The Benefits and Challenges of Scaled Agile Framework in the IT Industry

Case Study: Company X

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Abstract:

The purpose of this thesis is to investigate the benefits and challenges of Scaled Agile Framework (SAFe) in the IT industry. Agile processes and frameworks have been rising in popularity since the 1990s. Agile promotes self-managing teams, continuous learning, close collaboration with internal and external stakeholders and short development cycles. Initially agile methods were designed for small teams and organizations but during the past decade many agile scaling frameworks have emerged as large-scale organizations are looking to improve the agility of their processes. SAFe was established in 2012 and it has since become one of the most prominent scaling agile frameworks. However, past research data suggests that scaling agile processes can be challenging. The literature review section of the thesis provides an overview of the history of Agile and introduces frameworks such as Scrum, Kanban and Lean Software Development. The section also discusses SAFe in detail and introduces the key concepts of the framework. The research was conducted as a qualitative case study, and it focuses on a single IT company based in Finland. The research data was gathered using semi-structured interviews and in total nine interviews were conducted. The research data was analyzed using an inductive data analysis method. The results indicate that implementing SAFe provides several benefits such as increased product quality and transparency, and improved predictability of project planning and scheduling. The case company has also faced various challenges after the implementation of the framework. The challenges include prioritization of large-scale projects, portfolio management, lack of value provided by SAFe ceremonies and customers' lack of knowledge regarding SAFe processes. This study provides recommendations what can be done to overcome the challenges and further improve the agility of SAFe processes.

Keywords:

Agile, scaled agile framework, scaling, scrum, software development

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1. INTRODUCTION

Iterative and incremental software development methods started emerging in the 1970s and during the 1990s, several different agile methods were established as a reaction to the more traditional project management methods. The traditional project management methods were often considered overly regulated, micromanaged, and planned, leading to longer development cycles. In 2001, a group of professionals who had established new agile methods such as Scrum, Rapid Application Development and eXtreme Programming, established the Manifesto for Agile Software Development, defining different agile values and principles. (Swamidass, 2002, 261-262)

While different Agile methods have been gaining popularity during the past two decades, they are often focused on improving the processes and workflows of small-scale companies or teams. Many large-scale enterprises have adopted Agile methods but implementing these methods at a larger scale has led to new challenges such as inter-team coordination and communication, dependencies between teams and resistance to change. Despite the challenges, many large-scale organizations are looking to implement scaled agile solutions. (Uludag et al., 2018)

In the recent years different scaling focused frameworks, such as Scaled Agile Framework (SAFe) and Large Scale Scrum (LeSS), have emerged due to the need of scaling agile at large. While some organizations have adopted their own scaling solutions, SAFe has become the most popular scaling agile framework despite often being considered one of the most complex frameworks. (Russo & Verwijs, 2023)

According to a survey conducted by State of Agile (2022), the most widely used agile framework in 2022 was SAFe and the popularity of the framework increased from 37% to 53% compared to 2021. Other popular frameworks include Scrum of Scrums (28%) and Lean Management (8%). Furthermore, the most popular agile methodologies in 2022 were Scrum (87%), Kanban (56%) and ScrumBan (27%). (State of Agile, 2022)

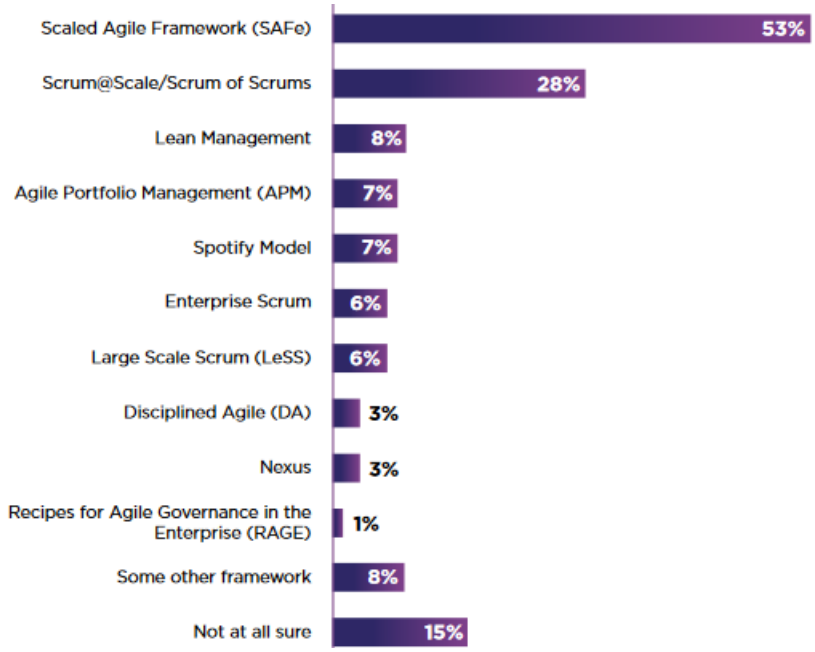

Figure 1. Most popular Agile frameworks in 2022. (State of Agile, 2022)

1.1 Motivation

The researcher works in an organization which implemented Scaled Agile Framework in 2020 and has firsthand experience of the framework and its processes. Since the implementation of the framework, its benefits and challenges have often been unofficially discussed within the organization by the employees. As the organization implemented SAFe in 2020, many long-time employees are now familiar with the processes of the framework and can provide valuable research data based on their experiences.

Different Agile frameworks and agile scaling solutions have been researched extensively since the 1990s. However, while there is anecdotal evidence that implementing agile practices improves the effectiveness of processes and workflows, empirical evidence may be hard to find. (Putta et al., 2021)

This thesis aims to provide more empirical evidence regarding the benefits and challenges of Scaled Agile Framework in the IT industry. In the context of IT, the benefits of the framework would mean improved software development processes. Therefore, the study aims to provide insight on how the implementation of SAFe has improved software development in the case company as this would provide important information for other organizations looking to adopt a scaling agile framework.

However, the challenges of the SAFe should also be taken into consideration. According to a study conducted by Russo & Verwijs (2023), SAFe has not been well-received in the industrial sector and many survey participants would not recommend the framework. Therefore, this study aims to further discuss the challenges of SAFe processes as well as offer solutions to these issues. Furthermore, companies in the IT industry are likely to face different challenges than those in the industrial sector. (Russo & Verwijs, 2023)

While the emphasis is on the IT industry, the thesis will also discuss SAFe and other agile frameworks in a more general sense. This thesis introduces SAFe and its most important principles and values as well as other relevant frameworks such as Scrum, Kanban and Lean Software Development which have influenced SAFe.

1.2 Research problem and questions

This thesis aims to examine the benefits and challenges of Scaled Agile Framework in the context of IT industry. Firstly, the thesis investigates how the implementation of SAFe has improved software development processes in the case company. Lastly, the thesis aims to provide solutions and recommendations regarding challenges that organizations which have adopted SAFe often face.

The objective of the thesis is to answer the following questions:

- RQ1: How has the implementation of SAFe improved software development in the case company?
- RQ2: What kind of challenges has the case company faced due to SAFe processes?

1.3 Research gap

While there has been an increasing number of research studies on agile scaling frameworks in the recent years, these is still a lack of empirical research evidence on the topic as stated by Putta et al. (2021) and Carroll and Conboy (2023). Furthermore, many studies on the subject focus on SAFe in general or in certain industries. Therefore, more industry specific research on the topic should be conducted as the challenges and benefits may vary between different industries. Putta et al. (2021) state that while there are some quantitative studies on the benefits and challenges of SAFe, more studies are needed due to the limitations of existing surveys.

Organizations which have adopted SAFe often highlight the benefits of the framework but there is still a limited amount of information regarding the challenges. According to Putta et al. (2021), majority of SAFe related studies are published on the official site of the framework, meaning that the information may be biased towards the benefits. According to Russo & Verwijs (2023), there is anecdotal evidence which suggests that SAFe is not well received in the professional agile community and that despite the popularity of SAFe, there is no agile scaling framework which is universally agreed as the best solution. This thesis aims to fulfill the research gap by investigating the benefits and challenges of SAFe in general but especially in the context of the IT industry.

1.4 Scope

The research part of the thesis is based on the experiences of the researcher's colleagues in a large-scale IT organization. The research was conducted using qualitative research methods and the Methodology section of the thesis describes the research process in detail. The qualitative research is limited to a single organization. The organization implemented Scaled Agile Framework in 2020 and the individuals who participated in the research interviews have several years of experience working in a SAFe organization.

The group of interviewees includes individuals representing different SAFe roles and in total, nine people were interviewed for this study. The interviews were conducted in May-July 2023 and the research data was analyzed shortly after. The study will look at the benefits and challenges of SAFe from the perspective of experts working in a large-scale IT organization. The results are based on the experiences of experts, but the sample size is limited to nine interviewees. However, as interviewees represent all important SAFe roles, the thesis should be able to provide a wide perspective on the research topic.

1.5 Structure

This thesis begins with an introduction chapter introducing the topic, motivation and scope of the thesis as well as discussing the research problem and questions. Chapter 1 also features a glossary of relevant Agile and SAFe related terms used in the thesis. The glossary is included to help understanding general concepts and terms better. Chapter 2 is the Literature Review

section of the thesis, and it introduces the Agile methodology and popular Agile frameworks with an emphasis on frameworks related to SAFe. Chapter 2 also features general information regarding SAFe and introduces different roles and concepts related to the framework. The chapter concludes with the benefits and challenges of SAFe based on past research studies.

Chapter 3 discusses the research method chosen for the thesis and how the research was conducted in detail. Chapter 4 covers the results of the qualitative research and conducted case study. Chapter 5 discusses the research findings. Lastly, Chapter 6 addresses the research questions and provides recommendations based on the qualitative research data. Chapter 6 also features a conclusion and summary of the thesis.

1.6 SAFe Glossary

This section provides definitions for Agile and SAFe related terminology used in the thesis. (Scaled Agile Inc, 2023)

Agile: Agile software development is a group of software development methodologies based on iterative development. In agile software development, solutions and requirements evolve through collaboration between self-organizing and cross-functional teams.

Agile Release Train: Agile Release Train (ART) is a large team consisting of smaller agile teams. Agile Release Train develops and delivers software development incrementally and often operates solutions in the development value stream.

Agile Team: An Agile Team is a cross-functional team that usually consists of ten or fewer members. Members of Agile teams have necessary skills to define, build and test development solutions to deliver value to their customer.

ART Backlog: The ART backlog is a Kanban system used for capturing and managing SAFe features and enablers. The ART backlog consists of upcoming SAFe features and managing the backlog is crucial for trains and the portfolio.

Built-In Quality: Built-In Quality is a set of practices which aim to ensure that the output of agile teams meets appropriate quality standards throughout the customer value creation process.

Business Owner (BO): Business Owner is an important ART stakeholder who has the primary business and technical responsibility for governance and compliance. Business owners engage with portfolio management and align priorities and PI planning.

Communities of Practice (CoPs): Communities of Practice (CoPs) are organized groups of individuals with shared interest in a specific technical or business domain. Members of CoP collaborate regularly to improve their skills, share information and work on advancing their knowledge of the domain.

DevOps: DevOps is considered a mindset, culture and a set of technical practices which support the integration, automation and collaboration needed to efficiently develop and operate a software solution.

Enablers: Enablers are ART Backlog items which extend the architectural runway of the software solution under development. Enablers also aim to improve the performance of the development value stream.

Epics: An Epic is a major software solution development initiative. Epics require the definition of Minimum Viable Product due to their considerable scope and impact.

Epic Owners: An Epic Owner is an individual whose responsibility is coordinating epics through the portfolio Kanban system.

Features: A Feature is a software solution functionality which delivers business and customer value and is sized to be delivered by an Agile Release Train within a single Planning Interval.

Iteration/Sprint: An iteration or a sprint is a standard, fixed duration period during which Agile teams and ARTs aim to deliver customer value while working towards the PI objectives. A single iteration usually lasts for two weeks.

Iteration Planning: Iteration Planning is a SAFe ceremony where all Agile team members together determine how much of the Team Backlog, they can commit to delivering during an upcoming iteration. The team also sets their own goals for the iteration.

Iteration Retrospective: Iteration Retrospective is a regular SAFe ceremony where the Agile team members discuss the results of the iteration as well as review their practices and identify ways to improve.

Iteration Review: Iteration Review is a regular SAFe ceremony where the Agile team members inspect the iteration increment and adjust the team's backlog.

Planning Interval: Planning Interval is a cadence-based period during which Agile Release Trains aim to deliver customer value in alignment with PI objectives.

PI Planning: PI Planning is a cadence-based SAFe ceremony for the entire Agile Release Train that aligns teams and stakeholders to a shared mission and vision.

Pre-Plan: Pre-Plan includes all activities that align and prepare Agile Release Trains for PI Planning.

Portfolio & Portfolio Backlog: A portfolio is a set of value streams delivering a continuous flow of valuable software development solutions to customers within a common funding and governance model. Portfolio Backlog is a Kanban system which is used to capture and manage the business and enabler epics. The system aims to create and evolve the portfolio's products, services, and solutions.

Product Management: Product management is responsible for defining software solutions that meet a customer's needs and supporting development across the product life cycle. Product management aims to define software solutions which are desirable, feasible, sustainable, and viable.

Product Owner (PO): Product Owner is an Agile team member who is primarily responsible for maximizing the value delivered by the team. This is done by ensuring that the team's backlog is aligned with customer and stakeholder needs.

Release Train Engineer (RTE): Release Train Engineer is a servant leader and Agile Release Train coach who facilitates ART ceremonies and processes. They also support SAFe teams in delivering customer value.

Roadmap: Roadmap is a schedule of upcoming events and project milestones which forecast upcoming planned software development deliverables over time.

Scaled Agile Framework (SAFe): SAFe is a framework for business agility and it integrates parts of Agile, Lean and DevOps into a single, comprehensive system.

SAFe Scrum: SAFe Scum is an Agile method used by SAFe teams to deliver customer value in a short period of time. SAFe teams use iterations, Kanban systems and SAFe ceremonies to execute, demonstrate, plan, and review their work.

Scrum Master: SAFe Scrum Master is a servant leader. Scrum master acts as a coach for a SAFe team and they also facilitate SAFe ceremonies and processes, and support teams and ARTs in delivering value.

Stories: Stories are short descriptions of a desired functionality written from the user's perspective. Bigger development requests are often divided into smaller stories, and they are often documented in the company's enterprise resource management system.

Team Backlog: Team Backlog is a Kanban system which is used to capture and manage the user stories. The team backlog includes stories which are currently not under development.

2. LITERATURE REVIEW

This chapter features a literature review on Agile frameworks with an emphasis on Scaled Agile Framework. The other Agile frameworks introduced in this chapter include Agile, Scrum, Kanban, and Lean Software Development. As SAFe contains elements of these frameworks, they can be considered relevant to the research topic. The literature review chapter outlines relevant online articles, literature and studies previously conducted on Agile

frameworks. The SAFe section of the chapter discusses the values and principles of the framework and details the most important processes and roles. SAFe roles are introduced to provide more context for the research interviews. The SAFe section also discusses the benefits and challenges related to the framework based on previous studies and expert experiences.

2.1 History of Agile

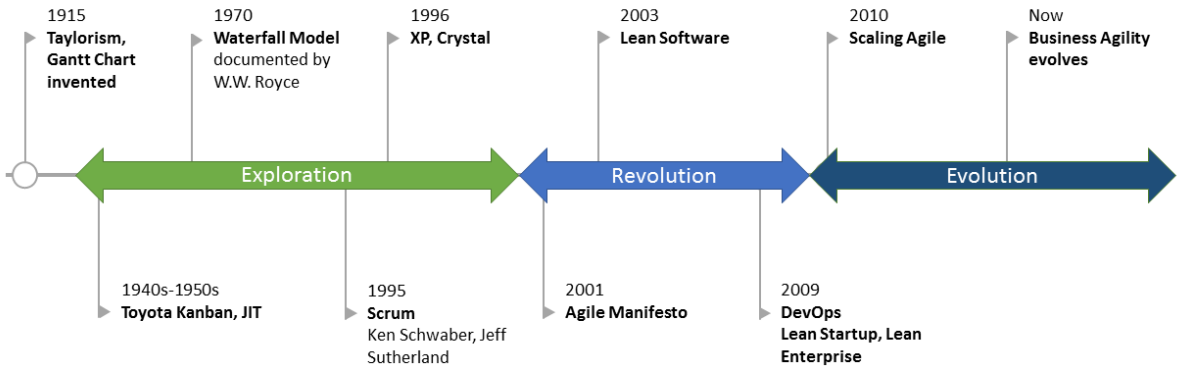

Figure 2. History of Agile. (Wheal, 2022)

Agile methodologies aim to implement flexibility in the project management processes. The agile project management processes in the IT industry are often designed to solve issues such as short development cycles, lack of physical deliverables, uncertainty, and ill-defined requirements. While many agile methodologies emerged in the 1990s, they were inspired by Toyota's flexible production system of the 1950s. Leanness is another key concept of agile methodology and the flexible production system evolved into the lean manufacturing concept. Furthermore, the lean manufacturing concept became lean thinking with the emergence of the quality movement, and this paved the way for agile software development. In 2001, a group of agile experts published the Agile Manifesto which features the core principles and values of agile. (Hobbs & Petit, 2017, 5-6)

Agile software development methods were initially designed for small, self-organizing teams which develop software in close collaboration with customers using short iterations. Agile methods were mainly applied to projects with smaller, co-located teams of fewer than 50 people. After seeing many projects and smaller organizations successfully implement agile methods, large-scale software developers also started to adopt these methods. However, implementing agile methods at scale poses challenges as the methods were initially designed

for smaller teams. Large-scale software development is often done in a multi-team environment, making project coordination challenging. (Uludag et al., 2021, 123-124)

To address issues with implementing agile methods in large-scale organizations, both creators of existing agile methods and experts who had worked with organizations to scale agile methods, established agile scaling frameworks such as Large Scale Scrum (LeSS) and Scaled Agile Framework (SAFe). The popularity of agile scaling frameworks has grown rapidly as these frameworks claim to provide an off-the-shelf solution to scaling agile. Today, many large-scale organizations face pressure to become more agile, making agile scaling frameworks such as Scrum and SAFe appealing solutions. (Uludag et al., 2021, 124)

2.2 Agile Manifesto

According to Peter Varhol (TechBeacon, 2015), the Agile Manifesto was established by a group of software developers in early 2001 as a response to growing frustrations related to product and software development. The goal of the group was to find ways to quickly build working software and deliver it to the customer faster than before. The group believed that the Agile delivery approach would enable the customers to gain business benefits of the software faster and allow the development team to receive rapid feedback on the software. The manifesto provides a single definition of Agile and describes the four core values and twelve principles related to Agile frameworks. (TechBeacon, 2015)

The four core values of Agile are the following:

- Individuals and interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

Robert C. Martin (2014, 4) argues that the most important ingredient of success are the people. A project may still fail even with highly skilled team members as bad processes can turn the members ineffective. Agility often requires a team with members who interact well with each other and have good communication skills. According to Martin (2014, 5), building a team is even more important than building an environment. Building a team first enables the members to adjust and configure the environment based on their needs. (Martin, 2014, 4-5).

Agile also focuses on delivering working software over comprehensive documentation to increase customer value. While some documentation is needed especially in software development, the documentation should be a by-product of the development process. In general, documentation is considered useful when it enables a person to handle a certain task more efficiently. In software development useful documentation ensures that other teams or team members can continue where the others left off. Agile teams often produce documentation themselves to ensure its usefulness. (Opelt et al., 2013, 8-9)

Agile aims to create a collaborative and open relationship between the customer and supplier. Opelt et al. (2013, 9) argue that software development projects are only likely to succeed when the development team and the client work together closely. A client is guaranteed to receive the product which they really need only if they are involved in the development process themselves. Therefore, it is important for the company to emphasize the importance of collaboration between the client and the development team to ensure the quality of the product. (Opelt et al., 2013, 9)

The Agile framework emphasizes the importance of being able to adapt to the change of plans to ensure the success of a development project. As business and technology related changes occur often during software development projects, the development plan must be flexible and take possible changes into consideration. In Agile, the recommended strategy is to make detailed short-term plans for tasks which are immediate while the long-term project plan will be more flexible and high level. Martin (2014, 6) argues that detailed plans are challenging to change as the development team is already committed to the original plan. (Martin, 2014, 6).

