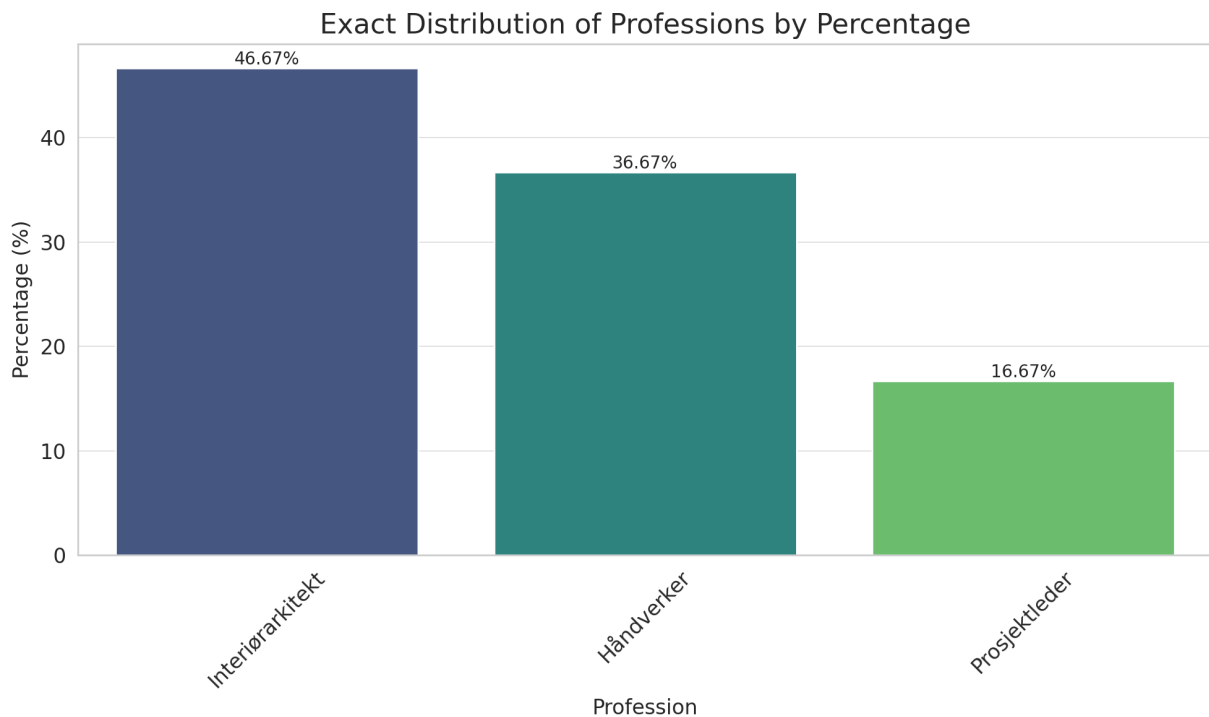
The survey served as initial data collection for gaining an understanding of digital tools that are used for communication, collaboration and work and how commonly they are used, and as we can see on the graphs the most used communication tools as we can see from the survey are email and telephone calls.
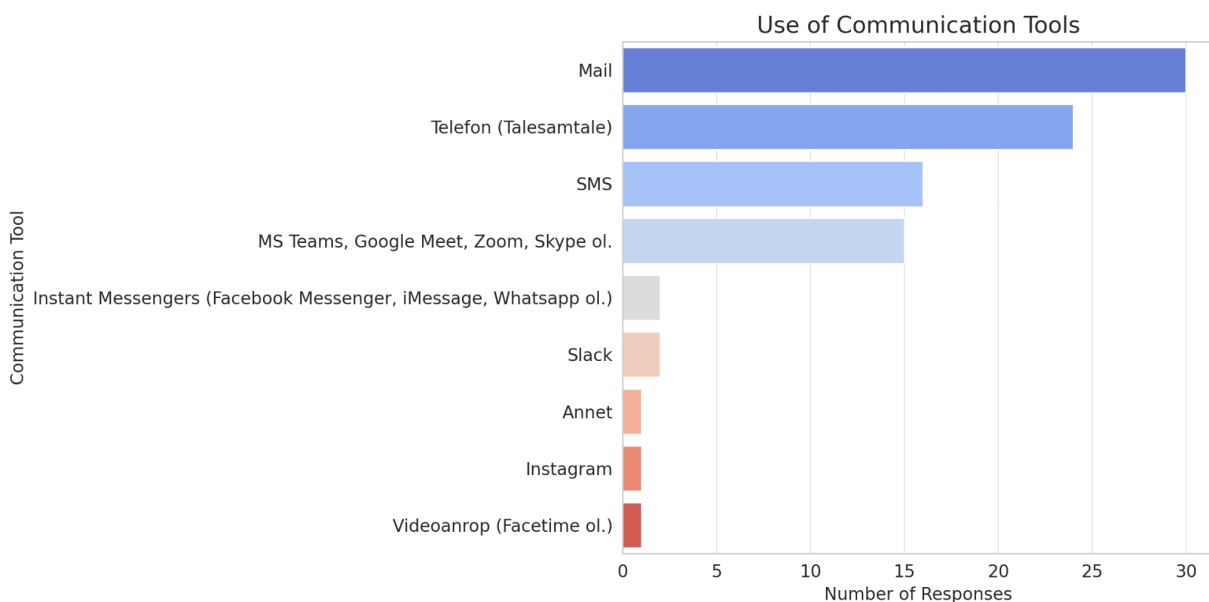
The aim of the survey was to identify common communication tools and routines, as well as to highlight the particular challenges faced by different roles within the construction process. By examining the responses of the participants, I sought to capture an accurate representation of the current communication landscape in the construction industry and the most common software used. The results from the survey were also used to create directed and refined questions for the in-depth-interviews that followed.

For the option "Other", respondents were able to write free text answers. Here a project manager wrote "Interaxo, Dalux etc.", and this was the first time in the research where I was introduced to Interaxo and Dalux, which is a Building Information Modeling (BIM) software, and I used this information to create questions around BIM and BIM-usage for the interview guide.

The interviews were focused on gaining insight into interior architects' and project managers' perspectives on managing and coordinating construction projects, their day-to-day communication and work, and the tools they rely on. They highlighted the meeting culture within the industry, pinpointed common challenges in communication and project execution, and underscored the significance of initial meetings for successful project outcomes.

- **Project managers** have a broad network of communication, interacting with clients, construction managers, interior architects, architects, craftsmen, suppliers, and electricians.
- **Interior Architects** frequently communicate with clients and project managers, as well as among themselves. They are active in sending revisions throughout the project, indicating iterative and ongoing involvement.
- **Craftsmen** are in direct contact with clients and interior architects, which suggests their input is valued in the custom creation process. Their involvement with custom furniture and fittings points to a hands-on, bespoke approach to their work.

4.3.1 A Typical Construction Project

Here's I provide a simplified timeline for a construction project based on the summary provided:

1. **Needs Identification:** Recognize the necessity for a new building or the improvement of an existing structure.
2. **Concept Study:** Specialists convene to discuss and plan the project's requirements. Feasibility studies and initial design concepts are developed.
3. **Design and Planning:** Detailed architectural and engineering designs are created. Necessary approvals and permits from relevant authorities are obtained.
4. **Pre-Construction:** Hiring of contractors and subcontractors. Procurement of materials and equipment. Finalization of contracts and construction schedules.
5. **Construction Phase:** Groundbreaking and commencement of construction work. Ongoing management of schedule, budget, and work quality. Regular coordination meetings and updates.
6. **Finishing Phase:** Interior finishing, installations, and detailing are completed. Systems testing (electrical, plumbing, HVAC) and building inspections are conducted.
7. **Final Inspection and Handover:** Final inspections to ensure compliance with codes and standards. Resolution of any identified issues. Official handover of the completed project to the client.
8. **Post-Construction:** Warranty period begins. Post-occupancy evaluations and potential adjustments.

Each construction project will have its own unique requirements and challenges, and the timeline might be adjusted accordingly and involve a myriad of interrelated activities (Alaloul et al., 2016). Project parties deal with large amounts of information derived from various stakeholders, such as designers, contractors, subcontractors, suppliers, banks and governmental units (Alaloul et al., 2016). However, this timeline provides a general framework of the stages involved in a typical construction project.

A typical construction project starts with an initial concept shaped by a client need, visions or requirements of a new building, the rehabilitation of an existing structure or improvements for energy efficiency. *"It starts with a need... and then you work it out as a concept"* as stated by i1 . This leads into a concept phase where various specialists, including interior architects, engineers, craftsmen and other contractors collaborate to create a construction plan. The project then moves through detailed design phases, obtaining necessary approvals and permits before construction can commence. The concept phase is followed by the pre-project phase, where the project manager engages all the advisers which eventually is led into the implementation phase, *"and then you have to plan what is going to be built... Then It's the contractors who come in"* as stated by i1. After the project manager engages the contractors, meticulous planning happens to achieve the vision, where architects, interior architects, craftsmen, among many other specialists collaborate to achieve the vision and complete the project. During the execution phase, project managers coordinate the work of contractors and various stakeholders to keep the project aligned with its timeline and budget. The project manager from i1 reflects on phases as presented by the client *"Here are the drawings, this is what you're going to build. I'll have it finished by that date, and it can't cost more than this amount."*

4.3.1.1 The Role of Communication in Construction Projects

Throughout the project, communication is key—ensuring all stakeholders are working towards a common goal. The success of the project is gauged not just by its completion within time and budget, but also by customer satisfaction and the functionality of the finished structure. Overall, a typical construction project is a concerted effort that integrates diverse skills and careful planning to achieve a functional and aesthetically pleasing outcome

In the survey, a craftsman presented the wish for a unified platform where all parties are informed at all times and can work together seamlessly when collaborating on projects *"I wish there was a common platform where everyone is informed at all times. A software that both interior architects and craftsmen can work in so that we can make the necessary changes for the project to be taken directly into production.".* Another respondent mentioned confusion over who has the main responsibility within a project - *"Who has the main responsibility? Many are involved, but I often wonder who really decides.",* expressing the need for clarity on decision making.

4.3.2 Coordination Mechanisms (Communication and Coordination Tools)

During the interviews the participants highlighted several common communication and coordination tools used in the construction industry. These tools collectively supports the flow of information, decision-making, and collaboration throughout various phases of construction projects. The choice of tools often depended on project-specific requirements and the preferences of project teams and tasks.

