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ICT in Business and the Public Sector

Characteristics of value streams in practice

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MASTER'S THESIS

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Abstract

Companies face increasing competitiveness and ever more rapidly changing environments (Abrahamsson et al., 2009). More than ever organizations need ‘business agility’, “the ability to quickly adapt business processes beyond normal levels of flexibility in order to effectively manage internal and external changes” (van Oosterhout et al., 2006).

Practitioner frameworks promising to provide business agility argue that organizations should start structuring around value (Knaster & Leffingwell, 2020; Larman & Vodde, 2010). For many organizations however this is easier said than done, as they are struggling with defining what the actual value streams are, and how to design the organization around them (Brenner & Wunder, 2015; Putta et al., 2019). Furthermore, scientific research on the position of these concepts in literature, and the application of these transformation processes with their actual challenges and success factors remains scarce (Dingsøyr et al., 2019).

The goal of this MSc Thesis is to learn how value streams are being applied in practice, and how they relate to existing approaches. This is achieved by performing 16 interviews with 15 interviewees across 5 different countries and 8 different organizations.

The results show that organizations tend to define a value stream as a process, but apply it more broadly by including it in their organizational design. For the initial identification of the value streams, companies generally do not use a predefined step-by-step approach. Interviewees are able to broadly define some steps and generally mention they looked at existing business lines, but there is often no clear governance. The results furthermore show that value stream based organizations are similar to the matrix approach with a productized focus instead of a project focus. Finally, on a process level, the concept of value stream reconfiguration appears to be similar to business process re-engineering.

Keywords: agile; agile portfolio management; business agility; large scale agile; organizational design; value streams

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I would like to thank all the 16 participants for taking part in this research project. I realize that it is not always easy to make time for a student wanting to ask you some sensitive questions. Hopefully the results provide you all some reciprocal value.

Additionally, I would like to thank my supervisors and partners from other universities and firms for the help in finding the participants. Ofcourse, you were all also a great help with the interpretation of the results and helping me find my way in the research process.

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1 Introduction

This first chapter will give a general introduction of this research project. Here, the context of this research will first be introduced. This is followed by the research objective and the relevance of this research in empirical context. Thereafter, the research question and the scope will be introduced.

1.1 Research Context

Initially, agile methods such as Scrum and Kanban were used within small single-teams in specific parts of an organization (Boehm & Turner, 2005). This came with great successes and therefore organizations started to scale agile these methods to larger projects across the organization (Dikert et al., 2016). This was often not without challenge. For example, inter-team coordination can suddenly become an important overlooked aspect. Also, generally, the larger the organization, the more difficult it becomes to introduce agile methods on a large scale (Dybå & Dingsøyr, 2008).

Several frameworks emerged to cope with such challenges and provide organizations guidelines. The most commonly used frameworks (Digital.ai, 2020) are the 'Scaled Agile Framework' (SAFe) and 'Large Scale Scrum' (LeSS) framework. These frameworks argue that an important aspect, which is often overlooked, is the need to structure the organization around value streams instead of functional silos (Knaster & Leffingwell, 2020). More specifically, organizations need to identify the value streams within their organization and structure their teams around it. According to SAFe[1], these value streams refer to the collection of activities performed by an organization to deliver value to a customer, from initial customer request to final delivery and support of the product.

1.2 Research Objective

Agile portfolio management frameworks such as SAFe have now been largely adopted within a large number of organizations (Digital.ai, 2020). These practitioner frameworks (Knaster & Leffingwell, 2020; Larman & Vodde, 2010) argue for a range of benefits when implementing the framework with a structure around value streams. For example, according to the SAFe framework this should maximize the performance, product quality, overall business results and provide business agility (Knaster & Leffingwell, 2020).

However, there is little empirical substantiation on how these frameworks, and the design around value streams, is being applied in practice (Dingsøyr et al., 2019). The objective of this research is therefore to find common characteristics among organizations that have identified and designed their organization around value streams. Additionally, the objective is to learn how value stream based organization relate to existing approaches in organizational design literature.

1.3 Relevance

According to Gartner (Bhat et al., 2020), by 2023 70% of organizations will be using value stream management to improve the flow in the DevOps pipeline, which will ultimately lead to faster delivery of customer value.

Identifying, separating, and structuring around the right value streams has proven (Putta et al., 2019) to be challenging however. In several case studies within existing literature proposed by practitioner frameworks, organizations struggle to identify and configure the right value streams when transforming their organization (Brenner & Wunder, 2015; Gusch & Herbai, n.d.; Holdorf, 2011; Putta et al., 2019; SEI Global Wealth Services, n.d.). A common problem is that the organizations were not ready for organization-wide restructuring around value streams. Instead of restructuring, they keep the old structure, which is often built around silos, to receive political acceptance (Putta et al., 2019). Additionally, organizing the dependencies between value streams has proven to be challenging (Brenner & Wunder, 2015).

[1] https://www.scaledagileframework.com/value-streams/

Although several scaling agile frameworks (Knaster & Leffingwell, 2020; Krebs, 2008; Scott W. Ambler, 2012; Vähäniitty, 2012) and adaptable structural practitioner approaches (Kniberg & Ivarsson, 2012; Kotter, 2014) provide guidelines, more studies (Dingsøyr et al., 2019) and empirical evaluation on the context of value streams is required. More specifically, researchers emphasize the need for studies on the adoption of these frameworks (Moe et al., 2016; Moe & Dingsøyr, 2017; Putta et al., 2019).

1.4 Research Question

This research, based on the objective, aims to find answers to the following research question:

Research Question: *What are characteristics of value streams in practice*?

Ultimately, by answering this research question, the research aims to learn how value streams are being applied in practice, and how they relate to existing approaches in organizational design literature.

1.5 Scope

In this explorative research, several organizations that have identified and designed their organization around value streams will be analyzed. As such, this research will be conducted as a multiple-case study. The duration of this research is approximately six months, as the researcher is expected to graduate after that time-period.

Organizations from different countries, within different sectors will be approached. There are some specific requirements for organizations to be eligible. These requirements are:

- Organization has configured value streams and strategic IT capabilities.
- Organization will have had some sort of restructuring based upon agile portfolio management.
- As project portfolios are commonly found in larger organizations (Stettina & Hörz, 2015), such a size will be a requirement (350+).
- Some sort of agile framework, as discussed in the literature review, is being applied.

The exact questions that will be asked can be found in Appendix A – Semi-structured interview guide The scope is furthermore reflected in the general subjects that will be discussed during the different interviews:

- Organizational & Agile introduction
- Value streams
- Organizational structure
- Impact and relations
- Agile Portfolio Management
- Future plans

1.6 Structure

This thesis consists of six different chapters:

In the following chapter, the literature background will be analyzed. Relevant concepts and studies will be discussed.

Thereafter, in section 3, the method will be further described in detail.

In section 4, the results, based on the semi-structured interviews, will be displayed.

Section 5 is dedicated to the discussion. Here, the meaning of the results will be interpreted. It will showcase what the results in the previous section actually mean.

In section 6 the thesis will be concluded. The main findings and their relation to the initial objective will be showcased.

2 Theoretical framework

In the theoretical framework the current academic stance on business agility, agile methods, organizational design, and value streams will be analyzed. Concepts will be introduced in the broadest sense, but the scope is mainly on software development context.

2.1 Business Agility

In 1957, Ashby (1957) introduced the law of requisite variety, which states: "*the variety within a system must be at least as great as the environmental variety against which it is attempting to regulate itself*" indicating that each system must be as least as agile as the environment it is in. It also means that the level of agility required will differ depending on the environment (van Oosterhout, 2010). With this law, Ashby was among the first scholars to argue that businesses require agility.

Various definitions by practitioners and researchers on business agility are applied throughout the industry. For example, according to Evans (2002), the formula for business agility is:

Business Agility = Speed x Flexibility

However, business agility is often more elaborate than simply speed and flexibility. Therefore, this study focuses on the descriptive definition proposed by van Oosterhout et al. (2006). According to them, business agility refers to "an organizations' ability to quickly adapt business processes beyond normal levels of flexibility in order to effectively manage internal and external changes". Business agility can then be used as a new way for creating and maintaining a competitive advantage (Sharifi & Zhang, 2001), which is especially applicable during uncertain times with turbulence in the business environment.

The business agility institute (Business agility institute, n.d.) describes the five different dimensions of business agility (Figure 1). The dimensions describing the characteristics are customer (1), relationships (2), leadership (3), individuals (4), and operations (5).

Figure 1 Domains of business agility. Excerpt from (Business agility institute, n.d.)

The customer domain is at the center of the model and is the reason organizations exist. What the customer is depends on your values and structure. This domain includes understanding what your customer is, developing customer journeys, and building trust.

The relationship domain provides the context for organizations. It revolves around an open broad-minded board of directors, a mission-aligned workforce, and flexible partners driven by customer value. It ensures transparency, and provides agile procurement.

The leadership dimension refers to the process of shaping an agile organization. It focuses on people management, having a team with a co-creative shared mindset, and good communication to provide adaptive strategic agility.

The individual domain addresses individuals and their work approach. It focuses on the individual's growth mindset, their ability to craft excellence, and the ownership and accountability individuals take for their work.

The final dimension is the operations domain. This domain refers to how agile organizations work. It includes structural agility, which is an organization's ability to change structures when needed. Additionally this domain includes process agility, the ability to continuously adapt and evolve processes to create the most value for customers. The final aspect is enterprise agility, which states that business agility requires enabling frameworks, rather than stifling ones.

Practitioner frameworks aim to provide guidelines to achieve business agility via agile and lean principles merged with organizational design. These topics will therefore be discussed next.

2.2 Agile

No universal definition of Agile has been defined, yet agile-like methodologies have been used for years. Originally these methods were used for agile manufacturing, but the term was later adopted independently in software development (Kettunen & Laanti, 2008).

The agile manifesto, a group of agile practitioners that proposed many of the agile software development methodologies, tried to make the concept more concrete. To describe agile they defined four key-values (Table 1). Based on these core values more agile software development methods and frameworks have erupted. Agile software development methods were further defined by Williams & Cockburn (2003) as using communication-oriented human rules with light rules of project procedures and behaviour.

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

Table 1 Values of Agile. Retrieved from the agile manifesto[2]

Initially, agile software development was mainly applied in the context of small teams (Kettunen & Laanti, 2008). With increasing competitiveness and rapidly changing environments more and larger organizations have started to adapt these agile concepts and methodologies (Abrahamsson et al., 2009). The differences before and after such adaptations will be discussed next.

2.2.1 Traditional versus Agile development

There are a large number of differences between traditional development and agile development (Moniruzzaman & Hossain, 2013). Several studies have been executed to uncover the extent of these differences.

Boehm (2002) argues that the primary objective for agile development is rapid value and the main requirement is rapid change. On the other hand, the primary objective of traditional methods is high assurance and the main requirement is stability. Nerur et al. (2005) describe that agile information systems can be built based on iterations, rapid feedback and continuous design. Conversely, traditional methods are based around extensive plannings that are fully specifiable. They summarize the differences between traditional development and agile development based on seven issues (Table 2). Moniruzzaman & Hossain (2013) summarize by arguing that the foremost difference between traditional and agile development is the acceptance of change.

[2] www.agilemanifesto.org

	Traditional Development	*Agile Development*
Fundamental Assumption	Systems are fully specifiable, predictable and can be build through meticulous and extensive planning	High-quality, adaptive software can be developed by small teams using the principles of continuous design improvement and testing based on rapid feedback and change.
Control	Process centric	People centric
Management Style	Command-and-control	Leadership-and-collaboration
Knowledge Management	Explicit	Tacit
Role Assignment	Individual - favors specialization	Self-organizing teams – encourages role interchangeability
Communication	Formal	Informal
Customer's Role	Important	Critical
Project Cycle	Guided by tasks or activities	Guided by product features
Development Model	Life cycle model (Waterfall, Spiral, or some variation)	Organic (flexible and participative encouraging cooperative social action)
Desired Organizational Form/Structure	Mechanistic (bureaucratic with high formalization)	Organic (flexible and participative encouraging cooperative social action)
Technology	No restriction	Favors object-oriented technology

Table 2 Excerpt from Nerur et al. (2005*).*

Boehm & Turner (2005) argue that agile methodologies can result in lower defect rates, higher customer satisfaction, provide faster development, and increase organizational adaptability to rapidly changing environments. Furthermore, Serrador & Pinto (2015) argue that using an iterative approach has a positive impact on the overall success of a project. However, empirical evidence regarding the supposed benefits and weaknesses agile development offers is proven to be very low (Dybå & Dingsøyr, 2008; Runeson et al., 2020).

The key takeaway when analyzing the different approaches is that there is not necessarily a 'better' development approach, and no one size fits all (Thummadi et al., 2011). Rather, organizations need to be attentive and select a method fitting for their situation. Furthermore, Boehm (2002) argues that hybrid-approaches, thus mixing the two methods, can also be most feasible in some scenarios.

2.2.2 Agile teams & Agile project management

A large number of different agile methodologies are being used on team- and project-level. Each year the State of Agile conducts a survey to gather information regarding the application. In 2020 approximately 40.000 agile experts were included. According to their report (Digital.ai, 2020), Scrum is the most used method (Figure 2). The scope of this literature review focuses on Scrum, and the other four most-used methods (greater than 5%).

i. Scrum

Scrum originally referred to a strategy used in rugby for returning an out-of-play ball back to the game. Nowadays it is more commonly used to describe the framework that supports software development. More specifically, it is a software development methodology that focuses on project situations with high uncertainty and where planning is difficult (Dybå & Dingsøyr, 2008). Due to its iterative nature and feedback-loops, requirements can constantly be changed.

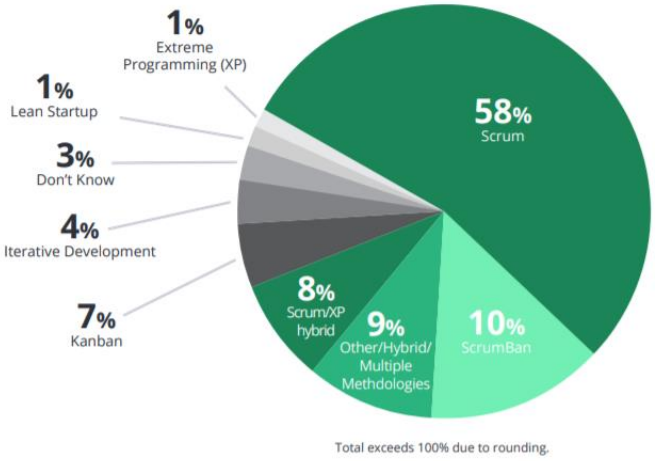

Figure 2 Overview agile methods. Excerpt from Digital.ai (2020)

Scrum introduces a new management role: the Scrum Master. The scrum master aligns the team's capabilities and management's wishes. Activities performed by the Scrum master include identifying the product owner, working with management, being responsible for ensuring that obstacles for the team are removed, and initiating the sprints (Schwaber & Beedle, 2002).

These 'sprint*s'* are development periods of two to eight weeks where high quality software is developed (Beedle et al., 1999) and delivered by self-organizing teams. The teams are made up of seven individuals with different educational backgrounds. The cross-functional structure of these teams not only allows them to be self-organizing, it also ensures that all skills required to fulfill a sprint are available. To ensure clear communication, meetings occur regularly.

Scrum describes three types of meetings before, during, and after the sprints (Schwaber & Beedle, 2002):

1. At the start of each sprint a *'*Sprint Planning Meeting' is called. During the spring planning meeting, the goals are discussed.
2. Each day during sprints a *'*Scrum Meeting' is held, which should take about fifteen minutes. During these meetings the teams should discuss what has been accomplished since the last meeting, what the current obstacles are, and what is going to be achieved for the following meeting.
3. The 'Sprint Review' is an informal meeting, which typically lasts about four hours. In this sprint review, the team presents the product increment that have been built in the sprints. Who is present at this meeting depends on context, but the management, customers, users, and the product owner should most likely attend.