According to Measey and Radtac (2015, 25), Agile planning is designed to enable inspection and adaptation. Agile requires a significant amount of detailed planning but for example, the general project plan is defined at a high level as the baseline plan may be expected to change. This also applies to the stage and release plans, and detailed plans are only done at iteration/sprint level. In Agile, general project and stage plans are not considered commitment plans, they are a forecast based on experience or factual proof, and changes should be expected as the project progresses. (Measey & Radtac, 2015, 25-26)

The Agile manifesto also consists of the following twelve principles:

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Businesspeople and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity, the art of maximizing the amount of work not done, is essential.
11. The best architectures, requirements and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly. (Measey & Radtac, 2015, 25-29)

In traditional non-agile projects, the customer does not see the product or software until the final user acceptance test phase, meaning that it can be very difficult to implement changes which might be needed. The emphasis on early delivery of the software provides an opportunity for the customer to provide feedback early in the development process. The development team can then implement changes based on the input, ensuring that the customer is satisfied with the final product. Charles G. Cobb (2015, 25) argues that working software can be considered a good measure of progress as it is more effective and accurate to measure progress of a delivered incremental product rather than trying to measure the completion of an incomplete large development project. (Cobb, 2015, 25)

Agile values the ability to welcome change even in the late stages of development. Software development projects are broken down into smaller stories which can be defined, developed,

tested, and delivered fast. This approach to the software development allows the team members to inspect, adapt and learn continuously. Collaborations between the customer and supplier are an important element of Agile and they can used to learn more effective ways to deliver value to the customers. Agile thinking also reduces the amount of time needed for producing detailed specifications and this further promotes flexibility. (Measey & Radtac, 2015, 25)

There are several different Agile frameworks, but they all aim to deliver product increments with additional value frequently to ensure fast feedback-cycles and being able to react to changes. Agile teams take an empirical approach to study what works and what does not as the development project progresses and make the necessary adjustments. Agile projects are often split into short increments with the learning process taking place at the end of each increment, allowing teams to learn and improve continuously at a rapid speed. (Cobb, 2015, 26)

Agile encourages companies to build projects around motivated individuals as it can lead to increased productivity. Agile is based on the empowerment and individual initiative by the people involved in the project and agile teams are often given freedom to figure out how to get the project completed effectively and efficiently themselves. This means that agile teams are usually given general direction rather than strict guidelines. (Cobb, 2015, 27)

The Agile manifesto states, that face-to-face communication is the most efficient and effective method of conveying information to and within a development team. Lack of face-to-face communication may hinder and extend the feedback cycle, which is an essential element of Agile. Measey and Radtac (2015, 26-27) point out, that while documentation and emails are a good way to provide information, written communication is still prone to misunderstandings as a great amount of communication is based on body language and visual cues. This is also the main reason why many Agile frameworks recommend individual team sizes between three and eleven people. In software development, it is common that team members are not physically located in the same place, meaning that it is crucial to implement a virtual collaboration environment to improve and promote communication. (Measey & Radtac, 2015, 26-27)

In Agile, working software is considered the primary measure of progress. The traditional way of measuring the progress of a project often involves splitting the project into tasks and then tracking the completion of the tasks. However, this method may provide results which are

inaccurate. Agile introduces the concept of definition of done which means that teams define what “done” means. Furthermore, agile software projects are split into smaller pieces of functionality where each piece of software has a definition of done. Agile also emphasizes doing testing while the software is being developed. (Cobb, 2015, 28)

Agile processes aim to enable teams to work at a sustainable pace to reduce work-related stress and burn outs. Measey and Radtac (2015, 27) argue that unrealistic time pressure may lead to corner cutting and cause long-term issues to the developed software. To solve the issue, many Agile frameworks include an Agile lead role. The Agile lead is responsible for ensuring that the team can operate at a sustainable pace. (Measey & Radtac, 2015, 27)

The Agile manifesto states, that agility is enhanced by continuous attention to technical excellence and good design. If this is neglected by the development team, it is possible that major design flaws or other issues will only be identified late into the delivery lifecycle. Such technical issues may cause long-term problems and be expensive to fix. Agile teams focus on developing and building the right product in the right order in the optimal way, ensuring that the software will be maintainable in the future. (Measey & Radtac, 2015, 27-28)

Agile emphasizes simplicity, meaning that development teams should focus on developing a solution which only meets existing requirements. Development projects should be kept as simple as possible to avoid overdesigning the software or functionality. Agile software projects aim to satisfy the current need and if needed, the functionality can be further expanded later. Minimum viable product (MVP) is another important agile concept. MVP means defining the minimum set of features a product must have to be viable in the marketplace. (Cobb, 2015, 29)

Self-organizing teams are essential to Agile frameworks as it is believed that the best architectures, requirements, and designs emerge from these teams. In Agile, it is assumed that as teams possess the best technical knowledge, they know the best way to proceed at a detail level. Also, there is a risk of loss of motivation if requirements and designs are defined without input from the development team. However, it should be noted that with large scale projects requiring multiple teams to complete, high-level architectural and design principles may be needed to produce. Teams will then align to the principles but will still be responsible for producing the detailed architecture and design. (Measey & Radtac, 2015, 28)

Lastly, Agile encourages teams to reflect on how to become more effective and tune and adjust its behavior accordingly at regular intervals. Transparency, inspection, and adaptation are important principles of Agile and different Agile frameworks often encourage teams to take time to continuously improve and adapt their development processes. Many Agile frameworks feature a retrospective event which is held at the end of each sprint. During the retrospective team members reflect on what is working and what is not and use the information to adapt to uncertain situations. (Cobb, 2015, 30)

Stig Ottosson (2019) argues that the terminology used in the Agile manifesto is not well-defined and allows for individual interpretation which can cause misunderstandings during the product development process. Ottosson (2019) further argues that while the manifesto offers a view of efficient software development, it is lacking the lifecycle perspective for the developed software. Furthermore, due to the technological advancements, principles such as emphasizing face-to-face meetings may be outdated. Today, there are many different solutions for efficient cooperation when the team members are physically in different places. Ottosson (2019) also criticizes the concept of self-organizing teams as there may be issues between the work management and the process management. (Ottosson, 2019)

2.3 Scrum

Scrum is an Agile framework, and it was designed to support flexible, iterative, and sustainable methods for operating a product engineering organization. Scrum is a suitable framework especially for IT companies as they produce intangible goods such as software and websites. Scrum focuses on developing measurable, cohesive, and modular solutions which can be estimated and tracked easily. In a Scrum organization, the teams are encouraged to focus working on a clearly defined set of features for a limited period. Scrum enables teams to better estimate how much time and effort it will take to produce a certain product. Scrum teams also reflect on development processes regularly and are encouraged to improve workflows. (Green, 2016, 1-2)

Scrum was first unveiled in 1995 by its originators Jeff Sutherland and Ken Schwaber. According to Measey and Radtac (2015, 153), Scrum and its variations are the most popular Agile frameworks. Scrum is an iterative and incremental Agile framework, and it is based on transparency, inspection, and adaptation. Scrum aims to provide transparency to all customers,

stakeholders, and parties responsible for the outcome. Inspection is another important Scrum principle, and it involves reviewing how well a product is progressing towards its goals in a timely fashion. Lastly, adaptation aims to adjust the processes to minimize any deviation from those goals. (Measey & Radtac, 2015, 153-154)

The three critical scrum roles are scrum master, product owner and team member. While the organization itself may have a hierarchy of management, the members of a scrum team are considered equals despite different roles. The scrum roles each have their own areas of expertise they are responsible for, and each role is empowered in a different way. Scrum master acts as a servant leader for scrum processes, product owner is responsible for maintaining the vision of the product and the team estimates, works on and completes development stories. All three roles are important for maintaining and preserving an agile environment. (Green, 2016, 28-29)

Scrum rituals are real time face-to-face or online gatherings which scrum team members attend regularly. The scrum rituals highlight key events in the progress of projects during a sprint. Scrum master's responsibility is to host scrum rituals and to ensure that the team members can produce the desired results. Scrum rituals have a specific objective and feature a defined time frame to ensure that the rituals are useful and respect the time of participants. (Green, 2016, 51-52)

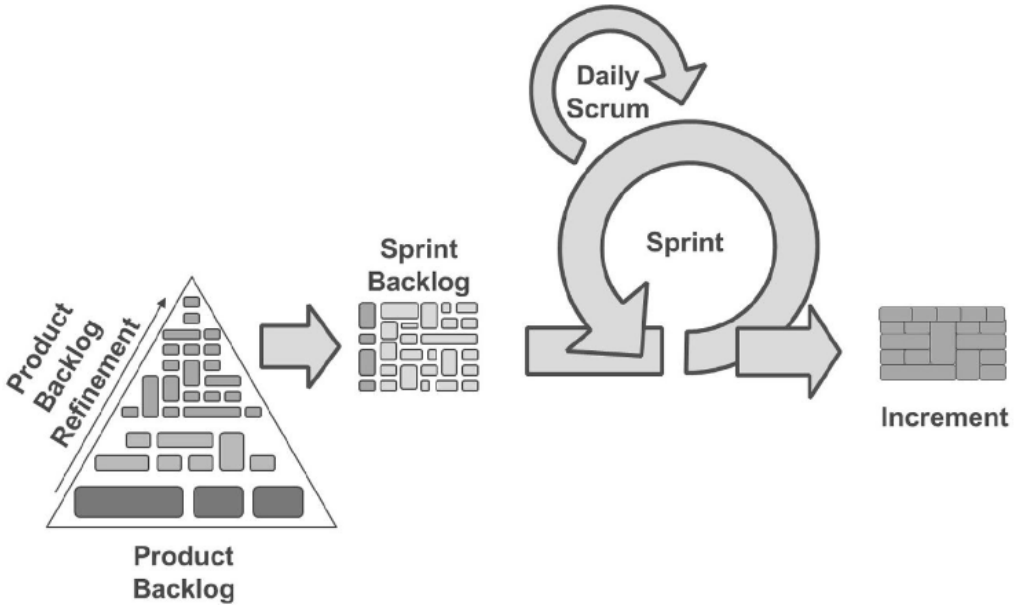

Figure 3. Scrum Process. (Measey & Radtac, 2015, 157)

The Scrum rituals include product backlog and its refinement, sprint backlog, daily scrum/standup, and increment. The Scrum team engages in a prioritization activity called Product Backlog Refinement as the product backlog items may require a considerable development effort to be completed and delivered. During backlog refinement, each backlog item is broken down to smaller, more concise items which are considered ready for sprint planning. The product backlog is used for planning upcoming releases and sprints, meaning that the items in the backlog must be estimated, ordered, and prioritized. (Measey & Radtac, 2015, 158)

The actual development time is divided into time-boxes called a sprint. Each sprint starts with a sprint planning ritual during which the team organizes and schedules work. The product owner and scrum master introduce the development stories which should be completed during the sprint and the team estimates their capacity based on historical velocity. At the end of sprint planning the team commits to a certain set of stories which they believe they can complete. (Green, 2016, 56)

During the sprint, the development team will focus on development, integration, implementation, testing, and documentation. At the end of the sprint, the team participates in the sprint review and sprint retrospective events. The sprint review focuses on demonstrating the completed backlog items to gather feedback. During the sprint retrospective, the team aims to identify areas for improvement. (Measey & Radtac, 2015, 159)

Agile values recurring synchronization meetings and face-to-face communication. In Scrum, the development team participates in a recurring daily Scrum meeting. Daily Scrum is a strictly time-boxed meeting, lasting for 15-30 minutes. During the daily scrum, the team members synchronize activities, share information regarding possible obstacles hindering development and review the current progress of sprint items. Daily scrum aims to encourage the culture of continuous improvement and conversations are often kept short and concise. (Measey & Radtac, 2015, 160)

The daily standup is facilitated by the team's scrum master and the standard agenda for the meeting features the following three questions which each participant answers:

- What have you done since the last standup?

- What do you plan to do until the next standup?
- Is there anything blocking your progress?

The participants share a progress update on what they are currently working on and what the next steps are. This provides more transparency and encourages commitment between team members. Lastly, if there are obstacles hindering the progress of development, the team members can voice their concerns regarding it. (Green, 2016, 64)

Research conducted by Raza and Majeed (2012) highlights several different issues and challenges in Scrum implementation. In Scrum and other Agile frameworks, teams have short term deadlines which may lead to issues with code quality as well as software testing. Software increments are released at a rapid speed and to keep up with the schedule, scrum teams may neglect testing and quality assurance. Another issue is the disruption of teamwork as the product owner and scrum master often interfere with team members as they ask for progress updates. Raza and Majeed (2012) also point out issues with communication and scrum rituals. Increased number of meetings and communication may cause some team members to feel disturbance during work. Scrum features several regular meetings and team members may consider participating in every meeting unnecessary for them especially if the discussed topics are not directly related to them. (Raza & Majeed, 2012)

Scrum also lacks guidelines for operating in an environment with multiple teams which may also cause issues. Raza and Majeed (2012) further argue that the Scrum of Scrums concept does not work when the scrum teams are specially distributed. This leads to additional pressure on scrum masters, as they are responsible for coordination among the scrum teams. One of the agile principles is focusing on working software over comprehensive documentation but this is not always successful in a real work environment. Specifications and changes to requirements may be delivered via email, making it difficult to document them properly in the Product Backlog. (Raza & Majeed, 2012)

2.4 Kanban

The word kanban is Japanese and can be translated as a signboard. Kanban was established by Taiichi Ohno during the late 1940s and early 1950s at Toyota. Ohno developed kanban boards to control production between processes at Toyota's manufacturing plants in Japan. Toyota

used kanban boards to minimize the work in progress and to reduce holding inventory costs. (Gross & McInnis, 2002, 2)

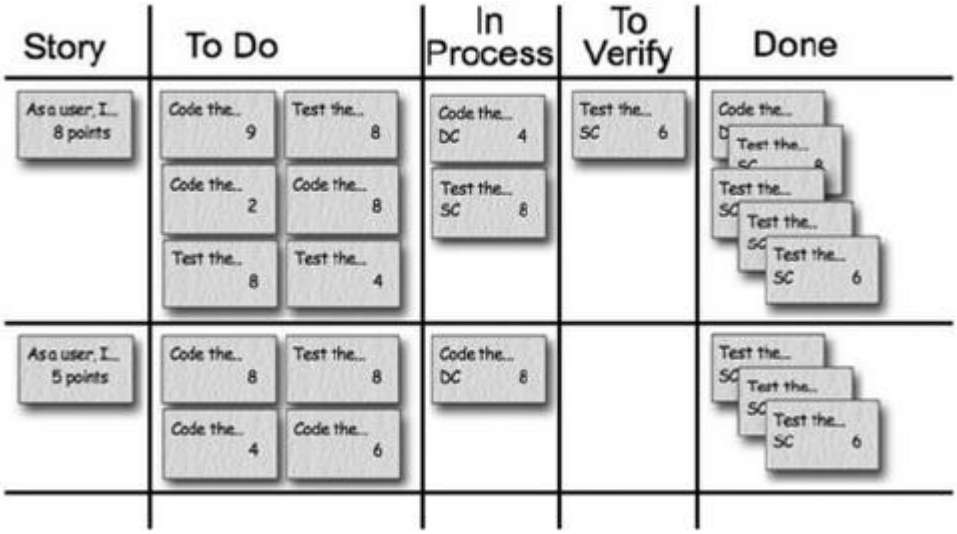

Figure 4. Kanban Board Example. (Saddington, 2012, 91)

According to Measey and Radtac (2015, 171), Kanban was adapted from the Lean manufacturing approach by David J. Anderson in 2007. Kanban aims to serve as a catalyst to introduce Lean concepts into software delivery systems and it emphasizes the fast flow of work and continuous improvement. Kanban can be applied to a wide range of different work such as recruitment, finance, sales, and advertising. However, Kanban is not considered an Agile software development method but rather another path to agility. (Measey & Radtac, 2015, 171)

Kanban is also more focused on improving organizational agility as opposed to product development agility which many other Agile frameworks are aiming to improve. Kanban does not feature specific roles or process steps as it is built on the concept of evolutionary change. The Kanban process starts with gaining understanding of how the current software delivery workflow functions and once it has been measured, it will continuously be improved one step at a time. The process does not stop once the improvement has been realized and it should continue indefinitely. (Measey & Radtac, 2015, 171)

According to Measey and Radtac (2015, 171), the six core Kanban practices are:

- Visualize the work
- Limit work-in-progress
- Make policies explicit

- Measure and manage flow
- Implement feedback loops
- Improve collaboratively, evolve experimentally

As the software delivery system deals with a flow of ideas rather than physical items, visualizing each step in the value chain process is important. Kanban's visualization process can be considered a prerequisite for effective management of the software delivery process. Different processes and workflows are often visualized on a physical board with notes which represent work. Another Kanban core practice is limiting the number of work-in-progress items to improve the flow of work. Kanban development teams focus on tracking the flow of value and in general, Kanban is about managing customer-valued work instead of managing people. (Measey & Radtac, 2015, 171)

Organizing and prioritizing work is based on customer requests and limiting the work-in-progress items allows the team to deliver customer value more effectively. Items are held in the backlog until more capacity is made available by finishing another item. New items are pulled into the process as more capacity is freed. The major benefits of limiting the work-in-progress items are reduced multitasking and increased focus. This leads to short lead times as teams are working on a smaller number of items. (Measey & Radtac, 2015, 172)

Kanban also takes documentation into consideration and all policies, such as process and management, must be documented. This means creating checklists of what is required to consider a certain step in the development process complete. Documentation may also include the decision-making process. (Measey & Radtac, 2015, 173)

Flow management means measuring and monitoring transitions between process steps in the workflow. This gives information about lead times and helps to get a historical picture of the flow of work. Analyzing the data acquired by flow management can be used to improve workflows but also to determine whether previously made changes have resulted in improved processes. And as Kanban values continuous improvement, flow management is an ongoing process which does not end even after the workflow changes have been successfully completed. (Measey & Radtac, 2015, 173)

Kanban uses feedback loops to facilitate learning about processes and to evaluate whether changes have been effective or not. It is encouraged to implement feedback loops at all levels. Lastly, Kanban has a great emphasis on creating a culture to support continuous improvement and change. Continuous improvement is a process that everyone regardless of their role in the organization should aim for. (Measey & Radtac, 2015, 174)

According to research conducted by Muhammad Noman Riaz (2019), the most common benefits achieved by the implementation of kanban include improved control of work-in-progress items, enhanced transparency, and improved risk management. Kanban was also seen as beneficial for building trust between team members and increasing employee empowerment. However, Riaz (2019) also points out that some organizations have faced kanban related challenges such as difficulties with task prioritization and managing work-in-progress limits. (Riaz, 2019)

2.5 Lean Software Development

Lean Software Development was established in 2003 and it has adapted ideas from Lean manufacturing. Lean Software Development is a popular Agile framework, and its principles often provide proven evidence for why many Agile practices work. It can also provide a framework for scaling and improving an Agile approach. According to Measey and Radtac (2015, 176), over time the boundary between Lean and Agile has become blurred. (Measey & Radtac, 2015, 176)

According to Poppendieck and Poppendieck (2003, 13-15), Lean Software Development framework consists of seven core principles:

- Eliminate waste
- Amplify learning
- Decide as late as possible
- Deliver as fast as possible
- Empower the team
- Build integrity in
- See the whole

Poppendieck and Poppendieck (2003, 13) argue, that anything that does not add customer value to a product, is considered waste. In the context of software development, features which are not immediately needed can be considered waste. The ideal Lean process is to find out what the customer really wants, then develop it and deliver exactly what the customer has requested as soon as possible. Things which get in the way of customer satisfaction are waste. (Poppendieck & Poppendieck, 2003, 13)

According to Measey and Radtac (2015, 177), the three biggest wastes in software development are extra stories, churn and crossing boundaries. Emphasis should be put on stories which create the most value. In software development, churn means code that is modified or deleted shortly after being written. If development specifications are specified too early, it might result in churn. Organizational boundaries may create buffers which slow down the response time and interfere with communication. (Measey & Radtac, 2015, 177)

According to Poppendieck and Poppendieck (2003, 13), "*development is an exercise in discovery, while production is an exercise in reducing variation, and for this reason, a lean approach to development results in practices that are quite different than lean production practices".* Software development can be considered a learning process, and it can be improved by amplifying learning. This is beneficial as software development teams are often large and the software products are complex. (Poppendieck & Poppendieck, 2003, 13)

Poppendieck and Poppendieck (2003, 13), argue, that in domains which involve uncertainty, development practices that allow for late decision making are effective. In many economic markets, companies avoid locking in decisions until the future is easier to predict and closer. This means that delaying decisions can be valuable as the decision will be based on facts rather than speculation. (Poppendieck & Poppendieck, 2003, 13)

Measey and Radtac (2015, 177-178) mention that the system architecture should be able to support the addition of new product backlog items at any time. And if there are decisions which are irreversible, the team should learn as much as possible before decision making. Code changes often during software development and this should be taken into consideration by making the system tolerant to changes. (Measey & Radtac, 2015, 177-178)

Initially software development had a careful approach and rapid development was not valued. However, Poppendieck and Poppendieck (2003, 14) argue, that there are many advantages to rapid development. Rapid development makes delaying decisions possible and allows to acquire reliable feedback. The development discovery cycle, which is important for learning, includes designing, implementing, receiving feedback, and improving. The shorter the discovery cycle is, the more teams can learn. Rapid development increases customer value as the delivery cycle is shorter. This ensures that the customer gets what they need sooner, and decision making can be delayed until the customer is sure of what they want. (Poppendieck & Poppendieck, 2003, 14)

Lean software development encourages empowering the teams as people who do development work, have the most knowledge about the details. Involving developers in the technical details is crucial to achieving the benefits of the Lean framework. According to Poppendieck and Poppendieck (2003, 14) teams will make better technical and process decisions when guided by a leader and equipped with necessary knowledge. Lean software development also aims to deliver refined versions of software at regular intervals. (Poppendieck & Poppendieck, 2003, 14)

Software is often expected to evolve over time as it adapts to the future needs and requirements. As software should maintain its usefulness over time, it should feature build in integrity or quality. Software with integrity has high usability, coherent code and architecture and is easily adaptable and maintainable. Also, the development process should be verified if there are any issues or obstacles. (Poppendieck & Poppendieck, 2003, 14)

The last Lean software development principle “see the whole” means optimizing not only the software but also the entire value stream. The entire value stream should be optimized to avoid suboptimization which can hinder company’s processes. As big software projects require expertise in many different areas, the developers may only maximize the performance of the part they are responsible for rather than focusing on overall performance. Measey and Radtac (2015, 178) also add, that companies should emphasize delivering complete products, including for example, documentation. Also measuring process capability, team performance and customer satisfaction can be considered an important part of the optimization process. (Poppendieck & Poppendieck, 2003, 14-15)

2.6 Scaled Agile Framework

This chapter outlines the overview of Scaled Agile Framework, describing the background of the framework, different levels of SAFe, core values and principles, and the most important roles. The focus is on the SAFe version 6.0, but earlier versions of the framework may be referenced as well.