#	Communication Tool	Description	Interview References
1	Email	Email emerged as a primary communication tool for sharing project-related information, documents, and updates. Used for both communication withinternal teams and external stakeholders.	i1, i2, i3, i5, i6
2	Phone Calls	Traditional phone calls and conference calls were utilized for one-on-one communication, clarifying details, and discussing critical matters.	i1, i3, i5, i6
3	Meetings	Face-to-face meetings and virtual meetings with the use of tools like MS teams were essential for discussing project progress, addressing issues, and making decisions. Regular project meetings helped maintain alignment among team members.	i1, i2, i3, i5, i6
4	Project Management Software	Various project management software platforms were mentioned for tracking project tasks, timelines, and milestones. These tools often included features for document management and collaboration.	i1, i2, i3, i5, i6
5	Building Information Modeling (BIM)	BIM software was widely used for creating and managing 3D models of projects. It facilitated better visualization and coordination among architects, interior architects, engineers, and contractors.	i1, i2, i5, i6
6	Document Management Systems	Document management systems were employed to organize and store project documents, drawings, and specifications. They helped ensure that team members had access to the latest project information.	i1, i2, i6
7	Collaboration Platforms	Collaboration platforms and intranet solutions allowed team members to share documents, communicate, and collaborate in a centralized digital environment. These platforms promoted efficient information exchange.	i1, i2, i3, i5, i6
8	Mobile Apps	Mobile applications were used for on-site coordination and communication. They allowed professionals to access project data and communicate while in the field.	i1, i3, i5
9	File Sharing Services	Cloud-based file-sharing services like Dropbox and Google Drive were mentioned for sharing large files and documents securely among project stakeholders.	i1, i2, i3, i5
10	Instant Messaging	Instant messaging platforms were used for quick, real-time communication among team members. They were particularly handy for resolving urgent issues.	i1, i3, i5, i6
11	Virtual Reality (VR) and Augmented Reality (AR)	In some cases, VR and AR technologies were employed for immersive project visualization and design review, enhancing communication.	i2, i5
12	Customer Relationship Management (CRM) Systems	CRM systems were mentioned for managing client interactions and project inquiries. They played a role in client communication and relationship building.	i3

Traditional modes of communication, such as *emails*, *phone calls* and *meetings*, continue to be a popular and fast means of communication as shown in the survey, and interviewee i2 explains its useful application particularly for one-on-one discussions and resolving urgent issues. However, as stated by i1, this can be at the cost of having traceable, written and documented information. The survey reflects that email is used by everybody and that is the most common mean of communicating and coordinating in projects. The blend of email correspondence and regular meetings enables professionals to maintain alignment and ensure that everyone is on the same page, but that is not to say that challenges don't arise with this tool set. Interviewee i2 shares her perspective on the volume of emails: *"Sometimes there can be a lot of mails. Many people complain about how many mails they get per day. It's a lot of work to answer, and answer nicely."* Interviewee i1 suggest that while email may be suitable for smaller projects, but it has its limitations in larger projects as *"we lack traceability and if some important players leave the project there may be some documentation we do not have. So ideally all documentation and communication should go through such platforms where everything is stored then"* - (Interview i1, BPJ)

Project management software has emerged as an indispensable tool. These platforms provide a centralized hub for tracking project tasks, timelines, and milestones. They also facilitate document management and collaboration, streamlining project workflows. Additionally, the advent of Building Information Modeling (BIM) software has revolutionized the industry. BIM allows professionals to create and manage intricate 3D models, greatly enhancing visualization and coordination among architects, interior architects, engineers, and contractors.

Document management systems play a pivotal role in organizing and storing project documents, drawings, and specifications. They serve as repositories for critical project information, ensuring that team members have access to the most up-to-date materials. Collaboration platforms and intranet solutions further bolster information exchange by providing a centralized digital environment for sharing documents and fostering collaboration.

Mobile applications have gained traction for on-site coordination, enabling professionals to access project data and communicate seamlessly while in the field. These apps enhance agility and responsiveness in managing construction and interior architecture projects. Furthermore, cloud-based file-sharing services and instant messaging platforms facilitate the rapid transfer of files and real-time communication among team members, addressing the need for swift and efficient information exchange. However, coming back to interviewee i2s quote, *"For me in the field of mobile communication it's - 'The less communication the better it is.'* implies that while mobile communication is used, it is not always preferred due to the volume of interactions it can generate, which may not always be productive.

In some instances, cutting-edge technologies like Virtual Reality (VR) and Augmented Reality (AR) are deployed for immersive project visualization and design reviews, enhancing communication and decision-making.

BIM for communication and coordination enhancement

Multiple interviewees, such as i1, i2 and i6, acknowledge BIM as an essential tool for managing and coordinating complex projects, streamlining processes and improving communication among various stakeholders. However, it is worth noting that both i2, i5 and i6 were familiar with working in large-scale industry projects, which is why BIM is an integral part of their work day. A pattern emerged where interior architects engaged with large-scale endeavors or part of more substantial firms were conversant with BIM software, unlike their counterparts in smaller companies or the interviewee from i3 with extensive industry experience who hadn't used it.

The ability of BIM to improve coordination is a recurring point for both i1 and i2, in regards to both getting daily updates on changes and feedback, as well as functioning as a platform for maintaining documentation and communication. This highlights BIM's role in keeping teams aligned and informed, but the adoption of BIM is shaped by various factors including the scale of the project, budget, and the user's proficiency. BIM is described as a smart, 3D-model-based approach that - when effectively implemented - simplifies work life, provided that the input from various professionals is precise and the model is replete with the correct information.

In interview i1, BIM is discussed as a collaborative tool that allows different team members to work within the same model. BIM provides a platform where information can be exchanged and detailed, allowing for each material and element to be correctly coded and thus ensuring that the information is accurate and can be extracted efficiently, which is especially useful for larger projects that demand high levels of detail and accuracy. The interviewee mentions that their team might work in the same model as the architect or in a different way, but it's essential that the codes within the model are correct to follow the project's detailing guidelines.

According to i1, The BIM server acts as a central point for shared files, allowing multiple users to work on a single file and contributing to a collective effort to detail the model. However, the interviewee points out that for smaller projects, the demand for BIM is not as stringent because such projects may not require the extensive information that a BIM model can provide, and the cost of using BIM for smaller projects was not worth the price tag.

Some of the interviewees indicate that BIM is widely recognized for its potential to revolutionize project management by enhancing coordination, communication, and problem-solving, and interviewee i2 describes it as *"an amazing tool to coordinate all people on a project together"* and

reflects on the process of using BIM after creating drawings such as EFC models (which are a common part of interior architects work production):

> "And when we export EFCs models - it's like a 3D model - to this BIM-program, and then there's a BIM coordinator who implements the drawing details into the 3D-model. And then it's very easy to see. Everything is in 3D". - (Interview i2)

Intervieweei2 emphasizes the practical benefits of BIM in visualizing and coordinating complex project details among all stakeholders, and interviewee i1 mentions BIM-models being increasingly used in the industry. *"We're constantly using BIM more often. I'd rather have it as early as possible in the project, so I try to incorporate it into at least the preliminary project".*

Interviewee i1 also describes the functionality of Dalux as a BIM-viewer, *"Dalux is a BIM viewer where you see the model - and you can use the model and comment on things while communicating and can upload documents. So it's a really good tool that I'm seeing more and more people using in projects".*

BIM's importance in enhancing stakeholder communication and maintaining accurate documentation was a recurrent theme. As the project manager from Interview 1 pointed out, BIM platforms are instrumental for ensuring traceability and a centralized repository for documents, which is crucial for proficient project management. This consensus among the professionals interviewed underscores the selective yet impactful role of BIM in project management within the field of interior architecture.

User-friendly technology and training needs
The ease of use of specific BIM software is mentioned by i1, while i2 points out the learning curve and the need for training, especially for those less familiar with digital tools. This indicates a need for accessible BIM solutions as well as BIM-training in the construction industry. In a research published by KHiB, BIM-training was seen as essential for making the construction industry more lean at large.

BIM for Risk-management
BIM was not only highlighted to solve communication and coordination challenges, but it was also noted by i1 that BIM was an effective tool for risk and change management. From interview i6, it is suggested that involving all specialties in a BIM model and executing good processes for crash-testing within the models can ensure that installations and other components are placed in the most optimal locations. This helps to foresee potential issues and mitigates risk by allowing for adjustments before problems materialize on the construction site.

Furthermore, the discussion about BIM also touches on its capacity to handle heavy files and the importance of a good BIM server for collaboration. It highlights the teamwork aspect in BIM, particularly using ArchiCAD, where multiple professionals can work within one file, facilitating easier access and shared work environments

Determining Factors for BIM Adoption

I recognized a pattern of when BIM adoption in projects. Interviewee i2 noted that BIM might be considered an unnecessary expense for smaller projects, which also resonates with interviewee i1's implications that BIM adoption varis and some professionals may not utilize it to its full potential. The issue of licensing was also common. BIM-licenses could be very costly, which is also why it was more common to use BIM in larger projects that would last for longer periods of time. In addition to this, interviewee i1 noted that who owns the license could also determine if BIM was used in a project or not. Oftentimes, it was often up to the "total entreprenør", building lead or building owner to determine if the project would use BIM software. This could also mean that interior architects or project managers that were used to using BIM for enhanced project flow, would not be able to use it if the building lead decided against it.

4.3.3 A Multifaceted Meeting Culture

First and foremost, communication in this industry is multifaceted, encompassing both traditional methods and modern digital tools. Email remains as the most common mean of communication and coordination, as well as for exchanging project-related information, documents and updates. However, the importance of face-to-face meetings cannot be overstated in regards to decision making, coordinating and planning. Regular project meetings, whether in person or through video conferencing, serve as crucial forums for discussing progress, addressing issues, and making critical decisions. Interviewee i2 underscores the value of meetings despite their length as a way to reduce unnecessary communication and ensure clarity in tasks and responsibilities and provides a conflicting perspective: *"I'm a big fan of these big meetings - We can sometimes spend six-hour sittings. I hate it - But everyone knows what to do in the next two weeks, and there's less non-useful communication".*

On the other hand, interviewee i5 noted concerns about the number of meetings and their duration. *"We have way too many meetings"* and reflects upon how some meetings need to be long in duration if it's not possible to draft the information in a mail or if a longer discussion is needed, while some meetings are unnecessarily long, though i5 did not specify which ones. *"I don't think meetings should be long."* The communication and coordination practices described in the interviews paint a comprehensive picture of how professionals in the construction and interior architecture industry navigate their complex projects. These practices reflect a heavy reliance on meetings as a main means for coordinating.

Virtual meetings have become part of the norm and daily lives for many of the interviewees and allows for more flexibility and less time spending traveling between locations, but interviewee i2 does make the statement that it was difficult to implement virtual meetings due to reluctances from the company and management, and it was mostly done so out of necessity because of COVID regulations, indicating a lack of autonomy for employees at companies in the industry. Now it is a norm, widely accepted and very preferred. Interviewee i6 provided insights, similarly to i2, on the efficiency of long initial meetings as well as the cost of them

> *"If there are many people in big meetings, it gets very expensive. Sitting in a meeting for half a day, 20 people in that meeting - it is very expensive - but, it something about getting enough first-hand information, and everyone is informed at once. And then we can skip these continuous strings of information, and all the contractors can make a decision then and there together".*
> *- (Interview i6, IA)*

The insights from the interviews suggests that while meetings are a crucial aspect of the construction industry's workflow, there is an ongoing effort to refine their frequency and

structure to ensure they are as effective and efficient as possible as mentioned by both i3, i5 and i6. There's a shared understanding that meetings are necessary for thorough communication, especially in the early stages of a project, but there is also a desire to streamline them to avoid redundancy and time wastage.