The teams take their work from the 'product backlog', a prioritized and visualized to-do list ordered by priority. This backlog should evolve as the product with the desired product and its environment (Beedle et al., 1999). Therefore, this backlog is constantly changing. Only the product owner can change this backlog.

ii. Kanban

The Kanban method for software development was first introduced by David Anderson (2010) when he was assessing a poor performing IT team at Microsoft. He based the method on the following principles:

1. Visualization of the workflow
2. Limitation of work in progress
3. Measurement of lead time

These principles reflect the main focus of Kanban: accurately describing what work has to be done, and by when (Lei et al., 2017). This is achieved by prioritizing tasks and defining the workflow in the '*Kanban board*'. The Kanban board represents a set of activities categorized in different phases. Generally used phases are 'to be performed', 'currently under development', 'in the testing phase', and 'finished'. From here developers can easily get insights in the assigned work and progress. The Kanban board further helps ensure that the work in progress is limited (Ahmad et al., 2013).

There are some clear similarities between Scrum and Kanban. Both use an iterative method and visualize the development process with small work items. Kniberg & Skarin (2010) state that both are scheduling systems which are based on empirical and continuous process optimization, and both argue that responding to change is more important than following a plan.

Kniberg & Skarin (2010) also state some key differences. Summarized, these relate to whether cross-functional teams and roles have been prescribed, the prescription of prioritizing the backlog, having daily meetings, and the use of sprints. Nikitina et al. (2012) note that while Kanban seems similar to Scrum, it is less perceptive.

iii. ScrumBan

Thanks to their similarities, a combination of Scrum and Kanban can be implemented. This is referred to as ScrumBan. Scrumban is a combination of the Scrum framework (feedback loops, daily meetings, sprints) and the Kanban principles (visualize workflow, limit work in progress, measure lead times) (Ladas, 2011).

The Scrum framework allows for constant value delivery, while the Kanban principles ensure a visualized overview and flexibility. Scrumban emphasizes the capabilities inherent to Scrum, as well as adding new perspectives (Reddy, 2016). According to Reddy (2016), ScrumBan should be applied when particular facets of Scrum or Kanban are not working to their full potential individually.

iv. Extreme Programming (XP) / Scrum hybrid

Extreme programming (XP) is another agile method applied throughout the industry. Often, a hybrid approach with Scrum is used. Beck (1999) defines XP as: "*a lightweight methodology for small-to-medium-sized teams developing software in the face of vague or rapidly changing environments*"

XP aims to include end-user participation by using this set of practices and use ethical software development (Hilkka et al., 2005). It was initially introduced to avoid lengthy development cycles. This is achieved by focusing on twelve best practices for software development (Dybå & Dingsøyr, 2008). The twelve practices included with XP (Beck, 1999) are described in Table 3.

Method	Description
Planning game	Planning is decided by customers based on estimates provided by programmers.
Small releases	Small iterations instead of solving the whole problem.
Metaphor	The system is based on a shared metaphor between the customer and programmers.
Simple design	Design is to be kept as simple as possible.
Tests	Programmers write unit tests and customers write functional tests.
Refactoring	Restructure code to ensure maintainability.
Pair programming	Code is written by two people at one computer.
Continuous integration	New code is continuously integrated within the live system.
Collective ownership	The entire system ownership is shared among all programmers.
On-site customer	A customer is on-site and sits with the team.
40-hour weeks	No frequent overtime.
Open workspace	The workspace is large and open. The pair programming is set-up in the center.
Just rules	Rules can be changed.

Table 3 XP Practices. Adapted from Beck (1999)

The XP/Scrum hybrid method combines the practices of XP with the Scrum framework. The development team works in sprints and divides the whole project into smaller segments. Subsequently, XP best practices are applied in the engineering process.

The reason for this combination is the lack of guidance Scrum provides on the engineering process of software development (Mushtaq & Qureshi, 2012). Musa & Tariq (2017) argue that this method allows for more flexibility than traditional methods, and should therefore be used in an environment with fast changing requirements.

2.2.3 Large scale agile development

As previously mentioned, agile was initially mainly applied in the context of small software teams (Kettunen & Laanti, 2008). These teams used agile methods like Scrum, XP, and Kanban. This proved to be prosperous, and therefore agile started being adapted for use in projects with large amounts of teams and hundreds of developers (Dingsøyr et al., 2019).

There are various interpretations of large-scale agile. A small study on the taxonomy of large-scale agile (Dingsøyr et al. 2014) suggests that large-scale agile is applied when collaborating with 2-9 teams. Additionally they suggest that when working with more than 10 teams the term very large-scale should be applied. However, other studies refer to the amount of people involved. Koehnemann & Coats (2009) for example, refer to an agile project consisting of 50 people as small, while Elshamy & Elssamadisy considered 50-100 people large.

After analyzing similar studies, Dikert et al. (2016) denoted that large-scale agile refers to "*software development organizations with 50 or more people or at least six teams*". For this definition, the 50 people must belong to the same organization. For the purposes of this research, the definition described by Dikert et al. will be applied.

2.2.3.1 Challenges and success factors for scaling agile

Scaling agile is not self-evident. In general, the larger the organization size the more difficult it becomes to introduce these agile methods (Dybå & Dingsøyr, 2008). According to Scott Ambler (2008), who was agile practice leader at IBM, several challenges must be considered before scaling agile. He mentions challenges related to team size, geographical distribution, entrenched culture, legacy systems and enterprise focus.

A recent five-year case study of a large-scale adoption of Scrum at a multinational telecommunications company (Annosi et al., 2020) also criticizes some points of adopting agile on a larger scale. Six concrete pitfalls are mentioned:

1. Learning and ideation behaviors are flawed by team interdependencies
2. Organizational structure prioritizes urgent issues over learning and innovation
3. Reduced knowledge accumulation
4. Reduced knowledge integration
5. Reduced coordination of knowledge
6. No individual self-efficacy

The main takeaway of the above pitfalls is that organizations have to take into account the organization's needs for integration mechanisms (Annosi et al., 2020). Such an integration mechanism can for example be cross-functional interfaces.

Furthermore, as previously described, it is common with agile methodologies for the entire team to collaborate. With larger projects however, this has proven to be challenging (Elshamy & Elssamadisy, 2006). One possible explanation for this is the fact that agile's nature is iterative (Stettina & Hörz, 2015).

According to Dikert et al. (2016) the main success factors for scaling agile are management support, proper training and coaching, choosing and customizing which agile model to use, and finally alignment and mindset.

2.2.4 Scaling frameworks

Several frameworks have erupted to support scaling agile across enterprises. The most used frameworks are ordered and listed in Table 4.

Framework	Adoption (Digital.ai, 2020)	Publication	Foundation	Suitable for (Dingsøyr et al., 2019)
Scaled Agile Framework (SAFe)	35%	Leffingwell (2007)	- Large enterprises - 7 principles for business agility	Groups of 50-150 to whole organizations
Others/No response	34%	N/A	N/A	N/A
Scrum of Scrums	16%	Sutherland (2001)	- Scrum	Whole organizations
Disciplined Agile Delivery (DAD)	4%	Ambler & Lines (2012)	- Agile development - Lean software development - Agile modelling	One to many teams
Large Scale Scrum (LeSS)	4%	Larman & Vodde (2005)	- Scrum - Experimenting	2-7 development teams
Enterprise Scrum	4%	Beedle (2002)	- Scrum	Undefined
Nexus	3%	Schwaber (2015)	- Scrum	3-9 development teams

Table 4 Large scale agile frameworks

The State of Agile report (Digital.ai, 2020) shows how these frameworks are used within the industry. In the 2020 report, SAFe is the most widely adapted framework.

i. Scaled agile framework (SAFe)

The most widely known and applied framework is the Scaled Agile Framework (SAFe)[3]. SAFe is like a container for several agile approaches and is primarily developed for managing agile practices on a larger scale. More specifically, it uses practices from Scrum, XP and Lean.

The framework describes roles, responsibilities, artifacts and activities to transform an organization towards enterprise-scale agile development (Knaster & Leffingwell, 2020). The most recent SAFe 5.0 offers three layers, which can be applied depending on organizational context. The three levels are Essential (one project), Large Solution (several projects), and Portfolio (aligning strategy with execution).

The framework is built around seven core competencies (Scaled Agile Inc., 2019) which supposedly deliver business agility. These competences are lean-agile leadership (1), enterprise solution delivery (2), agile product delivery (3), team and technical agility (4), lean portfolio management (5), organizational agility (6), and a continuous learning culture (7).

[3] https://www.scaledagileframework.com/

ii. Scrum of Scrums (SoS)

One method for scaling Scrum beyond the scope of one team is Scrum of Scrums (SoS). With SoS, different Scrum teams are working as they would with regular Scrum. Additionally, each team has an assigned person who is responsible for the SoS meeting. Literature recommends that SoS meetings then happen daily to 2-3 times a week (Paasivaara et al., 2012).

Larman & Vodde (2010) propose that three questions will be discussed during these meetings: what did you do since the last meeting which is relevant for other teams (1) , what will you do before the next meeting which is relevant for other teams (2) and what obstacles are in your way that you need help with from other teams (3).

iii. Disciplined Agile Delivery (DAD)

The DAD framework is a process decision framework based on different agile methodologies. The DAD has a goal-driven and people-first approach. Intertwined in the framework are well-known methodologies like Scrum, XP, Kanban and others. In a way it is a competitor for SoS, as it supposedly builds upon the Scrum framework (Scott W. Ambler, 2012). Yet it is also like SAFe, as it uses different agile methodologies to create a new framework.

The DAD framework distinguishes three main phases (Scott W. Ambler, 2012). The inception phase (1), the construction phase (2), and the transition phase (3). The first phase, the inception phase, is about forming a team, identifying requirements and risks, and aligning the enterprise direction. The second phase, the construction phase, is about producing a solution, addressing stakeholder needs, and moving towards a deployable release. The final transition phase ensures that the solution is ready for production, and makes sure that the stakeholders are ready to receive their solution.

The framework distinguishes several primary roles. A team lead (replacing the Scrum master), a product owner, an architecture owner, team members, and stakeholders. The DAD framework furthermore describes optional secondary roles for scaling. These options include an independent tester, a specialist, a domain expert, a technical expert, and an integrator.

iv. Large Scale Scrum (LeSS)

LeSS[4] is another framework based on Scrum, aiming to apply it at a larger scale. Based on experimenting, LeSS has defined rules and guidance for structure, and describes the scrum process at large (The LeSS Company, 2020).

With LeSS, organizations use teams as the basic building block. These teams are supposed to be stable and cross-functional, manage themselves, and tend to sit together. Among these teams are Scrum masters, which is a formally defined full-time role. Maybe the largest change regarding structure is the role of managers. With LeSS, managers are optional. When managers are included in the organization, their new role is to improve the value-delivering capabilities of the product development system (The LeSS Company, 2020). The role of the product owner is mostly the same as with Scrum. The foremost change is the focus of the product owner, which is on the whole-product view instead of local optimisation.

LeSS takes a slightly different approach in working with sprints than SoS. With LeSS, instead of having sprints for each teams, the sprints are now on product-level. That way sprint results are integrated into the whole product. These teams have two types of meetings, the known daily stand up meeting and multi-team sprints.

When working with more than eight teams, The LeSS Company (2020) advises changing to the LeSS Huge framework. Which has its own structure, rules and guidelines.

[4] https://less.works/

v. Enterprise Scrum

Another approach to scaling Scrum and aiming to provide organizations with business agility is Enterprise Scrum[5]. Enterprise scrum is defined (Beedle, 2018) as: *"... a framework that seeks to quickly deliver the most business value and balanced benefits to all people involved*". It is built around five values: commitment (1), courage (2), respect (3), openness (4), and focus (5).

As with Scrum, Enterprise Scrum defines three roles: Enterprise Scrum team, a business owner (previously product owner), and a coach (previous Scrum master). The Enterprise Scrum Teams (3-9 people) are formed around employee experience, balancing profit, and purpose which is supposed to maximize delivered value. These teams are autonomous, independent, and self-managed. In the team the business owner works with the stakeholders, defines and orders a to-do list, and measures business value provided to the customer. The coach on the other hand first selects the team members, schedules the meetings, facilitates communications, and matches people with what they want to do.

Instead of sprints, these Enterprise Scrum Teams perform time-boxed cycles. These cycles do not have a limit. As with Scrum, release planning is included with the cycles. In contrast to Scrum, the Enterprise Scrum Teams can use as many metrics as they want. Furthermore, Enterprise Scrum provides a large number of parameters to extend the known concepts.

vi. Nexus

The Nexus framework[6], like many frameworks, is based on the Scrum framework. However, unlike other frameworks, it only slightly augments the Scrum framework. It adds one new role and a few expanded events and artifacts (Bourk & Kong, 2016).

The teams (3-9) work with one product backlog aimed towards a goal. The new role introduced by the Nexus framework is the Nexus Integration Team (NIT). The NIT is accountable for the delivery of a product once the sprint has ended. Therefore, activities include solving issues, raising awareness on dependencies, and in emergency situations performing teamwork.

Events included with Nexus are similar to Scrum. These are the Nexus Sprint Planning, a Nexus Daily Scrum, a Nexus Sprint Review, and a Nexus Retrospective (Bourk & Kong, 2016). The main difference with the Scrum framework is the Nexus Daily Scrum, which is an additional meeting where different teams discuss integration issues before going to the individual Scrum Meetings. The other meetings are simply aimed towards large scalability by including several teams.

Like with LeSS and LeSS Huge, Nexus offers additional guidelines for working with more than 10 teams. This is referred to as the Nexus+ framework.

[5] http://www.enterprisescrum.com/

[6] https://www.scrum.org/resources/nexus-guide

2.2.5 Agile Portfolio Management for business agility

Traditional project portfolio management is defined by Martinuso & Lehtonen (2007) as "*the management of a group of projects that share and compete for the same resources and are carried out under the sponsorship or management of an organization".* It aims to link organizational strategy to the distribution of processes (Martinsuo & Lehtonen, 2007). In practice this comes down to a dynamic decision process, where each running project is regularly updated in order to prioritize the best projects. Müller et al. (2008) further describe three main categories of activities: prioritizing and aligning projects with the strategy (1), monitoring and communicating about project priorities (2), and reprioritizing projects (3). These traditional portfolio management best practices are mainly aimed towards stable environments (Luna et al., 2010). The main drawback according to Lycett et al. (2004) is that established project portfolio management frameworks lack adaptability in different environments as they assume equal effectiveness for different contexts.

Agile portfolio management extends project portfolio management and its activities. By connecting and aligning development teams to the strategy, agile portfolio management allows for more responsiveness and faster configurations of portfolio components (Müller et al., 2008). It furthermore aims to integrate agile principles within the portfolio. Implementing these agile principles into the portfolio management does pose additional challenges, which is mainly related to agile's iterative nature (Horlach et al., 2020; Stettina & Hörz, 2015). The main concerns are regarding scalability and its integration within traditional large-scale projects (Turetken et al., 2016).

Frameworks for coordinating and scaling agile portfolio management towards business agility have emerged (Knaster & Leffingwell, 2020; Krebs, 2008; Scott W. Ambler, 2012; Vähäniitty, 2012) to address these concerns. The previously described SAFe offers a one-size fits all approach (Knaster & Leffingwell, 2020), while the DAD framework gives high level descriptions on different approaches (Scott W. Ambler, 2012). Another framework by Krebs (2008) aims to manage portfolios by using financial models, and applying these in a flexible manner. Finally, Vähäniitty (2012) proposes a framework based on three processes which connect business and development. The processes are decision-making (1), product roadmapping (2), and release planning (3).

There has been some criticism on these frameworks. Horlach et al. (2018) argue that the SAFe framework only offers limited insights towards non-development and non-IT functions, and that the DAD framework lacks guidance on the realization of the agile portfolio system. Putta et al., 2019 mention the lack of guidance in the configuration of value streams. Stettina & Hörz (2015) and Puthenpurackal et al. (2021) furthermore emphasize the lack of empirical evaluation of these models.

2.3 Organizational design and theory

With digitalization, competition, and innovation, organizational design has become an everyday activity for each executive. There are many models available for describing organizational design (Jimmy et al., 2011), but for the sake of this study I refer to the star model (Galbraith, 2002). The star model argues that a good organizational design needs to align five components: strategy (1), structure (2), coordination (3), reward systems (4), and people practices (5). For this research however, the scope is mainly on organizational structures.

Aligning the different aspects of the star model, and thus creating the right organizational design, has proven to be an impactful factor for organizational success (Burton & Obel, 2018). A right contingency and institutional fit has proven to be a positive influence on firm performance (Volberda et al., 2012), while consequences of poor organizational design may be coordination issues, confusion, complexity, stress, and conflicts (Corkindale, 2011).

