Investigating SAFe implementation in Railway Industry

A case study at Alstom DC Sweden

Bilal Ahmad
ii Ratna Yanti Kosasih

Master’s Programme in Industrial Management and Innovation

Masterprogram i industriell ledning och innovation
Abstract

Investigating SAFe implementation in Railway Industry:
A case study at Alstom DC Sweden

Bilal Ahmad and Ratna Yanti Kosasih

Organizations have always tried and pushed themselves to bring changes in how they conduct business. They do this to reach the market quickly and achieve customer satisfaction. This master thesis was conducted at a global leader transportation company, Alstom, to investigate Scaled Agile Frameworks (SAFe) adoption in their Sweden Development Centre, identifying SAFe implementation challenges in a safety-related development as a single-case study. For the thesis, two research questions were formulated to identify the implementation challenges and find their reasons. For the data collection of the thesis, semi-structured interviews, self-completion surveys, and relevant research papers were used to serve the purpose of both primary data and secondary data sources. The researchers acted as ethnographers by participating in the company’s daily events and taking notes. The analysis of the collected data was done using the triangulation approach to get reliable results. In addition, researchers also used SAFe core competency assessment to evaluate the business agility of the case organization. The analysis from the collected data resulted in five implementation challenges. The data suggested that the major challenge was insufficient training and lack of agile mindset among the team members. The case organization had invested in training and support for going through the transformation, but the agile training was interrupted in 2019. Since then, the knowledge about SAFe and the agile way of working was acquired based on learning by doing. Based on the data, the researchers concluded that lack of continuous training has resulted in the development over time of other implementation challenges like insufficient self-organization, nonoptimal team size, and lack of clarity when defining role responsibilities. The data also suggested that transparent communication between different levels may still be a challenge. The SAFe assessment that has been conducted resulted in confirm previous result that in some places complemented the identified implementation challenges.

Key Words:
Preface

In 2021 after spending two wonderful years at Uppsala University as master students, we decided to take our master thesis with an external organization and study their way of working. Things turn out well by contacting Alstom’s employee, Alessandro Bartolini. He showed interest in studying their SAFe implementation that was done in 2017.

We want to thank Alstom for allowing us to conduct this thesis at their company. Without the help and support of our company’s supervisor Alessandro Bartolini, it could not have been possible for us to conduct our thesis at Alstom.

We contacted assistant professor Tomas Gustavsson to guide us through this research and become our subject readers. His experience in the current research field and academia has brought enlightenment to our thesis as he has studied and done research in large-scale agile software development projects at different companies.

The two authors have done the research together and wrote the thesis by iterative rewriting of each other’s text. During the research, the collection of data, literature analysis, and data analysis was done together. It was a wonderful six-month experience of doing research and writing a thesis together where we have learned a lot from each other and shared knowledge.

We would also like to thank Release Train Engineer, all the Scrum masters, Product owners, Department managers, and team members that have shown full support and interest in our thesis. We thank them for giving us their valuable time during interviews and surveys.

We also want to thank our colleagues at the university that have provided us valuable input during different seminars.

Lastly and most importantly, we would like to thank our families that have been supportive during our studies and thesis.
Table of Content

1 Introduction ......................................................................................................................... 8
  1.1 Background .................................................................................................................. 8
  1.2 Problem definition ........................................................................................................ 9
  1.3 Purpose and research questions ................................................................................. 11
  1.4 Project delimitations ................................................................................................. 11

2 Literature review ................................................................................................................. 12
  2.1 Traditional Organizational Management: ................................................................. 12
    2.1.1 Organizational Structure .................................................................................. 12
    2.1.2 Product Development ...................................................................................... 12
    2.1.3 Learning Culture ............................................................................................. 13
    2.1.4 Metrics: ............................................................................................................ 14
  2.2 Agile Management: ...................................................................................................... 14
    2.2.1 Scaling Agile Methods: .................................................................................... 15
  2.3 Scaled Agile Framework (SAFe): ............................................................................... 16
    2.3.1 SAFe Roles: ....................................................................................................... 18
    2.3.2 SAFe Overview: ............................................................................................... 18
    2.3.3 SAFe Critics: ..................................................................................................... 26

3 Methods ..................................................................................................................................... 27
  3.1 Research Strategy: ...................................................................................................... 27
  3.2 Research Approach ..................................................................................................... 27
  3.3 Research Design ......................................................................................................... 28
  3.4 Case Organization: .................................................................................................... 29
  3.5 Sampling: .................................................................................................................... 30
  3.6 Data Collection: ........................................................................................................... 31
    3.6.1 Primary Data: ..................................................................................................... 31
    3.6.2 Secondary Data: ................................................................................................ 33
  3.7 Data Analysis: ............................................................................................................. 34
    3.7.1 Phase 1: ............................................................................................................. 34
    3.7.2 Phase 2: ............................................................................................................. 35
  3.8 Quality of Scientific Research: .................................................................................... 36
    3.8.1 Trustworthiness: ............................................................................................... 37
  3.9 Methodological Limitation ......................................................................................... 38
  3.10 Ethical Consideration: ............................................................................................... 38

4 Empirics and Analysis ............................................................................................................ 39
  4.1 Business Agility of case organization: ......................................................................... 39
  4.2 Identified Implementation Challenges: ......................................................................... 42
    4.2.1 Lack of Interaction and Communication: ......................................................... 42
    4.2.2 Insufficient Trainings and Cross-functional competencies: .............................. 44
    4.2.3 Nonoptimal team size: ...................................................................................... 45
    4.2.4 Lack of Role Clarity: ......................................................................................... 46
List of Figures

Figure 1. Decision Making Chart Traditional vs Agile .................................................. 15
Figure 2. Full SAFe 5.1 configuration ........................................................................... 17
Figure 3. SAFe Overview .............................................................................................. 19
Figure 4. Cross functional teams & roles ....................................................................... 20
Figure 5. Westrum's Organizational culture model ......................................................... 24
Figure 6. Radar chart - Team members ........................................................................ 40
Figure 7. Continuous Learning Culture - Assessment Result ........................................ 42
List of Tables

Table 1. SAFe roles .......................................................................................................................... 18
Table 2. Team participation............................................................................................................. 30
Table 3. List of interviewees ......................................................................................................... 31
Table 4. Phase 2 groups ................................................................................................................. 33
Table 5. Used articles .................................................................................................................... 34
Table 6. Self-Assessment - Core Competencies and Dimensions.................................................. 36
Table 7. SAFe core competency rating - Team members ............................................................... 39
Table 8. Manager, SM, PO, and RTE - Assessment result ............................................................. 41
1 Introduction

This chapter is the starting point of the thesis. The research first starts with a brief background of the topic to let readers familiarize themselves with it. The background is followed by the problem definition chapter. Here the researchers have discussed the topic and the problems that motivated researchers to conduct the research study. Next, the aim and purpose of this research study, along with the listed research questions, are put forward for the readers. The chapter ends with a brief discussion about the project delimitations.

1.1 Background

Organizations have always tried and pushed themselves to bring changes in how they conduct business. They do this to reach the market quickly and achieve customer satisfaction. Over the years, various methods have been introduced to guide organizational changes and improve their processes. The prominent method or concept that gathered worldwide attention was Lean, which is defined as a philosophy focused on reducing the time from customer order to delivery by eliminating sources of waste in the production flow (Liker, 1997). This concept is associated with the Toyota Production System (TPS). Although the Lean concept is associated with manufacturing industries, the principle of Lean can be applied to different industries. In software engineering, the software development has been done using various methods like Waterfall, Rapid Application Prototype, Spiral, Rational Unified, and V-model (Kumar & Bhatia, 2014). These software development methods were based on sequential development, where each phase is dependent on the previous stage. The sequential way of development was considered good until the market trend changed a decade ago. Organizations are now competing in a changed marketplace altogether, in an environment characterized by short product lifecycles, where they strive for small windows of opportunities that remain open for a short time (Millson et al., 1992). This changed marketplace demanded new methods that can enable organizations to meet the market trend.

In this environment the Agile method was taking shape. “Organizational anarchists”, a group of 17 developers met in Snowbird, Utah, in 2001 to share their ideas for the one complete method (Rigby et al., 2016). They were an advocate of various lightweight frameworks of iterative development (where all stages in development occur in parallel in contrast to sequential), including Extreme Programming (XP), Adaptive software development (ASD), and others (Ibid). The group settled for a name for the method, Agile (Ibid, p. 3). They developed 12 operating principles which they named: “Principles behind the Agile manifesto”, and in 2001 all development frameworks that were aligned with these 12 principles were known as Agile techniques (Ibid, p. 3). Organizations started to adopt this way of working. According to MacCormack et al. (2003), the Waterfall model (sequentially doing one phase of development at a time) does not work well when the market or technology advances faster than the project can respond. In those cases where speed is essential, the agile approach provides a more flexible means of responding to change.

Organizations that are adopting agile may believe that implementing the Agile framework is quite a straightforward goal to achieve and that they can easily implement all steps that will lead them successfully towards agility; the truth is that it may not be so trivial as companies need are unique. They are unique in their processes, products, or services, who their customers
are, and many other factors. Companies may use different frameworks to scale agile, like Scaled Agile Framework (SAFe), Disciplined Agile Delivery (DAD), Large-Scale Scrum (LeSS) (Larman & Vodde, 2010). Implementation and adoption of agile can be done in different ways. For this purpose, organizational needs and the choice of a specific scaling agile framework should be clear when setting up an agile transformation or simply working based on Agile principles.

SAFe can scale at different levels: Essential level, Program level, large solution level, and Portfolio level. (Leffingwell, 2007). Since the case organization have implemented SAFe on essential level, this is the level of analysis for this study.

The case organization has transformed to SAFe from the traditional waterfall model three years ago. Like other big companies, Alstom faced and is still facing implementation challenges to completely meet the expectation of the framework they have chosen. For the thesis, the researchers are expected first to observe the company's ongoing processes, participate in sessions, understand daily routines and processes, and then filter all the observations through the SAFe. The company's goal is to identify the gaps in the processes, enlightening existing deviations from the SAFe framework that create implementation and execution challenges for them.

Through our research, we investigate the implementation challenges and provide analysis and possible recommendations for the identified deviations with respect to the SAFe framework. Whether this research is targeting specifically one company, Alstom pending question marks on their implementation as applicable to most organizations are considered. The deviations that will be identified in the scope of this thesis will represent common pitfalls that companies might face while implementing Agile methods. Conclusions out of our research will be a fruitful addition to the academic literature and useful to support other real case applications on top of being beneficial for the company that will be involved directly in this study.

1.2 Problem definition

Organizations are continuously evolving with their products and solutions due to an increase in demand and changing customer requirements. This changing requirement and increase in customer demand have pushed companies to increase the speed of their product lifecycle more than ever (Calantone & Benedetto, 2000). Companies are more focusing on quick product release and reaching the market quickly with innovative solutions. Rapid changes happening in terms of competitor threat, stakeholder’s preferences and choices, technology, and time-to-market has made the old way of prespecifying project requirements obsolete and irrelevant (Deepti & Alok, 2011). This has changed the scope of project and program management in product development. Organizations must take one step back, go through their organizational strategies and organizational structure and come up with ways to handle the small and large projects. This is where the term scalability was introduced.

The term scalability in the context of software engineering is the property of either reducing or increasing the scope of the method, process, and management according to the problem size (Ibid, p. 106). This art of scaling is difficult for companies that are using stiff processes. Organizations have been using traditional way of project management for very long. Everything
needed to be planned with fixed deadlines and resources, making the whole system stiff and non-adaptative. With the time, various methods introduced to provide flexibility and adaptability to adjust changing customer needs. One of this method was the Agile methodology.

Since its introduction in 2001 to the industries (Rigby et al., 2016) Agile methodology has gained popularity worldwide (Manen & Vliet, 2014) as many companies have adopted agile. Larger companies like Spotify and Netflix were born with agile and have grown since then, and companies like Amazon and other have made transition from traditional hierarchically structure organizational forms to more become agile enterprise (Rigby et al., 2018). The reason based on which companies have adopted this methodology and new companies are rising with built-in agile mindset and practices lies in its characteristics, as it mainly focuses on continuous readiness to rapidly realize change, pro-actively or reactively occurring of changes, and learning from changes while contributing to customer value (Manen & Vliet, 2014). Also, it promises to effectively cope with changing requirements, shorter time-to-market, faster releases, and improved product lifecycle (Cockburn, 2001).

Apart from its benefits and its growth worldwide, it has faced many challenges one of which is agile fits to only project done at small scale and cannot be applied at large scale, as it was designed for small and collected projects (Boehm & Turner, 2005). Scaling Agile methods is not easy as big firms bearing large projects are often distributed globally with large number of teams that need coordination and collaboration (Paasivaara, 2017). There is very less work done so far in scaling of Agile methodology (Ibid, p. 36). Various methods have been introduced so far to scale Agile methods, for instance (Ibid; Larman & Vodde (2010); Leffingwell, (2007); Ambler & Lines, (2012)) Large-Scale Scrum (LeSS), the Scaled Agile Framework (SAFe), and Disciplined Agile Delivery (DAD). There is a lack of independent empirical studies done on not only how these Scaling frameworks worked in practice, but also what kind of deviations and challenges did companies faced while adopting and using these scaling methods, and how they came over it (Dikert et al., 2016).

There were few studies done on the adoption of SAFe in different companies where researcher tried to find out the challenges or improvements after adopting SAFe, still there is a need to investigate this topic further on different use-cases/companies. The reason behind it is that SAFe is relatively new and there are not so many companies that have adopted SAFe at all levels. This lack of maturity of SAFe adoption in different companies have put limitations to the researcher to study the phenomenon and implications in detail. Despite the studies that have been done already (Paasivaara, 2017) there is limited information on company’s strategy toward measure & grow, and line management fitting to the newly adopted SAFe organizational structure and other various aspects that needed to be considered while investigating the adoption of SAFe within any organization. But this is understandable as there is always limitations in terms of scope of the thesis, timeframe, access to the resources and current literature guiding toward the problem. That is why researcher and practitioners have considered this topic as one of the top research challenges that requires further attention (Reifer et al., 2003; Freudenberg & Sharp, 2010), and emerging growth of SAFe in industry and practice requires an academic attention (Turetken et al., 2016). The presence of empirical research about this topic is very limited (Ibid; Dingsøyr, 2012; Moe et al., 2016). This research gap has motivated us to investigate the topic further, regarding SAFe at large-scale companies that were either not
investigated before or were investigated with limited insights. In our research, we are aiming for exploration of implementation challenges that a company might face after adopting Agile method, especially using SAFe.

1.3 Purpose and research questions

This study aims to understand SAFe and how it is adopted at large-scale organizations, and what are the potential implementation challenges or gaps companies might face after adoption.

A part of our research will enable us to find out possible inefficiencies in the adoption of the Agile methodology. During our research, we will observe organizational processes, their approach toward SAFe and continuously comparing with SAFe and how implementation differs from the ways prescribed by SAFe. For this reason, we have developed two questions that will guide us to reach the purpose of the research. The developed research questions are:

1) What are the implementation challenges when adopting SAFe in railway manufacturing companies?