The meeting culture within the construction industry encapsulates a rich blend of tradition and innovation, a duality that reflects the dynamic nature of the construction industry. It is traditional in the sense that it reflects the industry's preference for face-to-face interactions and on-site meetings, as highlighted in interviews i2, i3 and i5. Also, innovative in the sense that some companies such in the interview i3, where the company actively seeks to improve their meeting culture and internal processes by adjusting the frequency of meetings to enhance effectiveness as well as challenge their routines to find more efficient ways of working. As I will explore, the interview from i1 to i6 offers a wide perspective of the meeting culture, highlighting diverse practices that underscore the sector's complex collaboration and communication landscape. An observation to why it is such a wide perspective, is due to the fact that the domain within the construction industry is large, ranging from small companies to massive corporations which by its inherent nature introduces complexity in regards to practices involving meeting cultures.

4.3.3.1 Meeting volume, meeting readiness and preparations

Common among all interviewees were the standard of heavy meeting load was also common in the construction industry. The participants shared a variety of views on the quantity and quality of these meetings, as well as their structure and purpose. In interview i5, it was noted that there are "way too many meetings" and many of them could be shorter. It was suggested that having a meeting agenda is crucial, and sticking to it makes the meeting more efficient. Moreover, preparation was emphasized as key to keeping the meetings focused and productive, with an emphasis on asking questions no matter how trivial they may seem, to extract maximum information and gain a deeper understanding of the project and the perspective of various stakeholders.

4.3.3.2 The Importance of a Meeting Lead and Meeting Agenda

When asking the interviewees what is needed for a good meeting, multiple people pointed out that the meetings needed a meeting agenda and a meeting coordinator to be effective. Most of the time, the project manager was the one functioning as a meeting coordinator by leading the meeting and making sure that the discussion was not derailed. The importance of structured agendas and clear leadership during meetings is universally acknowledged. Disorganized meetings without a clear purpose or leader are deemed unproductive. An effective meeting

coordinator is crucial for keeping the discussion focused and ensuring that meetings are concise and result-oriented. A set purpose (meeting agenda) was also necessary for all participants to get an understanding of the purpose of the meeting, to be prepared as well as knowing what topics to include when in the meeting.

For effective meetings that provided a lot of value, a lot of the interior architects mentioned the need of having a set meeting agenda, as well as structure and a meeting lead. The most unproductive types of meetings were the ones where no one really understood what the meetings were for, and for meetings where the discussion became irrelevant. A good meeting coordinator, or a person who was in charge of directing the meeting or keeping everybody on track and on topics, were important for the meetings to be concise and effective. Efficient meeting practices, such as having a clear agenda and a good meeting coordinator, are also recognized as vital across the interviews to ensure that meetings are concise and productive.

Interviewee i3 provided insight into a company actively seeking to refine its meeting culture. They moved from weekly to biweekly meetings to optimize efficiency and effectiveness, focusing on systematic and focused discussions. They also value initial on-site meetings for their vividness and the ability to handle challenges directly and efficiently. For the company of interviewee i3, the meetings take place every other Monday and last between 1 ½ - 2 hours. Previously, they had worked with having meetings every Monday, but they experienced that it would be at the cost of effectiveness, which again would be at cost of customer satisfaction and project success.

> *"It has actually been that we have had many projects, and to be effective enough with the projects we have, if we are to have it every month, it takes two working hours from all the employees. So if we have meetings in every other week, we can be more effective and get more out of it, instead of taking so much time. And because we work very concentrated, if we don't get the most out of our projects, we become less effective towards the customer. So to get the efficiency up, we have always done it like that." (Interview i3)*

On the other hand, from the perspective of interviewee i2, having less meetings or decreasing the meeting duration, was not preferred. This was because she liked the forum because it allowed for discussions and difficult topics to be discussed easily. Some things are easier to discuss in meetings, than to do over email or even telephone. Telephone conversations were good for making quick calls to sort tasks and clear up information between two people, but for the meetings where a lot of contractors and professionals were present (such as engineers, building leaders, architects, customers, electricians and such) were better because the longer meetings allowed all relevant parts to be present to discuss in the moment. This could however be at cost for focused work and productivity to follow up work that had to be done for clients. Interviewee i2 emphasized however the need to decrease unnecessary meetings and communication. She did have a preference to having big meetings, where everyone knows what

everyone is working on and has to do for the next 2 weeks, which in turn would lead to less unnecessary communication and disruptions.

4.3.3.4 Initial On-Construction-Site Meetings and its importance

In the start of a construction project, initial meetings are held on the construction site to let the industry professionals get a holistic and real view of the construction site. In these meetings, there are multiple participants such as the construction lead, plumbers, electricians, architects, investors, sound acoustics among many other professionals required for project completion. In these meetings, the professionals assess the construction site together, take physical and mental notes, discuss potentials and constraints. The process of assessing the construction site with the professionals who would be partaking in the project, allowed for better mapping of needs, possibilities, constraints and themes to further discuss at a later point in the project. These meetings also allow people to gain a detailed understanding of the project and provides a dynamic problem-solving environment. As all the professionals are collected here, it allows for rapid and on-site discussions. The role of technology seems to be less emphasized than the value of face-to-face interactions, especially in the initial stages of a project, and there was more emphasis on the need for these meetings to be long in duration, commonly 5-6 hours, being observant and critical, as well as prepared and ready to ask questions.

> *"It's very difficult to see the challenges when you're in a meeting room. At the site, it's very visual and very local. You remember more and go through more. So it's desirable that it's at the construction site. And it takes a long time." (Interview i3)*

It is preferred to have the initial construction site meetings long, because with enough time on the construction site, the participants are able to take time needed to make the necessary observations, grasp and note down as many details, and be able to have a discussions with other professionals on the site. *"We prefer to split it up a little, because it can take two to three hours, or four if it's a big project. It takes time." (Interview i3)* The initial meetings should not only be long to be effective, but everyone on site should come prepared with questions to extract as much information as possible and also understand what the other participants have in mind when being on the construction site. By being inquisitive and critical, one can discover a lot.

> *"It's to be more inquisitive and critical, and dare to ask stupid questions. Because there are no stupid questions. Everything is... It doesn't say itself. And what we have in mind is something completely different than what the craftsmen have in mind. It's important to be prepared. Have a lot of questions set out. Because when you're there, and there are so many involved, you quickly forget what you're supposed to ask about." (Interview i3)*

On site is when a lot of the professionals spot elements such as construction obstacles, elements that needs to be upgraded and other details that may not have been mentioned previously, but

details that a professional within a field are easily able to spot when on site, and able to discuss with electricians, plumbers and such on site instead of having the discussion on telephone or on teams.

4.3.4 Familiarity with agile practices

When asking the interior architects in my interviews about their knowledge of smart processes or agile methodologies in general, a lot of them had the same perceived though;

> *"I don't think so. I'm so bad at IT." (Intreview i3) There lies a though, and idea, that the reason for not knowing about efficient practices or efficiency through digital tools, is that one is bad at IT. And even though, agile development is more psychological and methodical than technical, it is still perceived as "I don't know about this because I am bad at IT".*

> *"We are visually creative people, and then it becomes a completely different industry world again."*

This could indicate that the practices from the IT industry, and agile software development, is not necessary to learn about because one is from a different industry or that it is too technical or far out from ones knowledge scope or technical scope.

4.3.5 Coordination and Communication Challenges Identified

The most common coordination challenges identified by the interviewees included communication gaps, lack of early involvement, information accessibility issues, BIM implementation challenges, document management problems, role clarity, time constraints, and change management difficulties. These challenges highlighted the complexities of coordinating and collaborating effectively in the construction and interior architecture industry. Below I provide a list of the challenges identified, and map them out to the interviewees who were familiar with or had experienced such challenges.

Table 14: Communication and coordination challenges

Challenge	Description	Impacted Stakeholders	Consequences	Interviewee References
Accuracy Issue	Need for accurate project information to avoid rework and errors.	Various Project Members	Rework and errors during communication and coordination.	i1, i2, i5, i6
Document Management	Problems with version control and organization of documents.	Various Project Members	Difficulties in tracking documents and changes.	i2, i6
Lack of Early Involvement	Importance of early involvement in the project highlighted.	Interior Architects, Other Professionals	Design changes, additional costs, inefficiencies.	i1, i3
Information Accessibility	Difficulty accessing up-to-date project documents and data.	Various Project Members	Hindered decision-making and coordination.	i1, i2, i3, i5, i6
Communication Gaps	Frequent mention of gaps between project stakeholders.	Architects, Interior Architects, Engineers, Contractors	Misunderstandings, delays, errors in project execution.	i1, i2, i3, i5, i6
Change Management	Difficulties implementing changes requiring multiple stakeholder adjustments.	Various Project Members	Delays and increased coordination efforts.	i1, i3, i5, i6
Role Clarity	Need for clear definition of roles and responsibilities.	Various Project Members	Conflicts and coordination problems.	i1, i2, i3, i5, i6
BIM Implementation Challenges	Issues with standardizing processes and software compatibility.	Various Project Members	Hindered full leverage of BIM for coordination and collaboration.	i2, i3, i5
Time Constraints	Challenges in meeting deadlines and managing time.	Various Project Members	Compromised quality of coordination efforts.	i1, i2, i3, i5, i6

Accuracy Issue is a challenge Interviewee i1 speaks candidly about the inevitability of delays and mistakes, and attributes these mistakes to human error, project complexity and the dynamic nature of construction projects. The project manager highlights the importance of flexibility, risk and uncertainty management and the need for contingency in planning to address these challenges and how the use of software like BIM help in managing these

challenges and the importance of early contractor involvement and robust planning in the early stage of a project, emphasizing that well-planned initial phases can prevent costly changes later in the project's lifecycle.

Document Management: The interviewees also mentioned problems with managing documents effectively (i2, i6). In construction projects, which often involve a vast number of revisions and updates, the ability to track the latest version of any document is crucial. Without proper version control and organization, it's challenging to ensure that everyone is working from the most recent and accurate information.

Early involvement emerged as a recurrent theme, highlighted in i1 and i3. In i1, the significance of engaging contractors at the project's inception was underscored. This proactive approach leverages the practical building knowledge possessed by contractors, ultimately resulting in superior project outcomes, heightened responsibility sharing, and reduced potential for disputes. Similarly, i3 emphasized the value of on-site meetings, where stakeholders such as plumbers, electricians, and construction managers come together. These gatherings facilitate note-taking, adjustments to project plans, and in-depth discussions of critical details. However, these meetings are not brief affairs; participants prefer extended durations to accommodate thorough observations and discussions.

Information accessibility is a theme frequently pointed out in interviews. Difficulties in accessing the most current project documents and data is not uncommon, and lack of easy access can lead to decisions being made on outdated information, which can cause costly mistakes and delays, and i6 points out the recurring event things happen in the wrong order for such reasons:

> *"I never experience that it's optimal, even if you think you're in a great project. There is always a technical profession that comes and just takes notes a little too early. [...] We can wonder a lot why things happen - like why have the plumbers already installed the pipes, when the project had not gotten so far or other professionals were not ready yet" (Interview 6)*

During my short observations of a rehabilitation project of the housing association I live in, I was able to see for myself that a few technical contractors started their work too early. Painters had painted the interior of all exterior halways of every apartment complex, which was around 300 apartments, when there was a plan to remove the exterior doors. This caused issues in which the painters had to come back to paint again at a later time, because the installing of the doors caused the paint to chip off.