Although they relate closely, organization theory is not to be confused with organizational design. Organizational theory refers to the underlying fundamentals of organizational design. It is a descriptive field of study which aims to build theories and perform empirical research (Worren, 2018).

In this chapter, I will take a closer look at the history of organizational structures and typical challenges for organizational design. Thereafter, I will analyze how agility and value streams fit into this subject.

2.3.1 Organizational structures historically

Every organization has some sort of management structure that determines the relationships between the members, roles and activities (Burton & Obel, 2018). Deciding on the structure of an organization is an essential and critical decision for each executive (Burton et al., 2011). Organizational structuring includes assigning tasks to individuals, dividing resources among these individuals, designating customers and markets to units, and breaking down large problems into small segments (Burton & Obel, 2018).

In literature on organizational design (Burton & Obel, 2018; Walker & Lorsch, 1968), two dimensions are used to distinguish configurations: product and functional. Product-based structures center their organizations around the products and services they offer. While functional-based structures divide work around specialized activities. In a Harvard Business Review, Walker & Lorsch (1968) concluded that product organizations lead to better results in situations where the tasks are less predictable and require innovative problem-solving, while functional organizations perform better where stable performance of routine tasks is required. Based on these two dimensions, four fundamental structures have been used prominently (Figure 3). In this section I will describe the simple structure, the functional structure, and the divisional structure in more detail. Thereafter, I will elaborate on the multidimensional structure in a new section due to its complexity and relevance.

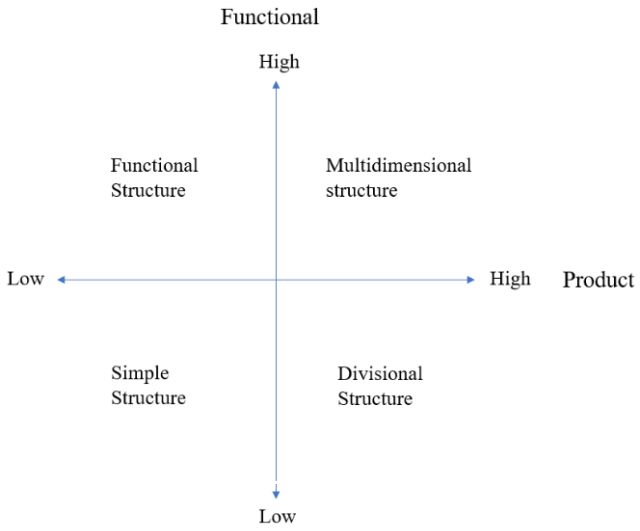

Figure 3 Organizational structures

2.3.1.1 Simple structure

First off the simple structure. Mintzberg (1983) characterizes a simple structure by the absence of a structure with little hierarchy, no departments, and informal roles. Such simple structures are often applied within smaller organizations (Worren, 2018), where one manager or leader oversees a small number of employees. Figure 4 shows a visual representation of the simple structure.

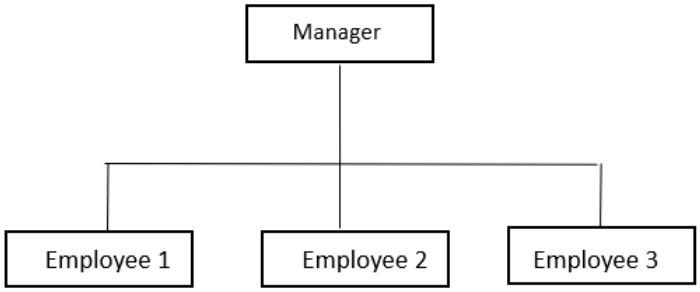

Figure 4 Simple structure

Having one manager is an advantage because he/she can quickly make decisions and respond to changes (Mintzberg, 1983) as there is no middle-management layer which has to approve everything. Another advantage relates to the simplicity as it takes minimal effort to set-up. At the same time, having one manager is also a bottleneck. If the manager falls sick, or does not have the capacity to process all the requirements, there will ultimately be some sort of delay. Furthermore, employees may complain about career prospects or look for them elsewhere.

2.3.1.2 Functional structure

In a functional organization, design is based around specific functional areas such as R&D, IT, sales, or marketing. Each of these have employees who are specialized in their respective area. In literature, this is also referred to as silos. In comparison to the simple structure, functional configurations, task assignment, and structures are well established. This allows for scaling and higher degrees of information processing (Burton et al., 2011). A visual representation is shown in Figure 5.

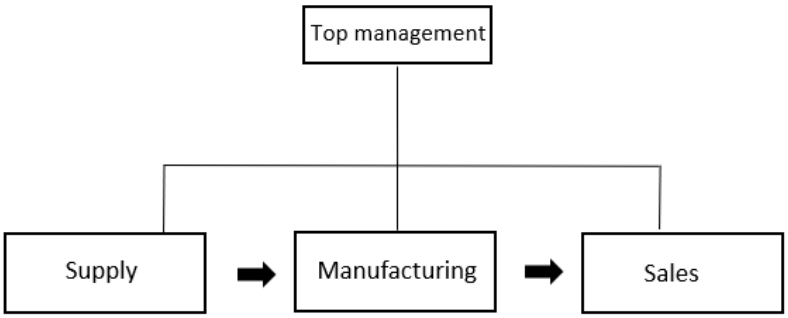

Figure 5 Functional structure

With a functional, and often a larger structure, career paths open up for employees. Moreover, by assigning specialized individuals to specific tasks, they learn to perform these tasks effectively (Burton et al., 2011). Also, functional structures are said (Worren, 2018) to encourage the development of specific specialized skills.

There are also some limitations when working with a functional structure. While this configuration is effective for organizations aiming to operate with high efficiency and operation, much of this is lost when rapid change is in order. It is also harder for employees in silos to prioritize which product to

develop and handle information from different products simultaneously (R. Duncan & Weiss, 1979; Worren, 2018).

2.3.1.3 Divisional structure

The divisional structure is based around relatively independent semi-structured business units. These business units are part of a division, which is responsible for a product or service. Often, each of these divisions is structured around the functional configuration. Again, supervision of these units is provided on executive level. The focus shifts however, from internal specialization towards a market, product, or geographical view. This may differ per division. Therefore, each division has its own goals, financials and strategy.
A visual representation of the divisional structure is shown in Figure 6.

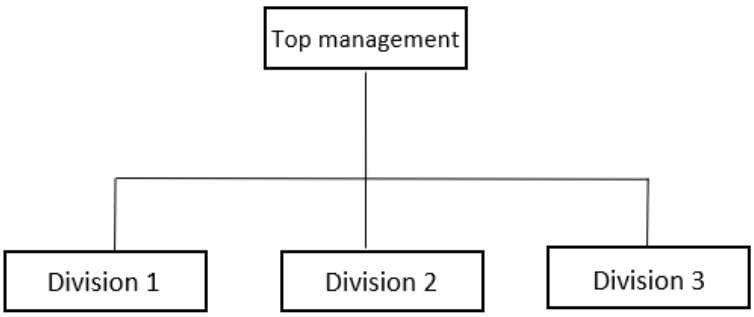

Figure 6 Divisional structure

With its external and autonomous approach, divisional structures are more market-responsive than the traditional functional configuration. Organizations can furthermore implement and delete products more easily.

The independent structure of the divisions also causes a disadvantage. Products that require work across different divisions are problematic. Also, products from different divisions do not always align well, which is problematic if a potential customer is interested in some sort of package.

2.3.2 Multidimensional structures

As companies expanded in size and complexity, they found that one dimension across different units is often suboptimal. Therefore a large number of organizations started using structures that combine different dimensions (Worren, 2018). With a multidimensional approach companies are able to focus on their products and markets, while also optimizing internal services. The general term for this occurrence is a 'multidimensional structure', although it is sometimes confused with a matrix organization. In fact, the matrix organization is one of several adaptations of a multidimensional organization. According to Worren (2018), three multidimensional structures are used to create multidimensional designs. These are the matrix structure (1), the front-back structure (2), and the modular structure (3).

2.3.2.1 Matrix organizations

The matrix combines different types of organizational structures to create a multidimensional structure. For clarification, an example matrix structure has been drafted in Figure 7.

As shown in the figure, employees generally report to two or more managers. One manager is responsible for the functional part, for example IT, while another manager is responsible for executing the project.

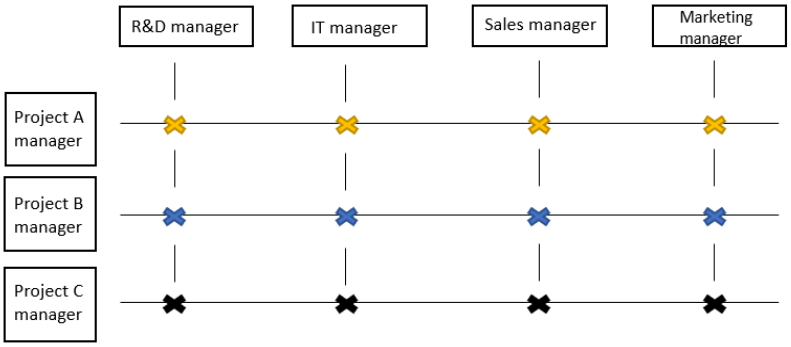

Figure 7 Matrix organization

When implemented right it can combine the benefits of different organizational forms. For example that of a functional organization (high efficiency) with the benefits of a divisional organization (high effectiveness). Furthermore, sharing of resources between functional units and projects becomes possible.

However, the configuration of a matrix structure can be hard and costly. Furthermore, conflicts may arise between managers of subunits (Burton et al., 2011) when the reporting structure or authority is unclear. Often, this dual-authority problem originates with the different goals of the managers that are being held accountable for (Worren, 2018).

2.3.2.1.1 Reporting structure in matrices

Balancing power within a matrix organization is a controversial subject. The product offers direct value to the customer and provides the organization with profit, while the functional side allows for efficiency and economies of scale. However, in practice the functional manager often gets the power tipped towards his/her direction. This is caused by employees' perception of the permanent role in the hierarchy by the functional manager versus the temporary role of projects or products (Stuckenbruck, 1979).

The Project Management Institute (2000) (PMI) distinguishes three types of matrices and separates functional and projectized structures. The different matrices are: weak (1), balanced (2), and strong (3). In a weak, the project manager's authority is limited, and the role is only fulfilled part-time. In a balanced matrix the project manager's authority is low to moderate, but the role is fulfilled full-time. In a strong matrix the project manager's authority is moderate to high and the role is also fulfilled full-time.

The previously described Spotify model can also be described based on PMI's criteria. This may help with providing a clear overview. The full description for each matrix can be found in Table 5.

	Functional	**Weak matrix**	**Balanced matrix**	**Strong matrix**	**Projectized**	**Spotify (Productized)** (Kniberg & Ivarsson, 2012)
Project Manager's Authority	Little or none	Limited	Low to moderate	Moderate to high	Moderate to high	Coordination role. Team is semi-autonomous and focused on products.
Percent of performing organization's personnel assigned full time to project work	Virtually none	0 – 25%	15 – 60%	50 - 95%	85-100%	95-100%
Project manager's role	Part-time	Part-time	Full-time	Full-time	Full-time	Full-time
Common titles for project manager's role	Project coordinator / Project leader	Project coordinator / Project leader	Project manager / Project officer	Project manager / Program Manager	Project manager / Program manager	No project managers
Project management administrative staff	Part-time	Part-time	Part-time	Full-time	Full-time	Full-time

Table 5 Types of matrices. Adapted from Project Management Institute (2000)

2.3.2.2 Modular structure

A modular structure, first introduced by Gharajedaghi (1984), is another multidimensional structure. The general idea behind this structure is that each organizational structure should be based around certain inputs, outputs, and its environment. These complement each other and together influence the division of labor and establish the line of command. Gharajedaghi (1984) argues that to allow for the right flexibility each part of an organizational structure should relate to one of these components. He uses five dimensions to elaborate on this theory. These are input modules (1), output modules (2), environmental modules (3), process (4), and management & control (5).

Input modules provide the right input for the product. The most basic form is manufacturing, but business services or research and development are also included within these modules.

The output modules host a product, project, or program. They carry the responsibility for delivering marketability, feasibility, and profitability for their respective host. Each of the different output units has their own multi-dimensional structure which is similar to the larger structure of the entire organization. In a way, each output unit is a miniature version of the larger organization. Interestingly, the output units are semi-autonomous and ideally self-sufficient (Gharajedaghi, 1984).

Input modules can be shared with output modules, for example with manufacturing. In such cases the input model operates as a profit center. This can supposedly lead to competitive and flexible facility management. It furthermore gives product managers more freedom by allowing them to provide requirements where they wish – inside or outside the organization.

The environmental modules allow for fast responsiveness to the outside. Gharajedaghi (1984) distinguishes two main functions. These are distribution (1) and advocacy (2). The distribution unit represents the organization to its environment and is responsible for sales, which are inherently related to each other. The advocacy unit senses the environment and defines system expectations. It 'advocates' the customers' wishes and expectations. A full overview is shown in Figure 8.

Besides these modules, Gharajedaghi (1984) also describes two more dimensions, the process, and management & control. The process, which often reflects a planning board, is concerned with reactive and proactive planning. It identifies and designs the organization's projects and forecasts future opportunities and threats. The management & control system represents the executive function which is responsible for realizing the organizational mission and overseeing the operation of the whole system.

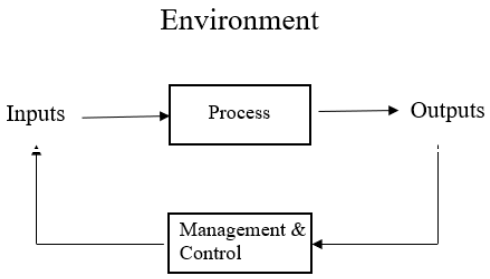

Figure 8 Components of a modular structure. Adapted from Gharajedaghi (1984)

With the modular structure, each module can become specialized in their respective area. At the same time, economies of scale and scope can be achieved. An example of this structure has been drafted up in Figure 9. The key-difference with the front-back structure, which will be discussed next, is that there is no relationship between the different dimensions. Rather, each unit has a supplier-customer type relation with its relevant sub-unit. This way, different units of the organization have a customer-like relationship with other related parts.

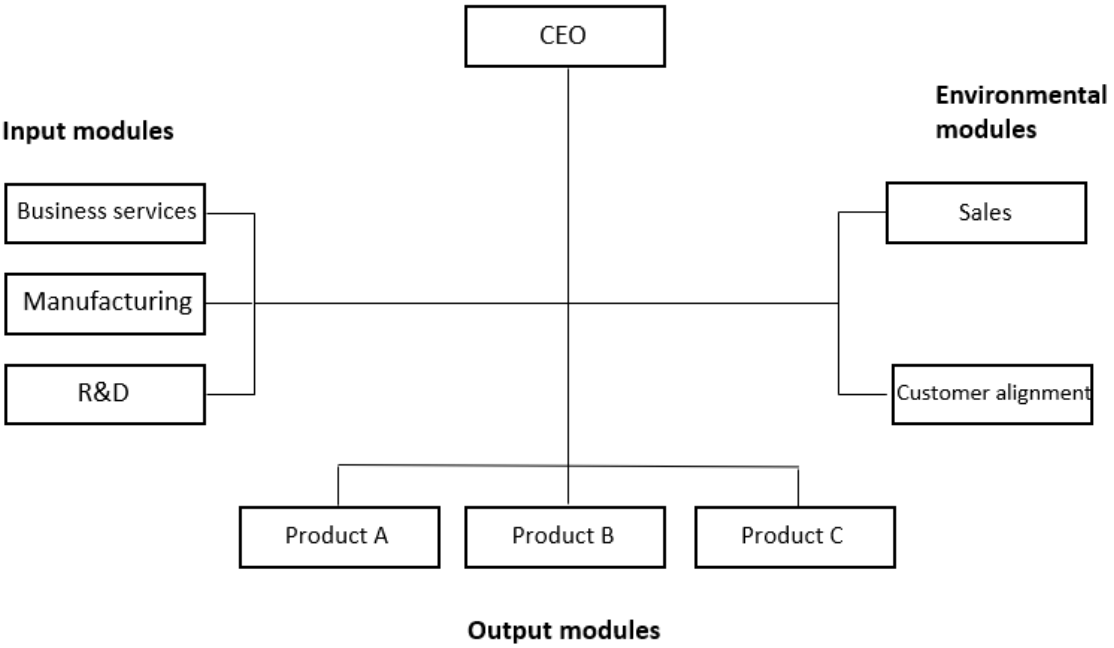

Figure 9 Modular structure. Adapted from Gharajedaghi (1984)

2.3.2.3 Front-Back structure

The front-back structure, introduced by Galbraith (2002), takes a slightly different approach than the matrix and modular structure. The structure is still based around separated units in different dimensions, however the main difference is that it distinguishes front-end and back-end as two separate structures. Like with the modular structure, it is built around independent profit centers.