To find out the answer for this question, the researchers have used single case study, observing daily processes and the Alstom approach towards SAFe adoption at essential level. The researchers will be reflecting upon the SAFe, how it differs from company’s way of working and SAFe adoption.

2) What are the possible reasons for the identified implementation challenges?

Besides identification of implementation challenges, we will investigate possible reasons behind the implementation challenges to be able to theorize the possible solutions. This will be done based on the analysis of findings we will get for research question 1.

1.4 Project delimitations

During this thesis, the researchers have not focused on what happened before the adoption of SAFe in the company rather, the focus has been put to analyze the current situation of the SAFe adoption at case organization and making solutions and recommendations of what can be done further to improve SAFe implementation. Researchers have dig deep in SAFe to find out answers for the research questions and have not used other frameworks such as Disciplined Agile Delivery (DAD) and Large-Scale Scrum (LeSS) and other. The researchers have investigated SAFe adoption only at Essential level as the case organization at the Development Centre Sweden has applied this framework only at essential level, no Portfolio and Solution level of SAFe are considered. The research has been done based on the data provided by the case organization and relevant literature cited by researchers. Based on the data the possible recommendation has been provided. However, implementing those recommendations is outside the domain of the research study. The researchers can implement recommendations at the case organization provided the opportunity given from case organization.
2 Literature review

This chapter has been written to give the reader a brief understanding about the research topic before going deep into its investigation and findings. The chapter start with brief description of traditional way of organizational management by highlighting few aspects of traditional management. Then agile management is explained along with various methods of scaling agile methods and practices. After Agile explanation, Scaled Agile Framework (SAFe) is extensively explained by covering various aspects of SAFe.

2.1 Traditional Organizational Management

Organizations have been dealing with projects for a long time. No matter the complexity of the project or the size of the organization is, project need to be managed to deliver value for the customer. This managing of projects is termed a Project management defined by Project management Institute (2021) as the “application of knowledge, skills, tools, and techniques to project activities to meet the project requirement”. Traditionally, projects were depicted as predictable bearing well defined plan with fixed deadlines (Andersen, 2006). Traditional project management approach was focused on following detailed plan initially set at the start of project and to deliver the result within defined budget, time, and scope (DeCarlo, 2004). In this section, the few aspects of traditional project management approach are discussed.

2.1.1 Organizational Structure

Irrespective of the approach taken for project management, it involves actors that handle the project right from its initial stages to the end of it. These actors interact with each other within a structure of a formal organization defined by its management (Mullins, 2007). The organizational behavior is indeed affected by not only technology but also the organizational structure, style of leadership and system of management by which organizational processes are planned, directed, and controlled (Ibid, p. 6). The term structure bears variety of concepts as it has been atomized into component parts referred as structural dimensions bearing size, hierarchy, and administrative intensity (Dalton et al., 1980). Various methods and models have been used in organization to structure their process and control people, but all those traditional models focused on predictability, tight control, distribution of power. The oscillation between bureaucracy and task force (project-based teams or short-term teams) goes back to nineteenth century (Prusak, 1997), where organizations with high efficiency and rationalism had characteristics of bureaucracy (Gerth & Mills, 1972). This approach of controlling people and processes by the hand of few people is associated with Henri Fayol who in 1911 with Scientific Management and in 1916 with Industrial management came with a framework that focused on command and control, formation of hierarchical organizational structure and delegation of power and responsibilities among various levels of organization (Cole, 2004; Fayol, 1949).

2.1.2 Product Development

Over the years organizations have been using predictive way of software development, where each development stage is dependent on previous stage and all the stages are done in sequential manner (MacCormack et al., 2003). This style of software development relies heavily on comprehensive planning and non-adoptive ways of development as the name suggests. Teams using this style of Software Development Life Cycle (SDLC) rely on defined requirements and
design before the cycle is started resulting in a big challenge to add any changes or detail during the product development lifecycle (Mircea et al., 2013). This style of SDLC is also known as a non-adoptive style of development as it is not flexible. They are not much efficient managing changes in the requirement during the SDLC (Kumar & Bhatia, 2014). There are various methodologies for Predictive Software development including Waterfall, Rapid Application Prototype, Spiral, Rational Unified, and V-model (Kumar & Bhatia, 2014).

V-model methodology
This model is a modified form of the WaterFall model but instead for linear abstraction phases, it goes upward after the coding stage making the shape of V (Balaji & Murugaiyan, 2012). In contrast to WaterFall, there is a relationship between each phase of the model while the designing and code phase goes top to down and test and integration phase start after the coding going in upward direction (Kumar & Bhatia, 2014).

Despite the high cost of change associated with Predictive way of Software development (Bilal & Deepali, 2020), many organizations are still using a predictive way of software development and the reason can be that according to some researchers such as Mircea et al. (2013), agile is well suited for medium sized companies but not for large organizations.

2.1.3 Learning Culture
Organization tends to improve themselves to get continuous improvement to become better organization. Continuous learning culture is echoed everywhere to gain more and more knowledge to improved organizational competencies. Senge, in his book fifth discipline, popularize learning organization, which explain them as a place: “where people continually expand their capacity to create the results, they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together.” (Senge, 1990, p. 3). Ikujiro Nonaka, in the same approach, designated knowledge-creating companies as places where “inventing new knowledge is not a specialized activity…it is a way of behaving, indeed, a way of being, in which everyone is a knowledge worker.” (Nonaka & Takeuchi, 1996, p. 7). David A. Garvin on Harvard Business Review criticized their recommendation, which is too theoretical without the practical framework, and too abstract (Garvin, 1993). For instance, how the manager knows if their organization have become a learning organization? How to become a learning organization? What are the steps? At which level are the organization currently? (Ibid).

To answer above questions, managers will need a foundation to run a learning organization. The groundwork that will guide the process to become a learning organization and the progress articulates through the three M’s process (Ibid):

- Meaning of learning culture: Well-grounded definition of learning organisations.
- Management: Defined guidelines from the top management.
- Measurement: Defining tools to assess the progress made by the employee and if the level of learning has improved or not.
As (Errey and Turner, 2007) explains, managers in traditional hierarchical structured organisations were given more executive responsibilities and skills and expected to have tight control, supervise teamwork and progress, and delegate work. They were also responsible to a large extent for implementing and foresting a learning culture.

### 2.1.4 Metrics

Metrics are used to show the right information in an effective and efficient way to the right people at the right time (Kerzner 2017). Metrics are used to measure something, the big questions behind it are: What we measure? Why we measure? There are five cornerstone to be considered when speaking about metrics, according to Lebas: First is, where have we been (scorecard about the past, to build the archives that will help forecast the parameter values used in decision analysis models), second is where are we now (our current status, and to see any potential for future achievement), third is where do we want to go (to provide support to the definition of objectives and targets, and consent to the design of action plans), fourth is how are we going to get there (the measures to support the budgeting and planning activities and continuous improvement), a fifth is how will we know we get there (measure the feedback to know which is the target or objective is achieved or not) (Lebas, 1995).

Traditionally, performance management focused on evaluating employee’s performance rather than improving or giving constructive feedback. Also, managers used to conduct the evaluation once or twice in a year compared to what the latest method relies on continuous feedback and improved communication. This concept, however, has picked up pace over the last decade, and the literature is increasing at the same rate as the literature for improving management techniques is increasing (Burgess et al., 2007).

### 2.2 Agile Management

Agility in the current competitive environment is no longer a matter of choice for organizations. Fierce competition, high intensity of rivalry in uncertain condition coerces the organization to have this agility (Harraf et al., 2015). According to Jim Highsmith, “Agility is the ability to adapt and respond to change...agile organizations view change as an opportunity, not a threat”. Agility comes having agile mindset. This mindset arises in the nineties when a lot of software company tried to use new ways to solve their production problem (Gustavsson, 2019.). For this purpose, Agile introduced in February 2001 by a group of 17 people that formulated principles for guiding any software development as mentioned in the Agile Manifesto’s values and principles (Beck et al., 2001). Those values and principles basically provide guidance on how to respond to change and deal with uncertainty (AgileAlliance, 2021). Those four Agile principles are part of the Agile manifesto (original version read “working software’ other than “working project result”) as stated in (Gustavsson 2019):

- Individual and interactions over processes and tools.
- Working project result over comprehensive documentation.
- Customer collaboration over contract negotiation.
- Responding to change over following a plan.
Agile management is different from traditional management in many ways. A significant difference between agile and traditional management is the way teams are being managed. Conventional methods have a project manager that leads and manages the team and responsible for most of the decision making in the group. In contrast, in Agile “Scrum Master” role is to coach and help the team removing the impediment, helping, and supporting the team, driving the team towards a self-organized structure that can run as autonomously and efficiently. Opposite to traditional way of working, in Agile, decisions are made together with the team members, as shown in (see figure 1) (Gustavsson, 2019).

![Decision Making Chart Traditional vs Agile](image)

**Figure 1. Decision Making Chart Traditional vs Agile**

To conclude, in the Agile Management book by Tomas Gustavsson, “The main principle of agile project management relates to flexibility and ambition to continually improve the project result, as well as the way of working within the project. This is achieved through short sprints consisting of cycles in which you plan, execute, review, and then act based on conclusions drawn” (Ibid, p. 21).

### 2.2.1 Scaling Agile Methods

From the discussion, we understand the importance of using agile methodology and how it can bring value to any enterprise. The adoption rate of agile methodology is increasing (State of Agile Survey, 2016). Many companies to reach the market quickly with the feature adopt agile methodology as it promises quick time-to-market. Big companies like Google, Microsoft have adopted agile methodology as the releases and distribution of software is cheap and quick (Murphy et al., 2013). The survey conducted in Microsoft over six years resulted in an increasing trend of agile techniques from 34% in 2006 to 57% in 2012 (Ibid, p. 77). Despite the increasing adoption rate, there is a high critique over its application for only small organizations compared to large-scale organizations with many teams. This issue was discussed at the First Canadian Workshop on Scaling Agile methods held on 20-21 February 2003, where 35 concerned professionals discuss how to scale agile methods for companies with many teams bearing a high number of developers (Reifer et al., 2003). The need to augment basic agile practices that will fit large enterprise settings and provide guidance for agile methods' use and scalability is increasing (Turetken et al., 2016). Many have come up with methods to guide and provide a complete guide to scale agile in large companies. The most widely used methods are Scaled Agile Framework (SAFe), Large-Scale Scrum (LeSS), and Disciplined Agile.
Framework (DAD) (Paasivaara, 2017). According to (State of Agile Survey, 2016), SAFe is considered the most widely used framework for scaling agile methods, increasing from 19% in 2014 to 27% in 2016, lagging the Scrum of Scrum method's 72% adoption rate. The next chapter will explain about the scaling method in detail.

2.3 Scaled Agile Framework (SAFe)

This chapter provide a brief description of SAFe. This framework was developed by Scaled Agile Incorporation (SCI) that have explained this over their websites and in books written by the co-founder of SAFe. The data has been collected mainly from these resources. However, other articles relevant to SAFe in terms of both positive aspects and possible drawbacks were also used.

As per definition (Knaster & Leffingwell, 2020), SAFe is an online knowledge base for all enterprises as it bears proven base of knowledge, integrated principles, practices, and guidance that brings the power of three primary bodies of knowledge:

- **Lean**: As defined by (Liker, 1997), a philosophy focused on reducing time from customer order to delivery by eliminating sources of waste in the production flow.

- **Agile**: A methodology with high focus on people interaction, customer collaboration, continuous delivery of software and capability and flexibility to cope with changing requirements (Lindstrom & Jeffries, 2004).

- **DevOps**: A set of practices intended to reduce time between committing a change to a system and the change being placed into normal production while ensuring high quality (Bess et al., 2015). In other words, adjusting to changes at both system level and production level by maintaining quality through the whole development process.

SAFe can be scaled at various level within an enterprise (Knaster & Leffingwell, 2020):

- **Essential Level**: Can be used as such or as building block for other SAFe configuration, bearing minimal set of roles, events, and artifacts.

- **Large Solution Level**: Operates with additional roles, events, and artifacts compared to essential SAFe, as it deals with large and complex solutions developed in big industries with focus on large solution rather than portfolio governance.

- **Portfolio Level**: As the name suggest, it focuses on aligning release trains (team of agile teams) to build right things with appropriate level of investments needed to meet strategic objectives.

- **Full SAFe**: Gives a full picture of SAFe including all artifacts, roles, and competencies as shown in (see figure 2). An organization needing the scalability of SAFe at all levels can get help from full SAFe.
As explained in (SAFe, 2021) (see Figure 2) shown above includes the SAFe core values, SAFe principles, implementation roadmap, and Lean-Agile mindset at the foundation along with one of the seven core competencies Lean-Agile leadership. Rest of the six core competencies are shown on very left side of the figure. These competencies entail different roles, and process that are shown in (see Figure 2) configured at different levels (Essential, Large solution, and Portfolio). Right side of the figure is called as spanning palette as it entails different artifacts that any organization can apply as per their configuration and need. There is also an account for the Measure & Grow that gives a framework of SAFe way of performance management and assessment. In the coming chapter various roles, processes, and artifacts shown in (see Figure 2) are briefly discussed. However, the focus has been put on five core-competencies necessary for essential SAFe configuration (Refer to delimitations section of thesis).

At the Essential level which is the basic of SAFe, there are various roles, processes, and artifacts. As explained by (Hoda R, 2018), “The roles involved at essential level are Product Owner, Scrum Master, and the team. The Product Owner is responsible for maintaining the correct business perspective. The Scrum Master works with the Product Owner and facilitates the team. The team should contain seven (plus/minus two) members. Activities include sprint planning, sprint review, and scrum meetings. A sprint is usually 2 to 4 weeks of development time where a set of selected stories are worked on. The sprint review reviews the previous sprint in terms of tasks achieved, and the next sprint details are defined. The Scrum Master leads a daily 15-minute meeting where each member briefly describes their tasks and concerns”.
2.3.1 SAFe Roles

There are various roles involved in SAFe operating at various level of SAFe. Each role has its own responsibilities and dependencies on other roles. The list of roles involved in SAFe are listed in (see table 1) below using SAFe website as a reference.