Change management was identified as a considerable challenge among multiple interviewees, underscoring its complexity and the coordination it demands from all involved parties. They conveyed that alterations to project plans or designs typically necessitate extensive adjustments across various teams, often leading to project delays (i1, i3, i5, i6). The time required for communicating changes, obtaining the necessary approvals, and then executing them can be significant, affecting project timelines and potentially increasing costs due to these disruptions.

Moreover, these changes often require intensified coordination efforts, resulting in additional meetings, updated documentation, and occasionally, the need to renegotiate contracts or project scopes (i1, i3, i5). The stakeholders impacted by these changes—such as interior architects, engineers, and contractors—must manage their expectations and adapt their contributions accordingly, which is a pivotal component of the change management process (i1, i3, i5, i6). They emphasize the need for systems that can handle the dynamic nature of construction work, where changes are frequent and must be managed efficiently to mitigate their impact on the project's success.

Human errors Interviewee i1 is clear when talking about the tendency of missing project deadlines. *"People make mistakes. All the time. Things take longer than you think. After all, it's just people working on projects, so there's a lot of human error. Things are more complex than you think."* *"Projects change all the time, so we have to be flexible about that."* [Project Manager, i1]

Lack of autonomy also seemed to be a theme interior architects were challenged with, especially interviewee i2. While interior architects are skilled professionals with the capability to make significant contributions to construction projects, the interviews suggest that their autonomy may be limited by factors such as late involvement in projects, communication barriers, and systemic issues in project information management. To enhance their autonomy, there may be a need for structural changes in how projects are managed, ensuring earlier involvement, clearer communication channels, and better access to information.

Role Clarity: Overlapping roles or unclear responsibilities can lead to conflicts and coordination problems, possibly constraining the freedom of interior architects to execute their vision without interference or confusion regarding their role. The lack of role clarity is strongly correlated to late involvement of interior architects in projects, which causes uncomfortable interactions between lately included interior architects and the arhchitects that were onboarded way earlier in the planning phase.

Chapter 5 - Discussion

By examining the stories of project managers, architects, and designers, I trace their challenges, methodologies, and the emergent need for adaptability in a rapidly changing world. The Agile framework, with its emphasis on flexibility, customer collaboration, and responsiveness to change, holds lessons of considerable value for the construction industry. In juxtaposing the established norms of construction with the innovative practices from large-scale agile software development, this chapter sets the stage for envisioning "Agile Construction"—a paradigm where efficiency, adaptability, and collaboration are not just aspirational but integral to the fabric of the industry. The construction industry finds itself at a crossroads, seeking innovative approaches to coordination and collaboration. This chapter delves into the current state of this industry through the lens of seasoned professionals, unearthing the daily challenges and triumphs of large-scale project management. The insights gathered from architects, project managers, and interior designers lay the groundwork for a pivotal discussion: what can the construction industry learn from its counterpart, the IT industry?

The IT industry, revered for its agile and dynamic project management techniques, offers a reservoir of agile methodologies that could potentially revolutionize the construction industry's approach to complex projects. From streamlined communication channels to iterative development cycles, there is much to be learned and inspired by. As I navigate through the interviewees' experiences, I lay the foundation for a comparative analysis that may well chart a new course for the construction industry, steering it towards a future where efficiency and collaboration are not just ideals, but everyday realities.

In regards to agile software development, plan-driven organizations moved away to value-driven organizations (Schön et al., 2017) and current digital transformations require organizations to continuously adjust how they organize operations, and requires adopting agile methods in larger projects which requires more inter-team coordination and interactions and continuous improvement (Mikaelsen et al., 2018).

As presented in the background literature, Alaloul places importance on coordination practices as a critical factor for managing construction practices, and other fields like computer science have focused on the importance of coordination whereas the construction industry is behind (Alaloul et al., 2016). In the IT industry, agile coordination practices such as daily stand-ups, retrospectives, kanban boards, sprint planning and pair programming are activities that increase team efficiency, increased customer value and continuous delivery and manage task dependencies. Alaloul also points out how managing dependencies is necessary for improving efficiency.

5.1   Cross-Industry Learning

There is the obvious distinction between the IT industry and the construction industry, such as in the case of the agile software development and IT industry, one always has the option to roll back changes if things go wrong. The construction industry is quite unlike in this regard, as when a construction object has been made, it is difficult to "roll back" or make changes without wasting time, resources and rework is expensive as materials are expensive.

> *"The changes we make, they're not so dangerous because a lot of the cahnges we make can be rolled back, they can be fixed. But I think a lot of industries have a lot to learn from some of these processes with agile methodology. Just what you said about that a decision and a solution can be made on the same day, that's something you have the opportunity to do. (Interview 8)"*

However, there are much to be learned in regards to agile practices and processes that the IT industry has adopted and cross industry benchmarking increases opportunities to acquire innovative but transferable ideas from players across a wide range of industries (Komazec et al., 2012). Communication is faster in the IT industry *"I see that the changes and developments from the IT industry are going much faster. And how one communicate and solve problems is happening very fast in a digital world." (Interview 8, Agile Coach).*

> *"While changes you see in other industries, such as the logistics industry, the construction industry, the health sector and industry and everything, it takes a long time before decisions and changes are made. It has to go through leadership, it has to go through different processes, before you get to the other side that says it's a good decision, let's do it" (Interview 8).*

This aligns with the background literature presented on the construction industry, on the most common coordination errors and factors in the construction industry, such as slow decision making, management and leadership are some of the key factors to bottlenecks in projects. To recap, Zidane points out coordination and decision issues, management, administration and bureaucracy, decision issues and waiting. Whereas Alaloul points out the importance of mapping out coordination factors such as quality assurance and participation plans, and managing dependencies between project activities, and even points to how the computer science field has investigated the importance of these and created a highly efficient and competitive field.

In order to maximize advantage from cross-industry learning, organizations have to have capacity to absorb new knowledge and flexibility to quickly adapt to the new procedures/practices (Komazec et al., 2012). Komazec also touches on the HR role is to know how to create the innovative profile of an organization, stimulate creative experience and

actions, increase employee satisfaction rate (because it is in close relationship with the attraction and retention of employees and unwanted departure of best performing employees and talents significantly influence competitiveness of the organization). As we can see from the findings, Fuse and Soney have been successful in creating employee satisfaction through autonomy and social events, and on the other hand, I interviewed an interior architect who was ready to resign from the company for not having as much autonomy and ability to have a direct impact on a typical workday, and had to fight for having virtual meetings. There are unlimited opportunities and pathways in exploring cross-industry learning and it's about organization transformational capacity and human resources potential (Komazec et al., 2012) which also aligns with Albuquerque's highlights on studies by Owen et al. (2006), which acknowledges that cultural transformation should be the first step toward a change in project management paradigms in the construction industry (Albuquerque et al., 2020).

"Similarly to the construction industry, the agile large-scale software development industry has experienced challenges in regards to inter-team coordination. Inter-team coordination refers to coordination happening outside an individual team's boundaries, either with other teams or with roles operating between teams such as architects and agile coaches. In complex, large-scale settings, ensuring optimal levels of inter-team coordination is far from straightforward as more teams, roles, and technologies are introduced across teams. Inter-team coordination problems may stem from a lack of shared knowledge about goals and prioritizations as well as inefficient communication and insufficient management of dependencies across teams" (Berntzen et al., 2023).

5.2 Parallels between the Construction and IT industry

Table 15: Parallels between software development and construction development

Parallels between Software Development and Construction Development		
	Software Development	**Construction Development**
Realm/Domain	Virtual	Physical
Team Structure	Developers Designers/UX, Team lead Architects Testers	Contractors Architects Interior Architects Interior Designers Sound Designers Stonemakers
Collaboration	Cross functional teams Agile enabled Autonomy	Collaboration between participants such as architects, contractors, interior designers, project managers and similar. Not necessarily a team.
Project Lifecycle	Iterative or agile (usually)	Linear phase
Deliverables	Code Applications Modules Documentation	Buildings Constructions Infrastructure Documentation
Flexibility	Very flexible Able to roll back changes and releases in case of crashes	Not flexible Once something is built, it cannot (usually) be undone without causing significant waste, delays and extra work
Tools and technologies	IDEs Version control systems Software testing frameworks Communication channels	BIM Communication channels Construction management software Modeling software
Adaptability	High degree of adaptability Lots of research on this	Not familiar or efficient in adabtability Research in this field is being developed
Risk factors	Software bugs Security vulnerabilities GDPR Data breaches Cost overruns Project delays	Weather conditions Supply chain disruptors Safety hazards Regulatory compliance Cost overruns Project delays

5.1.1 Key Differences between ASD and CD

To be able to answer the research questions, it will be necessary to define the factors and aspects that make up construction and software development. By defining how the teams work, operate

and develop, we can later in this discussion explore how construction projects can improve collaboration efforts and solve communication challenges by following the agile practices in the IT industry. We define the main differences and similarities between software development and construction development as such;

Physical vs Virtual space: In a construction project we have participants of different disciplines on the construction site, constructing a physical building on a construction site. One of the key differences between software and construction development is likely in the space the development takes place. When the actual construction part of a construction development process takes place, both manpower and resources are needed at the physical construction site at the time of developing the physical construction. Software is mostly developed on computers, which would be in the virtual space. Construction development however quite literally turns into a physical construction. The difference lies in the physical and the virtual.

Resources: A construction project is all about the deployment of scarce and valuable resources as learned from the construction interviewees. The sustainability aspect is also highly multiple times. "Things need to be sustainable, more circular. We don't have a choice." (Interview 6). Materials are scarce and require manpower, time, and effort to either develop or collect, transport and implement. There is less room for mistakes, and the implementation has to be certain. In comparison to software development, the wrong use and management of material and resources can prove both extremely costly in terms of price, time and manpower. In software development, developers and designers are able to develop, implement and test in multiple iterations before landing on a final product. It can cost time, but in terms of resources, the development can be unlimited without having any effect on material resources.

Project model: One of the main challenges that does not allow for a construction project to be agile, is that the construction industry relies heavily on waterfall processes. Task dependencies. The success of a construction project relies heavily on managing task dependencies. A painter is not able to paint a wall, before the wall itself has been built. A builder cannot build a wall before the foundations of a house has been built. Software development is quite modular, even in large-scale projects. Parts of a software can be created in parts (called features) and combined together at the end.

Product teams vs. construction teams: In software development, we often have teams that work on specific products. We call these types of teams "product teams". These types of teams have the ability to get to know a product over an extended period of time, and are highly focused on the product and its features. These developers and designers in these teams work closely together to make the product as good a possible. (få inn litt om team ethic, team mentality osv. Få inn lean principles her) In a construction project however, the construction team dissolves at

the end of a construction project and key participants does not necessarily work closely together to finalize the project. Certain participants in construction projects often work in close physical proximity on a construction site to build and implement physical models, and rely on direct verbal communication and physical blueprints or models. Other participants in construction projects such as actors with tasks focused on planning and designing, work off the construction site and build virtual models for on-site participants.