Galbraith (2002) argues that this structure is best-suited for organizations in a global environment that have several product lines and different market segments. Naturally, this structure is also a fit for organizations that aim to combine product- and customer-excellence.

The front-end focuses on customer relationships and mastery of different channels, while the back-end focuses on products and development (Galbraith, 2005). This means that the back-end is responsible for the product, while the front-end focuses on the customer.

This allows organizations to sell different products and services to one client, while also being able to combine different products in development. The general idea behind this approach is that it allows for more specialization and can derive advantages from economies of scope (Worren, 2018). Also, with the front-back structure employees only report to one manager, resolving the previously described dual-authority problem. An example of the front-back structure has been drafted up for more clarification (Figure 10). In this case the back-end is organized by different functions, while the front-end is organized by customer segments.

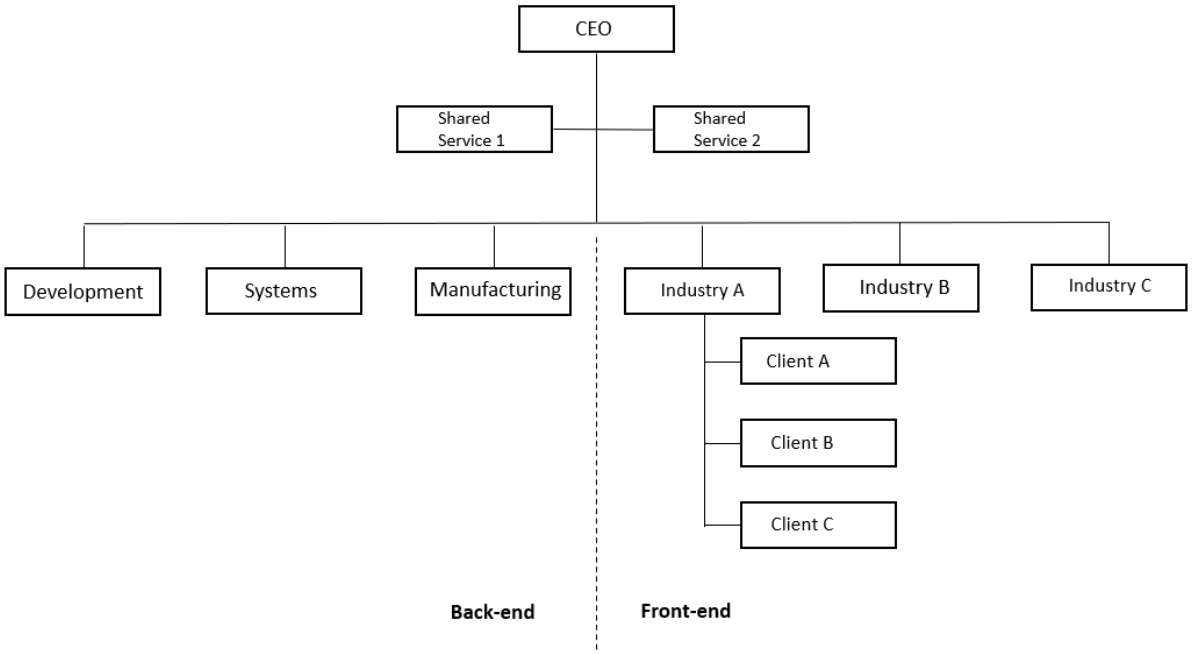

Figure 10 Front-Back structure

2.3.2.4 Comparing multi-dimensional structures

While the different approaches seem to have quite a bit in common, there are some noteworthy differences. Worren (2018) compared the different types of multi-dimensional structures and summarized them. An adaptation of these results can be found in Table 6.

	Matrix	Modular	Front-Back
Reporting structure	Dual (or sometimes triple)	Unitary reporting	Context dependent, but commonly to one manager.
Key Performance Indicator	Profit and loss on both dimensions	Profit and loss on both dimensions, but independent KPI's can be applied	Profit and loss on both dimensions, but independent KPI's can be applied
Organization of resources	Within each unit	In separate resource pool	Within each unit
Organization of 'front end'	No requirement	Always defined according to market segments	Always defined according to market segments
Advantage	Increases lateral coordination	Maximize flexibility	Reduces complexity and clarifies sub-unit roles
Disadvantage	High complexity, higher costs, and may lead to leadership conflicts	May increase risk of fragmentation	Intend of model often undermined during implementation

Table 6 Comparing multidimensional structures. Adapted from (Worren, 2018).

Arguably, each structure might be best within their own optimal context. The matrix organization may be used if a dual reporting structure is required, and an organization does not mind high complexity. The front-back structure might be most applicable for stable projects. Contrarily, the modular approach is very interesting when high flexibility is required.

Concludingly, the concept of multidimensional structures can be defined by the following characteristics:

- A combination of separated units and dimensions
- Combines benefits from a functional and a divisional structure
- Allows for more decentralization
- Proper configuration (linking of dimensions) can be complex and costly
- Represents products and markets, but also internal services

2.3.3 Adaptable structures based on practitioner frameworks

Practitioner frameworks which aim to find a balance between operational efficiency and strategic agility in response to organizational challenges have erupted.

Two adaptable structures stand out (Appelbaum et al., 2017). These are the dual operating system, and the Spotify model.

2.3.3.1 The dual operating system and network structures

A model aiming to combine management-driven hierarchies with flexible models is the dual operating system proposed by Kotter (2014). Kotter realizes that management-driven hierarchies are ineffective in complex and uncertain environments (as argued by Lawrence & Lorsch, 1967) and adds an strategic agile network to cope with these challenges. This management-driven hierarchy and a strategic agile network work in parallel within one organization.

Kotter praises management-driven hierarchies and mentions that it can provide organizations great benefits. The management-driven hierarchy offers the known reliability and efficiency through a functional organization. It performs well with incremental or predictable changes. However, with increasing digitalization and competition (Kotter, 2014), organizations also require the capabilities to respond to opportunities in a quick manner. Kotter argues that the management-driven hierarchy constrains this process systematically, and therefore argues that organizations should have a strategic agile network work with the management-driven hierarchy in parallel.

The strategic agile network, which consists of about 5 to 10% of the employees, is free from organizational controls and is Kotter's attempt to mirror enterprises in the early stage where environmental responses come naturally. It has no formal reporting structure, and its main function is to provide agility and speed, allowing the organization to 'leap into the future'. Interestingly, the people making up this strategic agile network are volunteers who are already working within the hierarchical organization. The payoff for these people is involvement, more engaging work, and accelerated personal development (Leavy, 2014). Kotter's reasoning for this is mainly regarding motivation: he prefers a network of people who are passionate and have the right intrinsic motivation over employees with an anxiety-driven urgency.

The foundation of the model is based around five principles. These principles provide the general guidelines of the model:

1. Many people drive the import change
2. A "get-to" mindset, not a "have-to" one
3. Action is head and heart driven
4. More leadership, not just more management
5. An inseparable partnership between the hierarchy and the network

Unfortunately, empirical validation for the dual operating system is limited. Leavy (2014) describes that the biggest challenge for this system is making emlpoyees that are used to a hierarchy are convinced that such a dual-operating system could work. Besides Leavy's contribution I found one available case at Nike (Burgelman & Denend, 2007). Here, a group of motivated individuals attempted to break down cultural barriers in a product-based company by addressing the needs coming from the fitness market for women. This group functions like the strategy acceleration network as described by Kotter. The project was concluded as a financial and strategic success, but unfortunately the proposed customer-focused approach was not extended throughout the entire organization due to insurmountable cultural, operational, and management barriers (Appelbaum et al., 2017; Burgelman & Denend, 2007).

The previously described SAFe framework integrates the dual operating model within its framework. The network, structured as a set of development value streams, supposedly provides quick adaptability to threats and opportunities. The network structure moves from project to product (Knaster & Leffingwell, 2020). Contrarily, the hierarchy is optimized for providing the necessary efficiency and stability.

Using a network structure in response to organizational challenges such as globalization, technological change and deregulation was already a known concept before Kotter introduced his Dual Operating System. The network structure, which fundamentals trace back to Snow et al. (1992), refers to the concept of a company-wide network structure which is built up from clusters of business units that are coordinated by the market mechanisms. Such a network structure supposedly helps organizations respond to changing market environments. Yang & Liu (2012) found that a network structure, when implemented right, can even lead to a competitive advantage.

Snow et al. (1992) distinguishes three types of network structures (Figure 11). An internal network (1) where all the work is performed in-house by independent units. This type is typically used to capture specific market- and entrepreneurial benefits without outsourcing. Another type is the stable network (2), which is used when organizations want to partially outsource and increase flexibility in the value chain. There is a central organization, but vendors perform some important part of the value delivery. Third, the dynamic network (3), is used in fast-paced competitive environments. The dynamic network takes outsourcing to an even higher level. With this network, an integrator who understands the market, identifies and combines different assets which are owned by established different companies.

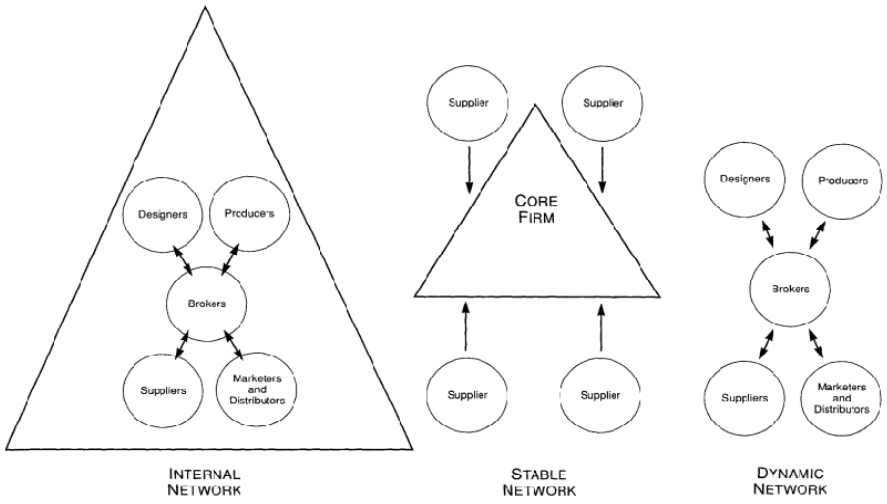

Figure 11 Network structures. Excerpt from (Snow et al., 1992)

2.3.3.1.1 Spotify model

Another practitioner model which is often referred to is the Spotify model. The model was introduced by the well-known music streaming company Spotify, and later adapted by different organizations due to its success with scaling agile principles across a larger organization. The spotify model describes four new concepts: Squads (1), Tribes (2), Chapters (3), and Guilds (4) which can be seen in figure 12.

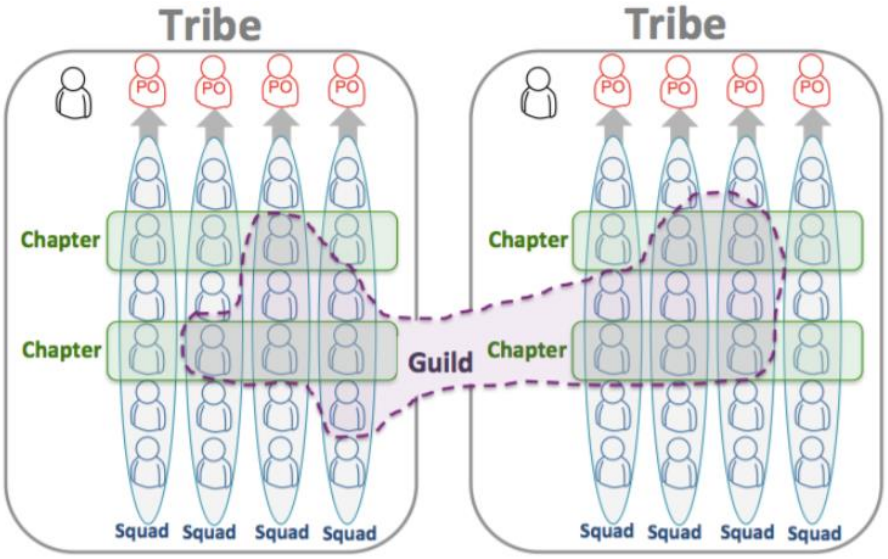

Figure 12 Spotify model. Excerpt from (Kniberg & Ivarsson, 2012)

Squads are similar to Scrum teams. They are semi-autonomous and have different backgrounds allowing them to perform a wide variety of work. However, people sharing the same expertise are also grouped in a different form. In the Spotify model this is referred to as chapters. These chapters, guided by a chapter-leader, can share experiences and knowledge to further streamline the process.

Different squads are organized within the same tribe, which are like lightweight matrices (Kniberg & Ivarsson, 2012). These tribes, usually consisting of about 100 employees, can be compared with the different product groups described in the matrix structure. A tribe works towards a product or service. Guilds on the other hand are similar to the different functional silos described in the matrix organization. Guilds are similar to chapters, but they are not bound to a single tribe. A guild is the collection of individuals with the same expertise working across different tribes within the organization. Every employee can join different guilds based on their personal interest, background does not matter.

The vertical structure, often facilitated via a product owner, is responsible for the ‘what’. Contrarily the horizontal structure, facilitated via chapter leads, is responsible for the ‘how’. These chapter leads fulfill the role of a functional line manager, while also while at the same time being a squad member. There is a clear separation between product delivery and technical excellence. The main difference with the traditional matrix organization is the focus towards value delivery (Kniberg & Ivarsson, 2012).

It should be noted that the Spotify model is not a true framework. It was published as a whitepaper to showcase some of the successes Spotify was experiencing. Quite unexpectedly, many organizations adapted the terms and approaches described in this whitepaper.

2.3.4 Organization and environment

These adaptable organizational structures aim to cope with challenges of functional demands from the environment. On one hand organizations have to increase profitability in the short term, while on the other hand they have to develop innovative services and products to remain competitive (Worren, 2019). On this topic, the contingency theory and ambidextrous organizations will be highlighted.

2.3.4.1 Contingency Theory

There is no universally valid organizational structure, rather organizations have to align their structures with the environment and its contingencies. This is also referred to as the contingency theory (Donaldson, 2001). Specifically, the contingency theory states that in order to manage an organization effectively, structure and control systems should align with the environment in which the organization operates. In other words, organizations must align internal structuring with external environments. The contingency theory is largely based on the following two studies.

Burns & Stalker (1994) researched organic versus mechanistic structures relating to the environment. To place this in context, mechanical structures can be placed in the functional dimension, where the focus is on centralized decision-making and predictability. Organic structures on the other hand promote flexibility and adaptability, which can be placed in the product dimension.
The study found that mechanistic structures work best in a stable environment, while organic structures are more effective in unstable and changing environments. They reason that stable environments do not require complex systems and can focus on efficiency. On the other hand, rapid-changing environments call for quick decision-making and information sharing, which the organic structure offers.

Lawrence & Lorsch (1967) performed a comparative study on six organizations. More specifically, they investigated the extent to which organizations differentiate their structures to fit the industry environment. They found that stable environments are more effective with a centralized and standardized structure. While unstable and rapid changing environments are more effective with a less centralized and less standardized approach, which allows for adjustments.

2.3.4.2 Ambidextrous organizations

Combining a mass-output standardized business with a structurally independent unit for breakthrough efforts like Kotter's dual operating system, is similar to a concept first introduced by R. B. Duncan (1976). Duncan argued that forward-looking firms need to consider dual structures for long-term success through pioneering innovation while also optimizing existing business. The general term for this dual structuring approach used in organizational theory is *organizational ambidexterity*. More specifically, organizational ambidexterity refers to: "an organization's ability to exploit today's business while also being able to explore future possibilities and threats" (O'Reilly & Tushman, 2008).