<table>
<thead>
<tr>
<th>Roles</th>
<th>Description</th>
<th>SAFe Configuration Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agile Teams</td>
<td>Cross functional team (5 - 11) people.</td>
<td>x</td>
</tr>
<tr>
<td>Product owner (PO)</td>
<td>Agile Team member managing team backlog and defining stories (breakdown of features).</td>
<td>x</td>
</tr>
<tr>
<td>Scrum Master (SM)</td>
<td>Coach and Servant leader of the agile team enabling them to be self-organizers.</td>
<td>x</td>
</tr>
<tr>
<td>Release Train Engineer (RTE)</td>
<td>Same as SM, coaches’ multiple Agile teams also known as Agile Release Train (ART).</td>
<td>x</td>
</tr>
<tr>
<td>System Arch/Eng.</td>
<td>Defining &amp; communicating shared technical and architectural vision for ART.</td>
<td>x</td>
</tr>
<tr>
<td>Product Manager (PM)</td>
<td>Making sure the solution is feasible, viable, desirable, sustainable, and meet customer needs.</td>
<td>x</td>
</tr>
<tr>
<td>Business Owner (BO)</td>
<td>Small group of stakeholders having primary responsibility (business &amp; technical) of governance, compliance, and return on investment (ROI) for solution made by ART.</td>
<td>x</td>
</tr>
<tr>
<td>Solution Arch/Eng.</td>
<td>Same as system architect, deals with ART.</td>
<td>x</td>
</tr>
<tr>
<td>Solution Management</td>
<td>Same as PM, deals with ART.</td>
<td>x</td>
</tr>
<tr>
<td>Solution train Engineer (STE)</td>
<td>Same as RTE, coaches’ multiple ART called Solution Trains.</td>
<td>x</td>
</tr>
<tr>
<td>Epic Owner (EO)</td>
<td>Coordination of Portfolio Epics (customer requirements) using portfolio Kanban system.</td>
<td>x</td>
</tr>
<tr>
<td>Enterprise Architect</td>
<td>Establish technological strategy and roadmap on portfolio level.</td>
<td>x</td>
</tr>
</tbody>
</table>

*Table 1. SAFe roles*

2.3.2 SAFe Overview

As depicted in (see figure 3), SAFe overview explains the seven core competencies of a Lean-Agile enterprise where *customer centricity (explained briefly in next chapter)* remains the focal point of all the seven core competencies. We will be using only five core competencies as two
of them (Enterprise solution Delivery and Lean Portfolio management) are out of scope of our thesis.

**Figure 3. SAFe Overview**

**Team and technical agility**

Team and Technical agility are one of the core competencies, which consist of three essential dimensions: Agile team, Built-in Quality, and Team of Agile Teams. This competency is the fundamental foundation of business agility (Koehnemann, 2021). The three dimensions have been stated below:

- **Agile team**: Agile team (see figure 4) is a cross-functional group, usually consist of 5-11 individuals. In one team, they have roles with cross functional competencies so they can define, build, test, and deliver an increment of value in a certain timebox (Ibid). Agile teams have a set decision-making competency, which gives them ability to be an autonomous and self-organizing team (Hoda et al., 2013). According to SAFe, agile team have two specialty roles: Product owner (responsible for the team backlog), and Scrum Master (as the facilitator and coach for the team). To optimize the workflow, teams usually use Kanban board, to visualize and manage their working progress. Kanban board helps the teams to maximize and improve the flow, also can identify the bottlenecks. Limit work-in-process (WIP) can also be visualized in Kanban board, this limit is very important to make sure the team finish ongoing work before starting the new stories (SAFe, 2021)
Built-in Quality: To achieve business agility, the enterprise must be supported by Built-in Quality to respond to the continuous market changes. To avoid reworks and delay, every solution must have a high-quality standard. Every increment must have this quality built into the deliverables. Built-in quality is one of the SAFe core values, as mentioned in the Agile manifesto, “Continuous attention to technical excellence and good design enhance agility” (Agilemanifesto, 2001).

Team of Agile Teams: Team of Agile Teams is a collaboration of agile teams. It usually happens when the enterprise has a large scope of work and required breadth of skill and multiple agile teams. These multiple agile teams will be collaborating in the Agile Release Train (ART). Together with other stakeholders, it will incrementally develop, deliver, and operate the solutions (Koehnemann, 2021).

Agile Product Delivery

Agile Product Delivery as per (Knaster & Leffingwell, 2020) is customer-centric approach or competency of a Lean-Agile enterprise to define, build, and release a continuous flow of valuable products and services to customers and users. SAFe divides this competency into three dimensions, where each of them focuses on maintaining continuous flow of delivery while meeting users need with built-in quality. (SAFe, 2021):

Customer centricity & Design thinking: Companies are competing based on continuous innovation where the innovations must meet the demand of customer or end user (Leonard & Rayport, 1997). Therefore, the popular mantra of managers is “Get close to the customer” and “Listen to the voice of the customer” (Ibid, p. 103). Companies are motivated to develop solution for the end user need for which they work on: Focusing on customer, understanding customer’s needs, think and feel like the customer, build holistic product solutions, and create customer lifetime value (SAFe, 2021). This is also explained by (Leonard & Rayport, 1997) in same article as the technique of Empathic design that focus on observing customer in its own environment rather than doing traditional market research. Organization achieves these goals by applying Design Thinking approach which is an iterative solution development process ensuring solutions are designed by customers and user while maintaining feasibility, economic viability, and sustainability of the solution throughout its lifecycle (SAFe, 2021).
SAFe define design thinking as a three-step process that starts from understanding the problem, designing the right solution, which is then Desirable, viable, feasible, and sustainable (Knaster & Leffingwell, 2020).

- **Develop on cadence & Release on Demand:** A customer-centric enterprise need to have a continuous flow of delivering value to the customer which is done by determining the timing of when to release the product, termed as release on demand (SAFe, 2021). SAFe also define a process model for this purpose called Develop on cadence, where agile teams coordinate based on reliable series of events and activities occurring on regular schedule. These events are termed as Iterations (“basic building block of Agile performed at agile team level having fixed length timebox that deliver incremental value at the end of iteration”) and Program Increments PIs (extended timebox, set of multiple iterations performed at Program Level where multiple agile teams are coordinating together forming an Agile release Train ARTs) (SAFe, 2021).

- **DevOps & continuous delivery pipeline:** Having a customer-centric mindset and then planning accordingly are the key dimensions for enterprise but an enterprise also requires set of skills and competencies and building of continuous delivery culture within an enterprise. The third dimension of agile product delivery has taken this aspect into consideration by focusing on having DevOps mindset and creation of culture for creating automated continuous delivery pipeline. SAFe approach toward DevOps is based on CALMR approach i.e., Culture of shared responsibility, Automation of continuous delivery pipeline, Lean flow accelerate delivery, Measurement-of flow quality & value, and Recovery reduces risk & preserve value (Knaster & Leffingwell, 2020).

**Organizational Agility**

In SAFe, Organizational Agility describe how agile teams maximize their processes, develop the strategy, and quickly adapt to every change, and prepare the organization for those changes as the new opportunity (Leffingwell, 2021). In SAFe there are three dimensions of organizational agility: “Lean-Thinking People and Agile Team”, “Lean Business Operations” and “Strategy Agility” as explained below (SAFe, 2021):

- **Lean-Thinking People and Agile Team:** In the delivery business solution, everyone in the company will be involved (including legal, HR, and finance), and everyone will be embracing the mindset, principles, and practices of Lean-Agile methods (house of Lean, SAFe principles, and Agile manifesto) (Ibid).

- **Lean Business Operations:** To eliminate non-values creating activities, company focus on Operational Value Stream (OVS) (sequences activities needed to deliver solution to their customers), and Development Value Stream (DVS) (sequences activities needed to convert a business hypothesis to technology solution) (Ibid).

- **Strategy Agility:** This dimension is showing the company’s ability to apply the strategy for quickly adapt the dynamic market change (Ibid). In this
digital’s era, the speed in responding to the customers’ needs is very important, that is why companies need the agility.

Continuous Learning Culture

To survive and continue to develop, the organization must have the ability to adapt quickly by continuous learning. Learning culture defines as "a collective, dynamic system of basic assumptions, values and norms which direct the learning of people within an organization" (van Breda, 2016). Continually increase knowledge, competence, performance, and innovation is define as a value of Continuous Learning Culture (SAFe, 2021). According to Nonaka, a continuous learning culture also brings the perks of increased competitive advantage (Nonaka & Takeuchi, 1996). Any organization can focus on these three dimensions to apply continuous learning culture: Learning Organization, Relentless Improvement, and Innovation Culture:

- **Learning Organization**: It requires following disciplines required to transform to learning organization:
  - Personal Mastery - employees develop a breadth of knowledge in multiple disciplines for effective and efficient collaboration,
  - Shared Vision - Invite others to share and contribute to a standard view of the future,
  - Team Learning - Sharing knowledge, suspending assumption, and learning together,
  - Mental Models - Open mind thinking, recreate the existing assumption based on Lean-Agile mindset: complicated concepts are broken down and become easy and understandable concepts,
  - System Thinking – Thinking about the big picture to optimize the system.

- **Relentless Improvement**: Problem solving is the driver for relentless improvement, (see figure 5). The series of small iterative and incremental improvement enable the company to overcome any impediment (solving the problem) and doing the continuous improvement.
Figure 5. PDCA problem-solving cycles (SAFe, 2021)

- **Innovation culture:** The environment which support creative thinking and curiosity needed for innovation culture to keep exist. To keep improving the innovation culture, some organization spare the paid time to exploring, and experimenting the innovation. According to (SAFe, 2021) the innovation culture enabling the employee to:
  
  o Explore ideas for enhancements to existing products;
  
  o Experiment with ideas for new products;
  
  o Pursue fixes to chronic defects;
  
  o Create improvements to processes that reduce waste;
  
  o Remove impediments to productivity.

**Lean-Agile Leadership**

Another core competency for an enterprise is to have Lean-Agile leadership meaning that the top management or leader of an enterprise need to have growing mindset instead of fixed mindset. This competency describes how leaders drive maintain organizational change and operational excellence by enabling individuals and teams to reach their highest potential (SAFe, 2021). Various type of organizational change initiatives has been taken in past years (Smith, 2002). However, two software development practices, Agile software development and DevOps are the most widely adopted types of organizational change in both large and small companies (Mayner (2017); Koch (2005); and Roche (2013)). One out of this theory emerged in 1970 was Servant Leadership (Mayner, 2017). It was first put forward by (Greenleaf, 1970), that explains it as this theory related to the leaders that gain authority by gaining the trust and respect as opposed to imposing their leadership or top managers title over their subordinates. Servant leaders not only take care of their subordinates but also coach them and make sure that their followers get everything needed to get the job done (Mayner, 2017).
SAFe is based on same kind of leadership theory where scrum masters, release train engineers, and other roles act as a servant leader rather than managers controlling them. Lean-Agile Leadership core competency is explained by dividing it into three dimensions (Knaster & Leffingwell, 2020) as shown in (see figure 6):

<table>
<thead>
<tr>
<th>Pathological Power-oriented</th>
<th>Bureaucratic Role-oriented</th>
<th>Generative Performance-oriented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low cooperation</td>
<td>Modest cooperation</td>
<td>High cooperation</td>
</tr>
<tr>
<td>Messengers blamed</td>
<td>Messengers neglected</td>
<td>Messengers trained</td>
</tr>
<tr>
<td>Responsibilities shirked</td>
<td>Narrow responsibilities</td>
<td>Responsibilities shared</td>
</tr>
<tr>
<td>Collaboration discouraged</td>
<td>Collaboration tolerated</td>
<td>Collaboration encouraged</td>
</tr>
<tr>
<td>Failure leads to scapegoating</td>
<td>Failure leads to justice</td>
<td>Failure leads to improvement</td>
</tr>
<tr>
<td>Innovation crushed</td>
<td>Innovation leads to problems</td>
<td>Innovation implemented</td>
</tr>
</tbody>
</table>

*Figure 5. Westrum's Organizational culture model*

The three dimensions of Lean-Agile leadership are (see figure 7):

- **Mindset & Principles:** Mindset is a kind of mental lens or filter through which thoughts are processed. It develops by structured learning (what we learn from courses) or unstructured learning (working experience) (SAFe, 2021). Leaders that have been working with one type of way of working have developed this mindset and looking at processes from traditional perspective. It is vital for them to first evolve the fixed mindset to growth mindset by structured learning and then bringing unstructured learning by practicing the new way of working (Ibid). This means that leaders should gain knowledge of SAFe core values, and principles and then applying them and reflecting on them in their processes (Ibid). In SAFe, that is the reason why Leadership always forms the basis of the whole SAFe.

- **Leading by Example:** Leaders once developed agile mindset, need to practice the agile mindset, and set examples for others. SAFe uses Westrum’s organizational culture model to show how leaders can bring change in the organizational culture. (See figure 6) above shows the demonstration of Westrum’s model.

- **Leading by change:** Organization experience major shift with the change organizational structure. Few people embrace the change while few cannot adjust with the change. This where leaders should lead them by providing creating the environment, preparing people, and provide them necessary resources to get the desired results (SAFe, 2021). Skills leaders should have to lead the change are (Ibid):
- Change vision - Communicating the change, motivating, and engaging team members.

- Change Leadership - Influence and motivate team members by developing personal drive toward the change.

- Powerful coalition for change - Enabling team members from multiple levels and across silos are empowered and have ability to lead the change.

- Psychological safety - Promote the risk-taking culture, where team members can bring change without fearing about the consequences like self-image or career.

- Training new way of working: Making sure everyone gets basic Lean-agile training.

**Figure 7. Lean-Agile Leadership dimensions**

**Measure & Grow**

Measure & Grow is a term used in SAFe to describe how a portfolio evaluates its performance and progress towards business agility and determining further improvement steps (Knaster & Leffingwell, 2020). In SAFe, it is by assessing business agility of an organization evaluating composition and maturity of SAFe core competencies that it is possible to understand how an organization is embracing SAFe.
The assessment is done by distributing defined questions for each dimension and core competencies among all the employees. Each question is answered by giving a rating. Once, the data is collected, it is further discussed among team members in interactive sessions that results in accumulated rating for each dimension and for each competency. The rating each competency gets, visualize the areas for organizations where they have improved and where they still need to improve.

Those tasks are often taken care by SAFe assigns SPCs (SAFe Program consultants) that are experienced in SAFe and have extended knowledge of LEAN, Agile, and DevOps principles (SAFe, 2021). SAFe suggests two patterns for SPCs to go for this process, either: participants fill the assessment solely and then discuss the results in group with others, or all participants discuss each statement together and then rate each statement together (Ibid). It is the SPC who can decide in the end which pattern fits to the organizational dynamics.

2.3.3 SAFe Critics

SAFe was introduced in 2011. Since then, many companies have adopted the framework and published their experience as a technical report or white paper (Turetken et al., 2016). The report outlined several improvements such as Higher ROI, faster time to market (20-30%), better alignment with customer needs, and higher productivity (20-50%). Nevertheless, SAFe has been criticized by practitioners and researchers. The criticism is about the SAFe being too strict and too formal (Gustavsson, 2019). The activity in SAFe are explained and recommended in detail, which may cause the possible risk of limiting the autonomous team, which could negatively impact team works and team performances (Ibid, p. 6). Moe also argues that too much detailed recommendations may lead to have teams that might be less spontaneous, less flexible, and less self-organized (Moe et al., 2018). Furthermore, too detailed recommendation contradicts with the Agile Manifesto, “Individual and Interactions over Processes and Tools”. According to (Schwaber, 2013), “keep the values, keep the principles, think for yourself. A core premise of agile is that the people doing the work are the people who can best figure out how to do it. The job of management is to do anything to help them do so, not suffocate them with SAFe”.