2.6.1 SAFe background

Scaled Agile Framework (SAFe) is a scaled approach to Agile and it was officially launched in 2012. Since the launch of SAFe 1.0, the framework has received several updated versions with the most recent one being 6.0 which was announced in March 2023. SAFe is a mix of different agile frameworks and it includes Scrum and eXtreme Programming practices found effective by its creator Dean Leffingwell and his collaborators. The SAFe framework provides a process model which covers the lowest and highest levels in the organization. It should be noted that many SAFe values and practices refer to other Lean and Agile approaches. These frameworks include Scrum, eXtreme programming, Kanban, Lean thinking, Lean product development flow, and the Agile Manifesto. (Measey & Radtac, 2015, 182-183)

2.6.2 SAFe levels

The SAFe process model is organized around four levels: teams, programs, portfolio, and value stream. SAFe development is powered by SAFe Agile Teams which adopt Scrum or Kanban, and the team level aims to provide value. SAFe teams often utilize eXtreme Programming as the foundation for development. SAFe teams adopt an iterative process, meaning that the entire project is divided into sprints that are typically two weeks in length. At the Sprint planning event, the SAFe teams plan a sprint for each Release Planning performed at the Program level. The SAFe team level also includes activities and artifacts which are identical to Scrum. At the team level, the most important SAFe roles are developers, product owner, scrum master and testers. SAFe teams participate in activities such as Sprint Planning and Sprint Retrospective. (PremierAgile, 2023)

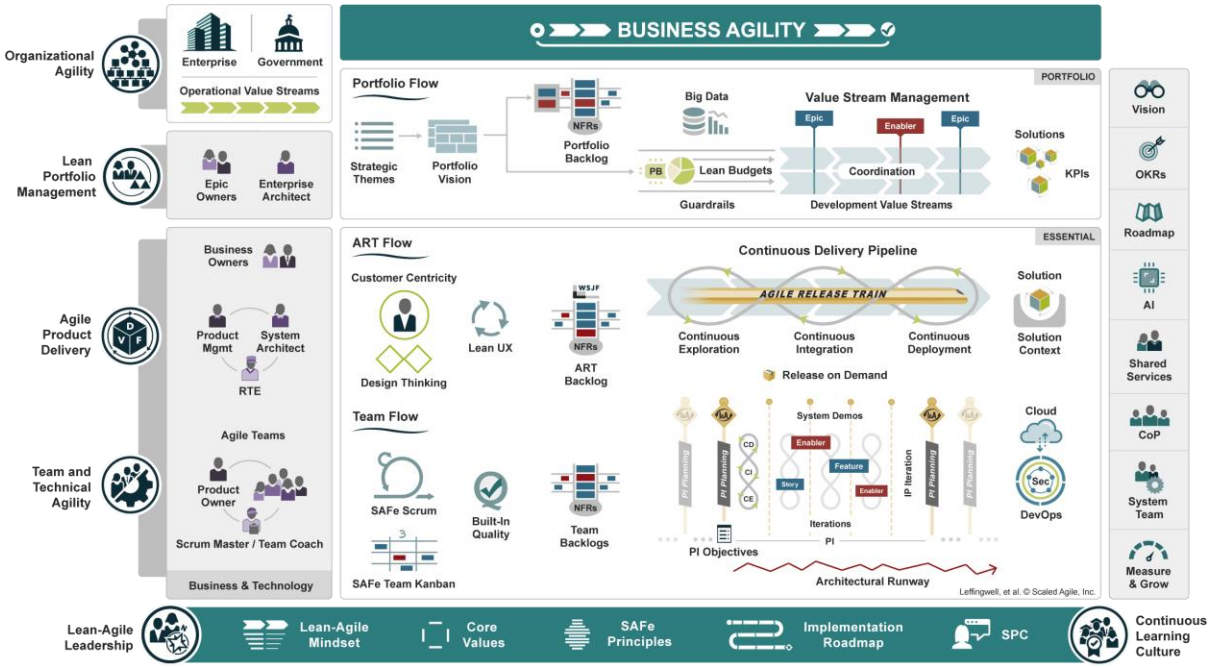

Figure 5. SAFe 6.0. (Scaled Agile Inc, 2023)

The second level is the program level which can be considered the most important of all SAFe levels. At the program level, the importance of Agile Release Trains is emphasized. The Agile Release Trains (ART) usually include multiple teams which are responsible for providing value in a certain project. ARTs create specific products or software that meet the customer's needs. This process is often ongoing, and it includes long-term development as well. ART processes are synchronized by using SAFe value streams. (PremierAgile, 2023)

An important part of the program level is the Program Backlog which is constantly being reviewed and updated. The Program Backlog management aims to prioritize the projects which create the most customer value at the top of the backlog. During the prioritization process, the projects with the highest business value are ranked higher and given more importance. ARTs are responsible for providing an indication of how long does developing the requested solution take. ARTs are also in charge of assessing and planning how to divide development projects into smaller value creating fragments which can be delivered quickly. Another important element of the program level is Program Increment / Planning Interval (PI), an iterative procedure with a cadence which occurs at 8–12-week periods. During the Program Increment Planning event, the ART teams plan and schedule work for the next PI. (PremierAgile, 2023)

Portfolio level is the highest SAFe level and the goals and objectives for the entire organization are set this level. At the portfolio level, the emphasis is on the organization and its priorities, purpose, and values. The Portfolio Management Office (PMO) is responsible for overseeing Lean processes and SAFe in general. Mid-sized companies may only have a single portfolio but large-scale enterprises with multiple customers often have their own portfolio for each client. The development requests and epics are defined at the portfolio level. Another essential characteristic of the level is measurement of progress which is done by using different lean concepts. Lastly, the general product roadmap is created at the portfolio level. (PremierAgile, 2023)

SAFe 4.0 introduced a new level called value stream. Value stream level combines both ARTs and program teams to ensure that high-quality solutions are being provided to customers. The value stream level is divided into two categories: operational stage and development stage. At the operational stage, the company offers its services to customers while at the development stage new software and products are created. Overall, the value stream level is considered important when the company aims to keep up with its competitors. (PremierAgile, 2023)

As different organizations have their own needs, SAFe offers various versions of the framework: Essential SAFe, Large Solution SAFe, and Portfolio SAFe. Essential SAFe is the most basic version of the framework and it is divided into two levels: team and program. Essential SAFe is a common starting point for organizations looking for agile scaling solutions and it provides the minimum of elements necessary for Agile Release Trains to deliver software solutions. Essential SAFe is also considered the easiest version to implement. (PremierAgile, 2023)

Large Solution SAFe introduces multiple new elements in addition to the ones included in Essential SAFe. These elements include new artifacts, events and roles which aim to further improve the organization’s processes. Large Solution SAFe is more complex than Essential SAFe, but it also offers more tools for teams building large and sophisticated software solutions. (PremierAgile, 2023)

Portfolio SAFe is recommended for large and medium-sized organizations with over 500 developers. This version of SAFe features portfolio-level artifacts, events, and roles as well as two additional competences, Lean Portfolio Management and Organizational Agility. Portfolio

SAFe aims to help establish strategy and investment funding, and Agile portfolio operations for the portfolio value streams. Portfolio SAFe is the most complete version of SAFe. (PremierAgile, 2023)

2.6.3 Core values and principles of SAFe

SAFe as a framework is based on several different agile frameworks but it especially emphasizes the following four core values: alignment, transparency, respect for people and relentless improvement. The core values aim to guide the actions and behaviors of everyone participating in a SAFe portfolio and are essential to the successful implementation of the framework. (Scaled Agile Inc, 2023)

In Lean-Agile, decisions are often decentralized to deliver value in the shortest sustainable lead time. However, if the decisions are not aligned, it may cause delays and hinder the quality of the product. Therefore, SAFe aims to provide consistent alignment through every level of SAFe. It is believed that value delivery with quality and speed will be achieved when all parties are aligned. SAFe emphasizes keeping the organization's vision, mission, and strategy constantly present to improve alignment. Another important way to maintain alignment is connecting strategy to execution by ensuring that everyone in the SAFe portfolio aligns their work to the most important things within the organization. (Scaled Agile Inc, 2023)

To help with alignment, SAFe provides a common language to ensure that everyone within the organization uses the same terminology to describe important artifacts, events, processes, and roles. The framework also considers regular reinforcement an essential part of the process to achieve alignment. SAFe events, artifacts, and face-to-face conversations are used to ensure understanding of goals. Lastly, SAFe values continuous exploration with customer centricity and design thinking to ensure that the backlog items are aligned with the customer's needs. (Scaled Agile Inc, 2023)

The official SAFe website (Scaled Agile Inc, 2023) states that the new way of working provided by SAFe will struggle to succeed without transparency and trust. Trust is essential to achieving transparency and SAFe offers different actions to ensure that an organization can build a culture of transparency. SAFe emphasizes creating a trust-based environment, meaning that people at every level of the organization must promote transparency, and make and keep

commitments to gain the trust of others. SAFe also values direct, open, and honest communication. Transparency can be further enhanced by making all work visible, meaning that all work at every level is captured and documented in a continuously refined backlog. Also, tools such as ART boards, Kanban boards, PI objectives and collaboration tools ensure that work is accessible and visible to everyone. It is also crucial to provide ready access to needed information by keeping it easily accessible. (Scaled Agile Inc, 2023)

Respecting people is another important core value of SAFe. It is believed that when people are treated with respect, they can evolve their practices while working in a toxic environment leads to poor performance. SAFe emphasizes putting value on the diversity of people and opinions, meaning that different viewpoints and perspectives should be respected. SAFe also aims to enhance the culture of respect by growing people through coaching and mentoring. Respecting people also applies to customers and SAFe focuses on treating customers with respect and empathy. This ensures that the produced products meet the customer's needs. (Scaled Agile Inc, 2023)

Lastly, building a culture of relentless improvement is one of the core elements of SAFe. According to the SAFe manifesto, this can be achieved by creating a constant sense of urgency and ensuring that improvement activities are given priority, resources, and visibility. Without the sense of urgency, organizations are in danger to become complacent, leading to a risk of losing customers. SAFe also focuses on building a problem-solving culture as it is often the main driver for relentless improvement. Reflecting and adapting frequently is crucial to the success of the framework as identifying and addressing shortcomings of processes often results in improvement. Finally, the culture of relentless improvement requires providing time and space for innovation. Improvements should be designed to increase the effectiveness of the entire process to ensure a sustainable flow of value. (Scaled Agile Inc, 2023)

In addition to the core values (Scaled Agile Inc, 2023), SAFe also emphasizes the following ten principles:

1. Take an economic view
2. Apply systems thinking
3. Assume variability; preserve options
4. Build incrementally with fast, integrated learning cycles
5. Base milestones on objective evaluation of working systems

6. Make value flow without interruptions
7. Apply cadence, synchronize with cross-domain planning
8. Unlock the intrinsic motivation of knowledge workers
9. Decentralize decision-making
10. Organize around value

2.6.4 SAFe Planning Interval

A Planning Interval (PI) is a cadence-based period in which ARTs aim to deliver customer value continuously in alignment with the PI objectives. PIs often last for 8-12 weeks and the most usual pattern for a PI is having four development iterations (or sprints), followed by one Innovation and Planning (IP) Iteration. It can be said that PI for an Agile Release Train is like an iteration for a SAFe team. During the PI, SAFe agile teams synchronize to combine the work of multiple teams into more releasable increments. Not every development project requires work from multiple teams, meaning that individual teams may also deliver customer value independently. The cadence and synchronization processes also enable ARTs to plan the next increment of work, limit work in process, and ensure consistent retrospectives. (Scaled Agile Inc, 2023)

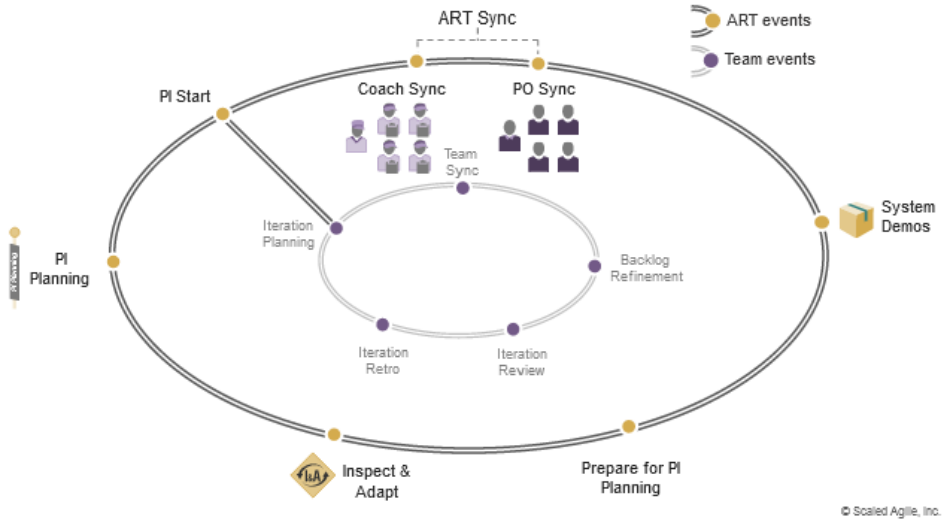

Figure 6. SAFe PI visualization. (Scaled Agile Inc, 2023)

Every PI starts with a PI Planning event. During the event, the teams estimate what they will be able to deliver and communicate their dependencies with other SAFe agile teams and release trains. PI objectives are the primary outcome of PI planning, and they detail what the ART should have to demonstrate at the end of the PI. Teams also conduct system demos during the

planning interval. The demo event tests and evaluates software solutions in a production like environment to receive feedback from different stakeholders such as business owners, other teams, management and even customers. Especially customer feedback is important as only the customers can evaluate the effectiveness and usability of the developed solution. The system demo event is held at the end of each iteration, and it offers guidance to the ART whether they need to adjust the course of development. (Scaled Agile Inc, 2023)

Every PI concludes with an Inspect & Adapt (I&A) event which allows teams to reflect on the increment, apply new problem-solving techniques, and identify processes which need improvement actions. This is done to increase the following PI's reliability, quality, and velocity. Product management and teams often showcase all finished development during the final PI system demo. The release train engineer and teams can add improvement features and stories to the backlog for the upcoming PI planning because of I&A. This ensures that every ART improves every PI. (Scaled Agile Inc, 2023)

2.6.5 SAFe roles

SAFe features several key roles for SAFe agile team, agile release train, solution train and portfolio. This chapter introduces each key role with an emphasis on agile team related roles. An agile team consists of Scrum Master, Product Owner, and Development Team. Agile teams define, build, test, and deploy features in short iterations. The Agile Release Train is composed of agile teams which collaborate and work together. In addition to agile teams, the agile release train is composed of SAFe roles such as Release Train Engineer (RTE), Product Manager (PM), System architect, and Business Owner (BO). (QRP International, 2023)

Release Train Engineer is one of the most important ART roles as RTE acts as an agile leader and facilitator. The RTE facilitates the progress of the train, ceremonies such as PI Planning and Inspect and Adapt and manages dependencies and risks. The RTE also monitors measurements and planning and is responsible for SAFe coaching at the train level. The RTE often also provides support for the product manager. (QRP International, 2023)

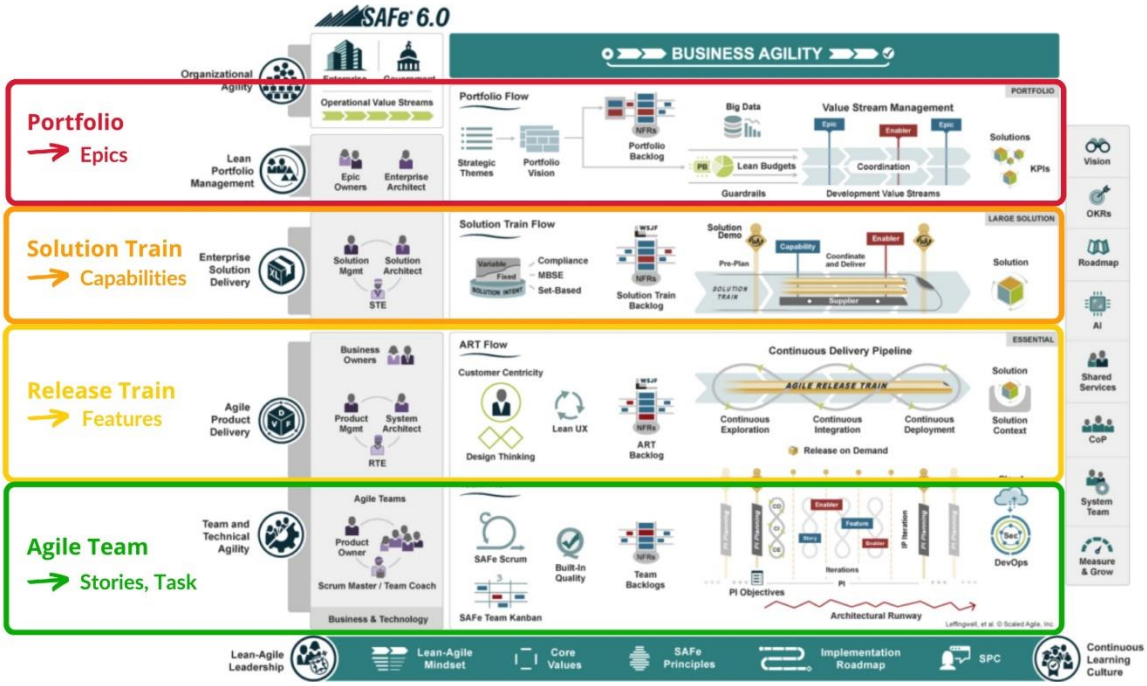

Figure 7. SAFe Role Categories. (QRP International, 2023)

Product Manager (PM) is the owner of their backlog on a program level. PM's main objective is to create the best possible product and promote customer centricity. Creating customer value is an important element of SAFe and the PM aims to ensure that ARTs develop products which provide customers the most value. As a backlog owner, the PM is responsible for implementation and realization of features. The Agile Release Train also includes system architects who define and communicate a shared architectural and technical vision for the ART. System architects aim to ensure that the solution being developed meets the customer needs. Lastly, the Business Owner (BO) is an important ART stakeholder as they have the responsibility for the release train's business results. (QRP International, 2023)