Three different types of organizational ambidexterity can be distinguished. These are sequential, structural, and contextual ambidexterity organizations (R. B. Duncan, 1976). With sequential ambidexterity, organizations (R. B. Duncan, 1976) shift their structures sequentially, aligning their structure with the firm's strategy over time. In structural ambidexterity there are simultaneous, structurally separate, autonomous exploitation and exploration subunits. (O'Reilly & Tushman, 2008). Finally, contextual ambidexterity focuses more on the individual. Throughout the organizations individuals are enabled, through a set of processes or systems, to allocate their time between exploration and exploitation. Choosing the right type to achieve ambidexterity is context-dependent (Shibata et al., 2019), i.e. structural ambidexterity may be most effective in dynamic markets with changing conditions while sequential ambidexterity may be more suitable for stable markets.

Maier (2004) found that ambidextrous organizations are significantly more successful at launching breakthrough innovations than functional designs, cross-functional teams, and unsupported independent teams. In regard to success factors, O'Reilly & Tushman (2016) proposed four categories. These are: clear strategic intent which justifies the need for exploitation and explorations (1), commitment and support from senior management (2), ambidextrous architecture (3), a shared identity such as vision, values, and culture (4).

2.3.4.2.1 Ambidextrous organization versus Dual operating system

Some similarities stand out between the Dual Operating System and the ambidextrous organization. Like Kotter, Duncan (1976) also refers to an organization's adjustment from organic and explorative approach (entrepreneurial) towards a mechanistic structure to exploit (management-driven hierarchy). Also, a case study (Maier, 2004) from HBR on the company CBA Vision mentions that the running executive started "sending daily emails to the entire news staff in which she highlighted the concrete accomplishments" of this network. This reflects Kotter's sixth principle of generating and celebrating wins. The Dual Operating system also appears to be similar to the previously described structural ambidexterity.

The difference between this ambidextrous approach and the SAFe framework should also be mentioned. According to the researcher, the main difference is the focus on value streams from the dual operating system, rather than sheer innovation. Hypothetically, with an ambidextrous organization, two functional organizations could work in parallel, while with the dual operating system this is out of the question.

2.3.5 Challenges in organizational design

Organizations, with all their different structures, face several challenges with structuring, growing, and making their operations profitable. Some general and common challenges will be discussed.

2.3.5.1 Balancing differentiation and integration

Organizations need to balance differentiation and integration. Companies that have a right balance have shown increased firm performance (Lawrence & Lorsch, 1967). Also, a consequence of faulty alignment is subunit orientation, which occurs when an employee views the organization strictly from the perspective of one's subunit.

Differentiation refers to the process of allocating resources and people to organizational tasks, and defining authority relationships (Jones, 2013). In practice this comes down to deciding the degree of specialization, and controlling the division of labor. Differentiations can be split up into horizontal- and vertical-differentiation. These refer to grouping of tasks and the allocation of authority respectively. For subunit orientation, horizontal differentiation is especially relevant. When differentiating horizontally, enabling specializations, organizations also need integration.

Integration is the process of aligning processes and tasks so that they work towards the same goal instead of crossing each other. The most basic form of integration is a hierarchy of authority. One of the most complex forms is applied when an integrating department is formed which is solely used for coordinating the activities of functions and divisions (Jones, 2013).

2.3.5.2 Centralization versus decentralization

Another challenge for organizations is to define the extent to which employees are authorized to make important decisions without managerial support. When employees can freely make decisions, an organization is decentralized. In contrast, when only management is authorized to make important decisions and initiate new projects, an organization is centralized.

Decentralization offers flexibility and increased responsiveness by allowing more autonomy. It also allows lower-level managers to show their knowledge and capabilities in decision-making. The downside however, is that some extent of control over the organization might be lost on higher levels resulting in difficulties with planning and coordinating (Jones, 2013). Centralization however does allow for more influence on coordination and focus from higher levels. However, when these higher levels become too stressed decision-making gets delayed. Furthermore, before a decision is made it has to go through several hierarchical levels, decreasing responsiveness.

2.3.5.3 Standardization versus mutual adjustment

Organizations also have to make decisions about whether rules and procedures are standardized, or if employees can use their personal judgement to make decisions. The extent to which organizations use written rules and norms refers to standardization. In contrast, mutual adjustment is the process of using one's judgement to make decisions. Balancing this is hard because managers want to provide employees the freedom to make their own decisions, especially in complex work. However, to maintain some coordination, rules and norms will also have to be applied.

2.3.5.4 Organizational complexity

Another challenge in organization design is that of organizational complexity. Traditionally, organization complexity was viewed from a differentiation perspective. Dooley (2002) defined it as "*the amount of differentiation that exists within different elements constituting the organization*". Interestingly, when elaborating on organizational design, Dooley (2002) also references the law of requisite variety, which was used earlier in this literature review to describe business agility. However, more recent studies argue that organizational complexity relates to interdependencies (Worren, 2018). They emphasize that organizational complexity refers to the extent to which systems are related to each other. Several studies confirm the relevance of organizational complexity:

Carillo & Kopelman (1998) examined the relationships between structural variables and operating efficiency. They found a negative relationship between subunit-size and productivity (1), and between vertical complexity (the amount of levels in the hierarchy) and productivity (2). Dooley (2002) argues that organizational complexity affects the amount of learning that occurs within organizations. When organizational complexity is high, organization members are distracted with solving existing and new problems, causing them to learn less. When complexity is low however, organization members can easily succeed with their daily routines, and therefore have little incentive for new learning. He argues that learning is at its peak when organizational complexity is moderate.

A more recent study (Schmitz & Ganesan, 2014) on the effect that organizational complexity has on sales people confirms psychological consequences. The results indicate that organizational complexity affects salespeople's job satisfaction, stress-levels, effort, and performance.

2.3.6 Increasing complexity

A study by IBM (2012), which included responses of 1500 CEO's worldwide, concluded that 60% of the organizations experienced complexity at the time and 79% expected an increase in complexity. This indicates that a large part of the CEO's involved is concerned about increasing complexity. There is not one clear explanation for this occurrence, and the context may differ for each organization. However, some general explanations might apply.

Probably the most obvious reason comes from companies' desire to grow. With growth more customers are acquired as new services and products are being offered which then requires more employees. This requires adaptations in the structure such as new roles and different responsibilities, which together contribute to the organizational complexity.

Another explanation can be found in "*the tyranny of small steps"* (TYST) (Haraldsson et al., 2008). TYST refers to unwanted change in systems as a result of small unnoticed activities. For example, when a manager is only concerned with his/her own teams and makes a small change in the system this goes by unnoticed due to its minimalistic nature. On its own such a change would not pose a problem, but when every manager in an organization consisting of 100 managers incorporated such changes, the complexity will ultimately increase.

Different explanations can also be found in the adoption of new organizational forms and management concepts (Worren, 2018). The continuously added new roles, relations, and structures to organizations that already may have been complex will likely also increase complexity.

Whatever the reason, managing complexity is becoming increasingly important, yet not self-evident. One study (Schmitz & Ganesan, 2014) argues that in order to manage complexity, managers must identify the 'heat maps' where complexity is causing the most problems for employees. Then, managers should start eliminating these by learning what's driving them. The ones that deliver no value should be eliminated first. Others can be handled via training and workshops. Another solution, which can be applied on a higher-level, might be organizational agility.

2.3.6.1 Organizational agility as a response to organizational complexity

As a response to challenges such as increasing complexity, competitive rapid changing environments, and organizations operating in a globalized world, more adaptive structures are required (Daryani & Amini, 2016). Although the right response is still heavily under debate (Appelbaum et al., 2017), one possible answer to increasing organizational complexity is organizational agility (Appelbaum et al., 2017; Daryani & Amini, 2016).

Organizational agility is acquired via the right strategy, structure, capabilities, employees and leadership (Appelbaum et al., 2017). The SAFe framework (Knaster & Leffingwell, 2020), as previously described, includes organizational agility as one of their seven core competencies. SAFe proposes a dual operating system with a network organized around flows of value (value streams).

Due to the relevance of value streams for this research, the next section will elaborate the subject in detail.

2.4 Value streams

The term ‘value stream’ has roots in lean thinking and was introduced by James Womack and Daniel Jones (Womack & Jones, 1996). They define a value stream as: “*the set of all the specific actions required to bring a specific product (whether a good, a service, or, increasingly, a combination of the two) through the three critical management tasks of any business*”. These management tasks refer to problem-solving tasks (1), transformation tasks (2), and information management tasks (3).

According to practitioner framework SAFe, value streams refer to: “the collection of activities performed by an organization to deliver value to a customer, from initial customer request to final delivery and support of the product” (Knaster & Leffingwell, 2020). The activities within the value stream do not only relate to actions performed by the organization itself. More specifically, SAFe distinguishes two different types of value streams: operational and development value streams. Operational value streams are the value streams that deliver the customer value. Development value streams are the support which are used to build the systems and provide capabilities to enable the operational value streams.

Identifying and configuring the right value streams is hard as organizations do not have a predefined set or amount of value streams (Rother & Shook, 2003). A small organization might only have one value stream, but depending on the context could also have five. The same goes for larger organizations.

In general, when there is a request for something, a value stream is being used (Martin & Osterling, 2014). Narasimhan (2004) describe four activities that should be involved when identifying a value stream:

1. Attempt to identify customer concerns
2. Perform a work-unit routing analysis (in case the customer does not identify the value stream)
3. Prioritize the value streams
4. Update the team charter

Value streams have roots in Lean thinking, which will therefore be discussed next. Thereafter, the concept of value stream mapping and the differences with the value chain will be discussed. Finally, traditional organizational structures will be compared to a structure around value streams.

2.4.1 Lean

Like agile, lean is an operational philosophy which has had a tremendous impact on academic and business-industries in recent years (Hines et al., 2004). It originates from the manufacturing industry in Japan. A company (beginning days of Toyota) with little capital had to create an efficient manufacturing line where economies of scale could not be applied, as Japan is a relatively small country. They achieved high efficiency by getting rid of all the waste in the production line with respect to customer value. Waste is to be interpreted in the broadest sense. It includes everything that does not create value for the customer: delayed transportation, waiting, items sitting still etc.

Based on the idea of eliminating waste, lean thinking has evolved throughout the years (Hines et al., 2004), and is currently being applied within different industries (Shou et al., 2017). It gained a fraction for the software development industry when Poppendieck & Poppendieck (2003) showed that the elimination of this waste is also relevant for software development. The main forms of waste in manufacturing, and the translation to software development are summarized in Table 7.

Wastes of manufacturing	Wastes of software development
Inventory	Partially done work (requirements)
Extra processing	Extra processes (without added value)
Overproduction	Extra features (without added value)
Transportation	Task switching (creating overload)
Waiting	Waiting (delays, including customers)
Motion	Motion (finding information)
Defects	Defects (not caught by tests)

Table 7 Different types of waste. Excerpt from Poppendieck (2011); Poppendieck & Poppendieck (2003)

Based on the idea of eliminating waste, lean has developed into a common approach to improve value. The main tenets describing lean (McManus & Millard, 2002) are:

- **Value**: Providing specified value to the right customer with the right product at the right time
- **Value Stream:** Collection of activities to deliver value to a customer
- **Flow:** Movement through the value-creating steps without interruptions
- **Customer Pull:** Acting is only based on customer need
- **Perfection:** Continuous improvement

When analyzing these key principles and the different forms of waste, the main difference between lean and agile becomes clear: the focus on value. This focus takes place throughout the whole development process (Petersen, 2015). Hines et al. (2004) furthermore state that the main goal for lean is to satisfy the customer by creating more value and eliminating waste by creating a smooth workflow, while agile aims to satisfy the customer by configuring specifically by order, and allowing for unpredictability. The two can also be combined. Practices from lean can even enhance agile practices (Petersen, 2015).

2.4.2 Value Stream Mapping

One tool for identifying and getting rid of waste, based on the wel known information flow mapping by Toyota, is value stream mapping (VSM). VSM is a technique where one charts the different processes that deliver value within the organization. This is supposed to deliver deeper insights about how internal processes relate to value delivery (Poppendieck & Poppendieck, 2003). Based on these insights, organizations can redesign some of their processes to better align with the value streams.

Applying this in the context of software development, VSM aims to visualize the development life-cycle by visualizing development- and process-waiting times (Petersen, 2015). This is ultimately supposed to enable organizations to understand workflows from an end-to-end perspective (Mcmanus, 2005). The output of VSM for software development is better information and more knowledge, unlike in manufacturing where it is time reduction (Shou et al., 2017).

Hines & Rich (1997) were among the first to propose tools for VSM. However, these were criticized for not properly visualizing the link between the information and the actual physical flows (Pavnaskar et al., 2003). Later, Rother & Shook (1998) addressed these problems by proposing a new version of VSM called *Learning to See*. Based on factory floor mapping, they focus on the improvement of creating value. Throughout the years more methods emerged. Allee (2000) introduced the *Value Network Diagram* (VLD), which focuses more on strategy and the exchange of values. A year later, Gordijn & Akkermans (2001) introduced the e^3*-value* method, which builds upon the Unified Modelling Language (UML), allowing for easy integration with IT-processes. Four years later *Service Oriented Architecture* (SOA) (Cherbakov et al., 2005) was first introduced. SOA allows the re-use of software components by structuring them as so-called services, allowing for faster adoptions. More recently, the *Process, Ownership and Availability* (POA) model (Scheller & Hruby, 2016) emerged. It offers a modelling notation with an individual process layer for the transition of possession, ownership, and availability. Finally, the Object Management Group (OMG) offers an elaborate modelling notation called the *Value Delivery Modelling Language* (VDML) (Object Management Group, 2018). VDML has a lot in common with UML, which was also created by the Object Management Group. The major difference is the focus on the exchange of value, instead of the relation between different business processes and systems.

2.4.3 Integrating value streams into organizational structure

As previously mentioned, the practitioner framework SAFe (Knaster & Leffingwell, 2020) uses value streams to organize a second operating system (the network) as described by Kotter. The main steps described by SAFe[7] for integrating an organization style around value streams are:

1. Identify the operational value streams
2. Identify the solutions which the operational value streams provide to customers
3. Identify the people that develop and support the solutions
4. Identify the development value streams that build the full business solutions
5. Add the people needed to build the full business solution
6. Realize development value streams into Agile Release Trains.

After these steps, SAFe proposes that teams should be organized around continuous value delivery based on four fundamental teams. This approach is based on the book written by Skelton & Pais (2019). The four different teams are:

1. **Stream-Aligned teams:** Teams that are responsible for a single valuable stream, without having the need for hand-offs to other teams to perform parts of the work. In SAFe typical responsibilities relate to collaboration, knowing customer needs, applying design thinking and supporting the solution in production.
2. **Complicated-Subsystem teams:** Responsible for building and maintaining components that require specific specialist knowledge. Most team members must be specialists in order to understand the demanding theory. Typical responsibilities for these teams in SAFe are building complicated subsystems, maintaining their levels of expertise and collaborating with stream-aligned teams.
3. **Platform teams:** Provide internal services (e.g. API's, tools) required by stream-aligned teams. Typical responsibilities in SAFe are building the platform, focussing on usability, and collaborating with stream-aligned teams.
4. **Enabling teams:** Responsible for helping stream-aligned teams acquire needed capabilities. In SAFe they are responsible for identifying opportunities of improvement, promoting continuous learning, and keeping the organization up-to-date with emerging best practices.

When value streams are identified and teams are formed the Agile Release Trains each form a separate virtual organization consisting of 50-125 people. SAFe argues this network can evolve very quickly and be reconfigured when necessary, while the hierarchy remains relatively stable. SAFe argues that this structureless network optimizes the flow of value by[8]:

- Reducing delays between functional areas
- Bringing together research, development and deployment
- Providing intense customer focus across disciplines
- Measuring success via outcome-based key performance indicators
- Allowing for easy reorganizations in the network, while the hierarchy remains stable

In regard to portfolio management, SAFe builds a technology portfolio around development value streams. This helps product- and customer-focus across the entire portfolio.

[7] https://www.scaledagileframework.com/identify-value-streams-and-arts/
[8] https://www.scaledagileframework.com/organize-around-value/

2.4.4 Value Chain

The value chain takes a slightly different approach than value stream mapping. Instead of identifying value streams, the value chain is used to disaggregate a firm into its value creating activities that are geared towards creating a competitive advantage (Porter, 1985).