There is another criticism regarding the scalability of agile. “The difficulty of adopting agile practices increase when there is a need to scale these practice” (related to the different dynamic and social consideration between large and small project (Turetken et al., 2016). However, since this area is still new, the studies about SAFe adoption in the academic literature still limited (Ibid, p. 15).
3 Methods

This chapter is an important part of the thesis, where researchers have described their approached towards the thesis. This chapter is divided into subchapters. Initially the first three subchapters explain "why" and "how" the authors choose the research strategy and research approach. In the next subchapter there is a discussion regarding research design as which framework was chosen to collect the data and the analysis of it. To be able to answer research questions properly, it is necessary to choose suitable methods that are academically proven, and which can guide the researcher toward reaching the aim and purpose of the thesis.

3.1 Research Strategy

To conduct the research, there are two common methods: Qualitative research and Quantitative research. Qualitative research usually focuses on non-numerical data, while quantitative research involves numerical data. Each design has its pros and cons. For instance, quantitative research design uses historical data, thus requiring less data collection and providing fast interpretation using statistical methods. However, it is not flexible and do not fit for understanding the processes. Qualitative research strategy can provide a better understanding of processes and people's opinion. The drawbacks are in its data collection, which requires more time and effort and involves complexity while analyzing the collected data (Bryman & Bell, 2015).

In our research study, both qualitative and quantitative research methods and techniques have been used. However, focus will be on using qualitative research methods and have qualitative results. Quantitative research methods are used to support quantitative methods and results. Semi-structured interviews, open-ended questionnaires have been collected and analyzed using qualitative research methods. Apart from semi-structured interviews and open-ended questions, surveys were used with the intent to have quantifiable results and data that has assisted qualitative findings. Main data collection methods have been semi-structured interviews, questionnaires (both open-ended and close-ended questions), and surveys (quantifiable questions). These sources acted as a primary source of data, while our secondary sources of data were company’s process documents, SAFe books, website, and other relevant research articles.

3.2 Research Approach

Research problem starts with first understanding its existence and reality. Does the problem really exist? What is the nature of the problem? This is defined as ontology – a philosophy of nature of being, existence, or reality (Bryman & Bell, 2015). This ontology can have different nature or reality of it. It can be either objectivist (outside or external to the social actors’ perceptions) or constructivist (something being developed or interpreted by people in their own way) (Ibid). Epistemology – a philosophy of theory of knowledge, meaning how can we reach the knowledge of assumed reality (Ibid). When questions existence of something, we ask ontological questions trying to understand the reality or existence of something. When we try to find ways to get the knowledge of something existing, we ask epistemological questions.
The ontology of our research is connected to constructionism, where we are more interested to understand people behavior, observe the differences in behavior of doing work, and detail discussion with people at organization making us interpretivist. It is connected to constructionism and understanding people behavior with no external reality as opposed to positivism that is related to objectivism. To reach the knowledge of the assumed reality one must formulate their research approach.

According to (Bryman & Bell, 2015), there are three primary research approach, as describes below:

- **Inductive approach**: That talks about developing a theory by observation. Observe the pattern and develop a theory. This approach mostly relies on qualitative analysis and collection of data.

- **Deductive approach**: In contrast to Inductive, it starts with testing an existing theory. Start with an existing theory, then formulation of hypothesis, testing of hypothesis, and then finally analysis of the result (either accept or reject the hypothesis). Usually use quantitative research.

- **Abductive approach**: This approach is the combination of the former two approaches. However, it was developed as answer to the limitations of induction and deduction approaches.

Since our thesis aim is to get a better understanding of SAFe adoption in the company and investigating implementation challenges while adopting SAFe, we will combine the theory with the observed data to find the answer for listed research questions.

The best approach to do this is the inductive approach as it fulfil our purpose of research. Participating in daily company’s processes, observing companies’ approach towards SAFe way of working and relating the observations with SAFe as it will enable us to answer our listed research questions and come up with good empirical finding that can be later proved to be a valuable addition in the literature.

### 3.3 Research Design

Research design is a framework we used to conduct the research. It gives guidance on how to collect and analyze the data. There are five primary research design: experimental, cross-sectional, longitudinal, case study, and comparative research design (Bryman & Bell, 2015). In this thesis, the researchers will conduct a case study in a single organization. A case study research is concerned with the complexity and particular nature of the case in question (Stake, 1995). Although a case study is usually associated with a qualitative method, it can also use quantitative methods or even a mix of research methods. Quantitative research design includes survey research on a single case to identify its nature and its important features. (Bell & Brymann, 2015). For qualitative research: Ethnography-participant observation (collected the data by attending daily work in the company and open about the research (Overt methods), Qualitative interviewing, focus group, Language-based approach to the collection of qualitative data, and the collection and qualitative analysis of texts and documents are used (Ibid). For our thesis, four research strategies are used:
• **Ethnography (participant observation):** To participate in a group, simply observe, listen, take notes, and analyze the interaction within a group, to understand what is going on in a group, and to have a better understanding about a practice doing in the group (Ibid).

• **Qualitative Interviewing:** In this thesis, we have used semi-structured interview. The question builds as a guide to cover specific topics. The interviews are usually audio-recorded and transcribed later for analysis purpose (Ibid)

• **The collection and qualitative analysis of texts and documents:** We have used the company’s official documentation regarding the company’s processes in agile way of working and public documentation related to our thesis (Ibid).

• **Surveys:** The data is collected mostly by questionnaires or by structured interviews on multiple occasions at a single point in time resulting in quantifiable data (ibid).

### 3.4 Case Organization

The researchers have considered this thesis as a case study in a product development group at the Development Centre Sweden Alstom. The case organization adopted SAFe since June 2017. One of the reasons, why they transform from Waterfall to Agile was to put structure in a complex and big product development. As we know, Waterfall works sequentially rather incrementally (Kumar & Bhatia, 2014). When the developer finishes with the code, the code moves on to the next stage with green light indicator and the process continuous till it reaches the final stage which is testing stage. In the given case organization, the same way of working was in use before the agile transformation. Waterfall lost its predictability, when problem happened where testing team find the issues over the code (indicating red light). This condition raises the need of going back to the initial stage, where the team was working on new code. In contrast, Agile development starts with the red light (the problem), iterate in small chunks of requirements, fixes the problem gradually in iterations, and finally requirements are finished, pass all the testing (green light), and move to the next stage. All the development phases in Agile are working in parallel with short feedback cycles in contrast to Waterfall that bears long feedback cycles. This situation along with other factors motivated the company to move from Waterfall to Agile methodology.

After deciding on Agile transformation, the next step was to select a scaling agile method. Since, SAFe is highly adopted scaling method compared to others, the case organization choose SAFe to scale agile methods and practices. They have been working in SAFe for three years and now they are trying to assess how well they adopted SAFe to identify remaining impediments they need to work on to reach better productivity, quality, and performances. As most companies also Alstom in interested in doing gap analysis to assess the company’s current state by comparing current state condition with expected (potential) condition, so the company could see how far the company went and what can they do to be better (Weller, 2018).

The researchers approached them for working in this project as it will be beneficial for both the development group and the researchers to carry on the investigation and bring valuable addition to the topic. As mentioned above, in this thesis, investigation of SAFe adoption is done in the company at essential level only. The researchers will be working under ETCS (European Train
Control System) application department. The department consists of 12 cross-functional teams which have been running in one Release Train (RT) facilitated by a dedicated Release Train Engineer (RTE) (explained in literature chapter). They are working in sprints of 2 weeks, building up in ten weeks Program Increment (PI). At the end of each PI, they deliver additional value, but they target to be able to deliver it at the end of each sprint in the near future.

3.5 Sampling

As the research is based on single case study, the sample population for the research was case organization (Alstom). The sample was chosen from one of the case organization’s department in charge of complex safety related requirement driven development, that had further four sub-departments. Each sub-department had more than 2 agile teams at least, that has SM, PO, and team members. For the observation and participation in daily events, only one sub-department was sampled that included four teams as shown in (see table 2).

<table>
<thead>
<tr>
<th>Teams</th>
<th>Duration of participation</th>
<th>Involved activities</th>
<th>Sub-Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team A</td>
<td>(1st Feb 2021 – 12th Feb 2021)</td>
<td>Daily stand-up, Sprint planning, &amp; Retrospective</td>
<td></td>
</tr>
<tr>
<td>Team B</td>
<td>(16th Feb 2021 – 26th Feb 2021)</td>
<td>Daily stand-up, Sprint planning, &amp; Retrospective</td>
<td></td>
</tr>
<tr>
<td>Team C</td>
<td>(2nd March 2021 – 12th March 2021)</td>
<td>Daily stand-up, Sprint planning, &amp; Retrospective</td>
<td></td>
</tr>
<tr>
<td>Team D</td>
<td>(16th March 2021 – 26th March 2021)</td>
<td>Daily stand-up, Sprint planning, &amp; Retrospective</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Team participation

Whole Execution department was sampled for interviews, and surveys. For semi-structured interviews, twenty people (20) were sampled as shown in (see table 3). For the research, purposive sampling method was used by going through maximum variation approach. Maximum variation sampling was used to get variety of perspectives regarding the research topic. As shown in (see table 3), we have interviewed different roles with each role having high number of people to get maximum perspective of each role. The research topic is also in line with typical purposive sampling approach that exemplifies the interesting or common dimensions of the research topic. For the SAFe assessment survey, we targeted two groups. One consisted of twenty (20) important roles including SM, PO, RTE, and DM, and fifty (50) team members.
<table>
<thead>
<tr>
<th>Name</th>
<th>Roles</th>
<th>Experience (Years)</th>
<th>Interview Date</th>
<th>Interview Duration</th>
<th>Method of Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviewee 1</td>
<td>Scrum Master</td>
<td>3,7</td>
<td>1st April 2021</td>
<td>28.12</td>
<td>Video Conference</td>
</tr>
<tr>
<td>Interviewee 2</td>
<td>Scrum Master</td>
<td>5</td>
<td>19th April 2021</td>
<td>35.40</td>
<td></td>
</tr>
<tr>
<td>Interviewee 3</td>
<td>Scrum Master</td>
<td>3,5</td>
<td>31st March 2021</td>
<td>37.10</td>
<td></td>
</tr>
<tr>
<td>Interviewee 4</td>
<td>Scrum Master</td>
<td>2</td>
<td>31st March 2021</td>
<td>30.37</td>
<td></td>
</tr>
<tr>
<td>Interviewee 5</td>
<td>Scrum Master</td>
<td>3,7</td>
<td>31st March 2021</td>
<td>35.16</td>
<td></td>
</tr>
<tr>
<td>Interviewee 6</td>
<td>Scrum Master</td>
<td>1</td>
<td>14th April 2021</td>
<td>33.09</td>
<td></td>
</tr>
<tr>
<td>Interviewee 7</td>
<td>Scrum Master</td>
<td>3,7</td>
<td>21st April 2021</td>
<td>35.17</td>
<td></td>
</tr>
<tr>
<td>Interviewee 8</td>
<td>Scrum Master</td>
<td>3,7</td>
<td>15th April 2021</td>
<td>38.16</td>
<td></td>
</tr>
<tr>
<td>Interviewee 9</td>
<td>Product Owner</td>
<td>1,5</td>
<td>16th April 2021</td>
<td>27.12</td>
<td></td>
</tr>
<tr>
<td>Interviewee 10</td>
<td>Product Owner</td>
<td>3</td>
<td>15th April 2021</td>
<td>29.34</td>
<td></td>
</tr>
<tr>
<td>Interviewee 11</td>
<td>Product Owner</td>
<td>3</td>
<td>16th April 2021</td>
<td>30.55</td>
<td></td>
</tr>
<tr>
<td>Interviewee 12</td>
<td>Product Owner</td>
<td>3</td>
<td>20th April 2021</td>
<td>31.08</td>
<td></td>
</tr>
<tr>
<td>Interviewee 13</td>
<td>Product Owner</td>
<td>2,5</td>
<td>14th April 2021</td>
<td>25.12</td>
<td></td>
</tr>
<tr>
<td>Interviewee 14</td>
<td>Product Owner</td>
<td>1,5</td>
<td>12th April 2021</td>
<td>31.45</td>
<td></td>
</tr>
<tr>
<td>Interviewee 15</td>
<td>Product Owner</td>
<td>2</td>
<td>19th April 2021</td>
<td>33.10</td>
<td></td>
</tr>
<tr>
<td>Interviewee 16</td>
<td>Dept. Manager</td>
<td>3</td>
<td>20th April 2021</td>
<td>30.34</td>
<td></td>
</tr>
<tr>
<td>Interviewee 17</td>
<td>Dept. Manager</td>
<td>3</td>
<td>12th April 2021</td>
<td>40.06</td>
<td></td>
</tr>
<tr>
<td>Interviewee 18</td>
<td>Dept. Manager</td>
<td>3</td>
<td>20th April 2021</td>
<td>31.07</td>
<td></td>
</tr>
<tr>
<td>Interviewee 19</td>
<td>Dept. Manager</td>
<td>3</td>
<td>20th April 2021</td>
<td>29.45</td>
<td></td>
</tr>
<tr>
<td>Interviewee 20</td>
<td>Release Train Engineer</td>
<td>3 months</td>
<td>19th April 2021</td>
<td>37.23</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. List of interviewees

3.6 Data Collection

Data collection is an integral part of any research project (Bryman & Bell, 2015), as it helps researchers to understand the topic in detail before coming up with results. For this thesis, we have used various sources to understand the problem in detail. We have used both qualitative and quantitative approaches of data collection and decided our approach in two phases. We can discuss about our data collection approach by dividing it into categories:

3.6.1 Primary Data

Data collected for a particular research problem by using procedures that matches to the research problem (Hox & Boeije, 2005). These data are not available, and researchers must gather them themselves. For our thesis, we also used several procedures to gather data for our research. We gathered primary data including semi-structured interviews, questionnaires, and surveys. However, the main research method was qualitative involving semi-structured interviews and open-ended questionnaires.
**Ethnography**

The researchers have participated in different events at company like PI planning, Scrum of Scums (SoS), and spent two weeks with each team. During the shadow sessions with each team, researchers participated in their daily stand ups, sprint planning, and retrospective sessions as observers. The number of teams observed is shown in (see table 2) in previous section.

The observations and notes taken by participating in these four teams and company’s events are used in the analysis and forming themes. It has served as one of the sources of triangulating towards our final analysis and improve the reliability of our analysis.

**Phase 1**

In phase 1, we used qualitative data collection approach as it included semi-structured interviews and self-completion questionnaires (survey). For interviews, we have approached Scrum Masters (SM), Product Owners (PO), Release Train Engineers (RTE), Department Managers, and Team Leaders. We conducted 30 to 60 minutes interviews using online video conferencing tools with each role (see table 3), where the discussion was open ended. The interviews were recorded to be transcribed later for the analysis purpose. The interviewees were informed about the recording and the intent of it, to avoid any ethical implications. In the interview, the interviewees were asked to highlight about their role, what were the main challenges in terms of their way of working they faced while in the role, and what is their general understanding about the role. These questions were common for all the roles mentioned above. However, we added few questions relevant to the respective role. For instance, SMs were asked to highlight about how they coach the team members, what were the improvements in terms of agile way of working did they brought in the team and if the organization encourage them to create continuous learning culture for the employees.