The Solution Train is composed of three main roles: Solution architect, Solution management and Solution Train Engineer (STE). The solution architect has a similar role as the system architect, and they are responsible for defining and communicating a shared architectural and technical vision across the solution train. Solution management is responsible for defining and supporting the creation of large-scale business solutions. The solution management identifies and defines customer requirements, and its focus is on understanding solution context, developing the solution vision and roadmap. The solution train engineer (STE) is the servant leader of the train and facilitates and guides the work of all ARTs and supplies in the value

stream. STEs responsibilities include leading and coordinating IP planning and large-scale solution delivery, measuring results, and proposing improvements. (QRP International, 2023)

The Portfolio level of SAFe integrates two additional key roles: Epic Owner and Enterprise Architect. The epic owner defines the features and capabilities in collaboration with the Agile Release Train and Solution Train stakeholders. Epic owners are responsible for coordinating the portfolio epics through the Kanban system and they define the Epic and its Minimum Viable Product (MVP). Once the epic has been approved, the epic owner facilitates the implementation. Enterprise architects are responsible for establishing a technology strategy and roadmap which enables the portfolio to support current and future business capabilities. The enterprise architects also promote adaptive design and engineering practices. (QRP International, 2023)

2.6.6 SAFe Agile Team

An Agile team consists of multiple members with different SAFe roles such as scrum master, product owner and development team. Agile teams usually have ten or fewer members and they have the necessary skills to define, build, test and deliver software solutions. Agile teams can be technical teams with an emphasis on building software solutions or business teams focusing on delivering business related solutions. In general, agile teams are focused on fast learning, gaining feedback from customers, assessing results, and adjusting accordingly. Agile teams are also known for being self-organizing, self-managing and cross-functional. (Scaled Agile Inc, 2023)

It can be said that Agile teams power the entire development portfolio as team collaborate with each other to deliver Agile Release Train solutions. They also contribute to the vision and roadmap of the organization and participate in important SAFe events. Members of Agile teams are dedicated to the team full-time, and they are expected to have all the necessary skills to create value. This means that team members can design features and stories needed to deliver customer value, building software solutions, testing the quality of new functionalities, and deploying increments of value to the customer. (Scaled Agile Inc, 2023)

SAFe is focused on continuous delivery of customer value and encourages teams to be built in a way that enables teams to deliver value consistently. To ensure this, teams should be stream-

aligned, meaning that they can perform every step of the process from the concept to delivery. Agile teams are also expected to be high-performing, and it is crucial that the team works well together. The agile teams are further enabled by the Scrum Master and Product Owner roles. (Scaled Agile Inc, 2023)

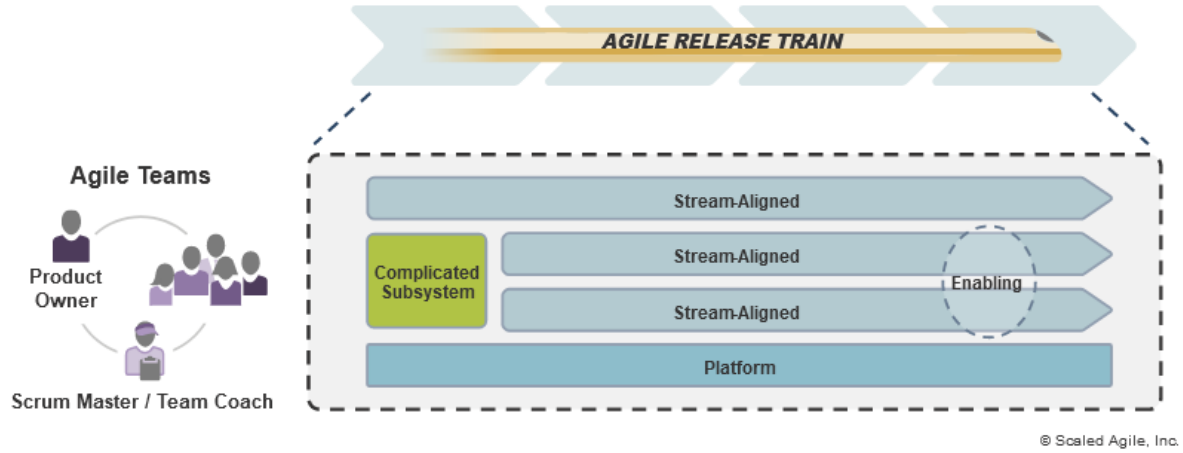

Figure 8. SAFe Agile Team. (Scaled Agile Inc, 2023)

2.6.7 Scrum Master

The SAFe scrum master acts as a coach and servant leader for an Agile team. The scrum master supports Agile teams and facilitates different processes and team events to ensure the effectiveness of SAFe processes across the organization. Scrum masters also coach teams in both self-management and self-organization and educate them in SAFe, Kanban, Scrum and Built-in-Quality processes. SAFe is aiming for continuous improvement of processes and building high-performing teams and is it often the scrum master who ensures that the team follows SAFe principles. (Scaled Agile Inc, 2023)

The scrum master has the responsibility to assist the Agile team to achieve its goals and identify and eliminate any possible bottlenecks related to SAFe processes. The scrum master should be empathetic and understanding to gain the trust of the team as this often results in higher levels of performance and better collaboration between team members. Scrum master often acts as a conflict navigator and supports the team in resolving issues such as interpersonal conflicts and problem-solving. (Scaled Agile Inc, 2023)

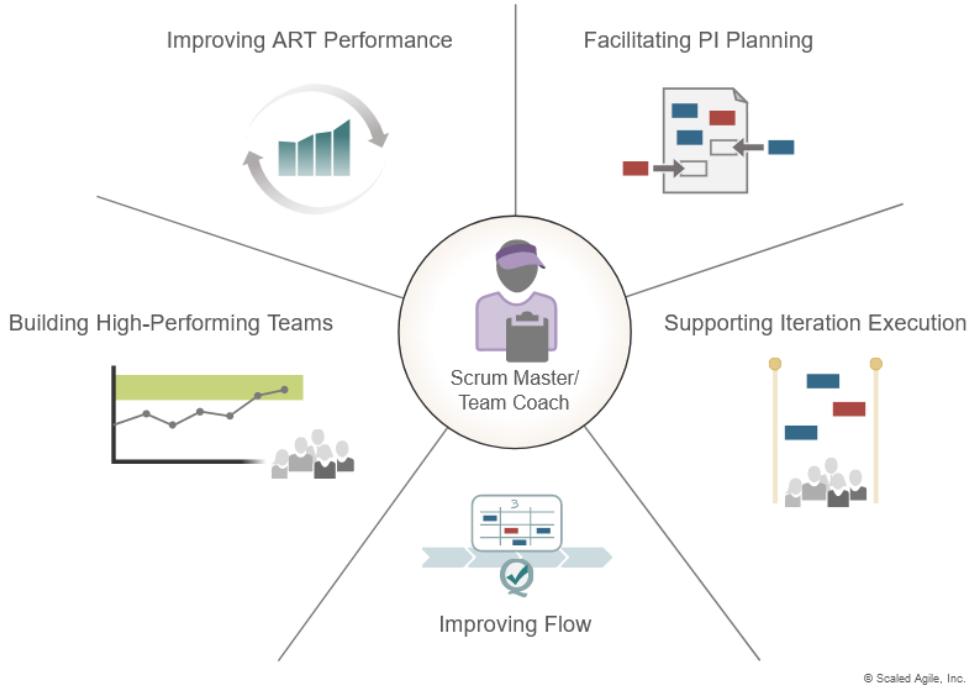

Figure 9. SAFe Scrum Master responsibility areas. (Scaled Agile Inc, 2023)

Scrum master is often considered a servant leader as they are rarely actual people managers. Rather than using authority, scrum master persuades the team members. They also focus on the needs of team members with the intention of achieving results which are aligned with the organization's business goals, values, and principles. Scrum masters have accountability regarding team performance, but they do have different options for achieving the wanted results. (Scaled Agile Inc, 2023)

SAFe features multiple different events (ceremonies) that team members participate in, and the scrum master's responsibility is making sure that these events are positive, productive, and kept within the scheduled time-box. SAFe team events are often facilitated by the scrum master, but it is also possible to let the team self-manage their own events. One of the important characteristics of SAFe is to rotate the event and meeting facilitating responsibilities to ensure the growth of the team and its self-managing ability. (Scaled Agile Inc, 2023)

Scrum masters act as mentors and coaches and support the personal development and growth of team members. The goal of mentoring is to help team members develop a positive attitude towards continuous learning. Rather than giving straight forward and directs solutions to issues, the scrum master guides team members to solve their problems more independently. One of

the most important core values of SAFe is transparency and scrum masters are open to feedback and they promote transparency in the team. (Scaled Agile Inc, 2023)

2.6.8 Product Owner

Product Owner (PO) is a member of the Agile team and mainly responsible for maximizing the value delivered by the team. The product owner aims to ensure that the team backlog is aligned with customer and stakeholder needs and acts as a link between the customer and the Agile team. The product owner role enables the team to balance the needs of multiple customers and stakeholders and overall, the role entails a wide range of responsibilities. The responsibilities of the product owner include connecting with the customers, receiving and applying feedback, contributing to the vision and roadmap, managing and prioritizing the team backlog and supporting the team in delivering value. (Scaled Agile Inc, 2023)

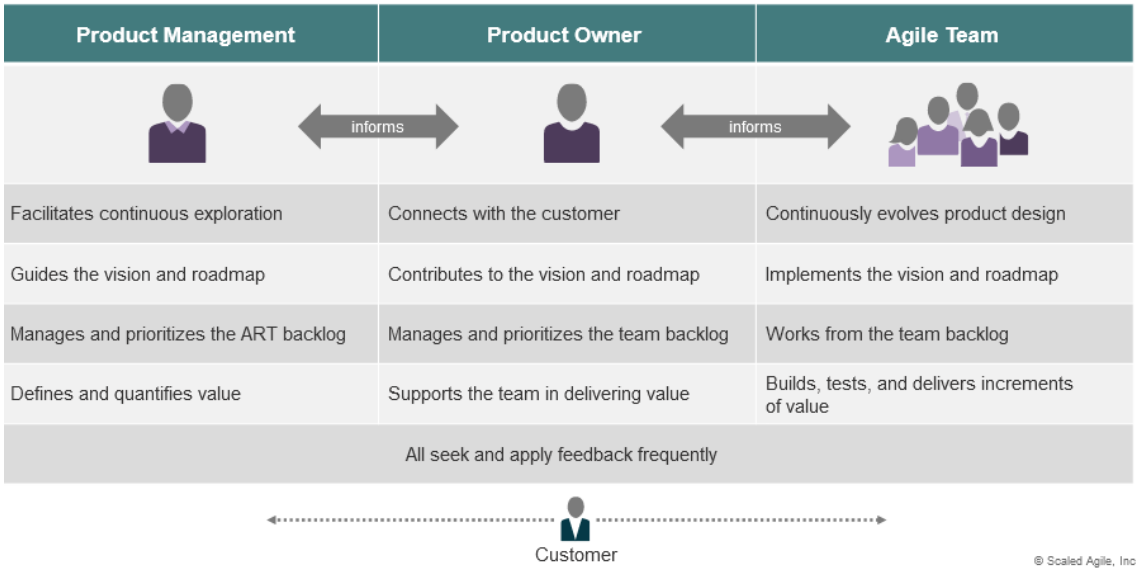

Figure 10. Key Product Owner relationships. (Scaled Agile Inc, 2023)

It can be said that the product owner acts as the "voice of the customer", meaning that the PO is responsible for communicating customer needs to the development team. It is also important that the product owner is aware of the customer needs as value is determined by the customer. The product owner continuously explores the wants, needs and preferences of customers and aims to build relationships with all stakeholders. As internal stakeholders are also important to delivering customer value, the product owner is responsible for identifying key stakeholders and aligning their needs with those of the customer. (Scaled Agile Inc, 2023)

The product owner acts as a link between the Agile team and product management and is responsible for contributing to the roadmap and overall vision. The product owner closely collaborates with the development team, end users and product management and communicates their needs to each party involved with the project. Agile Release Train backlog prioritization is an important SAFe process which requires product management, release train engineers, system architects and other stakeholder to collaborate and determine how proposed projects are prioritized to maximize customer value. The product owner plays an important role in this process as they are aware of the capabilities of the development teams and customer needs. The product owner is also responsible for ensuring that the development team understands what the customer truly needs and when the software solution should be delivered. (Scaled Agile Inc, 2023)

The product manager is responsible for managing and prioritizing the team backlog. The team backlog consists of user stories and enablers and must be maintained in a way that allows for work to be pulled for implementation. The product owner manages the backlog by guiding story creation, prioritizing backlog items, accepting stories and supporting the architectural runway. While all Agile team members can create stories, the product owner is responsible for ensuring that the stories are aligned with the product strategy. The product owner also assists the development team with story splitting and defining enablers. As all stories require accepted completion criteria, the product owner assists the team with the process and validates the criteria. (Scaled Agile Inc, 2023)

The product owner's role is to assist the team with different value-creation activities. According to the SAFe manifesto, customer value is created when teams pull development requests from the backlog, implement stories, integrate and test changes and deliver the requested software solution. In this value chain, the product owner provides insight to guide the development team toward the highest-value output. The process enables the Agile Release Train to deliver customer value continuously. As product owners collaborate with a wide range of stakeholders, they constantly receive feedback, input and insight from customers, stakeholders, and teams. As these sources may conflict each other, the product owner aims to balance different perspectives. (Scaled Agile Inc, 2023)

The product owner also facilitates meetings with their team to resolve issues, manage dependencies and communicate priorities. This is done to ensure that the development team

can split stories effectively to achieve increased velocity and shorter learning cycles. The product owner participates in various team and Agile Release Train ceremonies and provides feedback on the team's work from a more customer-centric perspective. (Scaled Agile Inc, 2023)

Lastly, the product owner plays an important role in enabling the continuous feedback loop which is valued by many Agile frameworks. The continuous feedback loop aims to maximize the customer value delivered by development teams and the product owner is responsible for seeking feedback which can be used to improve delivery processes. Obtaining feedback from customers and stakeholders is crucial as it indicates how well delivered software solutions meet their needs. The product owners gather feedback directly from customers and stakeholders and share the information with the Agile Release Train. (Scaled Agile Inc, 2023)

Figure 11. SAFe Product Owner responsibility areas. (Scaled Agile Inc, 2023)

2.6.9 Business Owner

Business Owner (BO) is a member of the Agile Release Train and primarily responsible for compliance, governance and return on investment of development projects. Business owners actively participate in Agile Release Train events and solution development. The SAFe manifesto states that self-managing and self-organizing teams are crucial to the success of the framework. The Agile way of thinking represents a major change in the management mindset as the management no longer needs to assign tasks or supervise work directly. Rather than

supervising development teams, the management leads by establishing a mission and vision. The business owner is a key leader responsible for guiding Agile Release Trains to optimal business outcomes. (Scaled Agile Inc, 2023)

Figure 12. SAFe Business Owner responsibility areas. (Scaled Agile Inc, 2023)

Business owners have several key responsibility areas, and they have a crucial role in SAFe implementation. As adoption of SAFe comes with a change in the management mindset, business owners act as change agents to ensure successful implementation. This requires business owners to lead by example, addressing the concerns of people resisting change and serving as an example of the new norms of expected behaviors. Business owners communicate the vision for SAFe adoption and participate closely in developing the implementation plan. (Scaled Agile Inc, 2023)

Lean Portfolio Management is primarily operated by managers responsible for business outcomes, but the business owners are often involved in the process as well. For example, business owners help ensuring that the portfolio and individual value streams are aligned, and they serve as epic owners when needed. Business owners are often involved in processes related to budgeting and assist Lean Portfolio Management in allocating the portfolio budget to its value streams. (Scaled Agile Inc, 2023)

Aligning priorities and PI planning are important SAFe processes and business owners are heavily involved in these processes. Prior to PI planning, the business owner participates in

backlog refinement activities to align the backlog with the portfolio's strategic goals. They are also responsible for ensuring that the business objectives are agreed to by the key Agile Release Trains stakeholders. The importance of the BO role is elevated during the PI planning and business owners engage in various activities. (Scaled Agile Inc, 2023) These activities include:

- Presenting the business context and vision
- Actively participating in the ART PI-planning activities
- Reviewing draft and final plans
- Watching for significant external commitments and dependencies
- Actively communicating business priorities to the teams
- Participating in the management review and problem-solving
- Participating in Solution Train planning

During PI-planning development projects scheduled for the upcoming PI are assigned a business value rating. The business value ceremony offers an opportunity to identify concerns regarding upcoming projects and gain a better understanding of business objectives and their value. During the business value ceremony, the business owner assigns development projects values on a scale from 1 to 10 based on the feedback received from the development team. The projects which provide the most customer value, are given the highest value. The business value is then used for project prioritization, meaning that the development projects with the highest value are prioritized over other proposed projects. (Scaled Agile Inc, 2023)

Business owners have an ongoing role helping to ensure the success of software development delivery. As priorities and the scope of projects may change, it is important to actively maintain alignment between the business and development priorities. Business owners also help validating the definition of MVPs (Minimum Viable Product) and attend SAFe team ceremonies such as Iteration Planning, Review and Retrospective. In case there are obstacles hindering development projects, the business owner helps resolving these issues. Release management is another crucial SAFe activity as the delivery schedule of completed projects must be planned and determined. This is often done by the business owner. (Scaled Agile Inc, 2023)

SAFe emphasizes continuous improvement across all levels and business managers are responsible for promoting the culture of improvement within the organization as well as motivating others. Business owners foster the adoption of important Agile principles such as

eliminating waste and delays and work on eliminating demotivating policies and procedures. As SAFe focuses on continuous innovation, learning and improvement, business owners focus on providing teams the time and space for these processes. Lastly, business owners support process and infrastructure enhancements to the continuous delivery pipeline. (Scaled Agile Inc, 2023)

2.6.10 Benefits of SAFe

According to a multivocal literature review conducted by Putta et al. (2018), implementation of SAFe provides organizations many different benefits. However, it should be noted that the results from the literature review are based on six reports from scientific databases and 82 reports from the grey literature. The reported benefits can be grouped into five different categories: build-in quality, alignment, transparency, organizational benefits and business benefits. (Putta et al., 2018)

When it comes to build-in quality, several companies have reported that the product quality has improved, and the development teams have been producing higher quality code since the implementation of SAFe. The defect rate has also dropped, and defect removal has become more efficient. Another reported benefit is the increased focus on continuous improvement. (Putta et al., 2018)

Many companies have also reported alignment related benefits. The alignment of teams, management and development teams has increased and the alignment between IT and business units has improved. The adoption of SAFe has also led to a greater cooperation between team members, teams and different units such as IT and business. SAFe has also made cross-team dependencies clearer which has resulted in improved dependency management and reduced dependency problems. (Putta et al., 2018)

The most common benefit is the enhanced transparency which has been mentioned in most studies. SAFe has enhanced the transparency of communication and different organizational processes. According to the literature review results, the framework has also helped identifying cross-team dependencies. Furthermore, many organizations state that the visibility of work has improved due to the implementation of SAFe. (Putta et al., 2018)

According to the literature review by Putta et al. (2018), SAFe has provided multiple organizational benefits such as improved productivity and employee engagement. Several organizations have reported an increase in productivity across both teams and team members and the delivery of number of products and capabilities has also improved. Furthermore, the implementation of SAFe has improved the predictability of product delivery and allowed the companies to receive feedback from customers faster than before. SAFe emphasizes the importance of self-organizing and self-managing teams and according to the study, teams have become more empowered due to the implementation of the framework. (Putta et al., 2018)

Business benefits reported by companies include increased release frequency, faster product and feature delivery and increased customer satisfaction. Companies can deliver products on time and the time to market products has improved greatly due to SAFe. As a result, the customer satisfaction has improved as customers receive features and products at a faster pace than before. (Putta et al., 2018)

An empirical survey conducted by Putta et al. (2021), indicates that the biggest benefits of SAFe are improved collaboration between teams, improved dependency management between teams and improved transparency. The results align with other studies conducted by researchers such as Salikhov et al. (2020), Laanti and Kettunen (2019) and Gustavsson and Bergvist (2019). However, Putta et al. (2021) also mention that the survey results indicate that the implementation of SAFe has not improved software quality. (Putta et al., 2021)

2.6.11 Challenges of SAFe

While many studies indicate that the implementation of SAFe has many benefits, multiple experts have also criticized the framework. Based on the multivocal literature review conducted by Putta et al. (2018), there are several challenges related to the adoption of SAFe. Organizational challenges include change resistance, difficulties with implementing an agile mindset and teams lacking autonomy. Companies also reported challenges related to SAFe roles. Commonly mentioned issues include resistance for new roles and staffing of roles such as product owner and scrum master. (Putta et al., 2018)

The findings of the literature review by Putta et al. (2018) also indicate that there are several challenges causes by the SAFe practices. Adopting SAFe has resulted in companies moving away from agile and moving back to plan driven methods such as the waterfall method. Many companies have faced challenges during PI-planning and the SAFe processes are seen as being complex and confusing. Furthermore, some companies have faced challenges with backlog management and feature prioritization. A survey conducted by Salikhov et al. (2020) also indicates that one of the biggest drawbacks of SAFe is the complex structure of the framework.