The key view of the model is that the entire organization can be seen as a collection of processes who all aim to create value. The value chain consists of value activities (primary and supporting), much like operational and development value streams in SAFe, but it also talks about margin. The value activities refer to the technological and physical activities performed by a firm. Then, the margin refers to the difference between the total value created and the cost of performing the value-creating activities.

Porter identifies the value by describing activities for a set of pre-defined functions such as marketing or logistics. In order to only use the relevant activities, Porter argues that the value-creating activities have a high potential impact or differentiation, represent a growing proportion of cost, or have different economics. The remaining activities can be placed in one of the different categories described in the value chain model. These activities are then also related by linkages within the value chain. In practice, organizations usually identify 3 to 15 value chains (Wolf, 2003).

To conclude, the value chain is a model which helps to identify the activities that create a competitive advantage for an organization. The model clearly describes the requirements for these activities and places them into different categories. The model, furthermore, shows the margin between the value-creating activities and the total costs of these activities. As previously described, value streams are slightly different. Value streams refer to a simpler concept; they are the collection of activities which create customer value. Based on the concept, tools such as the previously described VSM can be applied.

2.4.5 End-to-end work processes

Another similar concept to value streams and the value chain is found in organizational design literature. This is the idea of end-to-end work processes. The concept of end-to-end processes is not formally defined, however they typically refer to a “chain of process steps that starts as the result of a customer trigger and proceeds through until a successful outcome for the customer is achieved” (Davis, 2010).

Due to the lack of formal definition, it is hard to compare the idea of end-to-end work processes with value streams and the value chain. Based on the above description however, I would argue that end-to-end work processes could represent a value stream. However, a value stream can also include activities after a product is delivered.

It is also similar to the value chain. However, one could argue that the value chain has a more specific view point, as it is more geared towards connecting a company’s supply side with the demand (Wolf, 2003).

2.4.6 Structuring around products *versus* value streams

Practitioners aiming to provide organizational agility suggest that organizations should be organized around value (Knaster & Leffingwell, 2020). They argue that a separate configuration for each value stream should be established to create the most customer value. Such a value stream structure is not entirely different to the previously described project-centric companies, there are some key differences however. Galbraith (2002) describes the differences between product-centric companies and customer-centric companies on a high level. As value streams focus on the value-creating activities for the customers it is important to understand the differences. The key takeaways are summarized in Table 8.

	Product-Centric companies	Customer-centric companies
Goal	Best product for customer	Best solution for customer
Mental process	Cutting-edge products, useful features, new applications	Customizing for best total solution
Customer focus	Divergent thinking: *How many possible uses of this product?*	Convergent thinking: *What combination of products is best for this customer?*
Priority	Most advanced customer	Most profitable, loyal customer
Offering	Specific products	Personalized packages of service, support, education, consulting
Organization concept	Product profit center, product reviews, product teams	Customer segments, customer teams
Measures	- Number of new products - Percentage of revenue from products less than two years old - Market share	- Customer share of most valuable customers - Customer satisfaction - Lifetime value of a customer - Customer retention
Culture	New product culture: open to new ideas, experimentation	Relationship management culture: searching for more customer needs to satisfy
Rewards	Based on business unit performance	Based on company performance
Approach to personnel	Power to people who develop products - Highest reward is working on next most challenging product - Manage creative people through challenges with a deadline	Power to people with in-depth knowledge of customer's business - Highest rewards to relationship managers who save the customer's business
Sales bias	On the side of the seller in a transaction	On the side of the buyer in a transaction

Table 8 Product-centric companies versus customer-centric companies. Excerpt from Galbraith (2002)

Based on literature (Jones, 2013; Knaster & Leffingwell, 2020; Scott W. Ambler, 2012), the differences between structures are analyzed more specifically. The findings are summarized in Table 9.

	Divisional Structure	Multi-dimensional Structures	Value stream structure (Knaster & Leffingwell, 2020)
Focus	Market, product or geographical	Markets, products, and internal functions.	Flow of value
Authority	One functional manager	Context dependent. Commonly one or two	Semi-autonomous teams
Formation	Divisions	Units and divisions	Agile teams forming an Agile Release Train
Structure	Individual products	Combinations of products and silos	Value streams; dual operating structure
Argued advantage	- Market-responsive - Easily add and delete products	- Combine advantages from functional organization (efficient) with divisional organization (effective) - Allows for decentralization	- Reducing delays between functional areas - Research, development, deployment and service personnel brought together - Customer focus - Outcome-based KPI's - Easy reorganization
Possible disadvantage	- Independent divisions may cause lack of coordination	- Complex configuration - Costly - Authority challenges	- Hard to identify and configure (Putta et al., 2019) - Lack of empirical validation (Stettina & Hörz, 2015)

Table 9 Comparison of organizational structures

2.4.7 Challenges when organizing around value streams

Although the concept of structuring an organization around value streams is relatively new, some case studies have been performed. Putta et al. (2019) performed a case study at a large financial corporation in Finland. This corporation had trouble identifying and configuring the right value streams and found that the larger challenge was getting top-management support. Brenner & Wunder (2015) also describes a single-case study with an adoption of SAFe. The main challenge they found regarded the handling of cross-train (different groups of value streams) dependencies. Cases provided by SAFe (Gusch & Herbai, n.d.; SEI Global Wealth Services, n.d.; Yin, 2015) mention similar challenges with identifying and structuring around value streams, specifically for large enterprises. Like previously mentioned, another important challenge is the lack of empirical evaluation around the configuration of value streams.

3 Method

The objective of this research is to learn how value streams are being applied in practice, and how they relate to existing approaches in organizational design literature. This is reflected in the following research question:

Research Question: ***What are characteristics of value streams in practice*****?**

To achieve this, the chosen method is a multiple case-study with semi-structured interviews. Such an approach is applicable when there is a need to observe a phenomenon in a real-life environment, where the difference between the phenomenon and its context is not defined clearly (Yin, 2002).

The remainder of this section will be used to describe the method in more detail. In order to describe the different steps for creating an effective methodology, the model by Saunders et al. (2009) called the 'Research Onion' will be used. This research onion (Figure 13) distinguishes 6 layers for describing the most effective way to execute a research project: philosophies (1), approaches (2), strategies (3), choices (4), time horizons (5), and techniques and procedures (6). These will each be described separately. Thereafter, the research method will be summarized by describing the research steps.

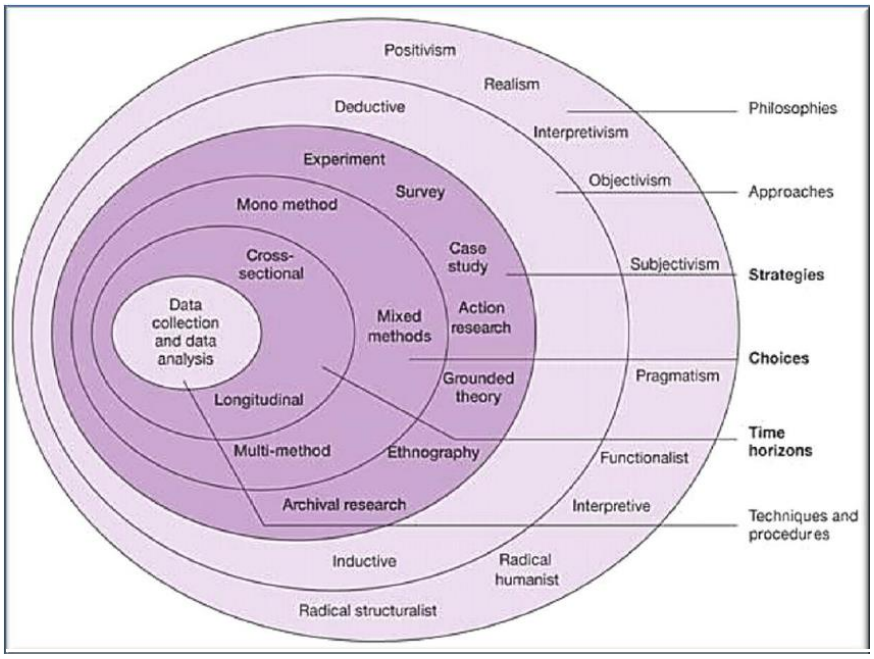

Figure 13 Research onion.. Excerpt from Saunders et al. (2009)

3.1 Research philosophy

The research philosophy, which is the first layer of the research onion, is the term used to describe the development of knowledge. Common approaches for similar research are positivism and interpretivism.

The chosen research philosophy is interpretivism, as the study is mainly based on the experience and opinions of industry experts. A key part of interpretivism is that there is a clear difference between performing research with complex individuals in contrast to objects. It claims that researchers need to be able to see the world through the actors performing the acting. Therefore, the interpretivism approach generally bases data collection on interviews and observations.

3.2 Research approach

The research approach, the second layer of the research onion, describes whether the inductive approach (develop theory based on collected data) or the deductive approach (test an existing theory) applies.

For this research the deductive approach applies, which is common with existing theories (Saunders et al., 2009). I will first describe the general concepts, as proposed by practitioner frameworks. Thereafter, based on interview data originating from different industries, the researcher will check whether these concepts can actually be substantiated empirically.

3.3 Strategy

The third layer is the strategy layer, which elaborates the intent of the researcher in regard to executing the work. For scenarios with uncertainty about a phenomenon with little empirical investigation, Yin (2015) proposes a multiple-case study.

Multiple-case studies cover multiple cases in order to draw a single set of conclusions (Yin, 2015). This approach can help to fill the gap within the literature by interviewing industry-experts, which is especially relevant because multiple-case studies within this area are scarce. A multiple-case study is furthermore most applicable as it shows how different environments within different contexts respond to their personal methods.

In order to further execute the research, the right cases have to be found. In order to maximize response, several methods will be applied. These methods are:

- Reaching out to the personal network of the researcher and supervisor(s). This network mainly consists of IT consultants in Western Europe.
- Direct cold-contact with case organizations described on websites from practitioner frameworks.
- Approaching different groups of transformation leaders and consultants through social media.
- The ‘snowballing’ method as described by Myers & Newman (2007). Snowballing is the process of asking interviewee’s to recommend other possible beneficiaries for the project, which may help with increasing the sample size.

If these methods would not have provided the researcher with the right number of cases, some requirements of the project would have changed. Possible adaptations are conducting shorter interviews, or changing the data gathering to a survey method. Fortunately, this was not necessary.

To ensure that gathered data is consistent and elaborate some requirements apply. The following requirements for case organizations are:

- Organization has configured value streams and strategic IT capabilities.
- Organization will have had some sort of restructuring based upon agile portfolio management.
- As project portfolios are commonly found in larger organizations (Stettina & Hörz, 2015), such a size will be a requirement (350+).
- Some sort of agile framework, as discussed in the literature review, is being applied.

3.4 Research choice

The fourth layer of the research onion is the research choice. This layer clarifies whether quantitative methods, qualitative methods, or a mixture of both will be applied.

While organizational designs have been discussed within literature thoroughly, the concept of applying value streams within organizational design context is a relatively new phenomenon. Therefore a more qualitative exploratory approach has been chosen for this particular study. A 'mono-method' will be applied, where one type of method will be used to gather data.

3.5 Time horizons

The fifth layer of the research onion refers to the time horizon of the research. Two types of time horizons are distinguished by Saunders et al (2009). First is the cross-sectional horizon, which refers to the study of phenomena at a specific limited point in time. Second, the longitudinal study, refers to a repeated data collection process spread out over a long(er) time-period. This is applied when important research factors change over time.

As this is not the case, as well as the fact that the researcher is time constrained due to University deadlines, the time horizon for this research is cross-sectional.

3.6 Techniques and procedures

Data will be collected by using semi-structured interviews with industry-experts and transformation leaders at different organizations which will be approached according to the previous requirements. A semi-structured interview-guide has been established with a set of relevant subjects and corresponding questions (Appendix A). This interview-guide is a basis for each interview, however the interviewer may choose to deviate from the guide when it is more beneficial. Also, improvisation is allowed.

The interviews will be recorded and transcribed into text. The aim is to perform at least 15 interviews. Final details will be anonymized in accordance with company- and privacy-regulations.

The transcribed interviews will be analyzed thoroughly. Each of the cases will be described and summarized, which will also be shown in the results. Thereafter, a table containing all the relevant data, based upon the most important questions (that are marked bold in the guide) will be created. Alongside this table, another table with the benefits and challenges for each case will be created. Additionally, visual mapping of organizational structures will be attempted where possible.

Based on this data, a cross-case analysis will be performed and described. This cross-case analysis will include visual mapping of organizational structures and networks where applicable.

Results will be validated by the interviewees to increase reliability. Comments and advice will be taken into consideration, and if applicable, have an impact on the final conclusion. Final limitations to the study are included within the written thesis (conclusion section).

3.7 Research steps

The general outline of the research steps, based on the research design described by using the research onion, is shown in Figure 14.

At the start of this research, a literature review of all available information will be conducted. Papers, books, and articles available via Google scholar and the University catalogue apply. The starting point of the literature review, due to its relevance with the subject, is the paper by Stettina & Hörz (2015). This paper, and the used literature, will be analyzed thoroughly. Thereafter, a keyword search on the following subjects will be performed.

- Agile
- Organizational design
- Agile portfolio management
    - Agile frameworks
- Value streams
    - Value stream mapping
    - Value chain

Where possible, papers, articles, and books will be filtered on relevance (total amount of citations). However, this is not always possible as some of the previously described subjects are relatively new and have little available literature. When applicable, such limitations have been mentioned in the literature review. After the literature review is executed, an interview guide will be established.

These interviews will be conducted at different companies, as described in the research strategy. The data analysis, as described previously, will then be used to find answers to the research question. An important part of this analysis is the validation of the data, which will be achieved by checking the results with the interviewees.

Finally the research will be concluded by writing down a thesis.

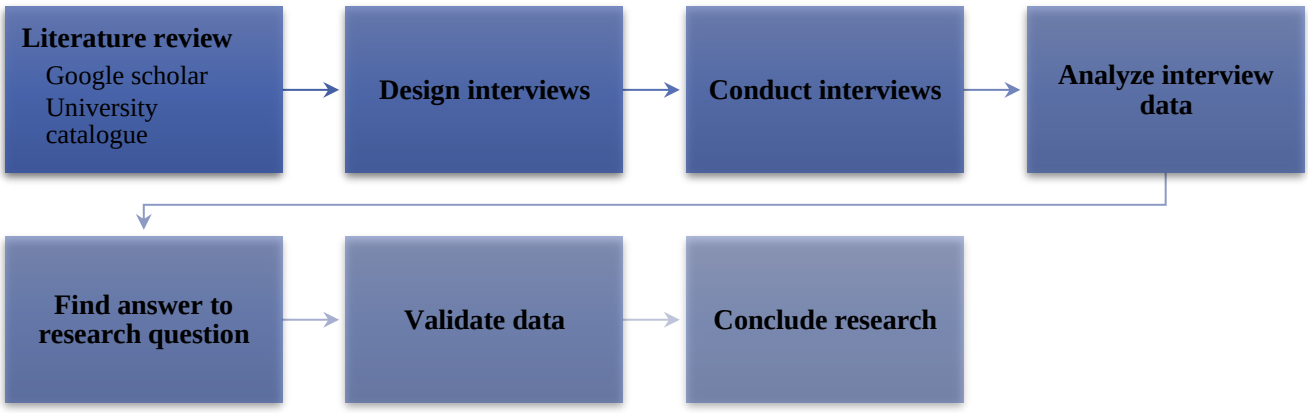

Figure 14 Research design

4 Results

In this chapter the research results and the cross-case analysis will be presented. The results will be explained both in textual and visual form (if applicable).

First of all, by showcasing several tables, an overview of insights from the different organizations will be showcased. Thereafter, each case company will be described in detail, followed by a cross-case analysis.

4.1 Overview of organizations

Data was collected through 16 semi-structured interviews, which are spread over 15 participants from 8 organizations. These interviews took approximately one hour on average.

In some cases, there is only 1 interview for an organization. In these cases an industry expert/consultant was asked about a case which they would find fitting in the context of this research. Therefore, there might be some additional information in the results based on the interviewee's experience. This applies to Companies C, E and H.

Table 10 gives a general overview of the organizations and the interviews. Table 11 shows key-information regarding their transformations.