Apart from the interviews, we also prepared questionnaire with the intent to reach team members of each agile team. Google Form was used as the main platform for the questionnaires. Total 21 questions were compiled consisting of both descriptive questions and scaling questions. The questionnaires were divided in two sections: section 1 targeting the agile understanding, and section 2 related more to respondents’ background. Agile section was put first before respondents’ background on purpose so that employees could spend some more time on them and fill in the right answer. The questionnaires were distributed among team members using the help of SMs of each agile team.

**Phase 2**

Phase 2 was done using quantitative data collection approach as it involved quantifiable, structured questions. This phase was done with the intent to assess the core competencies of SAFe within case organization and identify areas where the development group was lacking in terms of SAFe competencies. For this purpose, the survey documents that were available at SAFe website were used with little modifications. Each competency including Team & technical agility, Agile product delivery, Continuous learning culture, Lean-agile leadership, and Organizational agility was assessed individually by compiling questions for each dimension of each core competency.
The phase 2 was conducted after phase 1. This time, the target sample included all the leadership roles and team members of each agile team making them two separated groups. Google forms were used as a platform for this phase. The researchers used survey documents that were in line with the scope of the research. We used the following survey documents from SAFe website (SAFe, 2021).

<table>
<thead>
<tr>
<th>Core competencies</th>
<th>Managers, PM, PO, RTE</th>
<th>Team members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team and Technical Agility self-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>assessment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Learning Culture self-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>assessment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agile Product Delivery self-</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>assessment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organizational Agility self-</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>assessment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lean Agile Leadership self-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>assessment.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Phase 2 groups

The surveys were sent to both groups using emails. For team members, the researcher used the help of SM to reach team members. To avoid any misunderstanding of the questions or the terms used in those questions, we provided a dedicated guide with each survey. The questions were answered using five scaling options with five being the True and one being False. (See Figure 8) show the illustration of the questions format.

Figure 8. Phase-2 format

3.6.2 Secondary Data

Every time the researchers gather data, it is added to the existing knowledge basis of subject that is made available for re-use by future researchers which then use it as secondary data (Hox & Boeije, 2005). In this thesis project, we use two sources of secondary data:
• **Company’s process documentation**
  The company provided us their process documents which helped us to understand company’s way of working, various roles, and their description of SAFe. The process file included description of company’s processes, different standards, frameworks including SAFe, and description of various roles and their responsibilities. The document also had an account for the justification of their processes and roles with respect to SAFe. The researchers used this secondary data as a guidance to understand the company’s way of working and their implementation of SAFe within their daily process. The knowledge from the company’s process document assisted researchers during participation in various events (PI planning, Daily stand-ups, others) and understanding the responsibilities of each role within the company.

• **Literature**
  SAFe core competencies as explained in their website were used as a main source to study company’s process documents and their way of working. Apart from company’s process document, SAFe website, books written by SAFe co-founders like SAFe Distilled 5.0, and relevant articles that researched SAFe adoption at different companies. Few of the articles used widely are mentioned in (see table 5)

<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gustavsson, Tomas, 2020.</td>
<td>Inter-team Coordination in Large-Scale Agile Software Development Projects.</td>
</tr>
<tr>
<td>Maria Paasivaara, 2017</td>
<td>Adopting SAFe to Scale Agile in a globally distributed organization</td>
</tr>
</tbody>
</table>

*Table 5. Used articles*

**3.7 Data Analysis**

This chapter explains our approach toward the analysis of collected data.

**3.7.1 Phase 1**

In this section we will explain how we analyzed the collected data from phase 1 using tools and methods. As phase 1 involved qualitative data collection approach, so we used one of qualitative data analysis method using Thematic analysis.

**Thematic Analysis**

Thematic analysis is often poorly distinguished and acknowledge, but widely used qualitative analytic method (Roulston, 2001). It provides core skills that is useful for conducting many forms of qualitative analysis (Braun & Clarke, 2006). Thematic analysis is flexible analytic approach (Ibid, p. 78). This method as mentioned is widely used but lack a clear agreement about how to go for it (Ibid, p. 79). (Braun & Clarke, 2006) in their paper, tried to provide a path for conducting thematic analysis by dividing it into six phases as shown in (see figure 9)
Phase 1 starts with understanding your data, and then next phase generating codes, then searching for themes, reviewing themes, defining & naming themes and then producing the report in phase 6.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description of the process</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Familiarizing yourself with your data:</td>
<td>Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.</td>
</tr>
<tr>
<td>2. Generating initial codes:</td>
<td>Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.</td>
</tr>
<tr>
<td>3. Searching for themes:</td>
<td>Collating codes into potential themes, gathering all data relevant to each potential theme.</td>
</tr>
<tr>
<td>4. Reviewing themes:</td>
<td>Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic ‘map’ of the analysis.</td>
</tr>
<tr>
<td>5. Defining and naming themes:</td>
<td>Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.</td>
</tr>
<tr>
<td>6. Producing the report:</td>
<td>The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.</td>
</tr>
</tbody>
</table>

Figure 9. Six phases in Thematic analysis

In our thesis, we have also followed this approach as we first started with understanding the transcribed data collected from semi-structured interviews from our respondents. For the analysis we have used qualitative analytic software called MAXQDA 2021, that help to code any kind of qualitative data and proved insights of the data.

The purpose of using software was to analyze the data quickly as the number of interviews (20) we conducted were high and we wanted to analyze multiple files at once in parallel. We have used this software for each semi-structured interview conducted and the self-completion questionnaires used in phase 1. For phase 2, the survey has been analyzed using quantitative analysis methods as explained in the followed section.

3.7.2 Phase 2

Data in phase two have been analyzed using quantitative analysis methods. As explained in the data collection chapter, the Google forms were used to collect the data. The resulted data for each competency assessment was analyzed using excel. We use Radar Chart (also known as Spider Chart) in excel to present the results of a value scale and to compare against an average of the other responses. In this study, we compare the three dimensions of each SAFe core competency as shown (see Table 6).

<table>
<thead>
<tr>
<th>Core competencies</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team and Technical Agility</td>
<td>Agile Team</td>
</tr>
<tr>
<td></td>
<td>Built-in Quality</td>
</tr>
<tr>
<td></td>
<td>Team of Agile Teams</td>
</tr>
<tr>
<td>Continuous Learning Culture</td>
<td>Learning Organization</td>
</tr>
<tr>
<td></td>
<td>Relentless Improvement</td>
</tr>
<tr>
<td></td>
<td>Innovation Culture</td>
</tr>
</tbody>
</table>
Table 6. Self-Assessment - Core Competencies and Dimensions

During the analysis, the focus was on finding the variations in the data and the score each dimension gets. For instance, in case of Team and Technical Agility competency we found out that Built-in Quality dimension get lower rating than other two dimensions and that none of the dimensions got the maximum score, as shown in (see figure 10). The results from the core competencies were combined and assessed using Radar chart to have a general view of company’s level of SAFe adoption. For understanding, (see figure 10) shows the how the dimensions are visualized.

Figure 10. Team and Technical Agility Self-Assessment

3.8 Quality of Scientific Research

The most notable criteria for research quality evaluation are reliability and validity. Where “Reliability is concerned with the question of whether the results of a study are repeatable” and “Validity is concerned with the integrity of conclusions that are generated from a piece of research” (Bryman & Bell, 2015. p 46). Those two criteria are usually relevant for quantitative research. As we know that our main research design is qualitative research, based on (Korstjens, & Moser, 2018) some writers argued that applying those criteria to qualitative research is inappropriate or inapplicable, so we needed to find another criterion which was applicable for
qualitative design. The alternative criteria for qualitative research suggested by Lincoln and Guba (1985) are trustworthiness.

### 3.8.1 Trustworthiness

Lincoln and Guba (1985) propose trustworthiness concept to evaluate qualitative study. This concept made up of four criteria: Credibility, Transferability, Dependability, and Confirmability.

**Credibility:**
This criterion is equivalent to internal validity from quantitative research. Credibility is described as the confidence that can be placed in the research findings' truth (Lincoln & Guba, 1985). In this study, we use two strategies to ensure credibility, which are:

- **Triangulation strategy:** Which is when we use multiple methods or source of data in the study of social phenomena (Ibid). We have done ethnography, followed by a semi-structured interview and survey.

- **Prolonged engagement:** Doing Long-lasting engagement during observation to build trust, avoid misinformation, and get rich data (Ibid). In this study, apart from being involved in the daily meeting, we actively ask questions to scrum master regarding topics, behaviors, attitude we do not understand. We also had a weekly meeting with the company's representative to continuously update our knowledge and discuss possible problems, high level questions and concerns that arise during our study.

**Transferability**
This criterion is equivalent to external validity from quantitative research. Transferability relates to an aspect of applicability (Ibid). In this study, we use the thick description (description of collected data with respect to the context of it) as a strategy to ensure transferability (Ibid). For instance, in this study, we provide rich data regarding roles in SAFe, challenge in Agile adoption, metrics self-assessment, so the reader can do transferability judgement as per their needs.

**Dependability**
This criterion is equivalent to reliability from quantitative research. Dependability includes the aspect of consistency (Ibid). In this study, we use audit trail as the strategy of dependability, which is described transparently step by step in the research: problem formulation, selection of research participants, fieldwork notes, interview transcripts, data analysis decisions, all within the access of researcher (Brymann, 2015). Since consistency is one of dependability aspects, we kept all the meeting notes, interview notes, interview recording, and all the survey result to be able to demonstrate data consistency.

**Confirmability**
This criterion is equivalent to objectivity from quantitative research. Confirmability concern the aspect of neutrality. Make sure that interpretation is based on the data, not based on own preferences. The strategy for confirmability will be same as dependability, which is an audit
trail provides transparent and complete data from all phases of the research (Lincoln & Guba, 1985).

3.9 Methodological Limitations

Working from home due to COVID-19 has affected our data collection approach. The target we set for collecting data was not achieved as the response was not up to the mark. This is because we reached our samples using email addresses which sometimes was not as efficient as if we were collecting data physically. Case organization acquisition also resulted in late responses from the respondents due to integration and changed email domains of employees. SAFe assessment we conducted digitally was not up to the expectations. As SAFe recommend conducting SAFe assessment by having interactive sessions with the respondents where respondents discuss the questions and give the ratings (SAFe, 2021). However due to the COVID-19, the assessment was done sending questions via emails to the respondents.

3.10 Ethical Consideration

When doing research, we are concerned about ethical issues. Data from interviewees are stored in anonymous form and identity of interviewed people is not revealed. Therefore, we consider ethical elements in all aspects of the research when collecting data, managing data, and using the data themselves. According to (Blomkvist and Hallin, 2015), there are four ethical research principles: information requirement, consent requirement, confidentiality, and good use.

- **Information requirement**: Align with Bryman and Nilsson (2011) statement regarding transparency of information, where the respondent has a right to know every step of the study and its purpose of the steps. At the beginning of the interview, to maintain the transparency we asked respondent’s permission to record the interview for data analysis purpose, which was confirmed by all the respondents.

- **Consent requirement**: Before we conduct the interview, we ask permission if the employees were willing to be interviewed or not. There is no obligation to participate in this study. We ask permission of the respondent to join the interview beforehand.

- **Confidentiality**: In this case study, we needed an honest response from the respondents to get accurate data. However, respondents often feel uncomfortable with their superiors in the company, so that they give responses that they think is safe and will not jeopardize their position in the company. Embracing confidentiality will create more openness from the respondents regarding company condition. It affects the validity of the result. Therefore, we kept the confidentiality of company data and the interviewees' responses will also not be known by other interviewees. We also kept the respondent anonymous to avoid any harm (Diener and Crandall, 1978; in Bryman and Bell, 2011).

- **Good use**: Before collecting the data, the purpose of the gathering data has been informed to the interviewees. Also, the data generated during the study used only for research purpose (Bryman and Nilsson, 2011). The purpose of the interview also disclosed to the interviewees beforehand.
4 Empirics and Analysis

In this chapter, the data collected from interviews, surveys, observations are presented and analyzed. Results from SAFe core competency assessment are also presented. The chapter is divided into two sections. Section 1 is related to assessment of case organization’s business agility where the results from the SAFe assessment are presented. Section 2 is related to the implementation challenges identified from semi-structured interviews, observations, and surveys.

4.1 Business Agility of case organization

Phase 2 was done using SAFe core competency assessment template given at SAFe website. The aim was to assess company’s business agility and adoption of SAFe. In this section we have presented the data collected from both group and analyzed it using spider charts. All identified charts for both groups are kept in the appendix, while few of the important charts were presented in the section below.

SAFe core competencies assessment from Team members

We distributed questions related to the three core competencies assessment including team & technical agility, continuous learning culture, and lean-Agile leadership. Rest of the core competencies were not relevant for team members to answer. The ratings each core competency get is shown in (see table 7) below along with the radar chart.

<table>
<thead>
<tr>
<th>SAFe Core competencies</th>
<th>Average Rating</th>
<th>Dimensions</th>
<th>Average Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team &amp; Technical Agility</td>
<td>3.57</td>
<td>Agile teams</td>
<td>3.67</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Built-in quality</td>
<td>3.56</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teams of agile teams</td>
<td>3.33</td>
</tr>
<tr>
<td>Continuous Learning Culture</td>
<td>3.06</td>
<td>Learning Organization</td>
<td>3.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Innovation culture</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Relentless Improvement</td>
<td>2.80</td>
</tr>
<tr>
<td>Lean-Agile Leadership</td>
<td>3.15</td>
<td>Leading by example</td>
<td>3.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mindset &amp; principles</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leading the change</td>
<td>3.10</td>
</tr>
</tbody>
</table>

Table 7. SAFe core competency rating - Team members

When applied radar chart to the data for each dimension of each core competency, the resulted radar chart is (see figure 11):
In the figure given above, each blue line represents one scale ranging from 1 (in the middle) to five. Since, we have used only three core competencies assessment for team members and each core competency has three dimensions, so we have nine dimensions (See figure 15).

The responses we get from team members did not vary much as the average values for all the competencies were above 3 (three) and below 4 (four). However, from (see table 7) as well as (see figure 15) that, continuous learning culture got the least rating (3.06) from the team members along with lean-Agile leadership (3.15). From the ratings each dimension has got, work should be done on relentless improvement and creating learning culture. Team members also viewed leaders should lead them by example by first developing agile mindset which will then be translated into all team members.

Both identified competencies are linked in a way: developing agile mindset at top level will result in team members motivated to learn and continuously improve. Majority of the team members seemed to be satisfied with the way teams have enabled built-in quality.