In an article published on the Product Coalition website, Kyle Evans (2019) points out, that SAFe adds unnecessary layers to product development. Program Increment (PI) planning is a formalized process used for planning and discussing each team's deliverables for the next increment. Teams can also align their goals and priorities with other teams and stakeholders, meaning that PI-planning is beneficial to agility. However, as PI-planning lasts for several days, the process can be considered very burdensome in practice. Evans (2019) argues that the planning process takes away team's agility as it is too formalized, forcing teams to attend set meetings at a set time. Also, many commitments are locked in after the meetings. (Product Coalition, 2019)

According to Evans (2019), SAFe is an overly burdensome and complex framework and rather than streamlining development, it is slowing down the development cycle with unnecessary processes. In addition to complex processes, SAFe features multiple layers of management throughout the development process. In SAFe, there are development teams, epic owners, product owners, release train engineers etc. and the many management layers reflect the multiple process layers, leading to a complicated overall workflow. And as there are multiple levels of management and control is centralized at each level, the development process may become confusing and inefficient. (Product Coalition, 2019)

The roots of agile are in IT and the different practices of agile methodologies focus on optimizing the delivery of software solutions. However, due to the emphasis on IT, many organizations have limited adoption of agile frameworks to software development. Sunil Mundra (2018, 22) argues that organizations often consider agile something to "do" rather than something to "be". When "doing" agile, the adoption is often limited to applying a list of agile practices. (Mundra, 2018, 22)

According to an article published on the Project Management Academy website (2019), lack of flexibility is one of the most common challenges which organizations face after the implementation of SAFe. Out of different Agile frameworks, SAFe is considered rigid as there is very little room for adjustment, meaning that an organization may find it difficult to adjust the framework to their specific needs. The article also points out that in SAFe, team members are often stuck in their defined roles. In many Agile frameworks development team members thrive as they can take responsibility for objectives they plan to complete and are given an ownership over their own tasks. However, this does not always happen in SAFe organizations. (Project Management Academy, 2019)

SAFe processes primarily rely on top-down decision making, giving the managers and organizational leaders more power with important decisions. This may cause team members to become disengaged and put too much pressure on project managers. Project Management Academy (2019) argues that development team members may not consider SAFe much of an improvement compared to before due to the lack of decision-making power. (Project Management Academy, 2019)

Kyle Evans (2019) points out, that lack of autonomy is one of the challenges that SAFe teams often face. Agile frameworks emphasize the importance of independently operating development teams but in SAFe, the autonomy is removed, and the teams are tied down to lists of features. PI planning determines which features teams will work on during the next 2-3 months, meaning that teams are locked into features rather than outcomes. This makes it challenging for teams to function independently as they are formally dependent on each other and tied together. Agile frameworks value experimenting and learning but the structure of SAFe makes this process challenging. The lack of autonomy can also affect decision making. (Product Coalition, 2019)

Project Management Academy (2019) also points out that SAFe epics may cause different issues for the organization. Epic refers to an ongoing long-term project in many Agile frameworks, but the definition is different in SAFe. Before an epic is initiated, it needs to be evaluated for its potential return on investment as SAFe considers epics to be substantial enterprise initiatives. The difference between definitions may cause confusion within the organization. Another epic related challenge is prioritization. SAFe prioritizes epics based on

business value and this may lead to difficult decisions as individuals determine which projects should be prioritized. (Project Management Academy, 2019)

Work is often organized into large batches in SAFe organizations. Agile encourages development projects to be broken down into smaller, more manageable sprints. However, as SAFe is used to coordinate large teams and projects, the organizational structure often favors work to be organized into large batches. This may lead to issues with estimating project timelines as it is more challenging to accurately predict how long the completion of a large-scale project may take. (Project Management Academy, 2019)

Jeff Gothelf argues (2021) that SAFe is not agile due to the framework's focus on strict ceremonies and events and rigid team structures. Gothelf (2021) also points out that many Agile principles and values such as continuous learning and improvement, evidence-based decision making and customer centricity, are not the focus of SAFe. Another issue is that becoming SAFe certified requires teams to undergo heavy training, which may lead to resistance of change. SAFe training in general focuses on teams working in a specific way. The emphasis is on predictable delivery rather than learning, agility, or course correction. (Jeff Gothelf, 2021)

Lastly, currently the most notable source of SAFe related studies is the official SAFe website. Putta et al. (2021) argue that as most SAFe related studies are limited to only certain locations and organizations, the external validity of the studies is reduced. As the studies are published on the official SAFe website, it is possible that the results are biased towards the benefits of the framework. (Putta et al., 2021)

2.7 Summary of Literature Review

Based on the literature review, agile methodologies are effective project management tools especially for smaller teams and companies. Agile processes have been reported to increase productivity, product quality and transparency as well as cooperation between teams and team members. Furthermore, frameworks such as SAFe are seen as beneficial for organizations looking to scale agile processes.

The SAFe related studies indicate that the biggest benefits of the framework are improved product quality, increased transparency and visibility and improved coordination and

dependency management between teams. It should be noted that since majority of SAFe related studies are considered grey literature, the results could be biased towards the benefits of the framework.

However, there are also studies which discuss the challenges organizations have faced due to the implementation SAFe. SAFe processes are seen as overly complex and confusing and due to the hierarchy system of the framework, SAFe is seen as being closer to the waterfall method than agile methodologies. Furthermore, many organizations have also had issues with backlog management processes and project prioritization. Overall, the literature review indicates that the implementation of SAFe provides organizations more benefits than issues.

3. METHODOLOGY

This chapter features the methodology part of the thesis and includes descriptions of the selected research method and case background. The data collection and analysis processes are also described.

3.1 Research approach

The research method chosen for this study is qualitative case study with semi-structured interviews used as the data collection method. Furthermore, data was analyzed using an inductive data analysis.

3.1.1 Case studies

According to O'Gorman and MacIntosh (2015, 80), case study is one of the most common ways of conducting research projects and it is considered useful for demonstrating different research traditions. Case studies often feature detailed exploration and information is accumulated over a phase of time. The objective of a case study is to provide an analysis of the context and processes which enlighten the researched issue. Case studies also investigate phenomena in depth and within its real-life context. As the research focuses on a single organization, case study was deemed as the most optimal research method. The interview participants were also very knowledgeable about the research topic and were able to provide useful data. (O'Gorman and MacIntosh, 2015, 80-81)

3.1.2 Qualitative research

According to Saunders et al. (2019, 179), *"qualitative research studies participants' meanings and the relationships between them, using a variety of data collection techniques and analytical procedures to develop a conceptual framework and theoretical contribution".* One of the characteristics of qualitative research is that the meanings are derived from images and words rather than from numbers. Furthermore, qualitative research respondents are seen as participants in the data collection. Qualitative research data collection methods are either unstructured or semi-structured and collection methods include observations, interviews, and video recordings. (Saunders et al., 2019, 179-180)

3.1.3 Semi-structured interviews

Data for the case study was collected by using semi-structured interviews. The method was chosen due to the researcher having knowledge of the research topic. According to O'Gorman and MacIntosh (2015, 119), semi-structured interviews are recommended when the researcher has knowledge regarding the topic and the method can be used in conjunction with other research methods. The semi-structured interviews are also favored for their increased reliability and scope for comparability, meaning that the collected research data will be relevant and useful. Another characteristic of semi-structured interviews is that the interview questions are prepared in advance, ensuring that the most important points are covered during the interview. (O'Gorman and MacIntosh, 2015, 119)

3.1.4 Inductive data analysis

According to David R. Thomas (2003, 2), the main purpose of the inductive approach is to allow research findings to emerge from the significant themes found in the research data. The method is also used to condense extensive and varied text data into a summary format, making inductive analysis a common choice for analyzing raw interview data. Inductive data analysis also aims to develop theory about the underlying structure of processes or experiences evident in the text data. Lastly, the method is used for establishing links between research data and the summary findings and to ensure that the links are transparent and justifiable. (Thomas, 2003, 2)

3.1.5 Motivation of methodological approach

The research method was chosen based on the research topic. Qualitative research allows to gain a deeper understanding on the research questions and semi-structured interviews were deemed as the best way to collect data. While it is possible to draw conclusions of what the benefits and challenges of SAFe are based on past research studies, conducting a qualitative research study allows new observations to emerge.

The objective of the thesis is to answer the following questions:

- RQ1: *How has the implementation of SAFe improved software development in the case company?* This thesis aims to provide more empirical evidence on the benefits of SAFe as the evidence can be difficult to find due to lack of studies on the topic. The results of the study will be helpful for organizations planning to adopt agile scaling frameworks.
- RQ2: *What kind of challenges has the case company faced due to SAFe processes?* SAFe has evolved since it was first introduced, and each new updated version of the framework aims to address challenges of the previous version. However, several studies argue that organizations which have implemented SAFe still face various challenges due to the processes of the framework. The suggestions presented in this study can be used for further improving SAFe processes.

3.2 Data collection

This section introduces the case company and describes the data collection and analysis processes.

3.2.1 Case company

The case company is a Finnish IT company specialized in software solutions. The company employs more than 500 people with majority of the employees working on software development. The company implemented SAFe in 2020 and it is widely used in the entire organization. Prior to SAFe implementation, the company experimented with different agile frameworks and the developers were already split into agile teams based on their area of expertise. As a large-scale organization, the company has multiple Agile Release Trains with

several teams, and each customer has their own portfolio. The company is offering complex software solutions, meaning that agile teams and trains often collaborate with each other. The company implemented SAFe to improve the delivery of customer value and to make value stream processes more efficient.

3.2.2 Data collection process

The data collection process started with the researcher creating an interview guide with the interview questions. After the interview guide had been completed, the researcher compiled a list of potential interviewees based on their SAFe roles. The goal was to include as many different SAFe roles as possible to get a wide perspective on the research topic. The interviewees include members from the researcher's development team but also from other development teams.

The interviewees were contacted in May-July 2023 by either email (Appendix 2), face-to-face or remotely over Microsoft Teams and they were emailed the set of questions before the interview (Appendix 1A) and asked for a permission to record the interviews. The interviews were conducted both face-to-face and remotely over Microsoft Teams and all interviews were recorded with a permission from interviewees. This was done to ensure the quality of the collected data as the interviews were later transcribed. The interviews were recorded using Microsoft Teams and the Audacity software.

Six interviews were conducted remotely over Microsoft Teams and the remaining two interviews were conducted face-to-face including a group interview with two people. All interviews were conducted in Finnish and the length of the interviews varied with the shortest ones being under 20 minutes and the longest nearly 45 minutes. Before each interview, the researcher described important details such as the purpose of the study and assurance of the interviewees' anonymity and confidentiality. It was also reiterated that the interviews would be recorded and transcribed for the study. The interviewees were given the permission to use the name of the company and the software system. However, as this study was not commissioned by the company, the name of the company is not mentioned in the study.

All interviewees were asked the same set of SAFe related questions and during the interviews the researcher did not comment on the answers to ensure an unbiased approach to the

interviews. The interviews took place in May-July 2023. The interviews were transcribed in July 2023 and the interview recordings were deleted after they had been transcribed. The transcribed interviews provided 20 pages of data in total.

3.2.3 Interview guide

According to O'Gorman and MacIntosh (2015, 121), it is important that the interviewer briefs the participants on the purpose of the interview and what the data from the study will be used for. It is also important to reassure participants of confidentiality and ask for a consent to record the interview. Furthermore, the interview questions should avoid leading the interviewee towards a certain conclusion to ensure the validity of the responses. (O'Gorman & MacIntosh, 2015, 121)

The interviews were conducted using an interview guide featuring the questions. The interview questions were conducted in a way that allowed respondents to answer them regardless of their role. The questions were grouped together by theme to keep the structure and the flow of the interviews consistent. The interview questions were chosen based on previous research studies to ensure that they were relevant to the research questions of the study. During the interviews the researcher clarified the questions when needed but the questions were not changed, and each interviewee was asked the same questions. It should be noted that as the interviewees represent different SAFe roles, certain questions were not answered by every interviewee due to the lack of knowledge regarding the topic of the question. However, majority of the interviewees answered every question, meaning that the interviews provided enough research data.

Table 1. Interview questions.

ID	Question
Q1	What is your SAFe role?
Q2	How long have you worked in a SAFe organization?
Q3	What are the benefits of your own SAFe role?
Q4	What kind of challenges are there regarding your own SAFe role?
Q5	Do you have experience with other Agile frameworks?
Q6	What are the benefits of SAFe?
Q7	What kind of the challenges are there with SAFe?
Q8	How has SAFe impacted cooperation with stakeholders and customers?
Q9	What are the benefits of SAFe ceremonies?
Q10	What kind of challenges are there with SAFe ceremonies?
Q11	How has SAFe impacted software development?

Q12	What are the benefits of SAFe documentation?
Q13	What kind of challenges are there with SAFe documentation?

3.2.4 Interview respondents

In qualitative research, the sample sizes are usually kept small. Firstly, the data collected by qualitative research is often rich in detail, meaning that each unit of data collected provides a large amount of information. Qualitative research can be very intensive due to resources it requires as the researcher analyzes the collected data carefully. Qualitative research requires data to be analyzed thoroughly and as a result, increasing the sample size may lead to diminishing returns as no new findings emerge after a certain point. (Ritchie, J. et al., 2013, 83-84)

At the time of the research, the researcher worked at the same organization as the interviewees. The participants were chosen based on their SAFe role to obtain different perspectives on the research questions. All interviewees were working at the same organization at the time when the interviews were conducted and they represent multiple different SAFe roles such as development team member, scrum master, product owner, product manager and business manager. In total, nine employees were interviewed.

Table 2. Coding of respondents.

Title	Respondent #	Code
Scrum Master	Respondent 1	I 1
Product Owner	Respondent 2	I 2
Business Manager	Respondent 3	I 3
Product Manager	Respondent 4	I 4
Development team member	Respondent 5	I 5
Development team member	Respondent 6	I 6
Development team member	Respondent 7	I 7
Development team member	Respondent 8	I 8
Development team member	Respondent 9	I 9

During the interviews, the interviewees introduced their own SAFe role and experience. According to the interviewees, the company began the SAFe implementation process in March 2020 and by June 2020, SAFe had been implemented company wide. Out of the nine interviewees eight (I 1, I 2, I 3, I 4, I 5, I 6, I 7 & I 8) were employed by the company at the

time of SAFe implementation while one interviewee (I 9) was a more recent hire with around six months of SAFe experience. Overall, the interviewees had around three years of experience working in a SAFe organization.

Table 3. Respondents' SAFe role and experience.

Respondent	Role	SAFe experience in years	
I 1	Scrum Master	3	
I 2	Product Owner	3	
I 3	Business Manager	3	
I 4	Product Manager	3	
I 5	Development team member	3	
I 6	Development team member	3	
I 7	Development team member	3	
I 8	Development team member	3	
I 9	Development team member	0,5	
Average experience		**2,7**	**years**
Total experience of interviewees		**21,5**	**years**

Seven interviewees only had experience in a single SAFe role but two had acquired new roles during their tenure at the company. The SAFe roles of interviewees include development team member, scrum master, product owner, product manager and business manager. Five interviewees are development team members (I 5, I 6, I 7, I 8 & I 9) while the remaining four interviewees (I 1, I 2, I 3 & I 4) represent other roles. As a conclusion it can be said that the group of interviewees have extensive experience working in a SAFe organization.

3.3 Data analysis

The researcher conducted an inductive data analysis after the data collection process. According to Hair et al. (2020), qualitative researchers create themes and categories while working through the research data. In qualitative research, theories and ideas often emerge from the data and the researchers aim to identify important themes. Qualitative researchers often use coding to analyze data. Coding means assigning numerical values or names that reduce the large amount of text to a small number of relevant data. The purpose of the coding process is to simplify the collected data and focus on its meaningful characteristics. (Hair et al., 2020, 312).

The data analysis process started after the interviews had been conducted and the interview recordings were transcribed using Microsoft Word's transcribe feature. While there were no limitations regarding what the interviewees could discuss, it should be noted that the transcribed interviews were edited to exclude detailed information regarding the case company. As the thesis discusses SAFe in general, detailed information regarding the organization was deemed unnecessary. After the transcribed interviews had been edited, the researcher translated the key quotes to English. It should be noted that as the key points from the interviews were translated from Finnish to English, the nuance of the answers may have changed slightly as a result. After the interview quotes had been translated, the researcher conducted an inductive data analysis.

The transcribed interviews were read several times to identify patterns and themes in the research data. The researcher used Microsoft Excel to analyze the findings and during this process, different themes started emerging and developing. The researcher created codes based on the themes which emerged from the data and added each interview quote into one of the categories which were identified. As the thesis discusses both the benefits and challenges of SAFe, two different tables were created.

Table 4. Benefits of SAFe: Main and secondary themes.

Main themes	**Transparency**	**Predictability**	**Agility**	**Prioritization**	**Coordination**	**Product quality**
Secondary themes	Transparent plan & roadmap for the entire organization SAFe ceremonies enhance transparency Increased transparency for stakeholders SAFe documention enhances visibility of work	Increased predictability due to SAFe processes Improved predictability for customers Improved predictability due to ceremonies	Enhanced organizational agility SAFe roles have improved agility SAFe ceremonies have enhanced agility Improved development processes due to documentation	Prioritization based on customer value Improved project prioritization due to PM & PO roles Improved prioritization due to SAFe processes Improved cooperation with customers	Improved coordination between development teams Improved stakeholder coordination and communication due to SAFe roles Teams operate more independently	Increased emphasis on quality and testing Increased product quality and delivery speed MVP development Improved feedback loop

Table 5. Challenges of SAFe: Main and secondary themes.

Main themes	Prioritization	Flexibility	Processes	Stakeholders
Secondary themes	Internal prioritization conflicts Portfolio bottlenecks Portfolio management External stakeholders not familiar with SAFe processes	Lack of commitment to SAFe processes PIs and sprints affect flexibility SAFe hierarchy and processes affect team autonomy	Overlapping roles Complexity of SAFe processes Ceremonies do not offer value Less time for development due to ceremonies	Lack of knowledge of SAFe processes (external stakeholders) Challenges with cooperation (internal stakeholders)

The research data revealed several different main themes as well as secondary themes. The main themes related to the benefits of SAFe include transparency, predictability, agility, prioritization, coordination and product quality. When it comes to the challenges of SAFe, the main themes identified include prioritization, flexibility, SAFe processes and stakeholders. The results and relevant findings are discussed in more detail in the next chapter.

4. RESULTS

This chapter features findings based on qualitative interviews and highlight the important themes which emerged from the research data. The results of the research aim to identify the main benefits and challenges of SAFe. The interview questions included topics such as SAFe roles, processes, cooperation with stakeholders, ceremonies, documentation and software development. The questions covered a wide range of SAFe related topics, and this helped the researcher to identify multiple different themes regarding both the benefits and challenges of the framework.

The themes related to the benefits include improved transparency, predictability, agility, prioritization, coordination and product quality. The secondary themes as well as reasons for the benefits are discussed in the next section. Several themes related to the challenges of SAFe were also identified and these include prioritization, flexibility, SAFe processes and stakeholders. The interviews were conducted in Finnish, but the quotes have been translated to

English by the researcher. The quotes also include the interviewee code to increase the transparency and reliability of the research data.

4.1 Benefits of SAFe

Several different themes related to the benefits emerged during the interviews and the key points are the following:

- Increased transparency
- Improved predictability
- Enhanced agility
- Improved prioritization
- Improved coordination
- Improved product quality

The next section features key quotes from the interviews and mentions the secondary themes which were identified during the data analysis process.

4.1.1 Transparency

Based on the literature review, many SAFe related studies claim that the implementation of the framework has increased transparency within the organization. Transparency is one of the themes that was highlighted during several interviews and the research data indicates that the transparency has also improved in the case company. The interviewees also discussed how SAFe has enhanced transparency and what are the main reasons for it.

Transparency within the organization has improved due to SAFe processes according to several interviewees. Every development team is aware of the upcoming projects and the visibility has also increased for work in general. The first secondary theme which was identified was that SAFe provides a transparent plan and roadmap for the organization.