Final product vs MVP: In software development a minimum viable product (MVP) is a version of a product with minimum features that is enough to be launched to early customers, and is a useful way to collect valuable feedback and insights before heading on to developing more features. In a construction project, the closest thing to an MVP is likely a construction model such as BIM. "It's simply not cost effective to build a little bridge across a river just to find out if people will use it to get to the other side" (A lost quote from the internet).

Operate vs Improve: In the case of software development, is it not the case that the release of a product equals the finished version of the product. After a product release, features can be improved, changed, removed or added, depending on market and customer needs. In software development there is usually a product team consisting of developers, designers and team lead that further develop and improve on the product. At the end of a construction project, however, the team usually dissolves and participants move onto other projects. This also makes it more challenging to develop team morale and a shared common vision which is a main practice of Agile. The release of a product in a construction project, typically means the finalization of the product.

5.3   Adoption of Agile Practices and Lean Principles

Discovery and adoption of digital products happen through agile sense and response capabilities. With its practice focus, knowledge creation and sharing in agile organizations is situated and emergent. There is a focus on minimum and easy documentation, requirements are understood by close contact with the customer, training is done by pair programming, competence management is done by daily meetings, and continuous learning is facilitated through retrospectives (Mikaelsen et al., 2021). Many of these aspects have been seen in the cases of Soney and Fuse. This is clear in the case of team Auto observed at Fuse, and the theoretical underpinnings of agile methods focus on regular reflection for continuous knowledge creation and sharing, and the reflections happen through release planning, group programming, demos, daily standups and retrospectives (Mikaelsen et al., 2021).

In the search for alternative management approaches to manage construction projects, two different management approaches have been promoted by the construction industry, Agile and Lean; however, their use has still been immature. On the one hand, there is Lean construction, and on the other hand, Agile project management. Lean construction is good for dealing with static or predictable environments (Lalmi et al., 2022).

The right adoption of a project management methodology may be the first and most important choice that a project manager can make (Lalmi et al., 2022), and in the dynamic environment of today's business world, "leaders should learn new management behaviors, with which they can communicate both internal and external environment of their enterprises by the strategies of being agile and innovative organizations" (Essila, 2019).

It is hypothesized that the combination of Traditional, Agile, and Lean approaches in a single methodology for managing construction projects will be able to better react to changes and eliminate waste in the processes. This new innovative methodology might be the best way to cope with the complexity of construction projects and to achieve maximum performance in the future (Lalmi et al., 2022).

Alaloul identifies coordination factors that affect construction and building projects performance, in which the coordination factors identified were (1) well-developed relationships amongst key implementation parties (2) a shared vision (3) confidence and trust among agencies (4) and meetings to exchange ideas and dealing with conflicts (Alaloul et al., 2016). I will look at these factors during the discussions further below.

5.3.1 Improving iterative processes

The concept of change as an inevitable aspect of project management is a recurring theme in the construction industry, as identified through my interactions with multiple interior architects and project managers (i1, i2, i6). This inevitability underscores the importance of implementing iterative processes that inherently increase a project's adaptability to change. Iterative processes, characterized by their cyclic nature of planning, executing, and evaluating, allow teams to continually refine and improve upon their work, adapting to changes and challenges more effectively. This approach is particularly vital in an industry where unforeseen circumstances and evolving requirements are commonplace.

In the context of iterative processes, the composition of teams becomes a critical factor. Smaller teams, as noted in my interviews, are often more conducive to these processes due to their manageability (i9). The agility and flexibility of smaller teams facilitate tighter feedback loops and more efficient error detection, ensuring that any issues are addressed swiftly and effectively. This dynamic is crucial in maintaining the momentum of a project and minimizing disruptions caused by errors or changes.

The significance of minimizing the distance from error detection to solution implementation cannot be overstated. As one interviewee astutely pointed out, "But the distance from the error being detected to the solution, it must be as short as possible. And I think we have become pretty good at that" (i8). This statement encapsulates a core principle of agile methodologies, where the emphasis is on quick and responsive error handling. In an industry that traditionally operates on longer timelines and more rigid structures, this shift towards rapid response and adaptability can have profound implications on overall project success.

Furthermore, the analogy provided by interviewee 8 brilliantly illustrates the necessity of continuous monitoring and fast feedback loops in managing construction projects: "If you are on the wrong track, it is incredibly important to have a fast feedback loop. You have to be able to correct all the time. Otherwise, it will be like driving on the motorway... It would be a crisis if you closed your eyes on the motorway for a few seconds." This analogy vividly conveys the idea that continuous assessment and adaptation are as crucial to project management as they are to driving a car. Without them, the project, much like a vehicle, is prone to veering off course with potentially disastrous consequences.

In conclusion, the adoption of iterative processes, characterized by small, manageable teams and short feedback loops, is essential for improving adaptability and responsiveness in construction projects. These processes not only facilitate quick error detection and resolution but also align with the agile principles of continuous improvement and adaptation to change.

5.3.2 Agile practices for managing dependencies

In the realm of agile project management, managing dependencies is a pivotal aspect, especially in contexts where multiple teams and functions intersect. The agile methodology offers robust practices for identifying, discussing, and resolving these dependencies, enhancing overall project coordination and efficiency. One such practice, highlighted by Andriyani et al. (2017), is

the use of retrospectives as a forum for this purpose. During retrospectives, team members openly discuss obstacles they face, particularly dependencies and unfinished tasks. This practice not only surfaces existing issues but also fosters a collective awareness among team members about how their individual tasks interlink with others. Such awareness is crucial in understanding and resolving dependency issues, thereby streamlining project progress. By having retrospectives to identify background reasons of existing issues as to why teams were not actively progressing, the team not only understand what needs to be improved but are also able to further identity future action points (Andriyani et al., 2017).

Furthermore, retrospectives serve as a platform for teams to delve into the underlying reasons behind stagnant progress or unresolved issues. As Andriyani et al. (2017) suggest, by dissecting the root causes of existing problems, teams not only gain clarity on what needs improvement but also carve out actionable steps for future progress. This reflective practice is integral to the agile philosophy, where continual improvement and responsiveness to change are key.

Mikaelsen et al. (2018) underscore the complexity of managing interdependencies, particularly in large-scale agile transformations. This challenge is magnified when integrating non-IT functions and coordinating across various organizational teams. The essence of agile in managing such complexities lies in its inherent flexibility and adaptability. Adapting to agile practices, while time-consuming, offers a structured yet flexible approach to navigate the intricacies of interdependent tasks and functions.

An Agile Coach from Fuse, in their statement, further emphasizes the effectiveness of agile practices in addressing these challenges. Baumeister et al. (2017) also provide insights into this aspect, suggesting that the application of agile methodologies is not just a procedural change but a strategic approach to enhancing collaboration and efficiency in complex project environments.

In conclusion, agile practices, particularly retrospectives, play a crucial role in managing dependencies within project teams. By fostering open communication, collective awareness, and a problem-solving mindset, agile methodologies empower teams to tackle interdependencies effectively. This approach not only aids in smoother project execution but also aligns with the agile ethos of continuous improvement and adaptability in the face of changing project dynamics.

5.3.3 Leadership, Autonomy and Digital Transformation

Leadership is another important topic to discuss in the attempt of becoming more agile. Leaders have an important role in the life of autonomous teams, and for teams new to autonomy the leader role becomes increasingly important (Stray et al., 2018). Some traditional leaders may be unaware of the importance of agile or autonomy-enhancing coaching and the importance of establishing norms that align with autonomous and agile principles. And while barriers for the effectiveness of autonomous agile teams lie at the team level and the leadership of the team, the organizational and environmental context also affect the success of autonomous teams (Stray et al., 2018). It is also noted in similar research that "a company conducting a digital transformation needs to cultivate the leadership for such transformation (Moe et al., 2019). As such, we argue that leadership and digital transformation are interlinked.

Sergeeva and Winch discuss the concepts of "*Innovation leadership*" and the factor of championship as determining factors in the context of project based firms and their response to government narratives of innovation and the need for genuine leadership that believes in innovation beyond mere rhetoric. "Innovation has to be in the identity, in the 'DNA' of the firm and its employees' mindset. The narrative of innovation needs to be promoted in a similar vein as the narrative of health and safety. Owners are advised not to accept the proposals with the lowest costs, but those based on best value" (Sergeeva & WInch, 2020). This aligns with the narratives presented by i8, IT manager of Fuse, who was a key role in the way towards agile practices at Fuse, and explains how *"We had some champions who had come up with the idea of Agile methodology, but we also had some who had worked hard and had worked under the radar."*

IT Manager at Fuse reflects on the time when he and another colleague from the technology department went to a seminar in the US, held in 2005 by Mary Poppendieck, on agile and lean methodologies, and reflects on the seminar as an "Eureka-moment".

> *"When she presented Agile methodology, she put her finger on so many pain points that we had in our organization. We two who had attended that seminar - We came back and just admitted that we had to get the whole technology management in the company onto this." - (Interview 8)*

The company saw the need for fundamental change in both organization and leadership, as well as change in how teams work and the genuine desire to undergo such a transformation.

> *"We had to go to seminars with her to get the awakening in the company that we had gained by being on seminars with her. What we did right there was to admit that you have to get a transition that is very much about how the teams should work, but you have to genuinely understand and want to make a transformation." - (Interview 8)*

This is no easy feat, autonomous teams are not created by simply exhorting democratic ideals or by tearing down organizational hierarchies (Stray et al., 2018). Coaching autonomous teams in a large-scale setting is more complex than for single independent teams because of all the external dependencies and the need for external coordination (Stray et al., 2018). Stray also identifies 5 barriers to autonomous agile teams, which is (1) Not having clear and common goals (2)Lack of trust (3) Too many dependencies to others (4) Lack of coaching and organizational support (5) Diversity in norms. Managing these barriers may lead teams in construction projects operate in a more agile and autonomous way.

The journey towards Agile transformation as narrated by the Fuse interviewees (i7, i8, and i9), is not a destination but a continuous process of adaptation and learning. It involves not only changing how tasks are executed and projects are managed but also transforming the organizational culture to be more responsive, collaborative, and innovative. This transformation is marked by trials and triumphs, with each challenge presenting an opportunity for growth and learning. The experiences of these Fuse employees illustrate that Agile is more than a methodology; it's a mindset that enables companies towards a future of flexibility, resilience, and continual improvement.