**SAFe assessment Managers, SMs, Pos, and RTE**

In this thesis, researchers conducted five core competencies assessment from managers, SMs, POs, and RTE. Each core competency assessment consists of three dimensions as listed in the (see table 8), so we have 15 dimensions in total. Below (see table 8) is the assessment result for managers, SMs, POs, and RTE:
<table>
<thead>
<tr>
<th>Core competencies</th>
<th>Rating</th>
<th>Dimensions</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team and Technical Agility</td>
<td>3.33</td>
<td>Agile Teams</td>
<td>3.44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Team of Agile teams</td>
<td>3.22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Built-in Quality</td>
<td>3.33</td>
</tr>
<tr>
<td>Agile Product Delivery</td>
<td>3.11</td>
<td>Customer Centricity and Design Thinking</td>
<td>2.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Develop on Cadence; Release on Demand</td>
<td>3.09</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DevOps &amp; Continuous Delivery Pipeline</td>
<td>3.40</td>
</tr>
<tr>
<td>Organizational Agility</td>
<td>2.87</td>
<td>Lean Thinking People &amp; Agile Teams</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lean Business Operations</td>
<td>2.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strategy Agility</td>
<td>2.75</td>
</tr>
<tr>
<td>Continuous Learning Culture</td>
<td>3.05</td>
<td>Learning Organization</td>
<td>3.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Innovation Culture</td>
<td>2.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Relentless Improvement</td>
<td>3.00</td>
</tr>
<tr>
<td>Lean Agile Leadership</td>
<td>3.20</td>
<td>Leading by Example</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mindset and Principles</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leading the Change</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Table 8. Manager, SM, PO, and RTE - Assessment result

The researchers visualized the assessment result into radar chart (see figure 12):

![Radar Chart – Managers, SMs, POs, RTE](image_url)

Since this assessment aimed to assess business agility of the company, the assessment resulted enabling the company to see which area strong, and which area still needs improvement.
According to above radar chart (see figure 12), there are four dimensions that got rating lower than average value, which are:

- OA: Strategy Agility (2.75)
- OA: Lean business operation (2.8)
- CLC: Innovation culture (2.8)
- APD: Customer centricity and design thinking (2.8)

Innovation culture is one of the dimensions of continuous learning culture competency. Thus, a company can reflect on this core competency to find out the root cause of why this dimension has a low rating.

![Continuous Learning Culture Self-Assessment](image)

**Figure 7. Continuous Learning Culture - Assessment Result**

From figure 12 we analyzed that, strategy Agility and Lean business operation dimensions were recognized to be needed more attention from managerial level (Manager, SM, PO and RTE). Team and technical Agility competency have a strong rating (above average) for both three dimensions; Agile teams (3.44), team of Agile teams (3.22), and built-in quality (3.33).

### 4.2 Identified Implementation Challenges

The SAFe assessment presented in previous section highlighted areas to be analyzed. The interviews and observations done gave more in depth understanding of the implementation challenges at the case organization. The interviews conducted from 20 people belonging to the development group in the case organization were analyzed using MAXQDA which is a qualitative analytical software. The resulted themes identified from the coded data and observations are discussed below (the reader can find the complete table in appendix section):

#### 4.2.1 Lack of Interaction and Communication

Building good communication level has always been one of the important factors of SAFe. SAFe suggest various ways to enable good communication, both at the team level and at the program level. The case organization have daily stand-up, Kanban board, and others at the team level and Scrum of Scrum (SoS), CoP (Community of Practice) and others at Program level. Communication has a role to play in the success of teams working in a cross-functional
manner, that requires good communication to avoid misunderstandings. As experienced by one of the team members:

"I am to blame for the delay. I am not supporting my SM. We have serious communication issues... we should try to be more honest... take this issue to (Manager name mentioned). It's ridiculous he is blaming me for the delays... It's more to him. (Team-B Retrospective, 24 February 2021)

From the above observation, researchers analyzed that team members may be reluctant to communicate with the other team members and/or with people involved in the team everyday (SM, PO), which can create misunderstanding. The researchers also caught a related case during interviews. As one of the interviewees responded:

"One thing that I am doing, I bring to them an open discussion and open discussion is very important... team members should not be hesitating".
(Interviewee 3)

For interviewee 3, team members still hesitate to communicate with other team members even SMs, POs and managers. In SAFe, this should not happen as all team members (including SMs, POs and TL) are equal and peers (SAFe, 2021). There should not be any doubts about communication and interaction. For the researchers, this issue is there as heritage of a traditional organizational structure and hierarchy between employees.

During the interview, one of the interviewees discussed about the challenges related to indirect communication with customer. The interviewee reflected on the issue by saying:

“We don't always get direct customer information and direct customer interaction... we get sort of filtered information sometimes about the customer, that we have (interviewee 11)’’

The interviewee 11 reflected on two different levels of product owners, where high-level POs are involved in direct communication with the customers. These high-level POs then translates customer requirements and communicate them with low-level POs. Low-level POs sometimes get the direct contact with customers, but normally they get the sort of filtered information that according to interviewee 11 creates a doubt while managing backlogs and setting priorities. The interviewee 11 also highlighted the need to have more frequent communication with customers that will enable them to understand customer needs and propose solutions that might fulfill their (customer) requirements more than what they asked.

The researcher also observed other communication issues (Table 6, Team-A Sprint 13.1 - 4 February 2021). One PO experienced missed information and misunderstanding with RTE on what was presented. Whether those are to be considered as normal business interaction and clarification but the fact that it was highlighted to us is pointing out communication is not as smooth as it should be.

Based on a survey of 25 team members, 32% of respondents expressed good communication with other team members. Moreover, 52% felt more than good than poor communication, while the other 16% felt neither poor nor good as shown in (see fig 14) below.
4.2.2 Insufficient Trainings and Cross-functional competencies

Organizational growth is depending upon its employee’s growth. Employees can grow by learning from day-to-day work and by learning new skills that are provided by the organization. This importance of organizational growth was also identified and highlighted from the interviews and observations we did while participating in different meetings. The development group in the case organization is lacking in terms of providing technical trainings and courses related to SAFe. The case organization when transformed from Waterfall to Agile, provided few initial SAFe trainings to SMs, POs, and different managers. Then it has been delegated to one specific SM per site to extend a dedicated training to all employees and Team members. Furthermore, during the initial steps of the agile transformation, a dedicated SAFe expert was made available twice a week in the office for any questions and doubts on the topic, to support not only managers, but also SMs, POs and employees.

However, due to organizational reason after the first roll-out on-site support from externals has been interrupted and no dedicated training has been carried out and done for new-comers, whether they would have been SMs, POs or Team members. This lack of training was identified by both new and more senior employees.

While conducting interviews with managers and release train engineer, we asked them about the reason for not having frequent trainings. One of the interviewees replies was:

*I think it was an issue because of the acquisition between the Bombardier Transportation and Alstom there were financial issues... but as soon as this organization is done, I believe that we will get this and I’m looking forward for myself to receive the trainings (Interviewer 3).*

Since, Bombardier transportation was acquired by Alstom on 29th January 2021, company went under a lot of changes and there were some financial problems before the acquisition as well. However, when talking to RTE, he replied that providing trainings is already in their to-do list. During our participation in different teams, we observed that different teams were conducting
their SAFe events differently. Daily stand-ups, retrospective sessions, and sprint planning were different for different teams. For instance, in contrast to other teams one of the team did not use any tool to visualize the daily progress during the daily stand-ups. In SAFe, it is recommended that team conduct daily stand-up in front of story boards (SAFe, 2021) so that all team members can have an overall view of where they are in terms of reaching iteration goals. These observations reflect the need to have knowledge about SAFe way of conducting events. There were few teams that were following the SAFe way of conducting daily events and following the instructions, but this need to be followed by other teams as well.

From the survey that we conducted from the team members, their response toward the need of having trainings supported the identified theme. (See figure 15) below show the response from team members conducted through survey.

![Figure 15. Survey response from team members about trainings](image)

### 4.2.3 Nonoptimal team size

When we say big agile teams, we mean teams with more than 11 people in it. In SAFe, there are small teams of 5-11 people, that makes a big difference in terms of performance as mentioned in one of the SAFe core competencies (SAFe, 2021). A small team means that there will be more engagement between team members. One of the interviewees mentioned:

"We try out some sessions where we were doing planning and other things... more than you know, 80% of the team was always silent... there was no, nothing coming from them... maybe some team members don't like to talk in a big group"  (Interviewee 11)

Moreover, this comment also supports by another interviewee:

"It's working better for us, but for this to have an improvement on self-organization is not easy with such a big team." (Interviewee 5)

Team engagement is essential to maximize team capacity. When the team have a good engagement, it will result in improved efficiency and team effectiveness. Currently, in the
company, there are few teams having more than 11 team members. Another interviewee mentions the new development in the company regarding the numbers of members in the team:

"One development happened most recently is that we have started to split the teams on the scrum level... a team of 10 to 11 people have been split in two sub-teams with each five or four people... on daily work level, they have separate daily scrums, own iteration, and sprint backlog, and so on." (Interviewee 20)

Interviewee 20 felt that working in a small team in daily work may result in a better and safer environment. They even have a different sprint backlog and different daily standup meeting. During the observation, the researchers also highlighted different communication styles between small teams and big teams, both during the daily standup meeting, sprint planning, or retrospective meeting. During the participation of retrospective for team-D, researchers observed that few members were actively participating in the discussion while most of the team members were not participating. From the observation of team-D retrospective:

Very less input in discussion from other participants. Only team member 1, PO, SM, and team member 2 were discussing more (Team-D retrospective, 12 March 2021)

It can be due to less chance for all team members to give input and participate in the discussion, since the number of team members were more than eleven. In small teams, team members have more chances to participate actively and give their input.

4.2.4 Lack of Role Clarity

Organizations are run by the people and part they play to keep the business running is what makes the difference between a successful or not organization. Lack of defined roles and having roles overlapping each other’s by not having clear boundaries defined may create various issues within the company. It can create lack of focus on one specific job, or bottlenecks for individuals, and quality reduction. The interviews we have conducted, and the observation done so far have suggested us the same issue within the case organization. Lack of clarity on overall role scope or role overlapping by lack of boundaries seems to be another challenge faced by some individuals within the company. For instance, one of the interviewees responded to the question, “if they have faced or facing any challenge being in their current role?”:

If I was to come in from the outside you know, join company now would probably be confused... a lot of things which are maybe not written down, that this is the expectation from the PO (Interviewee 11).

The response from the interviewee implies the need to define and communicate expectations for certain roles and possibly to make boundaries between the roles as they might conflict with others. Another interviewee highlighting the fact of role overlapping by saying:

Sometimes my role become SM from PO, as I tell the team members what to do, how to do, and oversee their progress (Interviewee 12).
The recommendation goes into the direction of better defining roles and making clear boundaries between them.

4.2.5 Low-level of Self-organization

Self-organization is something that increases productivity and leads to autonomous team. It is the common target of every Scrum Team and a must have to have teams that over-achieve. If a team is having members that are self-driven and manage their task by themselves that would make them less dependent and that would permit to SMs and POs to focus on enabling the teams rather than telling team members what to do. As mentioned in (SAFe, 2021), SAFe agile teams unlike traditional teams should not rely on managers. SAFe agile teams together with SM and PO, decide what features they can work on and how will they implement it during the iteration. Role that SM should play is to provide them assistance and support them in case of having any impediment. However, this self-organization is not easy to accomplish as it consists of many factors like trust, confidence, and skills.

From what we have observed as ethnographers and participating in company’s daily events we can say that there is a need to enable more self-organization among team members. Few teams have some sort of self-organization but there is a room for improvements. Team members still rely too much on SM and PO for getting tasks assigned or executed. One interviewee said:

*Team members would reach to me asking “I am done what should I do next” ... they have backlog, where items are prioritized and allocated... I expect them to tell me I am doing this, and I will do this, does not ask*... (Interviewee 5)

During our participation in Team-D, we observed that there was less participation from all the team members during the daily stand-ups, sprint planning, and retrospective. For instance, during sprint planning of Team-D, only SM, PO, and one of the team members were discussing more while other team members were not contributing unless they were asked. This may be also due to lack of training or agile mindset that is still not developed among the team, or it can be due to frequent switching of team members in the teams (usually avoided but present in the Team under observation). One of the interviewees when asked about the self-organization in their team said:

*People were coming and going, and for me I am with the team from start...It was really a lot of repetition of roles, people leaving the team... it was hard to maintain any, any kind of self-organization in the whole team. (interviewee)*
5 Discussion

This chapter is designed to reflect on the findings and how these findings answer the research questions. This chapter will also highlight and reflect on findings from other researchers. The chapter is divided into two sections to discuss the two research questions separately.

5.1 Research Question 1

If we go back to first research question which was to find out what are the implementation challenges when adopting SAFe in railway manufacturing companies? It was designed to serve the basis for whole research. In first research question, the researchers aimed to identify implementation challenges in railway companies by taking the case organization as a case study. From the findings, the researchers came up with five major implementation challenges including:

- Lack of communication;
- Nonoptimal team size;
- Insufficient trainings and cross-functional competencies;
- Lack of role clarity;
- Insufficient self-organization.

The identification of these five implementation challenges was done by triangulating research question with observations, semi-structured interviews, and surveys to keep the credibility (Lincoln & Guba, 1985). The implementation challenges observed by the researchers as ethnographers were coherent with the data collected from the respondents. As mentioned above during the participation in retrospective sessions and daily stand-ups, researchers noted low level of self-organization within the teams. Team members were reluctant to participate and only few of the important roles would speak. As discussed in literature chapter, Hoda (2013) argues that decision making competency of team members makes them autonomous and self-organized. Team members may develop this competency by practicing agile practices and building agile mindset. This mindset develops by creating learning culture and giving more trainings to the team members. As Nonaka & Takeuchi (1996) explains it that building new knowledge and learning new things is not a specialized activity rather it is a way of behaving where team members consider learning new things as a part of their job. The interviews when conducted, resulted with the same area of concern. Other identified challenges were also in line with what was observed as ethnographers. Researchers also conducted SAFe core competency self-assessment from all the employee as explained in previous chapters. The survey resulted with many good insights that pointed out areas where case organization was lacking. One of the SAFe core competencies was continuous learning culture when assessed with team members and other roles resulted in low ratings. Responses from team members and other important roles were in lined. In terms of continuous learning culture, respondents believed that innovation culture should be built that will create opportunities for learning new skills apart from daily routine work. During interviews, this point for relentless improvement and creating innovations culture was also discussed by many interviewees. From SAFe, it is clear about how to enable innovation culture and acquire this competency. According to what SAFe (2021)
prescribes, organizations encourage employees to experiments with new ideas and continually explore ways to improve existing products.

The survey also suggested factors that were not identified from interviews or observations. For instance, when respondents were asked to assess the competency of leaders and how they lead all team members, the response was not completely positive. And it is understandable because it might be that case organization is relatively new to SAFe adoption and the leaders have gone through the transformation from traditional way of working to agile way of working.

The identified implementation challenges for the case organization are not unique as they can be considered common for other organizations going through the transformation from classical way of working to Agile/SAFe. Whether SAFe is new to companies few initial studies have been done on the SAFe implementations, use-cases and challenges that companies face while adopting SAFe (Gustavsson, 2020).