"*The biggest benefit of SAFe is the transparent plan for all work and being able to see how the planned tasks are progressing. SAFe makes it clear what should be achieved during each two-week sprint and it is easier to visualize how smaller stories are linked to bigger projects.*" (I 2)

"*The company has a clear roadmap featuring all future projects. Every team is aware of possible development dependencies to other teams ahead of time and this makes planning easier and more efficient. Prior to SAFe, development teams were often unaware of upcoming projects which affected planning greatly. But now, every team is aware of major projects for the next two or three years and it is easier to start planning and gathering development specifications early.*" (I 6)

"*SAFe epics and features make it easier to see the "big picture" on the team level as development work is divided into smaller stories and development may take multiple sprints to complete.*" (I 2)

The interviewees also discussed SAFe ceremonies based on their own role and experiences. SAFe features many different ceremonies which members attend regardless of their role. However, there are some role specific ceremonies as well. Another secondary theme emerged when the interviewees discussed how ceremonies have enhanced the transparency within the organization. The research data indicates that SAFe ceremonies have further enhanced the transparency as several interviewees discussed the positive effect the ceremonies have had on both internal and external transparency.

"*Due to SAFe ceremonies everyone is aware of what is planned or scheduled as every member is attending ceremonies regardless of their role. This also helps with risk management as teams can freely express if they are unable to accept certain projects, for example, due to lack of resources.*" (I 4)

"*SAFe ceremonies enable the company to set shared goals and improve companywide commitment to these goals.*" (I 3)

"*SAFe ceremonies have increased transparency within the company, and it is easier to see the "big picture" as different teams are aware of each other's projects. On a team level, efficiency has improved as every member of the team is committed to the same plan and due to ceremonies, it has been easy to track the progress of each member's stories.*" (I 7)

"*The biggest benefit of SAFe ceremonies is that teams have regularly scheduled meetings to go through what each member is currently working on. And much like product owners, scrum*

masters can also help remove possible obstacles with stories that cannot currently be progressed.“ (I 1)

“*As SAFe ceremonies create opportunities for transfer of knowledge and co-development, they should also be utilized for “SAFe budgeting”. As teams have their own capacity and resources, it should be discussed how to get the most out of the benefits achieved due to ceremonies.*” (I 3)

According to two interviewees, SAFe ceremonies have improved the flow of information throughout the company and as a result, transparency has further increased.

“*The flow of information has improved due to SAFe as many ceremonies are attended by the entire team.*” (I 1)

“*Information spreads throughout the company very quickly as there are many different ceremonies which team members and management are attending.*” (I 4)

Several interviewees (I 5, I 6, I 7, I 8 & I 9) talked positively about the daily scrum meetings. Employees of the company have mainly been working remotely since the Covid-19 pandemic started and the daily scrum has been a virtual meeting place for the team before the members start working on their own projects. During the daily scrum each team member reports the progress of their stories and can also ask for help if needed.

“*Due to SAFe ceremonies the entire team is aware of how scheduled tasks are progressing and members can ask for help in case there is an issue with a story*.” (I 9)

Increased transparency for stakeholders is another theme that emerged from the research data. Many interviewees stated that the SAFe processes have improved transparency for company’s external stakeholders such as customers.

“*SAFe provides transparency for both internal and external stakeholders and this allows each party to see how planned development is progressing.*” (I 3)

"*SAFe can be considered a "two-way communication" system which allows the company and its clients to efficiently communicate what kind of development is requested, what is required to complete it and the schedule of the project.*" (I 3)

"*SAFe offers great tools for cooperating with customers as well as monitoring the progress of SAFe features.*" (I 3)

"*Customers and other teams know what is scheduled and how projects are progressing during the next 2-3 months. The process works well when the customer submits their request with adequate specifications in time and lets the team to work in peace. This leads to customer receiving the completed development solution faster.*" (I 1)

"*Being able to clearly communicate the team's capacity to the customers is another benefit. This helps create realistic expectations for both sides.*" (I 2)

The interviewees also discussed the role of SAFe documention and how it has increased transparency within the company. Several interviewees mentioned that all documentation is beneficial as it makes work more visible, and this is another important secondary theme.

"*Prior to SAFe, development team members often did "invisible work" which was not documented anywhere, and it was not tracked in any way. SAFe documentation has improved the situation and today, majority of tasks are documented in the system. This is beneficial for both team members and management, and it increases transparency.*" (I 6)

"*If a team member leaves or is absent, documentation helps continuing the project as the current progress is documented in the system. Teams monitor their own SAFe stories daily and progress is updated regularly. This is especially important as even smaller projects often require cooperation with other members, teams, or the customer.*" (I 7)

"*SAFe documentation has improved both transparency and the quality of development. For example, the software development teams can see discussions with customers if they have been documented and ask for additional specifications. This is important as the management is not involved with the technical side of development and may not know how detailed the*

specifications should be. Also, the customers are committed to making sure that their development requests meet quality standards before they are submitted.“ (I 3)

4.1.2 Predictability

Another benefit that emerged from the research data as a prevalent theme is predictability. Many interviewees mentioned that due to the implementation of SAFe, predictability has improved, and it is easier to anticipate what will happen in the future. The first secondary theme which emerged from the research data is increased predictability due to SAFe processes.

“*Before SAFe it was challenging to predict what tasks team members would work on even on a daily basis but due to SAFe, this has changed and now the development team members are aware of tasks assigned to them for the next few weeks or even months.*” (I 7)

“*Due to SAFe, it is easier to clarify what is needed and how much time is required to complete projects.*” (I 1)

Another secondary theme related to predictability is improved predictability for customers. Two interviewees also mentioned that due to SAFe, customers are also required to have better predictability regarding what they want.

“*Prior to SAFe, the customer who was the “loudest” was often the one who was able to get their development request accepted the fastest. This caused issues for development teams as the customers had full freedom to change their minds and they were not required to know what they want next. And customers were able to change priorities as they wanted.*“ (I 8)

“*It is crucial to have regular conversations with customers to ensure that each party is aware of the scheduling and progress of both current and future projects.*” (I 7)

Another interviewee added that workload estimation has improved, and this has helped with customer satisfaction as well.

"*SAFe has improved estimating the workload and which tasks can be completed during the next increment. This has had a positive effect on communication with the clients as they also know what to expect.*" (I 4)

SAFe ceremonies have also improved predictability as stated by one of the interviewees.

"*PI/sprint planning and backlog refinement ceremonies have a good structure, and they improve predictability which is SAFe's biggest benefit in general. Prior to SAFe, development requests by customers were often done ad hoc and due to this, making long-term plans and schedules was challenging.*" (I 8)

One of the interviewees also discussed the positive effects that enhanced predictability has had on software development.

"*SAFe has improved the predictability and scheduling of software development as well as management of development requests. Prior to SAFe, development requests did not have a formal process and for example, customers were often asked to deliver a simple Excel-file featuring the request. This led to teams being forced to ask customers for more detailed specifications so the development process could be started. During the past few years, the company has unified the development request protocols and created request forms and more formal processes. The development requests are also thoroughly analyzed before they are offered to the development teams.*" (I 8)

4.1.3 Agility

SAFe is an agile framework, meaning that its main purpose is improving the agility of an organization. The first secondary theme which was identified during the data analysis process was enhanced organizational agility. Many interviewees discussed how SAFe has improved agility within the organization and how the positive effects have been achieved. Agility emerged as an important theme as several interviewees stated that SAFe has improved many processes and as a result, the overall agility of the organization has been enhanced.

Several interviewees talked about what kind of an effect SAFe has had on agility in general.

"*While Agile frameworks such as Scrum are effective in smaller companies, SAFe has solved the issue how large-scale organizations can better coordinate projects and improve efficiency across the company.*" (I 1)

"*The sprint capacity calculation ensures that every member of the team has an appropriate amount of work.*" (I 1)

"*The main benefit of SAFe is creating development in smaller parts rather than waiting for the entire project to be completed. This allows customers to provide constant feedback which helps teams to fix and improve the development solution before the project has been fully completed.*" (I 3)

"*As SAFe is based on Lean principles, it has allowed the company to provide value for customers faster than before. SAFe aims to enable efficient flow of development while eliminating wait times. And if the specifications for a development request are adequate, it is often possible to complete development, testing and validation during a single 12-week planning interval*." (I 1)

"*The software system itself is being developed as a whole and SAFe has reduced the silo mentality which has been prevalent in the company.*" (I 5)

"*Large-scale projects are planned and completed more efficiently than prior to SAFe. The company has clear plans for different projects and teams are committed to following these plans. SAFe has improved the flow of work with projects involving multiple teams especially when it comes to scheduling. This has led to a faster project completion rate.*" (I 6)

"*Smaller sprint stories can be considered another benefit [of SAFe] as they enhance agility. Development team members focus on completing certain parts of the development project rather than working on ten different projects without completing any of them. Also, SAFe documentation has enabled following the progress of development on both team and train level and the project goals are clearer than before. Both the representatives of management and development teams can monitor regularly how far a project has progressed and if there are any issues.*" (I 2)

Several interviewees discussed their SAFe roles and how the roles have improved agility in the company. Overall, the roles introduced by SAFe have had a major impact on organizational agility and this was another secondary theme which emerged from the findings. Due to the roles such as scrum master and product owner, development team members have more time and resources for software development related tasks.

"*The biggest benefit of my role (scrum master) is freeing development team members from maintaining SAFe processes. This allows team members to focus on software development while the scrum master maintains SAFe processes and ensures that the team is participating in SAFe ceremonies.*" (I 1)

"*The most important benefit of the product owner role is being able to act as a "gate keeper" for the agile team. As a result, the development team spends less time on coordinating and investigating tasks.*" (I 2)

"*The scrum master's role is especially important during PI-planning as we often cooperate and communicate with scrum masters from other agile teams. And as every scrum master is aiming to eliminate possible issues and roadblocks, this makes cooperation between scrum masters efficient.*" (I 1)

"*The development team can influence planned work and schedules for said work. SAFe has made daily work more systematic and scheduling allows team members to work on multiple tasks at the same time.*" (I 9)

Many interviewees also stated that SAFe processes such as ceremonies have further enhanced the agility of development processes, and this was identified as another important secondary theme.

"*The biggest benefit of SAFe is distributing all development work on PIs and sprints. This has enabled the company to deliver development at a faster pace compared to before*." (I 5)

"*Due to SAFe ceremonies, teams are able to track the progress of stories and can react to possible issues that prevent development from progressing. And if there is a story that cannot*

be progressed, the product owner can evaluate how it affects plans for upcoming sprints." (I 2)

"*One of the biggest benefits of SAFe ceremonies is that there is time reserved for discussion regarding both daily tasks and the current sprint. Also, having time reserved for PI-planning has been very beneficial and this has helped the team work more efficiently.*" (I 6 & I 7)

"*Many teams have started having their own pre-PI-planning meetings to ensure that the actual planning ceremonies are as efficient as possible. Pre-planning ceremonies have greatly increased the efficiency of PI-planning.*" (I 8)

Many interviewees (I 1, I 6, I 7 & I 8) mentioned that the Iteration Retrospective is one of the more important ceremonies. During Iteration Retrospective team members review practices, discuss the results of the iteration and look for new ways to improve. Iteration Retrospective is held at the end of each two-week sprint.

"*Iteration Retrospective has helped our team improve workflows and other processes. As a result, the agility of the team has gotten better.*" (I 8)

Three interviewees (I 6, I 7 & I 8) discussed the unofficial Agile framework the company experimented with before adopting SAFe. Company's own framework was never implemented companywide, but the interview quotes highlight how SAFe has improved processes. The first quote is directly related to the secondary theme "SAFe roles have improved agility".

"*The biggest difference compared to the old framework are the different roles. Prior to SAFe implementation every team member also had tasks that belong to the scrum master and product owner in the SAFe model. Essentially each member of an agile team would act as a scrum master, product owner, and developer.*" (I 8)

"*The previous Agile framework that was used was better suited for the projects that were on-going at that time. However, SAFe is more suitable for the current situation as the company has moved on from software launches to continuous software development.*" (I 6 & I 7)

Lastly, many interviewees mentioned how SAFe related documentation processes have improved agility. Improved development processes due to documentation was identified as one of the secondary themes related to agility.

"*Majority of SAFe related documentation is based on epics, features and stories which are documented in the company's enterprise resource management system. Teams are free to produce extra documentation but in general, SAFe documentation is more focused on creating value for the customers.*" (I 1)

"*I can see the importance of documentation and while it's still time consuming, it has become a part of regular everyday tasks and helped us overall.*" (I 5)

"*Initially there were challenges with SAFe documentation, but the processes are more efficient now that the teams are more familiar with the framework.*" (I 8)

4.1.4 Prioritization

Prioritization of projects and work is another theme which emerged when the interviewees discussed the benefits of SAFe. The interviewees also pointed out different reasons for the improved prioritization processes. One of the major benefits mentioned by two interviewees is that the prioritization of development projects is now focused on creating customer value, which is one of the SAFe values. This is also one of the important secondary themes.

"*Another thing that has changed since the implementation of SAFe is the prioritization of development requests, and all development is done in a prioritized order. The development requests which create the most customer value, are completed first.*" (I 1)

"*SAFe has helped the organization become more agile and all proposed work is properly prioritized in a way that brings value to the customer.*" (I 2)

"*Prioritization of development requests has been a major change compared to before. Prioritization has improved since the implementation of SAFe and the company is able to provide more customer value.*" (I 7)

The importance of roles such as product owner and product manager in the prioritization process emerged from the research data as one of the secondary themes. One of the interviewees also discussed their role and how they can influence prioritization. Their role has also had a positive effect on customer satisfaction.

"*The benefit of my role (product manager) is being able to influence the prioritization of proposed projects and which projects are approved. And as product managers work closely with customers, customer satisfaction has increased as a result*." (I 4)

Another interviewee (I 1) discussed the roles of product manager and product owner:
"*The product manager and product owner are tasked with expressing the customer's point of the view to the software development teams and provide the team with clear priorities.*" (I 1)

Furthermore, the prioritization processes introduced by SAFe have made development more efficient according to several interviewees and this was identified as a secondary theme related to prioritization.

"*Before the company implemented SAFe, tasks were often unclear and development team members were forced to participate in management level customer meetings and make decisions regarding projects on their own without feedback from the company's management. However, with SAFe the processes are clearer and team members can focus on work itself rather than acting also as "scrum masters" or "product owners*." (I 5)

"*Before SAFe, the priorities were not always clear, and it was challenging to tell which task should be finished first. After the implementation of SAFe, both the team and the entire release train are working on tasks based on a thoroughly prioritized list*." (I 7)

"*If a development project has dependencies to multiple teams, the teams are required to respect the priorities and work on the project as scheduled. SAFe also requires teams to inform other teams of potential dependencies during PI-planning. This has reduced the ad hoc requests from teams within the organization and reduced the workload.*" (I 8)

"*Implementation of SAFe has reduced the number of sudden ad hoc requests and teams can better focus on planning during the PI-planning week.*" (I 4)

While the research data indicates that SAFe has improved prioritization of projects internally, it has also had an impact on external stakeholders such as customers and this is another important secondary theme. Several interviewees discussed how SAFe has changed prioritization processes for customers. It should be noted that prioritization of development requests is done in cooperation with the customers.

"*Due to SAFe, customers are required to do their own planning and prioritization, and this has improved the overall situation as development teams are working on requests which create the most value for customers.*" (I 8)

"*SAFe has improved achieving mutual agreement between parties regarding prioritization.*" (I 3)

"*The quality of specifications regarding urgent development requests has improved as in the past, development projects have gotten postponed due to inadequate specifications from the customer. The customers are also now aware that if there is an urgent request, it must be submitted before or at latest, during the PI-planning sprint. Missing the window means that the development request will be scheduled in 10-12 weeks and development will be postponed.*" (I 4)

SAFe also has roles which are focused on the cooperation between the company and its customers and according to the interviewees this has had a major impact on prioritization processes.

"*Product owners and managers have regularly scheduled meetings with customers regarding prioritization and this has helped customers understand SAFe protocols better.*" (I 7)

"*Cooperation with customers has improved ever since they have become more familiar with the annual SAFe calendar. This has made scheduling clearer for both parties.*" (I 4)

One of the interviewees mentioned that improved prioritization has also made development processes more efficient. Furthermore, the management has a clearer picture of how development projects are progressing.

"*Development team members often have several SAFe stories on each sprint and due to clear documentation and prioritization, it is easier to plan what should be done and when. SAFe documentation also offers the management a clear picture of how different projects are progressing.*" (I 5)

4.1.5 Coordination

The interviewees were asked how has the implementation of SAFe changed cooperation with both internal and external stakeholders. Management and other teams can be considered internal stakeholders while external stakeholders include for example, customers, media, investors, partners, and suppliers. The interviewees mainly discussed cooperation with customers and other teams due to their SAFe roles. The first secondary theme related to coordination which was identified is the improved coordination between development teams. Several interviewees discussed how coordination and cooperation have improved since the implementation of SAFe.

Many interviewees pointed out that SAFe protocols and processes have improved project coordination between development teams.

"*SAFe has improved both communication and coordination with other teams due to SAFe protocols and ceremonies.*" (I 2)

"*If there is a large feature involving multiple teams and dependencies, all teams must agree on the schedule of the project.*" (I 2)

"*Cooperation between different agile teams has improved since the implementation of SAFe. This is achieved through pre-planning in coordination with other teams.*" (I 2)

"*Due to SAFe, it is easier to monitor the progress of other teams as well. This is important as development projects often require work from multiple teams. One team may oversee the actual software development while another team tests the new build and workflows. Prior to SAFe, there were scheduling issues with multi-team development projects, and it was challenging to*

follow each team's progress. SAFe requires such projects to be approved by each participating team and scheduling is also done together." (I 7)

"*Cooperation between development teams has improved due to SAFe processes. If there is a project involving multiple teams, every team is involved in planning. And the project's schedule must be approved by each team involved.*" (I 6)

According to several interviewees, project coordination between development teams and different external stakeholders has improved due to clear protocols and stakeholder focused SAFe roles. This is another important secondary theme.

"*One major change that SAFe has brought is having different roles for stakeholder communication. Scrum masters cooperate and communicate with other teams while product manager and product owner are in close contact with customers.*" (I 6)

"*SAFe has helped with customer cooperation, especially when they are aware of SAFe protocols. For example, if a customer has a development request, it can be scheduled, and it will have a clear structure. Also, the timeline for the development can be established at an early stage.*" (I 5)

SAFe values teams which are self-managing and self-coordinating, and two interviewees mentioned that the framework has helped their teams operate more independently. Teams being able to operate more independently was identified as another secondary theme.

"*SAFe has improved planning and scheduling as there are set goals which are monitored regularly. SAFe has also given development teams more freedom to operate independently.*" (I 2)

"*SAFe roles such scrum master and product owner are not traditional roles as the HR element has been removed. This has helped teams operate more independently and has improved self-coordination.*" (I 5)

One of the interviewees discussed how SAFe documentation has been beneficial for cooperation between different teams.

"*Large-scale development projects often involve multiple teams but due to SAFe documentation, it is easy to track the progress across all teams. And as all SAFe stories are assigned to team members, it's easy to find the person who is working on a certain project. Prior to SAFe, tracking down the right person was often challenging and time consuming.*" (I 9)

The same interviewee (I 9) also added that SAFe documention has improved coordination within their own team:
"*Real time SAFe documentation has made following the story progress easier. SAFe stories are updated regularly with information on progress and possible issues and this information is visible to all team members. Documentation also makes helping other team members easier and if someone is absent, others can still track the progress of their stories.*" (I 9)

4.1.6 Product quality

Improved product quality is another theme that was highlighted during the interviews. Many SAFe studies have mentioned improved product quality as one of the benefits of the framework, however, researchers such as Putta et al. (2018) have suggested that there is a lack of empirical evidence regarding the topic. Several secondary themes related to product quality emerged from the research data with the first one being increased emphasis on quality and testing. Several interviewees mentioned that the product quality has improved since the implementation of SAFe and discussed the reasons for it.

"*The quality of development has improved since the implementation of SAFe as there is a bigger emphasis on the quality aspect and testing of new development.*" (I 1)

"*One of the SAFe principles is reflecting on completed projects. In our company this has led to changes such as scheduling more time for testing and conducting testing together with the customers. The customers are often provided test material prior to completion of the project to ensure that the requested development works as intended. This way customers can confirm that the development is what they wanted and that it also works with possible software integrations.*" (I 1)

Another interviewee (I 6) mentioned that prior to implementation of SAFe, there were issues with development requests which resulted in product quality related challenges.