5.3.4 Adoption of Agile Coordination Mechanisms and Tools

The adoption of collaboration tools can be a deciding factor that enables companies to become more agile, as it can lead to more meeting inclusions, increased business competitiveness and serve as a factor to innovation and digital transformation. Jackson explains how there are factors such as cost, match to culture and inclusivity that decides adoption of tools. For match to culture, he notes how "not all company cultures are able to adapt to the new ways of working that may be required with the adoption of a new tool." "Collaboration tools are pivotal to stay competitive" "Even with the new tools, there remains the perennial problem of how best to organize the resulting artifacts in a repository, such as Google Drive or MS OneDrive, so they can be readily found. Teams must be vigilant in standardizing on a mechanism to store files to make it easy to retrieve them later" (Jackson et al., 2022) and the IT-manager/Agile coach at Fuse advocates the importance of smart tools and coordination tools, and companies "should avoid a lack of tools that prevent the organization from moving forward" when wishing to become more agile.

An interesting and positive side effect in regards to adoption of new tools has been that, for some teams, meetings have become more inclusive with greater participation and a broader range of ideas (Jackson et al., 2022) which is true in the case of Fuse, as according to the Team

Auto team lead reflects on the ease of setting up meetings and adopting the mentality that "anyone who is interested in joining, may do so" (i7). This also decreased pressure on the team lead having to decide who to include in meetings, as having an open invite allows people who one would not expect to have relevant knowledge or interesting insights, the ability to join themselves if they wish.

> *"Communication between you and the team members who are also visible to those who need the information. My recommendation is that you need to separate communication into two. You need internal communication, which means between you and your team. And then you need external communication, which is between your team and the rest of all people who need all the information."* *(i9)*

5.3.4.1 Slack as an optimal tool for teams in large organizations

Slack allows for more open communication (Stray et al., 2019) which is beneficial when looking at how email is the main means of communication in the construction industry and seeing how information gets lost during a construction project as illustrated by the building project manager from interview i1. Team lead i7 and developer i9 share views on how decisions made through mail can be detrimental to projects, as a common factor of using email usually leads to key participants not being included or getting access to important information and decisions. The introduction of Slack has also caused Fuse as an organization to use way less mail, and have been able to phase it out completely for internal team communication as i9 mentioned that "I never use mail.

Slack also supports easy access to, creation of and use of more separate channels (Stray et al., 2019) which we can see in the case of both Soney and Fuse. More separate channels allows for the channels to have a descriptive purpose of what discussions in said channel should be on. "*Each team should have a main channel*"(Stray et al., 2019). So for every team, a best practice would be to include internal and external team channels, where for all internal communication between team members are reserved for one channel, and another channel dedicated to teams and other parties that are in need of communicating with said team.

Slack also supports easy lookup of information, and was built around the principle of having easy access to information; its name is an acronym for the phrase ''searchable log of all conversations and knowledge''(Stray & Moe, 2020b). It also works to search up messages, and though some literature states that messages in Slack only can be seen and searched by those who are involved in the message (Stray et al., 2019), the external team channels help to lessen this issue. Slack also supports functionality for users to quickly respond and ease of finding the appropriate communication channel, so that there is less lookup-time, ease of access, and increases the awareness of who knows what, which is essential for high performing teams (Stray et al., 2019).

All of the interviewees from the IT industry highlight the importance of Slack, and how it is able to enable teams to coordinate and communicate efficiently, as well as being a space that is good at organizing different types communications and chats, such as having external and internal team communication, and having it readily available and easy to find in Slack, as well as having the option to create Slack sections to sort communication channels into topics and groups.

Slack also supports stronger and more autonomous teams, which is a prerequisite for the success of agile teams (Stray et al., 2019). By creating a space for continuous information sharing, teams can gain an understanding of the activities of others and build a stronger awareness for both the team and others work and responsibilities. A lack of awareness of what distributed team members are doing raises the barrier for initiating contact and the time to receive a fast response increases dramatically with the use of only asynchronous collaboration tools (Stray & Moe, 2020b).

Coordination mechanisms, such as meetings and Slack, can foster a smooth workflow but also fragment work by interrupting the focused work of developers. (Stray et al., 2022). Stray underlines how companies can organize coordination to reduce interruptions: by bundling coordination mechanisms in time (having meeting-free days), by scheduling them to suit the situation (by adjusting the timing of meetings), and by substituting coordination mechanisms for another (when two mechanisms address the same dependency) (Stray et al., 2022).

5.3.4.2 BIM and its benefits and impact on project management and collaboration, and similarities between MVPs from ASD

Creating Minimum Viable Products (MVPs) is a strategy in Lean Startup methodology which emphasizes the importance of learning and iterating as quickly as possible, and serves as a tool for enabling iterative processes, feedback and continuous improvement. Similarly, BIM also contributes to creating feedback loops as anyone with access to the BIM-model can come with feedback during any stage of a construction process. When the building or facility is finished, there will be a digital "as built" 3D model with all the information - a so-called digital twin of the real implemented building, that will be of great value to the owners and users, as well as authorities (Brekke, 2023). They are however different, as MVPs are used to engage early adopters and engage insights, while BIM models are used to engage stakeholders like architects, engineers, contractors and clients. However, I can argue that both are tools that aid in improving processes and serve as early models before creating a final version, and both BIM and MVPs are fundamental parts of risk evaluation and management. Both help with early and continuous

feedback, iterative learning, early intervention, stakeholder engagement and reducing uncertainty.

These are important factors for working agile, which is why I would argue that the implementation of BIM, especially in large-scale situations, are beneficial for construction projects working more agile and instilling lean principles. Consistent momentum can happen through more predictable delivery cycles, and having a high degree of quality integrity which BIM does through risk assessment and crash testing.

BIM also creates a platform where information is stored and readily available, as well as easily accessible. It enhances documentation and documentation practices, which is essential. "The worst situation you can be in, is to be in a situation where you don't have any information" (Interview 9) says developer from Team Auto when reflecting on Slack enables better information lookup and storing.

Adopting BIM does come with challenges, such as user-friendliness and cost mentioned by multiple interviewees from the construction industry, which also aligns with Jacksons literature on the adoption of coordination tools (Jackson et al., 2022).

5.3.4.3 Meetings for Continuous Improvement, Feedback Loops and Keeping Momentum

Meetings like retrospectives, Monday Commits, Friday Wins, and stand-ups serve as feedback loops for ***continuous improvement***. In this regard, the construction industry can learn much from the IT industry by looking at the meeting culture of companies such as Soney and Fuse.

What do you think you should do to ensure that other industries that are not IT-focused can work the way you do?

"I think that when it comes to other projects, they should have a kind of retrospective on the work done. They should also have something called... let's say there is something wrong that is happening in the project. They should have something called post-mortem, which is often an analysis of the mistakes that are happening in a project. And at the same time, it should be a kind of a reflection on the work that is being done. And at the same time, what other industries need to do, they need to have some concrete data points that they measure along the way throughout the entire project. That tells how they are doing in the project. So, for example, to deliver concrete... that other industries or projects should have concrete

data points and measure the project against. Yes, counting. There must be concrete data points that must be counted or can be quantitatively looked at." (i8)

As for the role of meetings for coordination and project management - meetings serve as a coordination mechanism for both project management, managing dependencies and increasing employee satisfaction. A meeting culture such as seen in both Fuse and Soney can cultivate increased coordination and dependency management, project management. Information is gold. "And I think the most important thing in a process like this is that you have feedback loops and that you keep momentum. As soon as you start slowing down your team by disregarding them with other problems that arise, it can quickly take a long time before you can start up projects again and work. So it's important to keep your developers focused, keep them away from as many meetings as possible." (i9) One thing I noticed throughout the Friday Wins in Fuse, was that a lot of the employees ended the week on a positive note, and seemed more ready and positive to take work back again during the Mondays Commits.

The meeting culture at Team Opsie was one of both structured and spontaneity. From the focused Monday Commits to the reflective celebration of Friday Wins, finishing off with social events, and the comprehensive strategizing in common meetings, Team Opsie has cultivated a meeting rhythm that underpins both their operational success and their strong internal community.

### 5.3.4.4 Operational Practices for Enforcing Agile Principles

Teams like Opsie are often overlooked, but play a significant role in the efficiency and uptime of agile software development companies, customer satisfaction and error handling. As such, they are part of enforcing agile principles such as stop-the-line and continuous imrpovement. The team also generates risk assessment reports and tracks the downtime of all services within the organization. They play a crucial part in recognizing patterns that create downtime, and work through meetings to resolve such issues and improve routines to enforce 100% SLA.

5.4 Interdisciplinary Collaboration

Inclusivity and early involvement: Shared visions and holistic solutions

As companies grow and roles within teams become more structured, as noted in interview i5, the approach to meetings has evolved. There's a greater emphasis on inclusive meetings that ensure every team member (irrespective of their role) is informed and engaged. This inclusivity is not just about sharing of information, but also about ensuring that each voice and profession is heard - an essential component for collaborative problem-solving, innovation and holistic solutions. As seen in all interviews, it is recognized that early inclusion is crucial to project success and project members satisfaction, and the industry's pivot towards a more inclusive and structured meeting ethos reflects a deeper understanding of the possibilities a collaborative work environment can create. As the industry navigates through these changes, the meeting culture continues to evolve into a space where technology enhances rather than replaces the human elements of communication and challenges traditional ways of working.

Figure 13: Interplay between early involvement, inclusivity, holistic solutions and shared vision
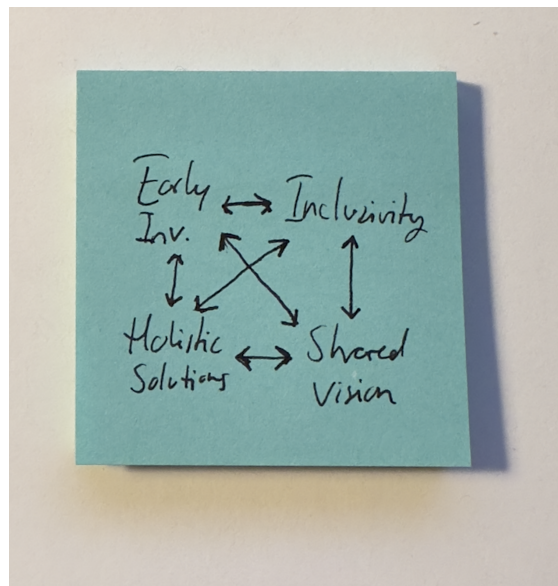
As teams grow and roles become more defined, there is an increasing emphasis on inclusive meetings. Interview i5 and i2 sheds light on the changing dynamics, where every participant, regardless of their rank or role, has a voice and a space to contribute to the project. The construction industry is not just about tools and technologies; it is about people. Stray notes how agile teams stimulate participation and involvement, leading to team members developing

emotional attachment to the organization and greater motivation to perform (Stray et al., 2018). This type of working culture that regards inclusivity is pivotal to nurturing a sense of ownership and accountability across the board, ultimately contributing to a more cohesive project vision in the eyes of i6.

> *"The solutions will be more holistic, and the solutions will be more meaningful. It's better to develop things together. You have different perspectives on how things can and should be. The interior architect has a focus on the end user. So it's very much about being functional and a good place for those who will use the same place, whether it's a school, a cafe or a house"* (Interview i6, IA).