	Size	Industry	Start of Transition	Total Interviews	Total Duration	Roles of interviewees
A	7.000	Telecom	2017	3	2,5 hours	Transformation lead, CIO
B	1200	Insurance	2019	3	3 hours	2 tribe leaders, agile consultant
C	2000	Government	2016	1	1 hour	Transformation lead
D	20.000	Telecom	2015	2	1,5 hours	2 transformation leaders
E	9.000	Manufacturing	2017	1	1 hour	Transformation consultant
F	20.000	Mobility	2019	4	4 hours	Tribe leader, portfolio manager, portfolio management-analyst, SAFe transformation manager
G	1600	Telecom	2016	1	1 hour	Transformation lead
H	10.000	Insurance	2014	1	1 hour	Transformation consultant

Table 10 Information interviews

	Framework	Value stream initiation and design	Milestones	Value streams identified
A	SAFe/Spotify	1. Look at existing business units 2. Start with unit that has least resistance	No defined milestones. Several in parallel: - Training (Scrum master, product owners etc.) - Changing mindset - Analyzing (first) value stream identification	5
B	Scrum at Scale/Spotify	1. Look at existing business units 2. Within each department that represent a value stream: -Define customer need - Define process/product - How is the product delivery process - Monitor value delivery to customer and company	Four waves: 1. Set boundaries and principles to base the governance upon 2. Define governance structure 3. Start implementing (including a new recruitment process) 4. Continue implementing with subsidiaries	4
C	SAFe	1. Perform interviews with employees from different work streams 2. Create portfolio canvas with processes and services 3. Categorize based on value	Not defined	6
D	SAFe/ITIL	Identification method developed throughout the years. General approach: 1. Define customer groups 2. Why are these customers approaching the company? 3. What value is being created for these customers? 4. What are the steps between step 1-3 Currently also looking to educate top-management	1. Assessment on what to do to increase effectivity 2. Start transitioning with SAFe 3. Transition through program increments 4. Introduce agile center of excellence 5. Start training employees 6. Roll-out in other countries	4
E	SAFe	1. Look at existing business units 2. Integrate idea of value streams by using workshops 3. Continuous testing	1. Start with a showcase in known territory (small ART, see how it works) 2. Roll out transformation in organization	3
F	SAFe/Prince 2	1. Executive issued project to IT-Architecture 2. IT-Architecture takes an external view of the value stream	1. Identify value streams 2. Design transformation plan 3. Rollout	8

		3. IT-Architecture provides a process-model		
G	SAFe	1. Value streams currently represent business lines, but are not yet formally defined	1. Train scrum masters 2. Realization more agile is needed 3. Start implementing SAFe	4
H	SAFe	1. Look at existing business lines, products, and services 2. Start small, and experiment 3. Continue implementing across business lines 4. (after four years) reevaluate and introduce virtual organization organized around actual value	1. Workshop for leadership team 2. Launch first ART and value stream 3. Introduce others ARTs and value streams. 4. Reevaluate and start second phase	5

Table 11 Transformation information

4.2 Company A

Company A is a telecom operator which offers mobile, fixed telephony and internet services. They started their transformation right after merging with another large company. With the merger, the company wanted to enhance innovation and accelerate digitalization. Therefore, they decided it was time for an agile transformation.

The agile transformation, which used a mixture of SAFe and Spotify best practices, started in 2017. At the end of the transformation, after three and a half years, 700 people were trained and the organization changed significantly.

Currently, Company A is still becoming more mature around agile. The mindset is still adapting, and engagement and velocity of teams is still going up. Structure-wise Company A is mostly done with their transformation.

4.2.1 Value Streams

Interviewees from Company A refer to a value stream as a process with a value stream mapping procedure on a visual board, where you make a roadmap of all the steps in the process. Also, the customers should help with defining the value stream, not the organization.

The main approach for identifying the value streams for Company A was looking at the existing business units and the value they produced. One of the business units, which was most eager to start the agile transformation, was the first to fully embrace the value stream approach. As such, it was on a voluntary basis.

After this proved to be successful, several other business units followed. In total, five value streams were identified. Interestingly, the interviewee mentioned that each of these value streams were based on a business line. Also, for each of these departments, value stream mapping was applied.
These different value streams were, after identification, all organized in an autonomous agile environment. This was later referred to as a Tribe.

Mapping the value was done through a backward analysis of the products/value delivered over the last two years. The systems, the delivery times, and the products delivered which were impacted by developments were defined. This allowed them to create efficient team-compositions. It also prevented developers with specific knowledge of a system, which may only be useful 3 times a year, from being put in a Scrum team that works in an iterative manner.

4.2.2 Organizational structure

The organization after the agile transformation was largely organized around tribes and chapters. Each tribe is accountable for one value stream. The chapters cut across the value streams in a matrix-like fashion.

The tribes represent the new organization built around value streams. The innovation of the tribe stands in an organization that sees both business and IT together, belonging to the same tribe with different roles and working together to perform and deliver value. In many cases, tribes are multi-speed (waterfall and Agile), and include autonomous teams.

The units that decided to embrace the Agile, were organized in chapters. A chapter is a group of people having the same skills; a chapter works as best practice for that specific area, defining guidelines and quality standards to follow but, above all, supporting the professional growth of the people belonging to it. Each chapter has a chapter Lead, who improves, coaches, and supports the personal development of each chapter member. One relevant example is the chapter called ‘agile transformation’. This chapter includes Scrum masters, agile coaches, and a chapter lead who coaches all the members and supports their growth. These chapters go across the value streams, so each tribe lead can request skills from the chapter that holds the needed skills.

Working with chapters and tribes in a matrix-like fashion requires clear reporting governance. At company A, the tribe leads are ultimately responsible for delivering value to the customer. On the other hand the chapter lead is responsible for promoting and supporting the growth of the skills for their respective chapter members. Although this was defined as such, many conflicts arose. This however, according to the interviewee, is a good thing. The interviewee argues that it means that the business and IT are communicating and better understanding both their needs. According to the interviewee, the main difference in regard to the organizational structure was the leadership mindset which is elevated in an organizational structure around chapters.

Another adjustment to the organization was the structure around marketing. The marketing department was transformed to an agile department. Design thinking was introduced, and instead of sending ideas straight to IT, multi-disciplinary teams started prototyping and testing with concrete feedback. A high-end view of the organization is shown in Figure 15. The value streams have been highlighted with blue outlining.

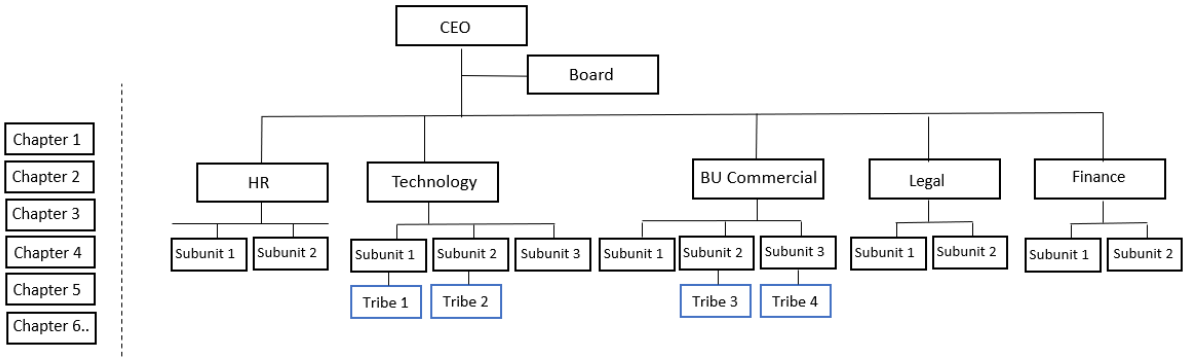

Figure 15 Structure Company A

New product propositions are context dependent but generally do not require tribes to be reconfigured, as tribes can easily interact with different chapters. However, sometimes there are challenges such as limited capacity.

Organizing around value did not conflict directly with the organizational design, however there is still some resistance in the company, especially people who have worked at the company for a longer time and are sticking to their culture and habits. This was mainly regarding middle-management.
To cope with this challenge, and other challenges such as legacy systems and culture and habits, a new role was also integrated. This was the ‘integrator role’, which was bridging the gap between business and IT and was helping with smoothening dependencies.

4.2.3 Agile portfolio management

At first, Company A organized their portfolio in a waterfall-like manner. For example, requirements were sent to IT, which made a proposal, which then went back to the business where they did a feasibility study and proposed a budget. This process however, allowed for very little agility in the budget. Therefore, there were some adjustments to the process.

The general portfolio management process remained largely intact, as the transformation leader was not able to implement the portfolio management as expected in SAFe. Therefore, each tribe had a separate portfolio management with a budget of their own. One main adjustment was the introduction of a chapter in IT called Portfolio Management. This was only introduced in IT, as a large part of developments was in IT.

Another adjustment was the budget approval process. Previously requirements were approved before they were happening. After the transformation, the capacity budget would get revisited every three months for the whole tribe. With this process, the tribe leads have to propose their ‘epics’, which are like project proposals, to the portfolio management. The main difference with this process is that tribe leads have to prove that it will bring value to the organization.

The third change was the implementation of a service creation process, which was developed together with the portfolio management department. This service creation process revolves around connectability between tribes and more specifically between agile and waterfall structures.

The main benefit of these changes was to improve the possibility to change the requirements, ultimately creating some sort of agility.

4.2.4 Impact

The interviewee mentions that Company A, after the transformation, was better able to identify the value in advance. Because people with the same skills were able to sit around a table together, they were able to see where the value lies. For example, they were able to see some systems which were developed but are hardly used. Through communication they were able to reduce waste.

The main challenges for this transformation were resistance from middle management, changing the budget approval process, and a wall between the business and IT.

4.3 Company B

Company B is an insurance provider that started their transformation in 2019. They used a collection of best practices which largely reflects a mix of Scrum at Scale and the Spotify model.

They transformed their organization in four different waves. The first wave started at two departments who were already applying agile on a smaller scale and were the least resistant. The successful transformation of the first two departments was used as an example, and other departments followed. The transformed departments also designated ambassadors who would help with the transformation in the new waves.

Currently, company B is closing the final wave by finalizing the implementation. Hereafter, the focus will be more on governance.

4.3.1 Value streams

Interviewees from Company B define a value stream as an end to end process that delivers value. For Company B, this can be towards customers, towards employees, or towards both.

In total, four value streams were identified which are represented by three tribes and one team which is functioning as a tribe and gradually becoming one. This smaller team, which consists of less than 30 people, is basically acting as a tribe, but does not need to become a full tribe yet due to the smaller scope of the value stream (corporate clients). Each tribe is fully organized in an agile manner.

The main identification method was looking at the existing departments. One interviewee mentioned that to further identify the value stream the organization looked at four elements to define. These are: what is the customer need (1), what is the process/product (2), delivery to the customer (3), monitoring if it provides value to the customer and to the company (4).

Different squads within each tribe are responsible for different parts of the value stream. In one tribe for example, the first part, which is performed by an onboarding team, gathers information about the customer and promotes the well-being of solutions. There are several teams responsible for developing and monitoring the products. Also, there is a squad called ‘healthy customers’. This squad is responsible for developing solutions beyond the core business. Finally, the happy customer squad is fully dedicated to establishing a strong relationship and developing a friendly customer journey.

There is one exception where one squad, also referred to as 360 degrees, is fully responsible for a relatively smaller value stream. One interviewee described this as the optimal solution, as internal communications are shared easier. Also, it is supposedly easier to see the problems and needs of the customer for whom the solutions are provided. This does however require very tight cooperation and alignment between product owners and scrum masters.

Interviewees at Company B emphasize that a successful configuration means to deliver value to the customer and the organization. Other interviewees mentioned that the success of the value streams is measured by KPIs which are monitored on a bi-weekly basis.

Up to now, no value streams have been redesigned. However, there is a clear need for redesign in some parts, but the governance for this is not yet in place as Company B is finalizing their final wave of implementation.

4.3.2 Organizational structure

The organizational structure changed radically. It went from a functional organization with seven hierarchical layers to a two-dimensional organization with three hierarchical layers.

The main change relates to the introduction of four tribes, and the concept of squads and chapters. Each tribe is responsible for a value stream and differs in size from 35 – 70 people. One executive is responsible for the general strategy and coordination of these value streams and the corresponding tribes. Each tribe has a defined OGSM, which stands for: Objective, Goals, Strategy, Measure.

Some formal departments remain in place and are responsible for supporting the value delivery of the different tribes. These are, for example, legal or finance-teams.
The tribes at Company B are made up of people from chapters and cross-functional semi-autonomous squads responsible for a product in the tribe. This cross-functional approach helped with splitting the silos. Chapters consist of people with the same skill set who work together to collectively enhance their skills. These chapters go across different value streams. Each squad (4-9 people) is responsible for a specific part of the value stream and their activities do not cut across different value streams. There are about seven squads for each tribe. Unfortunately, it is not possible to draft up a high-end overview of the organizational structure due to anonymity considerations.

There are also enabling teams in place which are at the center of the organization, as shown in Figure 17. These are the formal departments which are previously described. The other teams are responsible for the customer values and use a mixture of lean and agile approaches, but are not organized in tribes.

In order to align the squad work with strategy and provide governance, company B introduced rituals. The rituals are:

- Product owner weekly Scrum (weekly) – alignment
- Tribe Review (Bi-weekly) – result progress
- Tribe retro (monthly) – discuss risks
- Portfolio guild meeting (bi-weekly) – portfolio management
- Business performance guild meeting (monthly) – monitor business performance

According to interviewees, the main influential factor of the organizational structure was the mindset within the organization. They mentioned it was very important that a large number of internal people supported the transformation and the transition towards an organization more focused on value delivery.

Figure 17 Structure Company B

4.3.3 Agile portfolio management

The portfolio for Company B gets revisited every three months and starts with a pitching event. During this pitching event each team can present an ‘epic’, a large project which they would like to work on. These epics go across the different value streams.

The executive committee is present at this pitching event and prioritizes the backlog based on the different pitches and makes sure to align them with the corporate strategy. At the end of this event, a backlog is created for the coming three months. After this, the tribes and squads determine how much of the backlog they can realize.

This backlog is not set in stone. There is a bi-weekly meeting between tribe leaders and the executive committee where they discuss the progress, how the epics evolve, and whether any changes are required.

After the backlog is created and the squads start working on their epics, different meetings occur. The squads have a two-week release cycle in which they deliver their results. Executives also occasionally visit these cycles.

4.3.4 Impact

The main perceived benefits relate to increased transparency, inclusion, better communication, and an overall focus on being more customer-centric. Also, due to decreased hierarchy, participants found it easier to communicate and they gained speed in terms of reaction. Previously, a lot of times customer insights were lost in middle management bureaucracy. Now however, Company B can react faster to the ever-changing market.

The agile portfolio management process became more transparent and could be changed more easily thanks to the bi-weekly meetings.

Several challenges were mentioned. One interviewee mentioned that there were different challenges in different phases. At first it was mainly uncertainty. Later it related more to the restrictions and resistance within the company. So culture and habits.

Another mentioned challenge is the budgeting process, which is still for the whole year instead of three months. Finally, there are different sorts of complexity (legacy systems, and inherited complexity from silos).

4.4 Company C

Company C, a government agency, transformed from a siloed organization toward a value-driven one. The main goal was to increase the flow of value across the organization. In order to achieve this, they largely applied the SAFe framework.

For Company C, no concrete milestones were mentioned.

4.4.1 Value streams

In the case of Company C, it was easy for the transformation consultant to identify the different value streams as each subsection (highest level department) of the agency actually represented a value stream. There were in total six different value streams.

The transformation consultant realized this after interviewing people from the different work streams. The interviewee noted that the problem with Company C was not the structure, rather it was the mindset which was not geared towards the overall goals of the agency. This became clear after observing similarities between the different streams. The interviewee realized that some people were working on the same features, where they could cut the work in half if they worked together.

Two major steps were performed for the overall identification. First, a portfolio canvas was created to understand all the products and services within the organization based on interviews with people from the different work streams. Thereafter, they categorized the different products and services in order to create the different value streams.