"*While development planning was done in cooperation with customers, development teams were often not part of the planning stage. Only after specifications and planning were already finished, the completed plan was presented to the development team. The lack of input from software developers during the planning stage often led to the finished development project not being what the customer wanted or having other issues.*" (I 6)

However, the same interviewee (I 6) added that the situation has improved due to SAFe processes, and this was identified as a secondary theme.

"*SAFe has eliminated such issues and development projects are started and completed faster while delivering higher quality solutions than before.*" (I 6)

Several interviewees mentioned reasons why they believe that SAFe processes have improved the product quality. Secondary themes which emerged from the research data include MVP development and improved feedback loops.

"*Customers can submit feedback directly even during the development stage and both the company and its customers can monitor the progress closely.*" (I 7)

"*One of the most important benefits is that SAFe offers a model for creating epics based on development requests and stories. Epics feature a detailed description of what kind of value it is supposed to provide as well as completion requirements. SAFe documentation has helped teams better understand the needs of customers which has improved the quality of development in general.*" (I 2)

"*Minimum Viable Product development can be delivered to the customer faster and after implementation, the solution can be further improved based on the customer feedback. The customer can follow the development cycle and submit feedback. And if there are technical problems or other issues during development, they can be addressed before the developed solution is delivered to the customer.*" (I 5)

4.2 Challenges of SAFe

The interviewees mentioned several different SAFe related challenges during the interviews and the data analysis process revealed four different themes with multiple secondary themes. According to the research data the biggest challenges are the following:

- Prioritization
- Flexibility
- SAFe processes (such as ceremonies)
- Stakeholder cooperation

The next section features relevant quotes from the interviews and points out secondary themes which were discovered during the data analysis.

4.2.1 Prioritization

While the research data indicates that SAFe has improved many processes related to project prioritization, the interviewees also pointed out several challenges which hinder both agility and prioritization itself. The first secondary theme is related to the prioritization process itself and how the organization has had internal conflicts regarding prioritization of projects involving multiple teams.

"*Prior to SAFe, it was easier to ask for help from other teams but now every team must respect each other's prioritization, and this affects agility at times.*" (I 7)

"*It can be difficult to get projects approved especially with other SAFe trains as they often have their own prioritization.*" (I 4)

The next identified secondary themes are the portfolio related issues such as portfolio management and bottlenecks. One of the interviewees (I 3) discussed portfolio bottlenecks caused by epics.

"*SAFe offers two-way transparency as both the management and the clients can see how epics are progressing but due to the portfolio bottleneck it is challenging to predict when certain*

epics are completed. The backlog is not decreasing as new epics are constantly coming in.“ (I 3)

“*There are many epics owned by business managers which have been active for years but have not been fully completed. This causes issues with the portfolio backlog as the unfinished epics are creating a bottle neck for new epics.*” (I 3)

The same interviewee (I 3) also added:
“*It must be frustrating for development teams as these unfinished epics cannot be closed and they are still offered to the teams in PI-planning. And as teams have their own priorities, they might not have enough available capacity to work on the older unfinished epics.*“ (I 3)

Several interviewees also discussed the challenges with portfolio management.

“*The PI is a rather long period which makes it difficult to predict changes or take them into consideration. For example, a development request may have already been accepted and scheduled but suddenly another, more urgent request may take its place. And it can be difficult for customers to understand why their request is postponed even if the company has already promised that development will start soon.*“ (I 8)

“*It can be hard for customers to understand that the release train may already have scheduled projects with different priorities. Another customer may have submitted a development request with a higher priority which will be scheduled to start as early as possible.*“ (I 4)

According to the interviewees, the portfolio management issues are at least partially caused by the customers. External stakeholders not being familiar with SAFe processes was identified as another secondary theme.

“*At least some customers do not fully understand the SAFe protocols and for example, development requests may still be submitted late which makes PI-planning more complicated. As PI-planning is based on prioritization, this may reset the original plan for the upcoming planning interval.*” (I 7)

"*Customers should focus even more on prioritization rather than submitting ad hoc requests which may affect the already scheduled projects.*" (I 6)

4.2.2 Flexibility

Flexibility is another main theme which emerged from the research data. Many interviewees discussed challenges related to SAFe processes and how they can hinder agility. The secondary themes which were identified include lack of commitment to SAFe, PIs and sprints affecting flexibility and SAFe hierarchy and processes affecting team autonomy.

Two interviewees (I 1 & I 9) discussed flexibility issues related to the SAFe PI & sprint system.

"*SAFe is not always flexible as work is planned and scheduled for the next ten weeks. If the plan requires major changes, it can be challenging to implement them quickly and as a result the agility that SAFe is supposed to provide, suffers.*" (I 1)

"*Since a sprint only lasts for two weeks, unexpected events may easily postpone scheduled stories. For example, if completion of development requires customer feedback or more detailed specifications, the development work may have to be rescheduled for a future sprint. And this causes further issues as planned development projects have already been scheduled for sprints during PI-planning.*" (I 9)

It was also pointed out that commitment to SAFe is another issue which may affect the agility of the organization. This was identified as a flexibility related secondary theme.

"*Every team within the company must be committed to SAFe protocols or else agility suffers as a result. The benefits of SAFe should be made clear for everyone from management to developers to get the most out of the framework.*" (I 4)

"*The biggest challenge with SAFe is understanding that SAFe is a tool for agility and help and not vice versa.*" (I 4)

One of the interviewees (I 3) discussed software development related challenges caused by SAFe processes.

"*One of the SAFe principles is offering software development teams freedom to operate independently and that customers should be able to submit development requests to the teams. For example, a customer submits a development request, the development team develops a few different software solutions and then the customer would choose the one most suitable for their needs. This does not always happen in our organization.*" (I 3)

The interviewee (I 3) also added:
"*SAFe hierarchy is often affecting creativity when it comes to development and projects cannot progress due to lack of detailed specifications. And in case the development request requires extremely detailed specifications, it can be challenging to progress the request especially if the product management is unable to get help from software development teams. The dialogue between different parties can be lacking which leads to reduced agility and efficiency.*" (I 3)

Another interviewee (I 1) further discussed the situation between the management and development teams and how the lack of team autonomy is affecting software development.

"*Development teams should have more freedom to suggest possible solutions for development requests. The development requests offer a comprehensive view of the customer's needs and possible solutions. However, the management may often decide how development should be done without input from the development team.*" (I 1)

"*I believe that development teams could come up with even more efficient solutions if they had more freedom as they have more technical knowledge.*" (I 1)

4.2.3 SAFe processes

The interviewees highlighted several challenges related to different SAFe processes and the secondary themes which emerged from the research data include overlapping roles, complexity of the framework, ceremonies failing to provide value and less time for development due to ceremonies.

One of the interviewees (I 2) discussed how SAFe roles such as product manager and product owner have overlapping responsibilities.

"*There is some overlapping between the product manager and product owner roles, and it is not always clear who should do what. And this can affect the efficiency which SAFe is able to provide.*" (I 2)

Several interviewees pointed out issues due to the complexity of the framework and its processes.

"*SAFe is sometimes used as a "wall" to block requested work and due to this, agility, which SAFe is supposed to provide, suffers.*" (I 4)

"*SAFe is very complex as a framework because it features many unique terms and abbreviations. Because of this, learning all the SAFe terminology can take a lot of time.*" (I 1)

"*When SAFe was first adopted, many teams struggled with PI-planning as the schedule is very hectic and the amount of work required can be high especially with the bigger teams.*" (I 8)

"*Especially at first it was frustrating having to spend so much time on documentation. And as SAFe documentation is more detailed, it took time until it finally became a routine.*" (I 5)

Interviewees also criticized the SAFe capacity calculation process. One of the major issues is team's calculated capacity as it might cause development to slow down.

"*Even if development could be completed during a single sprint, it may have to divided into smaller stories on different sprints if the capacity for the ongoing sprint is already full and the upcoming sprints have more available capacity.*" (I 7)

The same interviewee (I 7) also added:
"*The team's policy has been to avoid scheduling stories for the PI-planning sprint as planning requires time. But due to stories being postponed, members often still do development work during the PI-planning sprint.*" (I 7)

Another interviewee (I 8) also pointed out challenges with the capacity calculation and the causes for these issues.

"*One of the issues is silo mentality as developers in different teams might be specialized in certain tasks. Due to this it is often difficult to plan stories for team members and every member should have planned stories even if they are unable to help with the currently planned development work.*" (I 8)

The interviewee (I 8) further discussed the impact of the silo mentality:
"*Due to silo mentality, development tasks are often centered upon certain team members. If there is a development project, it might be that only one or two members of the team participate in development rather than the entire team. Development does not move from one member to another, and a single team member may complete the entire project. The situation has not changed since the implementation of SAFe despite the framework offering solutions for it.*" (I 8)

The interviewees also discussed the challenges related to SAFe ceremonies. Several interviewees argued that as there are several regularly scheduled SAFe ceremonies, they take up a lot of time which leads to having less time for development. Furthermore, lack of value provided, and lack of commitment were mentioned as challenges regarding SAFe ceremonies.

"*There is still not enough time reserved for ceremonies and because of this, team members often do development related tasks during ceremonies. As a result, some ceremonies may feel like a waste of time.*" (I 6)

"*Lack of commitment is one of the biggest challenges. Not everyone values SAFe ceremonies as highly and this has decreased commitment.*" (I 7)

"*While daily scrum meetings are valuable, they are also often repetitive as the team goes through each member's stories every day. And if there is an issue with a story that prevents it from progressing, the team often spends a lot of time investigating the issue.*" (I 5)

"*Many people regardless of their role are idle during SAFe ceremonies. The conversations during SAFe ceremonies are usually focused on things with issues and discussing these issues takes most of the scheduled meeting time. The SAFe ceremonies also often have people waiting*

for their turn to speak and sometimes people attending the ceremony might not have anything to discuss." (I 4)

The interviewee (I 4) also discussed the ceremonies related to PI-planning. Many teams have their own pre-planning ceremonies that are held before the actual two-day PI-planning. The pre-planning meetings are not official SAFe ceremonies but to ensure that actual planning is efficient, many teams have added pre-planning to the schedule.

"*There are differences between teams regarding how pre-planning is done and some teams may already have a near finished plan before the actual PI-planning. This means that attending PI-planning barely creates any additional value. On the other hand, not every team is as productive and efficient during pre-planning.*" (I 4)

Two interviewees (I 5 & I 8) criticized the Retrospective ceremony.

"*Since Retrospective is held at the end of each two-week sprint, there is often nothing new to discuss regarding the sprint.*" (I 5)

"*Retrospective features the same set of questions each time and they rarely lead to any deeper discussions within the team. The ceremony is often treated as a "checklist", meaning that it is enough to answer the regular set of questions without engaging in deeper discussion. And the answers are often very similar from sprint to sprint as two weeks is a short time to assess what has happened and what could be improved.*" (I 8)

Another interviewee (I 3) discussed the challenges of SAFe ceremonies from their own personal point of view. As a business manager they cooperate with six different release trains, meaning that there are several different ceremonies they should attend.

"*The ceremonies are very time consuming and because of this I often prioritize stakeholder meetings to ensure that different projects are progressing and have adequate specifications.*" (I 3)

Two interviewees (I 1 & I 4) discussed how SAFe ceremonies could be improved.

"*Since there are several ceremonies that team members attend, the ceremonies should offer enough value so that attendees would not want to miss them. For example, missing a ceremony would mean that the member will miss some important information.*" (I 1)

"*The meeting agenda for ceremonies and the list of invited attendees should be given more thought. For example, only inviting people who are relevant to the topics that will be discussed.*" (I 4)

4.2.4 Stakeholders

Several interviewees mentioned both external and internal stakeholder related issues and it was the one of the key themes which emerged from the interviews. Furthermore, external stakeholders' lack of knowledge of SAFe processes and challenges with internal cooperation were identified as secondary themes.

Several interviewees mentioned that there are challenges with external stakeholders such as customers. According to the interviewees this is caused by the lack of understanding how the SAFe model works.

"*The biggest challenge is the customers' lack of understanding and knowledge of how the SAFe model works. While the customers have been informed of company's SAFe procedures, they are still not always clear which has led to issues with scheduling requested development projects.*" (I 4)

"*The clients are not always familiar with SAFe protocols, and they might give a list of 25 requests which are all considered high priority [by the customer]. The requests should be better prioritized to ensure more efficient PI-planning.*" (I 1)

"*Customers have had difficulties understanding SAFe scheduling and especially at first, they often assumed that the development teams would start working on every development project request immediately.*" (I 7)

Furthermore, several interviewees stated that the development request specifications delivered by the customers are often lacking which causes prioritization and software development issues.

"*The specifications provided by customers are often lacking but from the customer's point of view the development work should still be planned and scheduled for an increment.*" (I 3)

"*Development requests by customers are not always reviewed [by the customer organizations] and as a result, the quality of requests might vary greatly. The current request form is not structural, and the text written by customers is often very uneven.*" (I 4)

"*Customer requests often lack proper specifications required for development and this leads to development slowdowns.*" (I 1)

One of the interviewees (I 3) mentioned further challenges with external stakeholders. They also stated that the implementation of SAFe has not helped with the issue.

"*The company is not on an equal level with many other stakeholders and when there are major changes, the company is often not involved with the specifications until they are nearly finalized. SAFe does not offer tools to improve cooperation in such situations.*" (I 3)

Lastly, interviewees discussed cooperation related challenges with internal stakeholders such as other development teams.

"*It can still be challenging to request help from other SAFe teams. Teams often have their own priorities and what is important for one team, might not be for another team.*" (I 6)

"*How SAFe agility works is sometimes personified meaning that cooperation works better with certain teams or team members. It can be said that in such cases agility works despite SAFe protocols.*" (I 4)

5. DISCUSSION

The results of the empirical study will be discussed in this chapter. Furthermore, the chapter will investigate whether the results align with the themes that were discussed in the literature review section of the study.

5.1 Benefits of SAFe

When discussing the benefits of SAFe, the main themes which emerged from the research data were increased transparency and predictability, improved prioritization, coordination and product quality and enhanced agility. Each theme will be discussed in the next section.

5.1.1 Transparency

Most interviewees mentioned that transparency has increased greatly since the implementation of SAFe and this has had many additional benefits as a result. Transparency has improved cooperation between different teams and communication with clients. Furthermore, there is now a clear roadmap for the entire organization and development plans are more transparent than before. SAFe documentation has also made work more visible in general as even tasks which are not related to features or epics, are documented.

According to the research data, SAFe ceremonies play an important role in enhancing transparency. SAFe features many planning related ceremonies and as a result, project planning and management has gotten more efficient. Flow of information has also improved due to SAFe, and this has led to a more transparent organizational culture. Agile teams are aware of projects managed by other teams and ARTs, and members can also see what is planned for future sprints and PIs.

The research data is in line with studies such as the empirical study conducted by Salikhov et al. (2020). According to Salikhov et al. (2020), the implementation of SAFe increases transparency and provides a clearer vision of the big picture. Enhanced transparency and improved visibility are also mentioned as some of the most reported benefits of SAFe according to the literature review conducted by Putta et al. (2018). The results of the multiple case study

by Gustavsson et al. (2022) also indicate that transparency and improved understanding of the bigger picture are benefits of SAFe.

5.1.2 Predictability

According to the research data, one of the biggest benefits of SAFe is improved predictability. Agile teams and ARTs have a clear understanding of projects which will be developed in near future and the company's roadmap offers a timeline for long-term development projects. Predictability has also improved the self-coordination and self-management of teams. The results align with the literature review conducted by Putta et al. (2018) as improved predictability was identified as one of the benefits of SAFe. Improved predictability is also mentioned in the survey research by Laanti and Kettunen (2019). Multiple case study by Gustavsson et al. (2022) also mentions predictability as one of the benefits and the improved predictability has allowed organizations to make better long-term decisions.

5.1.3 Agility

Based on the research data, the implementation of SAFe has improved various processes and increased the agility of development related workflows. As a result, teams can deliver value faster than before and due to this, communication with stakeholders such as customers has improved. Improved multi-team project coordination has also decreased the delivery times of software increments. SAFe has also had a positive effect on development projects which require multiple teams to complete due to the increased transparency of planning processes. This has mainly been enabled by ceremonies and SAFe roles such as scrum master and product owner and in general, SAFe has enhanced the overall agility of the organization.

The research data also indicates that SAFe documentation processes offer several benefits to organizations. SAFe related documentation makes it easier to monitor the progress of projects as the documentation is available for both internal and external stakeholders. The progress is also regularly updated. As large-scale development projects are split into smaller stories, the development teams can focus on one task at a time and as a result the agility of the development processes improves. The results are in line with the studies conducted by Laanti and Kettunen (2019), Putta et al. (2018) and Salikhov et al. (2020).

5.1.4 Prioritization

The research results indicate that the company's project prioritization processes have improved since the implementation of SAFe. Firstly, the prioritization is based on customer value, and this has increased customer satisfaction and cooperation. Product owners and product managers constantly communicate with the customers and client organizations have gained more knowledge regarding SAFe processes and protocols. This has led to many client organizations putting an increased focus on the prioritization of their development requests. The results align with research studies conducted by Abheeshta Putta (2022), Laanti and Kettunen (2019) and Gustavsson and Bergkvist (2019) which all indicate that prioritization is one of the benefits of SAFe.

5.1.5 Coordination

Based on the research data, the implementation of SAFe has improved communication and coordination with both external and internal stakeholders in the case company. This has primarily been enabled by SAFe roles such the product owner, product manager and scrum master which have a higher focus on stakeholder communication. The coordination with internal stakeholders such as other agile teams has improved due to the scrum master and product owner roles.

As every team is following the same SAFe protocols, coordination of multi-team projects is often more efficient than before, and dependency management has improved as well. SAFe ceremonies such as sprint and PI-planning have further enhanced coordination between teams and team members. Furthermore, teams are more self-coordinating and self-managing than prior to the implementation of SAFe. Studies by Abheeshta Putta (2022), Salikhov et al. (2020) and Laanti and Kettunen (2019) have also reported similar results regarding improved coordination and cooperation due to the SAFe implementation.

5.1.6 Product quality

According to the research data, the implementation of SAFe has had a primarily positive impact on product quality in the case company. SAFe has improved the efficiency of project planning and scheduling, and as a result the development teams can deliver customer value faster than

before. The case company is now more focused on testing and software quality than before, and MVP type of development has allowed the company to release software solutions at a faster rate than prior to SAFe. Another key point is the improved feedback loop as it allows the customers to submit feedback during the development phase and the development teams can improve the software solution before it is delivered. This ensures that the final delivered solution is what the customer wants and that it works as intended. The results of studies by Salikhov et al. (2020) and Putta et al. (2018) also indicate that due to implementation of SAFe, the product quality has improved in several organizations.

5.2 Challenges of SAFe

Based on the research data, the biggest challenges of SAFe are the project prioritization, lack of flexibility, SAFe processes as well as stakeholder related issues. Each theme will be discussed in detail in the following section.

5.2.1 Prioritization

Several interviewees discussed prioritization issues that the case company has faced since the implementation of SAFe. The prioritization of projects which require multiple teams to complete is seen as challenging as teams and ARTs have their own priorities. And as teams must respect each other's priorities, some projects may end up being postponed. Furthermore, SAFe protocols are used to block development projects or delay them and as a result, the agility of development processes is hindered.

This has also led to issues with portfolio management as there are several epics which are not progressing due to prioritization issues. Customers are constantly submitting new high priority epics and they are often prioritized over older, medium priority epics. This has created a portfolio bottleneck. Portfolio management is also affected due to the external stakeholders not being familiar with SAFe processes and protocols. Studies conducted by Abheeshta Putta (2022) and Putta et al. (2018) also highlight prioritization related challenges. According to Putta (2022), the SAFe roadmap lacks detailed information on ART formation and value streams. In the case company, the ARTs are formed based on teams and their expertise rather than being aligned with client portfolios.

5.2.2 Flexibility

The research data revealed several challenges caused by the lack of flexibility. The main challenges are the lack of commitment to SAFe processes, the PI and sprint system hindering flexibility and the SAFe hierarchy affecting team autonomy and flexibility. According to several interviewees the lack of commitment is hindering the benefits that SAFe could provide and SAFe processes and protocols can also be used block help or requested projects.

The length of sprints was also mentioned as one of the challenges and this is linked to the issues with lacking specifications and coordination of multi-team projects. While most stories can be completed during a single sprint, development tasks might have to be delayed due to the customers or other teams. This leads to the scheduled stories being moved to future sprints but due to the nature of SAFe planning, the upcoming sprints might no longer have free capacity for the delayed tasks. SAFe has also been criticized for the lack of flexibility as all projects are locked in for the duration of the program interval as stated by an article published on the Product Coalition website (2019). The PI lasts for 10-12 weeks and it can be challenging to make changes to plans quickly and this can lead to reduced flexibility.