These views also align with the views of the agile coach at Fuse; *"We're going to make the best possible service possible for our users. That's what motivates the majority of the company"* (Interview i8). The discussion around the interplay between early involvement, inclusivity and shared vision seems to align with the coordination factors that Alaloul places an importance on managing, for construction project success. As there are multiple people working to complete a construction project, but not necessarily together at the same time, we can draw parallels between construction teams and distributed agile software development teams. Knowledge creation and sharing based on common ground and social ties are challenged when different forms of distance are introduced, and it is even more important in agile distributed ISD as it relies on mutual adjustment and frequent communication, and for knowledge sharing to succeed, effective communication is a key success factor to remedy that of not being co-located and seeing and experiencing what others are doing (Mikaelsen et al., 2021).

Early Involvement for better cross-collaboration project success and efficiency

The interviews collectively underscore the need for early involvement of all parties in the meeting processes and early phases of construction projects, to ensure that each professional can contribute effectively from the start. There was a consensus across the interviews that they were excluded from the early phases of the construction project, and stated that if they had been involved earlier on in the process, a lot of unnecessary changes and rework could be avoided. The cost of doing the rework and changes are both expensive and costly in regards to time, and is perceived to be an uncomfortable experience. One thing that was uncomfortable for both interior architects and architects, was the event of when it is needed for an interior architect to change some of the solutions of the architect, to make their best work possible, because they had not been included early enough in the process. This is a tension the interior architects interviewed would like to avoid, but commonly experience in projects. Interviewee i5 offered a perspective on how interior architects desire to be included early on in projects to avoid uncomfortable situations where they have to alter architect's plans.

All of the interior architects also highlight a common preference for being included in the initial on-site meetings as well as early phases of a project, which would allow for a more detailed understanding of the projects and a more dynamic problem-solving environment, indicating a change in the emerging and changing culture, as it seems to be a hot topic, but not yet practiced widely in the construction industry.

The concerns mentioned by the interior architects are reflected and reinforced by statements made by a project manager in interview i1, where the project manager reflected on the importance of involving contractors early in the project as they possess practical building knowledge that can lead to better outcomes, increased responsibility and fewer disputes. The emphasis on early and effective engagement to minimize misunderstandings and conflicts later in the project.

Interviewee i6 also highlighted the importance of early involvement of interior architects in design meetings. Being included from the onset of a project avoids downstream problems and fosters an integrated project development approach. This proactive involvement is a strategic move to ensure that every contractor is aligned with the project objectives from the very beginning.

> *"The earlier you collaborate in a project, the better the result. Instead of an architect building a finished building, and then the interior architect has to come in and find a problem. It's better to develop things together." - (Interview i6, IA)*

5.4 Role Clarity and Team Dynamics

New and unclear roles might result in misunderstandings and conflicts due not to interpersonal factors but because of team-related contextual factors such as unclear responsibilities. Therefore, the teams should have a formal structure for conflict resolution (Stray et al., 2018). As such, there seems to be a relationship between the interplay of clear role definitions, efficiency and team performance. The ever changing role of the interior architect in the construction industry may be a contributing factor to the undefined roles of the interior architect which causes less efficiency and overall late inclusion in projects. Role clarity was determined to be one of the key communication challenges in the construction industry, and literature on autonomous teams has shown that by having clear role structures and responsibility within the teams, it provides a way to optimize team independence and collaboration.

5.7 Recommendations to implementing Agile

As I had the opportunity to interview an agile coach and IT manager (Interview i8) who was a key actor in the digital and agile transformation of Fuse, I obviously had to get his recommendations for companies or teams that are looking to work more agile or implementing agile practices based on his long expertise and experience. In summary he provided six key factors to enable agility in companies, (1) Good team structure (2) Visible communication and (3)Feedback loops (4) Keeping momentum (5) Good collaboration tools (6) MVPs and (7) Metrics. I will discuss them respectively.

Team Structure - Autonomous Teams, Team Roles, Feedback loops

"My recommendation is to have a good team structure. That means you should have a product manager, someone who sees and fights for the product needs and long-term needs. And then you should have at least two developers. It does not matter if it is being back-end, front-end, full stack - just be sure to have two developers. The reason for that is that you need the developers to check each other's work to ensure that what is delivered is good. And there have been too many times where you sit alone, you do not get feedback you struggle to know what is right, what is wrong, what to do, not to do.And you have no one to check through the work and see if this is good or not. The reason for that is that we are very attached to what is called author bias. It is a bias that we are not able to see our own mistakes in the things we write and make. We need other, more objective people to look at it. Someone who does not have any direct influence on it." (i8)

Metrics

Implementation Strategies - Implementing agile+lean

- **Enhance comparative analysis:** give a direct comparison with the IT industry's agile methodologies. Highlight contrasts and similarities in communication, coordination and project management practices between the two industries
- **Incorporate case studies where agile practices were attempted** or could be applied would provide practical insights. These can be hypothetical or based on real world examples
- **Focus on agile practices:** discuss how agile practices can be adapted to the construction industry. This will make the application of agile methodologies more tangible for readers
- **Address industry-specific challenges:** elaborate on the unique challenges in the cI that might hinder the adoption of agile methodologies. Discuss potential solutions or modications to these methodologies to overcome these challenges
- **Expert opinions and interviews:** *if possible, include insights from interviews with CI expers who have interest in agile methodologies. Can add credibility to my findings*
- **Technology integration:** explore how modern technology like BIM, AI can facilitate the adoption of agile methodologies in construction.
- **Implementation strategies**: Provide a section on strategies for implementing agile practices in the construction industry, considering the industry's resistance to change and the need for a gradual transition
- **Recommendations**: conclude with a recommendation for construction companies interested in adopting agile methodologies and suggest areas for future research

5.8 Future Directions and Research Opportunities

This thesis serves as a contribution to research in multiple ways.

- **Firstly**, the main contribution of the study is to the emerging literature on agile construction
- **Secondly**, it contributes to the emerging literature of comparing software development and construction development.
- **Thirdly**, this thesis serves as a contribution to literature on software development practices and their application to similar practice

Several studies have analyzed the applications of both agile methodology and lean management in different industries such as automotive, software development, and even in traditional

industries of mass production, though few have specifically focused on the construction industry (Albuquerque et al., 2020), but researchers such as Alberquerque et al. have shown interest but acknowledge the limitations of such research. This thesis attempts to bridge the research gap and serve as a foundation for further cross exploratory studies in the fields of agile, lean and construction. Lalmi et al. also conducted research that hypothesized that a hybrid project management, using Traditional, Agile and Lean approaches might increase the chances of successful construction projects (Lalmi et al., 2022).

We can notice that the number of publications in IT exceeds the number of publications in business and management because it is only in the last decade that Agile approaches have been introduced and have been steadily gaining popularity in this domain (Lalmi et al., 2022). Since the migration from Traditional to Agile, software development approaches are growing rapidly, as well as the application of lean practices in the industrial sector. (Lalmi et al., 2022)The potential to further research the application of agile and lean methodologies is high and can be of extreme potential value.

Other researchers have also attempted to breach the literature gap in project management literature, and literature search reveals that the literature in the area of project management is quite deficient and superficial when it comes to development of milestones (Kalsaas & Kristensen, 2018), and that project delivery models with early involvement of contractors provide a better basis for concurrent development of integrated milestones (Kalsaas & Kristensen, 2018). This thesis serves to bridge the literary gap and serve as a foundation for further research on the specific topics discussed in this thesis

Contribution to practice

This case study of a project manager's role in the construction industry manifests several principles that can be assimilated from IT project management. For instance, the construction industry's emerging reliance on technological platforms for project coordination mirrors the IT industry's longstanding use of such tools for agile project management and continuous integration. The dialogue between the interviewer and i5 illustrates how the construction industry is moving towards a more collaborative and integrated project management approach, resonating with the IT industry's collaborative frameworks designed to streamline processes and foster innovation.

The intersection of IT and construction project management methodologies, as revealed through i5's experiences, becomes a testament to the universal applicability of efficient coordination and collaboration. These insights can be pivotal in guiding the construction

industry towards adopting best practices from the IT industry, potentially revolutionizing its own project management strategies.

Alberquerque presents interesting literature on the topic of "In addition to the low adherence in the cases found, it was possible to realize that neither LPD nor APM were minimally known to the interviewees. Despite not knowing about LPD, many of them had had previous contact with lean manufacturing applied to construction (also known as lean construction). As for the APM, only C2 and C3 interviewees affirmed that they had previous contact with it through lectures on the subject; however, they did not possess considerable knowledge about the theme. Yet, some affirmed that it was presented to them as if APM practices were applicable only to project management in other fields, such as software development." (Albuquerque et al., 2020). Further research should explore the organizational readiness and willingness to implement agile practices in the construction industry. The familiarity with Agile practices and Lean principles is limited in the construction industry, but interviews with professionals suggest that there would be interest as companies and professionals are looking and interested in new ways of working, digitalizing and solving the identified coordination challenges.

Chapter 6 - Conclusion

Throughout this thesis, I have explored the potential for the construction industry to adopt agile and lean practices, drawing on lessons from the agile software development and IT industries. The insights gained from the interviews with interior architects, craftsmen, project managers in the construction industry, and observations in IT firms like Soney and Fuse, provide a comprehensive understanding of the challenges and opportunities in this endeavor.

The construction industry, characterized by its linear, phase-based processes, stands to benefit significantly from the flexibility, adaptability, and continuous improvement ethos of agile methodologies. Key areas of potential transformation include enhanced team collaboration, iterative project life cycles, and more dynamic communication strategies.

Insights discussed in this thesis can be of interest to the construction industry overall, as well as the parts of the construction industry that are interested in adopting a more lean way of executing construction projects.

The implementation of tools like BIM (Building Information Modeling) mirrors the iterative, feedback-oriented approach of software MVPs (Minimum Viable Products). This similarity suggests that construction projects could evolve towards more iterative, adaptive processes, aligning with agile principles.

Adopting agile practices in construction requires a cultural shift, emphasizing open communication, cross-functional collaboration, and a willingness to embrace change. Leadership plays a crucial role in this transition, facilitating a shift from traditional hierarchical structures to more autonomous, empowered teams. Agile methodologies can foster a more responsive, innovative project management approach in construction, aligning with the evolving demands of the industry.

In conclusion, the journey towards integrating agile practices in construction is not merely about adopting new methodologies but transforming the industry's approach to project management, team dynamics, and stakeholder engagement. While challenges exist, particularly around the industry's traditional reliance on linear processes and defined roles, the potential benefits of increased efficiency, reduced waste, and enhanced adaptability are significant. Future research should focus on practical case studies of agile implementation in construction, further exploring the interplay between traditional practices and agile methodologies.

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A - Interview Guides

Intervjuguide - IT-Manager / Agile Coach

Introduksjon (meg)
1. Start med å introdusere deg selv og formålet med intervjuet.
2. Spør om IT-lederens erfaring med smidige metoder og hvordan de har påvirket prosjekter.
3. Som oppvarming fortell meg litt om
   a. Autonome team.
   b. Agil metodikk
   c. Team Topologies.
   d. Møtekultur i Fuse
4. (Hvordan henger disse sammen i Fuse?)