Above identified challenges can be added to literature and considered together with instances raised in the work done by Gustavsson (2020) on large-scale implementation of SAFe in which one of the factors he identified in his study was lack of autonomy and the work done by Mikhieieva & Stephan (2020), that have come up with many challenges that organization that was their use-case faced while adopting SAFe like lack of agile skills, resistance at management level, and others. The identified challenges from other researchers were based on their observation of their own use cases which is not surprising. The differences in the identification of challenges might be due to the differing agile maturity which will be discussed in the next section.

5.2 Research Question 2

The second research question was, “What are the possible reasons for the identified implementation challenges?”. To answer this question, the researchers reflected on the literature that has been compiled. The identified implementation challenges suggest that since case organization adopted SAFe recently, they lack SAFe maturity which will be developed over time (Knaster & Leffingwell, 2020), as discussed in literature chapter. Study done by Conboy & Carroll (2019) in this subject from 13 agile transformations over 15 years at various large-scale companies has resulted in various challenges. One of the identified challenges from the study was organizational readiness and appetite for change (Ibid, p. 48). Organization continually assesses their adoption, identify gaps, and take steps to fill those gaps (Ibid, p. 48). These steps may be very based on the identified challenges. The case organizations studied in this research is also facing few challenges. These challenges can be linked to insufficient trainings and agile mindset. Building learning culture and creating relentless improvement are the important factors to resolve challenges like self-organization, big teams, lack of role clarity. Bringing innovative culture and relentless improvement is one of the four pillars of SAFe house of Lean that lies on one foundation which is Lean-Agile leadership (SAFe, 2021). Lean-Agile leadership as identified during the survey suggested that case organization is lacking this competency. Provided the improvement in this competency along with improvement in creation of learning culture and building agile mindset across the employees will result in reducing other identified implementation challenges. Insufficient trainings and agile mindset are not only root cause for other identified challenges. Challenges like lack of communication and self-
organizations are faced due to big teams. If we reflect on the existing literature (Koehnemann, 2021), lack of communication is related to team and technical agility core competency. This competency explains how to collaborate and communicate well with cross-functional teams, what communication tools to be used, even the number of team members in one team is also regulated in it. The number of team members is also identified as one of the implementation challenges and can be considered a factor as well behind difficulties and lack of communication. From the observations during participation in different agile teams, it is understandable that team members were more reluctant to communicate in big circles than in smaller ones. A small team also tends to be less resilient to lack of self-organization (Leffingwell, 2007).

The five identified implementation challenges based on the investigated literature are related and connected to each other and was also confirmed from our observations.

### 5.3 Thesis highlights

Based on the results and discussion on the results, we can come up with four major highlights of the thesis namely:

- Lack of SAFe maturity;
- Training and building agile mindset among employees;
- Support from leadership;
- SAFe self-assessment.

As already discussed in previous section of this chapter, the case organization have adopted SAFe three years ago. The case organization is still adopting SAFe which makes them less mature in SAFe adoption. This lack of SAFe maturity was reflected in the identified implementation challenges. For instance, insufficient trainings and lack of developed agile mindset can be generalized as a factor behind other identified implementation challenge. Challenges like lack of self-organization or non-optimal size of agile teams can be medicated provided the improved trainings and agile mindset. Agile mindset serves the basis for bringing all the ingredients to cook organizational agility for organization as it is one of the dimensions of the SAFe core competency called organizational agility (SAFe, 2021). However, these traits can develop provided the support from leadership that act as a foundation for the SAFe four pillar in a SAFe house of Lean (SAFe, 2020). SAFe assessment conducted in the case organization by the researchers have also been a highlight this thesis. It not only contributed practically to the current practices of assessing performance but also highlighted various important points. The quantitative results presented in the empirics and analysis chapter, complemented the identified implementation challenges. From the survey, it was clear that team members rated high the need of having learning culture and bringing cross functional competencies among team members. The survey also highlighted the need of having support from leadership that can provide them opportunity to spend time on learning new skills apart from the daily routine task.

The SAFe assessment is one the highlight of this thesis because it answers the questions asked by Lebas (1995). Lebas (1995) mentioned five core stones to be considered when going for metrics and assessing performance as explained briefly in metrics section. SAFe assessment not only provide the answer to the question of what we measure? by providing a brief template
of list question to be asked but, also provide answer to the question of why we measure? which is to assess the business agility of the company. One positive factor to be mentioned about the performed survey was that there was no real discrepancy between rating expressed by employees and leaders on core competencies and related dimensions. That highlight that the leadership team is aware of the limits and openly acknowledge them, setting up this way the first cornerstone and pre-condition to move the next step forward.
6 Conclusion

This chapter is designed to conclude thesis by summarizing the answers we get for both research questions. In this chapter, we have also highlighted on the contribution this study has made, limitations it faced, and the space for future researchers to investigate this topic further.

6.1 Research Questions

The research questions formulated before starting with research helped throughout their research process. The researchers from their research study were able to identify the implementation challenges that are being faced by the case organizations while adopting SAFe. The data collected for each of the research questions and the answer for each of them have been discussed already. However, based on our analysis of the collected data and literature we used it was possible for us to see and confirm that companies implementing Agile/SAFe coming from previous way of working face challenges.

This will happen to every organization as they will adopt SAFe. We have understood after doing this research that organizations are composed of people that are trained to deliver business solutions and achieve business objectives and that they may feel comfortable once they are fully familiarized with the way of working no matter which way of working, they follow.

Now, when the company adopt a new way of working it bring a lot of challenges with it. Challenges that most of the researchers have identified including our research have few common factors. People tend to be first resistive, then they gradually start accepting the change, then they start learning about it and practicing it. This process takes some time but provided the support and assistance from leaders, this process can be speeded up. Based on our data, most of the identified implementation challenges revolve around one thing and that was lack of agile mindset among all the employees on different levels. The SAFe core competencies that reflect on how much organization have achieved agility, when assessed at different levels resulted in low rating for several competencies.

The reason for all the deviations and implementation challenges is insufficient knowledge of agile across the organization and their lack of agile mindset and practices. Provided the support from leadership, and the space given to the employees, things can be improved. The data provided in the scope of this thesis can be used as supportive base for identifying the next actions. Whether each company will have deviations from their adoption of SAFe compared to what state of art SAFe implies, it is important faced challenges are never ignored or forgotten until they become business as usual. They must be constantly taken up and worked out to complete the transformation and relentlessly improve embracing the agile mindset and getting the best out of the agile experience.

6.2 Contributions

This thesis has provided insight into implementation challenges in the case organization. For theoretical contribution, this study provides the empirical finding in railways industry that will add value in the existing knowledge base of companies that have adopted SAFe especially in railways industries also in companies that make use of requirements driven development. This study also provided the first comprehensive assessment of business agility in the case
organization. This practical contribution could be carried out further in the organization and being used as future base to assess the core competencies and become a regular self-assessment which will help the use-case as well as other companies to keep on track their transformation and journey towards business agility.

6.3 Limitations

The research was based on single-case study involving only one organization making it hard for researchers to generalize the results for all organizations. During the research study, researchers faced few limitations. One of the major limitations was the current Covid-19 pandemic that has implied performed the research completely remotely as everyone was working from home. There were few points when the physical presence of employees was needed. For instance, during the conduction of SAFe assessment of core competencies, the ideal way would have been to have all the respondents writing their answers and then discuss it in group as SAFe suggest it. However, this had to be done using Google forms. It was difficult at some point to reach all the employee and get their answers by having discussion with them. The timeframe for a thesis topic like this that involve the study of whole organization’s way of working and them commenting on it was also short. This pushed the researchers to do the research and complete it in defined time. The case organization also went being acquired by other organizations (Bombardier to Alstom) during the research process that resulted in delay for few things that were planned at that time.

6.4 Future Research

The findings of this study have several important implications for future practice. First, further studies need to be carried out to validate and generalize our finding across other organizations. Recommendation is to repeat the execution of the research in requirements driven development outside of the railway industries and check for similarities. Multiple case studies in different organization might give more robust empirical finding in this area. Since, according to (Yin, 1994) a single case study cannot be generalized because not represent the population. Second, due to the nature of qualitative research which tend to be biased and subjective, more study using qualitative analysis might be needed to get more solid and richer empirical result in this area. Third, due to Covid-19 situation, further self-assessment can be carried out in the proper time and proper method (Physical meeting instead of online meeting), which might get a different result in the different case organization.
7 Reference List


Appendix A: SAFe assessment
# Lean Agile Leadership Self-Assessment

![Diagram of Lean Agile Leadership Self-Assessment](image)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agile Teams</strong></td>
<td>Teams use proper tool(s) to monitor work in progress, potential issues/impediments and manage them. Teams use the tool(s) above to keep the number of items in progress limited. Teams implement small, estimated, functional, vertical user stories that fill in an iteration. Stories are completed throughout the iteration with multiple define-build-test cycles. By implementing retrospective improvements, teams improve relentlessly. Teams reliably meet 80-100% of PI Objective business value.</td>
</tr>
<tr>
<td><strong>Team of Agile teams</strong></td>
<td>ARTs include everyone required to deliver and support business. Dedicated and trained Release Train Engineers (RTEs) program events effectively. Dedicated and trained Product Management develop and prioritize the feature backlogs. Dedicated and trained System Architects work with teams to extend the architectural runway. Business Owners provide vision and align the Agile Release Train (ART) to enterprise strategy. All agile teams are owning core competencies needed to deliver end to end. ART have all the skills necessary to deliver end to end business solutions (e.g. including support function Validation, Safety...) Portfolio stakeholders (GAS/SA) provide constant feedback/input to the Release Train. System teams are effective in their roles.</td>
</tr>
<tr>
<td><strong>Built-in Quality</strong></td>
<td>All Agile teams apply general quality practices: flow, peer review, collective ownership, standards, automation, Definition of Done (DoD). Development teams use Agile technical practices: TDD, BDD, Agile architecture, refactoring, spikes. Teams share responsibility for design. Teams reduce technical debt in each iteration. Teams foster cross-training and T-shaped skills. Continuous integration and automated tests run at team and system levels.</td>
</tr>
<tr>
<td>Dimension</td>
<td>Statement</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Customer Centricity and Design Thinking</strong></td>
<td>Market segments are clearly defined</td>
</tr>
<tr>
<td></td>
<td>To understand customer needs, Continuous Exploration includes market research</td>
</tr>
<tr>
<td></td>
<td>Return of experience from field provide direct insight into user needs</td>
</tr>
<tr>
<td></td>
<td>The product vision guides solution and PI roadmaps</td>
</tr>
<tr>
<td></td>
<td>The value proposition is known and documented</td>
</tr>
<tr>
<td></td>
<td>Empathy maps help teams understand user needs (Customer needs mapped on planned items)</td>
</tr>
<tr>
<td><strong>DevOps and the Continuous Delivery Pipeline</strong></td>
<td>The Continuous Delivery Pipeline (CDP) workflow is clearly defined</td>
</tr>
<tr>
<td></td>
<td>Teams have shared responsibility for development, deployment, and operations</td>
</tr>
<tr>
<td></td>
<td>At each step in the CDP, process time, lead time, delay time, and percent complete and accurate are measured</td>
</tr>
<tr>
<td></td>
<td>The CDP is continuously optimized</td>
</tr>
<tr>
<td></td>
<td>Security considerations are included throughout the CD pipeline and release processes</td>
</tr>
<tr>
<td></td>
<td>Code analysis and inspection tools examine code and third-party packages for known security vulnerabilities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lean Thinking People and Agile Teams</strong></td>
<td>Agile technical teams are cross-functional, long-lived, and relentlessly improving</td>
</tr>
<tr>
<td></td>
<td>Business teams that support business solutions are trained in SAFe</td>
</tr>
<tr>
<td></td>
<td>Business teams are 'on the train' and participate in delivering and supporting innovative solutions</td>
</tr>
<tr>
<td></td>
<td>Physical workspaces are optimized for Agile teams and trains **</td>
</tr>
<tr>
<td></td>
<td>Agile tooling supports Agile processes</td>
</tr>
<tr>
<td></td>
<td>Agile HR brings an Agile mindset, values, and principles to hiring, engaging, and retaining people</td>
</tr>
<tr>
<td></td>
<td>Hiring is based on team orientation, agility, and cultural fit</td>
</tr>
<tr>
<td></td>
<td>Leaders are trained as &quot;lean-thinking managers/teachers,&quot; and they continue their learning journey</td>
</tr>
<tr>
<td><strong>Lean Business Operations</strong></td>
<td>Development and operational value streams (Objectives) are defined and understood</td>
</tr>
<tr>
<td></td>
<td>Value stream mapping is used to improve flow (Single objectives are aligned and support the overall vision)</td>
</tr>
<tr>
<td></td>
<td>Process times and delays are made visible and measured</td>
</tr>
<tr>
<td></td>
<td>Bottlenecks, delays, and impediments are addressed quickly</td>
</tr>
<tr>
<td></td>
<td>Proper tooling helps to visualize and limit Work in Process (WIP)</td>
</tr>
<tr>
<td></td>
<td>Backlogs scope is properly setup and optimized</td>
</tr>
<tr>
<td></td>
<td>Development teams apply customer-centricity when defining scope with internal and external customers</td>
</tr>
<tr>
<td><strong>Strategy Agility</strong></td>
<td>Vision, mission, and strategy are communicated effectively</td>
</tr>
<tr>
<td></td>
<td>Market research and analysis is continuous</td>
</tr>
<tr>
<td></td>
<td>Customer feedback is institutionalized, routine, and fast</td>
</tr>
<tr>
<td></td>
<td>Reorganizing around value creation is normal and fluid</td>
</tr>
<tr>
<td>Dimension</td>
<td>Statement</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Learning Org.</strong></td>
<td>The organization invests in the growth of employees</td>
</tr>
<tr>
<td></td>
<td>The organization continuously creates, acquires, shares, and transfers knowledge</td>
</tr>
<tr>
<td></td>
<td>The organization empowers employees to gain knowledge and experience in multiple disciplines</td>
</tr>
<tr>
<td></td>
<td>Teams work collaboratively to achieve common objectives by sharing knowledge, solving problems, and learning together</td>
</tr>
<tr>
<td></td>
<td>Teams defer group and personal goals for the greater good of the organization</td>
</tr>
<tr>
<td><strong>Innovation Cult.</strong></td>
<td>Leaders create an environment that supports creative thinking, curiosity, and challenging the status quo</td>
</tr>
<tr>
<td></td>
<td>Leaders train, encourage, and foster entrepreneurship and innovation</td>
</tr>
<tr>
<td></td>
<td>The organization provides clear pathways for advancement to employees, who demonstrate exceptional performance as innovation change agents</td>
</tr>
<tr>
<td></td>
<td>The organization creates and protects regular time for employees to devote to creative, exploratory activities</td>
</tr>
<tr>
<td></td>
<td>The organization provides physical spaces conducive to innovation activities</td>
</tr>
<tr>
<td></td>
<td>The organization promotes learning and exploration through experimentation without fear of failure</td>
</tr>
<tr>
<td><strong>Relentless Impv.</strong></td>
<td>Improvements optimize the end-to-end flow of value</td>
</tr>
<tr>
<td></td>
<td>Problem-solving is engrained in the organizational culture</td>
</tr>
<tr>
<td></td>
<td>Individuals and teams are given the time and resources to identify and solve problems</td>
</tr>
<tr>
<td></td>
<td>Teams at every level of the organization pause regularly to reflect and improve</td>
</tr>
<tr>
<td></td>
<td>Improvement efforts are based on facts and data over opinions and conjectures</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leading by Example</strong></td>
<td>Leaders promote a positive, performance-oriented culture based on trust, respect, expertise, engagement, and commitment to organizational goals</td>
</tr>
<tr>
<td></td>
<td>Leaders act with honesty and integrity</td>
</tr>
<tr>
<td></td>
<td>Leaders are authentic—their words, actions, and beliefs are aligned</td>
</tr>
<tr>
<td></td>
<td>Leaders openly admit and own their mistakes</td>
</tr>
<tr>
<td></td>
<td>Leaders demonstrate self-awareness and management of their emotions</td>
</tr>
<tr>
<td></td>
<td>Leaders manage intense emotional situations skillfully</td>
</tr>
<tr>
<td></td>
<td>Leaders continuously invest in their own learning</td>
</tr>
<tr>
<td></td>
<td>Leaders consistently invest in the education and professional growth of their teams</td>
</tr>
<tr>
<td></td>
<td>Leaders prepare their teams for increased decision-making authority, investing in their technical competence and providing organizational clarity</td>
</tr>
<tr>
<td></td>
<td>Leaders consistently provide decision authority to teams that have the best information and context</td>
</tr>
<tr>
<td><strong>Mindset &amp; Principles</strong></td>
<td>Leaders demonstrate a growth mindset by showing openness to new ideas, seeing challenges as a growth opportunity, and being receptive to feedback</td>
</tr>
<tr>
<td></td>
<td>Leaders identify and overcome existing fixed mental models that need to be challenged in order to embrace new ways of working</td>
</tr>
<tr>
<td></td>
<td>Leaders fulfill their responsibilities by exemplifying the core values of alignment, transparency, built-in quality, and program execution</td>
</tr>
<tr>
<td></td>
<td>Leaders simplify Lean principles by focusing on value, respect for people and culture, flow, innovation, and relentless improvement</td>
</tr>
<tr>
<td></td>
<td>Leaders live the values and principles of the Agile Manifesto</td>
</tr>
<tr>
<td></td>
<td>Leaders exhibit and teach the 10 SAs/Lean-Agile Principles</td>
</tr>
<tr>
<td><strong>Leading the Change</strong></td>
<td>Leaders clearly communicate when and why change is needed</td>
</tr>
<tr>
<td></td>
<td>Leaders envision the vision for change in ways that inspire, motivate, and engage employees/teams to make the change successful</td>
</tr>
<tr>
<td></td>
<td>Leaders use personal advocacy and drive to lead change versus positional authority</td>
</tr>
<tr>
<td></td>
<td>Leaders form cross-domain guiding coalitions and empower them to plan and guide the change</td>
</tr>
<tr>
<td></td>
<td>Leaders create a safe environment for change that supports risk-taking without fear of consequences to self-esteem, status, or career</td>
</tr>
<tr>
<td></td>
<td>Leaders set the example by investing in their own training in Lean, Agile, and SAs</td>
</tr>
<tr>
<td></td>
<td>Leaders invest in the training necessary to build the knowledge and understanding teams and individuals need to perform Lean, Agile, and SAs responsibilities</td>
</tr>
<tr>
<td></td>
<td>Leaders follow sound Organizational Change Management (OCM) practices</td>
</tr>
<tr>
<td></td>
<td>Leaders use the Implementation Roadmap to guide the adoption of SAs</td>
</tr>
<tr>
<td></td>
<td>Leaders provide sufficient SAs Program Consultants (SPCs) to support the organization’s SAs implementation</td>
</tr>
</tbody>
</table>
Appendix B: Semi-structured Interviews