According to the research results, the complex SAFe protocols are affecting the autonomy and creativity of development teams in the case company. Development projects often require detailed specifications and development teams are focused on delivering exactly what the customer is requesting. However, this also means that development teams lack freedom to offer multiple different solutions to the customer. SAFe values creativity and continuous learning but due to its processes, this is not always realized. While customers are aware of what they need, the development teams could possibly offer even better value if they had more freedom to develop different solutions. Studies by Salikhov et al. (2020) and Putta et al. (2018) have also reported flexibility related challenges caused by the implementation of SAFe.

5.2.3 SAFe processes

Based on the research data, the biggest challenges related to SAFe processes are overlapping roles, complexity of SAFe processes, lack of value provided by ceremonies and having less time for development due to ceremonies. Roles such as product owner and product manager have overlapping responsibilities which has affected the agility of the case company. Many SAFe processes and protocols are considered complex, and the ARTs faced challenges during

the first PI-planning due to the hectic schedule. Furthermore, SAFe features many unique terms and the overall structure of the framework is very complex, meaning that it might take a long time to fully understand how SAFe processes work. The results are in line with the studies conducted by Putta et al. (2018) and Abheeshta Putta (2022) which indicate that multiple organizations have faced similar challenges regarding SAFe roles and PI-planning.

Another major challenge which emerged from the research data are the issues related to SAFe ceremonies. SAFe features multiple regularly scheduled weekly and bi-weekly ceremonies, meaning that there is less time for development work and other tasks. This has led to team members often being forced to work on development tasks even during ceremonies. The research data indicates that the PI-planning related ceremonies provide value and have made development more efficient. However, the regularly held iteration/sprint ceremonies may affect the quality and speed of software solution delivery and as a result the agility of the organization is decreased.

Another issue related to the SAFe ceremonies is the lack of value provided by them. As most SAFe ceremonies are held regularly at fixed time intervals, there might not be anything new to discuss, meaning that the activity does not offer value to the participants. For example, the Iteration Retrospective is held at the end of every iteration/sprint and according to the interviewees, there is not enough time for new discoveries to emerge. The repetitive nature of SAFe ceremonies may also lead to issues with commitment as members may deem the ceremony unnecessary if it does not offer enough value. Several interviewees mentioned that they often work on development and other tasks during ceremonies due to the lack of value ceremonies provide.

Studies conducted by Ciancarini et al. (2022), Gustavsson et al. (2022) and Putta et al. (2018) also discuss challenges related to SAFe processes. The framework requires a high level of commitment and due to its complex processes, it may be difficult to achieve the benefits that SAFe can provide. According to a case study conducted by Gustavsson et al. (2022), being forced to participate in SAFe ceremonies can limit the personal autonomy of team members. According to the study conducted by Raza and Majeed (2012), the increased number of meetings and communication might cause some team members to feel disturbance during work.

It should also be noted that many studies do not discuss the challenges related to SAFe ceremonies in detail, and it could be due to the respondents involved in the surveys. The interviewees who participated in this study mainly represent roles directly involved with software development processes rather than members of management, meaning that the interviewees attend several different SAFe ceremonies.

5.2.4 Stakeholders

Many interviewees highlighted challenges related to both external and internal stakeholders. The main secondary themes which emerged from the research data are the lack of knowledge of SAFe processes by external stakeholders and the cooperation challenges with internal stakeholders. While communication with customers has improved due to SAFe, many customers are not familiar with the framework and its processes and protocols. This caused issues initially as the case company changed many processes and protocols due to the implementation of SAFe. The situation has improved over the years, but it is still causing issues for prioritization and planning of work as the client organizations do not use SAFe processes. Also, as the case company is a large-scale organization with multiple customers and portfolios, it can be challenging to determine the prioritization of projects. While the case company has multiple development teams and ARTs, they are not focused on specific customer portfolios.

Another major customer related challenge are the epic and development request specifications. SAFe values efficient delivery of customer value and the goal is to develop solutions which meet the customer's expectations and needs. As software development can be very complex, the development projects often require highly detailed specifications. When the specifications are unclear or more information is needed, the development process may slow down as a result. Unclear or lacking specifications may also lead to the finished solution not being what the customer really wants.

Many interviewees also mentioned challenges regarding prioritization. While most interviewees believe that SAFe has improved stakeholder communication in general, there are still issues affecting cooperation with external stakeholders. Firstly, customers still submit development requests late causing issues with PI-planning. Secondly, as the case company is working with multiple portfolios, the customers do not always agree with the prioritization of projects especially if their request is deemed less important than another customer's request.

Challenges related to external stakeholders are not mentioned in most SAFe related studies. According to Gustavsson et al. (2022), external stakeholders, such as customers, stealing resources can be considered a threat to team autonomy. Customers may approach developers directly with unrelated tasks, disrupting projects that the team is already working on. In the past, similar ad hoc requests by customers happened regularly in the case company. However, the implementation of SAFe has helped with the issue. Furthermore, according to the interviewees, the customers are now more familiar with SAFe processes and protocols which has helped with the challenges. Also, due to the nature of the software system developed by the case company, highly detailed specifications by customers are often required.

The interviewees also discussed challenges regarding cooperation with internal stakeholders such as other development teams and release trains. Development teams and release trains often have their own priorities, meaning that it can be challenging to request help or coordinate multi-team projects. The teams and ARTs have their own priorities which must be respected and what is important for one team, might not be a high priority project for another team. Furthermore, it was stated that in the case company, cooperation is easier with certain teams and individuals. Studies conducted by Putta et al. (2018) and Gustavsson and Bergvist (2019) also mention challenges related to coordination and dependency management.

5.3 Future Research

The research data gathered for this case study indicates that SAFe provides several benefits to the organizations and the framework can be considered an efficient way to scale agile processes. The benefits which were discovered are similar to what many researchers have found when researching the topic. However, organizations adopting SAFe may still face challenges and it would be useful to conduct further research on the issues of the framework. This could possibly help both Scaled Agile, Inc. and organizations implementing the framework to address the challenges more efficiently.

As the research data is based on the experiences of people working in the same company, it would be beneficial to conduct a multiple case study on the topic. Furthermore, the study focuses on SAFe in the context of IT industry and as the framework is used in other industries

as well, it would be interesting to see whether the benefits and challenges are different in the industries other than IT.

6. CONCLUSIONS

The chapter addresses the research questions and presents recommendations regarding the challenges of SAFe. The validity of the case study is also discussed.

6.1 Addressing the Research Questions

The research questions are addressed and discussed in this section. Furthermore, the recommendations regarding the second research question are presented in the next section.

RQ1: How has the implementation of SAFe improved software development in the case company?

The research results indicate that the implementation of SAFe has increased the transparency of development projects for both internal and external stakeholders and improved the predictability of project planning and scheduling. Furthermore, SAFe has increased the agility of the organization due to the more efficient prioritization process of development projects. As a result, the company can deliver customer value faster than before. The framework has also had a positive effect on large-scale project coordination and communication with customers due to improved alignment. The improvements have been enabled by efficient project prioritization and portfolio management, planning ceremonies and the introduction of SAFe roles.

The findings align with the multivocal literature study conducted by Putta et al. (2018). According to the study, the most common benefits of SAFe include transparency, alignment, quality, predictability, productivity, and improved collaboration between stakeholders. The results of the study also indicate that organizations which have implemented the framework have gained benefits related to the core values promoted by SAFe. As a conclusion it can be said that implementing SAFe provides various benefits and improves multiple processes. However, many of the benefits are like what other agile frameworks provide and there is not much empirical evidence regarding the unique benefits of the framework. (Putta et al., 2018).

RQ2: What kind of challenges has the case company faced due to SAFe and its processes?

According to the research data, the biggest SAFe related challenges are the prioritization of large-scale multi-team projects, portfolio management, customers' lack of knowledge regarding SAFe processes, value provided by SAFe ceremonies and the lack of flexibility. Another issue that the company has faced is the quality of customer development requests or epics which has affected both portfolio management and software development. This issue is directly related to the customers' lack of knowledge regarding SAFe processes. The project prioritization issues with multi-team projects have also affected the delivery of customer value and created bottlenecks in portfolio management. As a result, several projects have faced multiple delays.

Research studies such as the multivocal literature study conducted by Putta et al. (2018) have presented similar results. In some cases, SAFe is hindering agility due to its fixed increments, centralized planning and complex processes. Other challenges include the loss of iterative development and the framework focusing too much on details. Findings by Putta et al. (2018) also indicate that several organizations have struggled with PI-planning related activities and backlog management. Furthermore, the study argues that SAFe is not suitable for organizations working on multiple products. Agile Release Train related issues include managing cross-team dependencies across ARTs, integration of development teams into ARTs, and arrangement of trains for distributed teams. (Putta et al., 2018).

However, the research results indicate that the company is also facing unique challenges not discussed in previous studies such as the customer related issues and the value of SAFe ceremonies. Many studies focus on the implementation process of the framework but as the case company adopted SAFe in 2020, the responses by the interviewees emphasize the current situation more. It should also be noted that many research studies focus on the benefits of the framework while the challenges have not been as widely studied (Putta et al., 2018). According to the research data, the unique challenges are often related to the external stakeholders such as the customers and their lack of understanding regarding SAFe processes. This often leads to issues with portfolio management. The interviewees also discussed the challenges caused by SAFe ceremonies and how the ceremonies often fail to provide value to the participants. While planning related ceremonies were considered beneficial in general, the regular iteration/sprint ceremonies are often considered repetitive. SAFe has introduced several different regular

activities and ceremonies and in some cases the number of SAFe events is affecting productivity as there is less time for development tasks.

6.2 Recommendations

The main challenges are project prioritization conflicts with external and internal stakeholders, cooperation with customers and the value provided by SAFe ceremonies. The recommendations are based on the research data, and they aim to address the challenges discovered.

Cooperation with customers: The research data revealed several issues related to cooperation with customers. Most of these challenges are due to the customers not being familiar with SAFe processes. According to the interviewees, the company has already started working with these challenges and product owners and business owners are consistently communicating with customers to ensure that they are aware of SAFe processes and protocols. However, as many of the customers are also large-scale organizations with multiple departments that can submit development requests, it could be beneficial to organize SAFe presentations to customers to ensure a better understanding of the processes. Furthermore, the development request processes should be unified to ensure the quality of epics and features.

Prioritization conflicts with external and internal stakeholders: While the research data indicates that SAFe has improved cooperation between teams, there are still issues hindering the progress of projects. Large-scale development projects often involve several teams, meaning that there are dependencies between teams. The case company could create a cross-ART process to remove obstacles related to dependencies and have an even greater focus on project prioritization. ARTs and development teams investigate dependencies during PI-planning, but the process could be started even before the planning iteration. This would require portfolio management to process development requests more efficiently. However, as the client organizations become more knowledgeable regarding SAFe processes, the quality of development requests should improve, and they could be processed faster. Furthermore, development teams should have a more active role in the planning and prioritization process.

The company is also facing challenged regarding external stakeholders. The company manages several different customer portfolios but while there are multiple development teams, they are

not focused on any single portfolio. As the prioritization is causing issues especially for the smaller client organizations, the release trains and teams could be re-organized based on portfolios. However, due to the nature of the software developed by the company, it would not be recommended to re-organize every team as it could be difficult to divide the resources evenly. But to ensure that requests submitted by smaller organizations are developed and delivered in a timely fashion, there could be smaller development teams primarily focused on their portfolios. Furthermore, the product management could create new prioritization processes.

SAFe ceremonies: The case company is strictly following the recommended official SAFe protocols and has implemented most SAFe processes and ceremonies as a result. However, ceremonies can be time consuming and repetitive as they are often held regularly. As a result, the development teams have less time for development related tasks. It would be recommended to evaluate and investigate which SAFe ceremonies truly provide value and even reduce the frequency of the regularly scheduled ceremonies. PI-planning related ceremonies are considered beneficial, but the protocols are not unified, meaning that teams often hold their own pre-planning meetings. The planning process could be further unified so that each development team would follow the same planning protocols. Furthermore, the company could emphasize efficient time management more to ensure that only people involved with the discussion topics will attend the ceremony.

6.3 Ethical and Trustworthy Aspects of the Study

The validity of the research study is important in both quantitative and qualitative studies as it expresses how trustworthy the research results are. There are various methods to increase the reliability and validity of the study to ensure the quality of qualitative research. When conducting a qualitive research study, it is important to use methods which ensure that recording research data is accurate, and the researcher should aim for empirical, logical, and replicable interpretations of data to increase the reliability and validity of the study. (Thyer, 2010, 355)

Reliability: Reliability is concerned with the consistency of research findings and if the findings can be replicated. It also refers to the degree to which other researchers performing similar research would generate similar results. (Thyer, 2010, 356) Every interviewee was

provided with the same set of questions regardless of their role or team. Furthermore, to increase reliability of the research data, the interviewees were carefully selected, ensuring that the most crucial SAFe roles were covered. The researcher recorded each interview and took notes to increase the reliability of the research data. During the data collection process the researcher listened to the recordings while transcribing the interviews to ensure that the data was accurate. However, it should be noted that both the researcher and the interviewees were working in the same organization, and this may explain why there was similarity in the answers of interviewees.

Validity: At the time of the interviews, the researcher worked at the same organization as the interviewees selected for the study. The researcher started working at the organization prior to the SAFe implementation and has over three years of experience working in a SAFe organization. According to Bruce Thyer (2010, 365), prolonged engagement is a useful way to increase the validity of the study. Prolonged engagement provides researchers an opportunity to test both their own and respondents' biases and perceptions regarding the topic. Furthermore, the researcher did not give their own opinions regarding interview questions to ensure that the interviewees were not influenced by the researcher's views on the topic. (Thyer, 2010, 365)

According to Bruce Thyer (2010, 365), demonstrating emergent findings and valuable insights increases the validity of the research. Purposeful sampling method often includes first selecting a few cases and then proceeding to select additional cases to test the findings of the analyzed cases. The interview subjects should also represent different points of view on the topic. To further increase the validity of the research study, the researcher used purposeful sampling to select the interviewees. The interviewees were selected based on their experience working in a SAFe organization as well as their SAFe role and team to ensure that the interviewees were knowledgeable about the framework and that the gathered data covered various views on the topic. As the interviews were held during a three-month period, findings began emerging before the data gathering process was fully completed.

The researcher was working at the same organization as the interviewees during the data collection process and four of the interview participants were members of the same development team as the researcher. To avoid researcher bias, members from other teams were also interviewed. Furthermore, the researcher's own experiences are based on the role of the development team member, and prior to interviews the researcher was not knowledgeable

about other SAFe roles. The interview questions were conducted in a neutral way to avoid leading the interviewees to a particular conclusion and during interviews the researcher did not comment on the responses by the interviewees. During data analysis, the researcher fully transcribed all interviews and only edited the parts where the company's name was mentioned. This was done to ensure the confidentiality of the interviewees and the validity of the research data.

Data verification strategies include triangulation of sources and ensuring the honesty of participants. Utilizing triangulation of sources as a verification method means using a wide range of participants, different locations or periods of time. Furthermore, ensuring the honesty of participants can be ensured by guaranteeing confidentiality and avoiding being deceptive. (O'Gorman & MacIntosh, 2015, 89)

The research interview participants include a wide range of different participants, representing multiple SAFe roles and teams. The participants also included members with a considerable amount of experience working in a SAFe organization but also more inexperienced members. As the research method is a single case study, it was important to include a wide range of participants in order to obtain different points of view on the subject. The researcher also described the purpose of the study and the interview protocols thoroughly and guaranteed the confidentiality of the participants. During the literature review process, the researcher studied a wide range of different SAFe related studies including a comprehensive literature review by Putta et al. (2018). The studies used as source material for this thesis cover both the benefits and challenges of the framework to ensure an unbiased point of the view on the subject.

6.4 Conclusion

This study was conducted to provide more research data on the benefits and challenges of Scaled Agile Framework in the IT industry. As a conclusion it can be said that based on the research results, SAFe has provided more benefits than issues to the case company. Software development processes have seen major improvements since the implementation of SAFe and the company can deliver software solutions at a faster pace than before without sacrificing quality. The culture of transparency is another major change that has benefitted both the company and its customers. The rapid feedback cycle enables development teams to react to issues before the solution is delivered and as a result, the quality of the software has improved.

At the same time, the increased transparency has improved the coordination of large-scale projects.

However, there are challenges hindering both agility and development processes and they should be addressed to ensure that the company can deliver value to customers more efficiently in the future. Improving cooperation with both internal and external stakeholders and portfolio management as well as adjusting SAFe ceremonies could further enhance the benefits provided by the framework.

In the future, it would be interesting if researchers focused more on the challenges of SAFe as currently, most research studies primarily discuss the benefits provided by the framework. It can be challenging to find empirical research data and as scaling agile frameworks gain more popularity, exploring the topic further could provide valuable research data for organizations looking to scale their processes.

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Appendices

Appendix 1A: Interview Questions in Finnish

1. Mikä on SAFe-roolisi?
2. Kuinka kauan olet työskennellyt SAFe:n parissa?
3. Mitkä ovat oman SAFe roolisi hyödyt?
4. Mitkä ovat oman SAFe roolisi haasteet?
5. Ovatko muut ketterät viitekehitykset / menetelmät tuttuja?
6. Mitkä ovat mielestäsi SAFe:n suurimmat hyödyt?
7. Mitkä ovat mielestäsi SAFe:n suurimmat haasteet?
8. Miten SAFe on vaikuttanut työskentelyyn asiakkaiden ja muiden sidosryhmien kanssa?
9. Mitä haasteita SAFe seremonioihin liittyy?
10. Mitä hyötyä SAFe seremonioista on?
11. Miten SAFe on mielestäsi näkynyt järjestelmäkehityksessä?
12. Mitkä ovat mielestäsi SAFe dokumentaation hyödyt?
13. Mitkä ovat mielestäsi SAFe dokumentaation haitat?

Appendix 1B: Interview Questions in English

1. What is your SAFe role?
2. How long have you worked in a SAFe organization?
3. What are the benefits of your own SAFe role?
4. What kind of challenges are there regarding your own SAFe role?
5. Do you have experience with other Agile frameworks?
6. What are the benefits of SAFe?
7. What kind of the challenges are there with SAFe?
8. How has SAFe impacted cooperation with customers and other stakeholders?
9. What are the benefits of SAFe ceremonies?
10. What kind of challenges are there with SAFe ceremonies?
11. How has SAFe impacted software development?
12. What are the benefits of SAFe documentation?
13. What kind of challenges are there with SAFe documentation?

Appendix 2: Copy of the email sent to interviewees.

Hei X,

Olen tekemässä opinnäytetyötä ammattikorkeakoulu Arcadan MBA-tutkintoa varten aiheesta ”SAFe:n hyödyt ja haitat sovelluskehityksestä”. Opinnäytetyön tavoitteena on selvittää SAFe-viitekehityksen hyötyjä sekä haittoja ja tarjota kehitysehdotuksia, miten viitekehystä voisi kehittää tulevaisuudessa.

Kyseessä on laadullinen tutkimus ja pyrin haastattelemaan mahdollisimman laajasti eri SAFe-roolien edustajia, jotta työhön saadaan useita eri näkökantoja. Uskoisin, että sinulla voisi olla mielenkiintoisia näkemyksiä aiheesta, joten tiedustelisin, että olisiko sinua mahdollista haastatella opinnäytetyötä varten? Haastattelua varten olisi hyvä varata aikaa noin puoli tuntia.

Haastattelut voidaan tehdä joko toimistolla työajan jälkeen tai sitten etänä Teamsin välityksellä. Opinnäytetyöni on englanninkielinen mutta haastattelu voidaan toteuttaa myös suomeksi. Huomautan vielä, että haastattelut tullaan tallentamaan tutkimusaineiston laadun ja tarkkuuden varmistamiseksi. Haastattelutallenteet poistetaan heti kun tutkimusaineisto on saatu purettua ja litteroitua.

Työssä ei tulla mainitsemaan yrityksen nimeä eikä myöskään haastateltavien nimiä. Olet kuitenkin vapaa vastaamaan kysymyksiin omien työn kautta tulleiden kokemusten perusteella. Haastatteluiden kommentteja tullaan käyttämään itse opinnäytetyössä mutta yrityksen sekä haastateltavien nimet tullaan poistamaan lainauksista.

Vastaan mielelläni mahdollisiin kysymyksiin ja voin toimittaa sinulle haastattelukysymykset hyvissä ajoin etukäteen.

Terveisin,
Matti Järvinen