Erfaring med Smidige Metoder
1. Disse er jo kjent som smidig metodikk. Kan du dele din erfaring med smidige metoder i programvareutvikling? Hvordan har smidige rammeverk eller metoder påvirket prosjektene du har jobbet med?
2. Har du spesifikke eksempler på smidige metoder som har vært spesielt vellykkede eller utfordrende?

Tilpasning av Smidige Prinsipper
1. Hvordan mener du at smidige prinsipper har forbedret prosjektledelse og arbeidsmetoder?
2. Har det vært noen spesielle utfordringer eller begrensninger i å implementere smidige metoder i programvareutviklingsprosjekter?

4. Teamdynamikk og Samarbeid
1. Hvordan har smidige metoder påvirket samarbeidet og teamdynamikken i IT-teamene dine?
2. Kan du dele spesifikke strategier eller praksiser som har vært effektive for å fremme godt samarbeid og kommunikasjon i en smidig arbeidskultur?

5. Overkomme Utfordringer

1. Hvilke vanlige utfordringer har du møtt under overgangen til smidige metoder, og hvordan har du håndtert disse?
2. Har du konkrete eksempler på situasjoner der tilpasning til endrede krav har vært kritisk, og hvordan har smidige metoder hjulpet i slike tilfeller?

6. Måling av Suksess og Ytelse

1. Hvordan måler du suksess i prosjekter som er gjennomført med smidige metoder?
2. Hvilke spesifikke KPI-er eller metrikker synes du er mest verdifulle for å evaluere effektiviteten av smidige praksiser?

Å lære

1. Hva er den beste måten å lære på?
2. Hva er hensikten med å ha retrospektiver?

8. Kulturell og Organisatorisk Endring

1. Hvor avgjørende mener du den kulturelle endringen er for en vellykket implementering av smidige metoder?
2. Har du råd til bransjer som vurderer å ta i bruk smidige prinsipper, spesielt hvis de møter kulturell motstand?

9. Fremtidsperspektiv

1. Hvor tror du at smidige metoder vil bevege seg i IT-bransjen? Ser du noen kommende utviklinger eller endringer?
   - Hva med utenfor IT-bransjen?

Organisering med autonome team - situasjon nå. Vs. fremtiden

1. Hvordan var teamorganiseringen før? Hvilke team har dere i dag og hvordan er de organisert i dag?
2. Hvilke endringer i team struktur ser dere for dere i fremtiden?
3. Hvordan definerer du et autonomt team?
4. Hva tenker du er de største utfordringene ved oppstart av autonome team?

Erfaring med ny organisasjonsstruktur

1. Hva er erfaringene dere har gjort dere med å jobbe på den nye måten og med ny organisering?
2. Hva ville dere gjort annerledes?

Beslutning om å endre
1. Hvordan var prosessen fra man innså at man hadde et problem som krevde store endringer, til man hadde identifisert hva man skulle gjøre og hvordan det skulle implementeres?
2. Hvordan tok man avgjørelse om hva som skulle endres?
   a. Var det vanskelig å forankre dette i ledelsen?
   b. Var det vanskelig å omstrukturere organisasjonen?
3. Har dere et bevvist forhold til å eksperimentere eller teste ut ulike metoder og hypoteser?

7. Leksjoner for Byggebransjen - Råd ol.
1. Basert på din erfaring, hvilke råd ville du gitt til en organisasjon som ønsker å implementere agil metodikk og autonome teams?
2. Basert på din erfaring, hvilke leksjoner eller prinsipper tror du byggebransjen kan lære av smidig programvareutvikling?
3. Ser du spesifikke praksiser eller strategier fra smidige metoder som direkte kan anvendes i byggebransjen?

Avslutte: Hvilke råd har du for de som jobber prosjektbasert, men som ønsker å jobbe mer iterativt?

Intervjuguide - Team Lead - Soney

Bakgrunn og kontekst
- Fortell meg litt om deg selv og din rolle her i digitalbank-utviklingen.
  - Hvor mange år har du vært her?
  - Hvor lenge har du nå vært team lead?
- Kan du gi en kort oversikt over ditt team og teamets rolle i digitalbank-utviklingen?

Prosess og metode:
- Hvordan opererer ditt team på daglig basis?
- Kan du beskrive trinnene dere følger i håndteringen av en typisk hendelse eller incident?
- Har dere noen metoder eller rammeverk dere bruker for incident management, for eksempel ITIL eller andre?
- Hvordan har hendelseshåndtering utviklet seg her i digitalbankutviklingen?

Roller og ansvar
- Hva er rollen til teamet ditt i incident management-prosessen?
- Hvordan fordeles ansvar og oppgaver blant teammedlemmene under en hendelse?

Verktøy og teknologier
- Hvilke kommunikasjonsverktøy bruker dere i digitalbank utviklingen?
- Hvilke samarbeidsverktøy bruker dere?
- Hvilke verktøy og teknologier bruker dere for å overvåke, registrere og håndtere hendelser?
- Hvilke verktøy bruker dere for å kommunisere i løpet av hendelser?
- Hvordan har teknologiske løsninger bidratt til å forbedre Incdident management i banken?
  - Hvilke teknologier er disse?
- Nå har du jobbet en god del år i Soney, og erfart endringer. Hvilke endringer har du sett som har vært positive?
- Hvordan syns du implementeringen av Slack har fungert?
- Husker du en Soney uten Slack?
  - Hva var bra, hva var dårlig med det?
- Om en annen organisasjon skal implementere Slack, hva må til for at det skal funke så effektivt som det gjør hos dere?
- Hvordan forholder Soney seg til kommunikasjon gjennom mail?
- Hva er innsikt-siden nyttig for?

Samarbeid og kommunikasjon
- Hvordan samarbeider teamet ditt med andre deler av organisasjonen?
- Hvordan samarbeider teamet ditt med eksterne partnere utenfor organisasjonen?
    - Hva er det som skal til for å ha god kommunikasjon med eksterne partnere?
    - Hva er utfordrende?
    - Hvilke utviklinger har du sett her?
- Hvilke kommunikasjonsverktøy eller praksiser bruker dere for å holde alle relevante interessenter informert?
- Hvordan ser kulturen for informasjonsdeling ut i Soney?

Dokumentasjon
- Nå har jeg fått høre fra andre at vedlikehold av Confluence kan være utfordrende. Hvordan stiller du deg til denne oppfatningen?
- Andre organisasjoner har for eksempel ikke et saksløsingssystem som Remedy.
    - Hva vil du si er fordelen med å ha Remedy?
    - Hva er utfordringen?
    - Hvordan tror du man ellers kan få det til?
- Kan du fortelle meg mer om sakshåndtering-systemet Remedy?
- Hvordan kan Confluence og Slack bruker sømløst sammen?

Møtekultur
- Nå har jeg fått være med på en del Monday Meets og Friday Wins tidligere i år. Hva er hensikten med å ha disse møtene?
- Hvordan syns du at disse funker?
- Hva skal til for å ha et godt møte?
- Positive og negative innvirkninger?
- Som team lead, ønsker du færre møter?

Målinger og suksesskriterier
- Hvordan måler dere effektiviteten av hendelseshåndtering og incident management? Hvilke KPI-er eller målinger bruker dere?
- Kan du dele noen suksesshistorier eller utfordringer du har møtt etter å starte som ny Team Lead?

Team Lead
- Hva var de største utfordringene med å bli team lead?
- Hva skal til for å være en god team lead?
- Hva er typiske utfordringer som et team lead møter på i hverdagen?

- Kan du dele noen utfordringer du opplevde i starten som ny team lead?
    - Hva gjorde du for å løse det problemet?

Råd til andre
- Hvilke råd vil du gi til andre organisasjoner som ønsker å forbedre sin hendelseshåndtering?
- Hvilke råd vil du gi til andre organisasjoner for å oppnå bedre digitalt samarbeid?
- Hvilke råd vil du gi til en som skal begynne å lede et team?

Intervjuguide - Interiørarkitekt

Bakgrunn og erfaring

- Kan du kort beskrive din bakgrunn og erfaring?
- Hva slags erfaring har du innenfor prosjektledelse eller prosjektkoordinasjon?

Prosjekt

- Kan du fortelle meg hvordan et typisk prosjekt ser ut?
- Hvordan foregår kommunikasjonen i et typisk prosjekt?
- Hvordan koordineres et prosjekt fra start til slutt?

Måling av påvirkning:

- Hvordan måler dere prosjektsuksess?
- Hvilke målekriterier eller indikatorer bruker dere?

Team

- Jobber du i team med dine medarbeidere fra selskapet i løpet av et prosjekt? Hvordan er denne team-strukturen?
- Jobber du i team med parter utenfor ditt selskap?

Kommunikasjon og koordinasjon

- Hva er de vanligste koordinasjons-utfordringene du møter på i løpet av et prosjekt?
- Hva er de vanligste samarbeidsutfordringene?
- Hva er de vanligste kommunikasjonsutfordringene?
    - Hva tror du må til for å oppleve mindre av de mest typiske utfordringene?
- Hvordan sikrer man at alle parter er informert om endringer og oppdateringer?
- Kan du dele konkrete eksempler på prosjekter der koordinasjon spilte en betydelig rolle for resultatet?
- Hvordan fremmer du effektivt samarbeid og kommunikasjon blant ulike interessenter i et byggeprosjekt, inkludert arkitekter, entreprenører og kunder?
- Hva er det som skal til for å ha et ha god kommunikasjon med andre deltakere i et prosjekt?

Møte

- Hvilken rolle spiller møter for fremdriften av et prosjekt?
- Blir de noen av de viktigste avgjørelsene og diskusjonene tatt i løpet av møter?

Prosjektledelsesstrategier:

- Hva syns du skal til for å lede et prosjekt på en god måte?
- Hva er det som skal til for å ha et suksessfullt prosjekt?

Programvare

- Hvilken programvare bruker du som interiørarkitekt?
- Hva slags programvare benytter du med tanke på oppgavehåndtering og fremdriftsplan?
- Hvilken programvare syns du gjør arbeidshverdagen smidig?
- Hva er de største utfordringene du opplever i programvaren du benytter deg av nå?
- Er det noe du savner ved programvaren du benytter deg av?
- Bruker du felles programvare med de som er med på prosjektet (feks. Entreprenører, håndverkere, rørleggere osv.)?

Teknologiske verktøy og løsninger

- Hvilke teknologiske verktøy eller løsninger har du funnet mest effektive for å forbedre koordinasjonen i et prosjekt?
- Hva er de største smertepunktene ved disse verktøyene?
- Hvordan har disse verktøyene påvirket prosjekteresultater og effektivitet?

Integrasjon av BIM og andre teknologier:

- Bruker dere BIM eller CRM? Hvilke?
- Hvilke fordeler eller ulemper opplever du disse?
- Synes du at disse (BIM, CRM) forbedrer koordinasjon og effektivitet? På hvilken måte?

Dokumentasjon og filutveksling

- Har dere rutiner rundt dokumentasjon og filutveksling?
- Hva slags verktøy benyttes her?
- Er dokumentasjonen lett tilgjengelig? For hvem?
- Syns du rutinen du har nå funker? Styrker og svakheter.

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