Scrum Master:

**Introduction:**

We are two master students from Uppsala University, currently working in Alstom since January 2021 doing our master thesis. This interview intention is to observe SAFe adoption in the organization. This interview will be anonymous, and all data that we gathered will only be used for master thesis purposes. And this interview will be recorded for analysis purposes if you don’t mind.

**Question guide:**

1. Could you please introduce yourself:  
   a. Name  
   b. Background  
2. What was your previous role in the company?  
3. How long have you been a SM?  
4. Did you get any training for the role? I mean did you take this role willingly or you were assigned as a SM? Do you get training regularly?  
5. How will you define the role of SM in general?  
6. What is your role as a SM?  
7. How will you describe your limitation as a SM? and also the scope of your role?  
8. What were the challenges you faced being in the role of SM?  
9. What changes you brought into the team as a SM?  
10. How will you differentiate between the role of SM and TL (Team leader)?  
11. What do you think can be improved in terms of an agile way of working, as a SM?

Product Owner:

**Introduction:**

We are two master students from Uppsala University, currently working in Alstom since January 2021 doing our master thesis. This interview intention is to observe SAFe adoption in the organization. This interview will be anonymous, and all data that we gathered will only be used for master thesis purposes. And this interview will be recorded for analysis purposes if you don’t mind.

**Question guide:**

1. Could you please introduce yourself:  
   a. Name  
   b. Background  
2. What was your previous role in the company?  
3. How long have you been a Product Owner?  
4. Did you get any training for the role? We mean did you take this role willingly or you were assigned as a PO? Do you get training regularly?  
5. How will you define the role of PO in general?  
6. What is your role and responsibilities as a PO?  
7. How do you manage team backlogs?  
8. How do you prioritize items in the backlogs?  
9. How will you describe your limitation as a PO? and also the scope of your role?  
10. What were the challenges you faced being in the role of PO?  
11. How has the team improved in terms of agile ways of working and how much of a role have you played in bringing improvements in the team?  
12. In the SAFe framework, we have POSync to have coordination with another team. Do you have POSync in Alstom? (Let them know about PO sync or ScoS)?  
   a. Yes: How does it bring value to the team?  
   b. No: Do you think it should happen just like SoS happening in the Alstom?  
13. How would you differentiate between the role of PO and PM (Product Manager)?  
14. How will you differentiate between the role of PO and SM (Scrum Master)?  
15. What do you think can be improved in terms of an agile way of working, as a PO?

Manager:
Introduction:

We are two master students from Uppsala University, currently working in Alstom since January 2021 doing our master thesis. This interview intention is to observe SAFe adoption in the organization. This interview will be anonymous, and all data that we gathered will only be used for master thesis purposes. And this interview will be recorded for analysis purposes if you don’t mind.

Question guide:

1. Could you please introduce yourself:
   a. Name
   b. Background
2. What was your previous role in the company?
3. How long have you been a Manager?
4. What is your role and responsibilities as a Manager?
5. How will you describe your limitation as a Manager? and also the scope of your role?
6. Your views regarding self organisation?
7. What are/were the challenges you faced being in the role of Manager?
8. What changes have you brought into all teams as a Manager?
9. How is your role being a manager in SAFe different from Line manager in traditional organizational structure?
10. What do you think can be improved, as a Manager?
11. What worked well for you In SAFe? What did not go well?
12. What other methods can be good in place of SAFe?
### Appendix C: SAFe assessment

<table>
<thead>
<tr>
<th>Quotes and Meeting notes</th>
<th>Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interview:</strong> &quot;I see that we have some things that has been more challenging, and I can tell you that one of the challenging things for me was the bureaucracy, having to go through a lot of forms and systems and all that kind of stuff to get things done&quot;. (Interviewee 18)</td>
<td>Lack of communication</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;The only thing I don't like is when someone is trying to hide something that a lot of your issues that they have to be visible otherwise they become dangerous&quot;. (Interviewee 8)</td>
<td>Lack of communication</td>
</tr>
<tr>
<td><strong>Interview:</strong> If you can fix it yourself, you do it. If you cannot fix yourself, you hand it over to someone else. If you do not hand it over to someone, it is still a problem&quot; (Interviewee 19)</td>
<td>Lack of communication</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;One thing that I am doing, I bring to them an open discussion and open discussion is very important… team members should not be hesitating&quot;. (Interviewee 3)</td>
<td>Lack of communication</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;We don't always get the direct customer information and direct customer interaction… we get sort of filtered information sometimes about the customer, that we have.&quot; (Interviewee 11)</td>
<td>Lack of communication</td>
</tr>
<tr>
<td><strong>Observation:</strong> (Team Member): &quot;I am to blame for the delay. I am not supporting my SM. We have serious communication issues. So, we should try to be more honest. We should take this issue to (Manager name mentioned). It's ridiculous he is blaming me for the delays. It's more to Him. (Team-B Retrospective, 24 February 2021)</td>
<td>Lack of communication</td>
</tr>
<tr>
<td><strong>Observation:</strong> Yesterday (SM name mentioned) asked RTE about something that he did not communicate yet in PI planning… but RTE said that it was there in PI planning… and today he asked (PO name mentioned) whether its communicating or not, and PO also said nothing in PI planning, and SM thinks it's missed communication from RTE. (Team-A Sprint 13.1 - 4 February 2021)</td>
<td>Lack of communication</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;I think it was an issue because of the acquisition between the BT and Alstom there were financial blockages and stuff because of which they could not release the finances straight away to have this training, but as soon as this organization is done, I hope at least, and I believe that we will get this and I'm looking forward for myself to actually receive the training.&quot; (Interviewee 3)</td>
<td>Insufficient trainings and cross-functional competencies</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;A lot of people think that Agile is only for software developers, for me it doesn't matter whatever you do, you can follow and adapt to agile way of working as it's a philosophy, a way of working, a mindset… people who were not a software developer did not believe in that this was actually not for us… when they followed this way of working, agile mindset was developed... still there is a room for improving agile mindset and having trainings&quot; (Interviewee 19)</td>
<td>Insufficient trainings and cross-functional competencies</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;Everyone got, including all the SMs and POs at least got some this SAFe SM training. It was three or four days.&quot;(Interviewee 8)</td>
<td>Insufficient trainings and cross-functional competencies</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;Team can automatically go in learning direction provided time and space where they could only focus on learning and not on producing anything else.&quot; (Interviewee 20)</td>
<td>Insufficient trainings and cross-functional competencies</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;It's all about training and improving because I think when we don't really have time for that, we are chasing deadlines and learning by doing... not the most efficient way and we are, we are just running without really thinking much, without being really efficient.&quot; (Interviewer 12)</td>
<td>Insufficient trainings and cross-functional competencies</td>
</tr>
<tr>
<td><strong>Observation:</strong> One of the team did not use visual presentation of Kanban board or other visualizing tools during their daily stand ups session (Team-C Daily stand-up, 24th March 2021)</td>
<td>Insufficient trainings and cross-functional competencies</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;It's working better for us, but for this to have an improvement on self-organization is not easy with such a big team. &quot; (Interviewee 5)</td>
<td>Insufficient trainings and cross-functional competencies</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;We try out some sessions where we were doing planning and other things... more than you know, 80% of the team was always silent... there was no, nothing coming from them… maybe some team members don't like to talk in a big group&quot; (Interviewee 11)</td>
<td>Nonoptimal team size</td>
</tr>
<tr>
<td><strong>Interview:</strong> &quot;One development happened most recently is that we have started to split the teams on the scrum level, like for example a team of 10 to 11 people have been split in two sub-teams with each five or four</td>
<td>Nonoptimal team size</td>
</tr>
</tbody>
</table>
people... teams have sort of like an overall team context where they may do certain things together but on daily work level, they have separate daily scrums, own iteration, and sprint backlog, and so on.” (Interviewee 20)

<table>
<thead>
<tr>
<th>Observation: Very less input in discussion from other participants. Only team member 1, PO, SM, and team member 2 were discussing more (Team-D retrospective, 12 March 2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview: &quot;I would say it's an advanced scrum master it's not really how I believe a scrum master is intended to do work.&quot; (Interviewee 3)</td>
</tr>
<tr>
<td>Interview: &quot;Yes, that is what makes it challenging for me even more to be a team leader for a team I'm not a scrum master for because I don't know what's happening.&quot; (Interviewee 4)</td>
</tr>
<tr>
<td>Interview: &quot;If I was to come in from the outside you know, join company now would probably be pretty confused... a lot of things which are maybe not written down, that this is the expectation from the PO.&quot; (Interviewee 11)</td>
</tr>
<tr>
<td>Interview: &quot;I try not to give that feeling to the team members so that we can separate this role of the team leader and the scrum master that this is not getting influenced, but it can get influenced in people's mind.&quot; (Interviewee 3)</td>
</tr>
<tr>
<td>Interview: &quot;Sometimes my role become SM, as I tell the team members what to do, how to do, and oversee their progress...&quot; (Interviewee 12)</td>
</tr>
<tr>
<td>Observation: During PI planning, for few team SMs presented the PI objective and for few teams’ PO presented PI objectives. It was unclear for us who should be responsible for communicating team's PI objectives. (PI 13 planning, 27th January 2021)</td>
</tr>
<tr>
<td>Interview: &quot;Some team members would reach to me asking I am done what should I do next… I mean they have backlog, where items are prioritized and allocated, you should be telling me I am doing this, and I will do this does not ask...&quot; (Interviewee 5)</td>
</tr>
<tr>
<td>Interview: &quot;It was more of a top-down, SM tell people what to do… I felt it was not good... self-organization can be brought to the team.&quot; (Interviewee 14)</td>
</tr>
<tr>
<td>Interview: &quot;We see that it is blocking that nobody raises those issues with the other team members so that they can actually resolve it happens it's getting, it's getting better with time I notice since I'm in the team I'm observing changes,&quot; (Interviewee 6)</td>
</tr>
<tr>
<td>Interview: &quot;I am trying to do is to use examples when things are happening like today and try to set the expectation for the next time you know, I am expecting them to take more initiative and act in this way.&quot; (Interviewee 5)</td>
</tr>
<tr>
<td>Interview: &quot;Okay, people were coming and going, and for me I am with the team from start...It was really a lot of repetition of roles, people leaving the team… it was really hard to maintain any, any kind of self-organization in the whole team.” (Interviewee 12)</td>
</tr>
<tr>
<td>Observation: During the sprint planning, only three out of nine people including PO, SM, and one of the team members were actively participating. No input was there from other team members. (Team-C Sprint planning, 30th March 2021)</td>
</tr>
<tr>
<td>Observation: SM made a goal for one of his team. they should be deciding their own goal. (Team-B Sprint 13.3 Planning, 1st March 2021)</td>
</tr>
<tr>
<td>Observation: Very less input in discussion from other participants. Only 4 peoples talking from 12 participant (Only SM, PO, Team member 1, and team member 2) were discussing more (Team-D Retrospective - 12th March 2021)</td>
</tr>
</tbody>
</table>