In order to measure the successful implementation of the value streams, Company C applied the metrics that are used in the SAFe framework. For example, strategic themes, strategic objectives, and key results. All on a quarterly basis. They also identified metrics from a business perspective, reflecting on performance (e.g. achieving SLAs, revenue, number of requests). They also looked at measures on Agile Release Train level, such as program predictability.

More specifically, the interviewee mentions that in order to measure the success of a value stream design, they would look at the lead time from receipts until production, but also various cycle times and customer satisfaction.

At no point in time were the value streams reconfigured. The value stream identification was quite clear from the start of the transformation.

4.4.2 Organizational structure

The organizational structure remained largely in place, as this was not the main problem. The six existing departments were basically the six different value streams offered. The main problem was the overall mindset. Employees did not work towards a shared vision which provides the most value to the overarching organization. There is no figure of the organization available due to anonymity considerations.

Company C did experiment with moving teams across value streams for a period of time. Unfortunately, no concrete results were measured. The interviewee did emphasize that teams should be moved as a whole, rather than moving different individuals across several projects.

The interviewee also mentioned that unless organizations truly go from projects to products, it is hard to take advantage of the benefits of value stream management. This is because you remain in a transitional aspect. Then, budgeting and reporting structures may still get in the way.

In regards to the dual operating system with its virtual network organization, the interviewee from Company C believes that it is more a transitional state, and not optimal for organizations.

4.4.3 Agile portfolio management

Portfolio management was installed upon the different value streams. This portfolio management changed the view from six different departments towards a more centralized organization. Instead of having a focus on the single department or team, it became clear where the most value was created for the entire organization. This, for example, allowed teams to be moved across value streams.

Also, each and every epic had to be reviewed by the portfolio, even program epics. This allowed for alignment with strategic themes and objectives.

4.4.4 Impact

The mindset around the portfolio changed with this transformation. Employees of Company C realized they could help each other in order to create more value.

The main perceived benefit from mapping the value streams was being able to identify bottlenecks and seeing where the process was getting bogged down. Based on this, bottlenecks could easily be deleted. This ultimately improved the flow of value.

The main challenge during this transformation was having the different value streams cooperate together. One trap, which Company C fell into, was designing the organization around the systems instead of the value, ultimately creating new silos.

Another challenge mentioned by the interviewee is the reluctance of managers to give up their power and change the hierarchy.

4.5 Company D

Company D is a telecom provider that started their transformation around 2015. The main reason for starting the transformation was siloed budgets and siloed prioritizations. They wanted to break this down and increase productivity and predictability. They started their transformation in one of the six countries in which they operate. As this was very successful, other countries soon followed.

They use a mix of the ITIL and SAFe framework. They emphasize that they follow the SAFe framework strictly and tend not to deviate. Their transformation is a continuous process that is not finished yet.

They continue their transformation through program increments and continuous improvement.

4.5.1 Value streams

Company D makes a clear distinction between operational value streams and development value streams like described in SAFe. In general, a value stream for Company D is the sequence of activities to create and convey value to the customers. For defining a value stream, it is vital to understand who the customers are, and why they are coming to the organization.

The method for identifying the value streams changed throughout the years. At first, Company D was not successful with identifying the right value streams. There is no clearly defined approach, but it generally consists of three steps: defining what customers are being served (1), defining what value is being created for those customers (2), and what are the steps to go from step 1 to step 2 (3). Another approach is looking at the revenue streams. Only recently did business agility come up, and they are now looking to educate top management in order to achieve this.

Company D uses different dimensions of value streams and trains. Currently on the highest level, Company D has identified four value streams which broadly represent the main business lines. However, these would be so broad that the structure would not make sense. Therefore, there are different dimensions. An estimate of relevant value streams is currently around 25. Besides this, there are also internal supportive value streams, also referred to as development value streams. The interviewees mention the value stream configuration developed while they were designing, and this should be considered.

There are different kinds of development value streams. There are end-to-end value streams for basic service activation. But there are also value streams for maintaining and securing the services. The third type of value stream is regarding the payments.

Interviewees of company D mention that it was especially challenging for them to define their value streams as they are in the service business and have no concrete products which they deliver to customers.

In order to measure the success of the value streams, Company D looks at the dependencies for each Agile Release Train. They also look at concrete metrics offered by SAFe, like feature lead times. One interviewee also mentions that you will not know what is the right configuration until you try, and that it is a continuous learning process. Based on whether the agile release trains are successful they can, and have been, redefined.

4.5.2 Organizational structure

The initial organizational hierarchical structure has not been changed, as Company D transformed the organization by introducing a separate organization as proposed by the dual operating system in SAFe. This ‘virtual’ organization is mainly responsible for developments and operations. Naturally, it did have an impact on some roles and responsibilities of the employees within the unchanged initial structure. Many of the line-managers duties had to be changed.

When starting this second organization, they observed two cases. One in which managers gave full autonomy and trust to the ART, and one in which they remained a control and command culture. They noted that only the one with full autonomy became successful. Currently, the 'virtual' organization is still under construction as several ARTs and large solution trains are still being introduced.

4.5.3 Agile portfolio management

Company D has 9 lean portfolios, with the aim to have little dependencies between them. Due to the size this is not entirely possible, and there are still some dependencies between them. These work according to SAFe, as company D is aiming to be as vanilla SAFe as possible. This includes bi-weekly meetings and a quarterly portfolio summit.

From these portfolios most are for specific countries which focus on attracting customers with good offerings. When a country is significantly larger than others it can have two or three portfolios. There are also three portfolios that go across the different countries and are more geared towards supporting the outwards going portfolios. These three are communication (1), connectivity (2), and IT services (3).

Below that are 4 large solution trains and the 25 agile release trains, of which 5 still have to be activated. They are aiming to go to 25-28 activated ARTs by the end of this year. The anonymized high-end overview of the network is shown in Figure 18. Within the figure, the 9 value streams each have a different color.

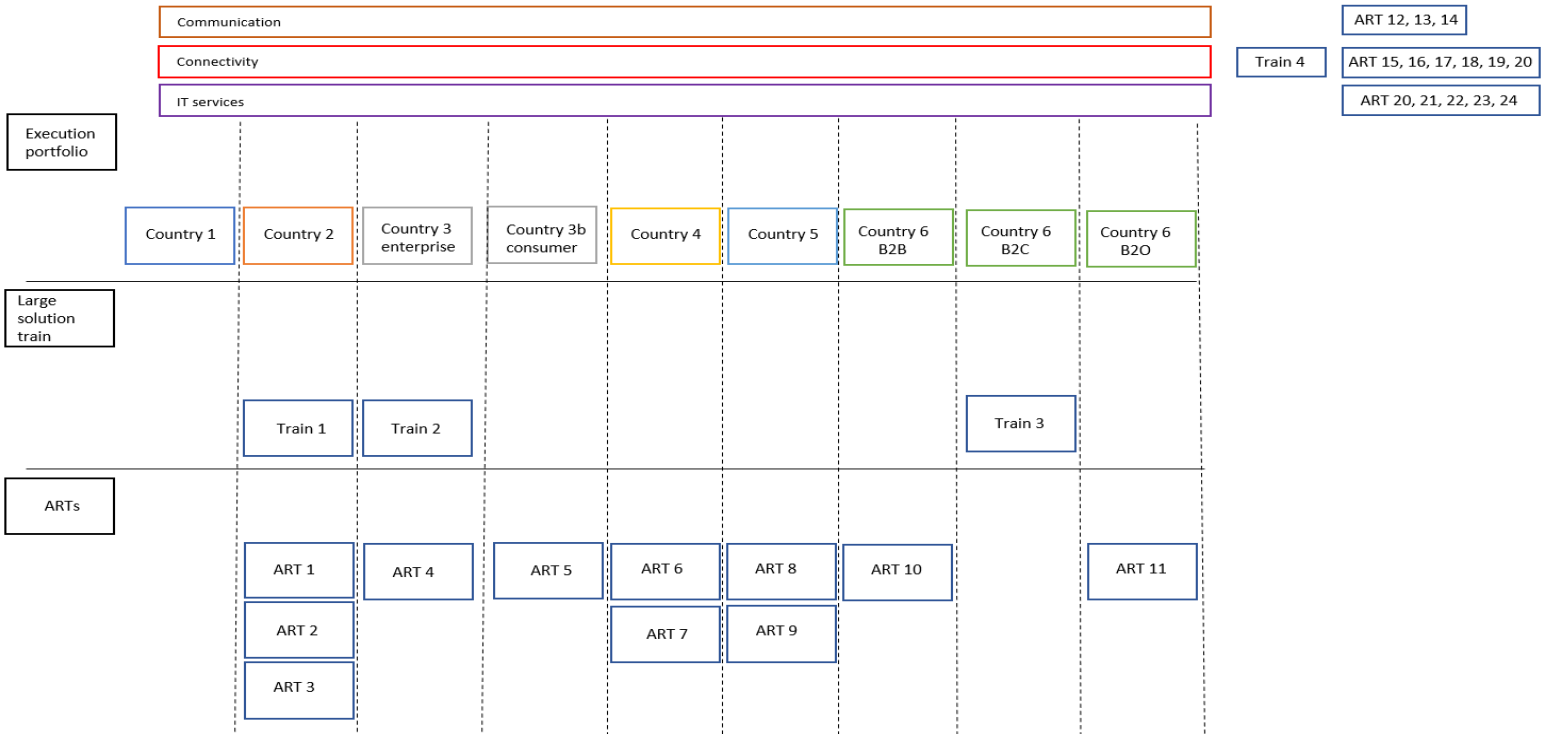

Figure 18 High-end overview APM Company D

Each portfolio process uses the SAFe description 1 on 1, as Company D is especially focused on that.

4.5.4 Impact

The interviewees mention that they consider this configuration to be very successful. The CIO is satisfied, and they are looking to expand their transformational efforts towards other countries. One metric offered to prove these results is that the time-to-market decreased from 17 weeks to 7 weeks.

Interviewees from Company D mention that by using the dual operating model they could easily reconfigure their value streams by using the virtual structure which is separated from the initial line-management. No unions or HR had to be involved.

For Company D, it was challenging to understand what the value streams were in the organization. The interviewees argue that this related to their core business being a service provider.

4.6 Company E

Company E is a manufacturing company. Before the transition to large scale agile in 2017, they were already using some agile teams on a smaller basis.

The main goal for the transformation is quite unorthodox, since the company was running great and on paper there were little problems. However, on closer inspection, it became clear that parts of the organization were fragmented. There was no clear ownership. This leads to inefficiencies, lack of morale, and lack of throughput. The goal was therefore to create stable teams with better morale, and more predictability. In a sense, they wanted to get ready for their next growth steps.

For this transformation Company E applied the SAFe framework.

4.6.1 Value streams

The interviewee from Company E follows the distinction between operational, and development value streams. For Company E, an operational value stream refers to the process of getting an idea to really putting the value in the hands of the customer and receiving a reward for that. On the other hand, the development value stream is the stream of people that improves the operational value stream, and builds the product in a certain phase of that operational value stream.

Company E started their transformation and identification by showcasing one agile release train to the organization. They started at a software platform, as this was most thoroughly documented in SAFe. This transition went smoothly and positive results were visible. Therefore, the entire organization started transitioning.

Two main steps were used in identifying the value streams. These were workshops (1) and testing (2). With these workshops and then testing different structures a ‘magic mix’ of value focus and product focus was created. The ultimate goal here is to make them as autonomous as possible.

On the highest level, three main value streams were identified. Each of these value streams closely represents a business line. However, these value streams are too large to organize around. Therefore, these highest level value streams are actually split into different teams that represent the product. These are intentionally not called sub-value streams as then the system would be dragged due to too many interdependencies.

Following SAFe, they made a distinction between operational and development value streams. However, there is a small deviation as development value streams do not necessarily support the operational value streams. Rather, the development value streams are more in line with the operational value streams, as these are actively building a part of the product which largely reflects the operational value stream. In a way, Company F, due to their continuous drive to innovate, constantly blends their product roadmap with their customer roadmap.

The success of these value streams is measured by the throughput of value to customers. Specifically, Company E makes sure that they are creating stable teams that are facing outwards, i.e. have a focus on the clients.

At no point in time were the value streams reconfigured, as they were quite clear from the start of the transformation. The interviewee, being an expert on the subject, did mention that a reconfiguration is often the result of conflicting priorities and inter-team dependencies that are getting too thick. Also, the interviewee mentions that in many cases one is going to fail anyway, and should just try and learn along the way.

4.6.2 Organizational structure

The organizational structure did not change much. As mentioned previously, the value streams represented the three main business lines which did not have to change. One thing that did change was the introduction of a second 'virtual' organization. They made a separation between the initial hierarchy and a network of semi-autonomous teams originating from different groups governed by rituals. These teams are generally responsible for a product in the value stream. Unfortunately, no figure can be drafted as Company E did not want to share details of the organizational structure due to anonymity considerations

The main challenge for Company E was regarding the role of project managers, as it was unclear for them what their new job was. The main benefit mentioned by the interviewee is that if you are able to decouple your value stream design from your hierarchy, you have more options to change and learn.

The largest changes were applied in the team formations. When designing these teams the main focus was on commonality in the design of different products.

However, as value streams are heavily interconnected, a challenge that Company E is facing is how to organize the experts. This is because there are three different specialist disciplines that are needed across the organization. For the most part, they have not decided whether to create separate specialized departments or scatter them across the organization. The interviewee mentions that this is not a drawback of the value stream design, but rather a generic challenge that each organization could face.

Finally, new product propositions are very relevant for Company E. Choices regarding disruptive propositions are taken on the highest level, so above the different business units. It is plausible that they decide to take a large part of the organization and form a new value stream. This has happened in the past.

4.6.3 Agile portfolio management

Currently, agile portfolio management is only applied at one of the three business units. This includes a quarterly portfolio planning event in which they make choices, prioritize, and cut products. This unit is very enthusiastic about the agile portfolio management process.

The other two business units still have not implemented agile portfolio management due to politics, size, fear of change, and previously mentioned organizational challenges.

4.6.4 Impact

For the interviewee and company E, value stream design is a constant sport that you start with, but never stop. At this point in time however, Company E has already seen great impact.

There was a massive increase in predictability, approximately from 30% to 80%. Furthermore, team engagement and stakeholder satisfaction is going up. The introduction of the agile portfolio management at the one unit has caused increased clarity and flexibility. It has greatly improved the system.

There are also some drawbacks. As teams start to feel protected, they are also starting to push back more heavily. Therefore, the product focus and actually getting things done is a challenge. Also, as mentioned previously, one of the main challenges was how to organize around the three different specialist domains.

The main takeaways for the interviewee are that if you are able to decouple your value stream design from your hierarchy you have more options to change and learn. Also, if you start value stream design you can never stop, as it is a continuous process and it is never done.

4.7 Company F

Company F is a mobility provider which employs around 20.000 people. They started their transformation in 2019. For this transformation they largely applied the SAFe framework.

The main goal of the transformation was to become more efficient and increase the agility of the teams. They furthermore want to create more clarity about the goals and responsibilities of the different teams within the organization and increase stakeholder inclusion. Ultimately, they would like the teams to be as autonomous as possible.

The transformation is currently still ongoing, and they are currently still trying to design the organization around the value streams.

4.7.1 Value streams

Interviewees from Company F define a value stream as the whole of activities which lead to a product for the customer. So the whole process, which includes supporting applications, ultimately delivering value to the customer.

In order to start organizing around value, executives of company F engaged the architecture team in a project. The architecture team received a project where they would act as a management consulting role. The main goal of this process was to structure IT in a way that their services could be more aligned with the business. The result of this project was a process model, in which the 8 main value streams of Company F were defined. Each existing silo can have one, or several, of these value streams within their organization. The size and budgets differ greatly.

A part of Company F is still trying to decide what the value stream design should look like based on this model. For this they are trying to apply granularity within the process model. Another part of the organization has gone through a transformation and is already reaping some benefits. Therefore, they used a different method than the process model.

Company F distinguishes three types of value streams. There are the main processes (1), additionally there are also supporting processes like HR, legal, and safety (2). Third, there are some governing processes (3) which are responsible for developing the strategy, and supporting the information provisioning.

Several interviewees mention that they find measuring the success of value streams a daring challenge. They are unable to clearly measure what value is actually being added by the different teams who are becoming autonomous. There is some information available based on metrics, but getting actual management information remains hard.

According to interviewees a good value stream configuration is autonomous and has little dependencies.

4.7.2 Organizational structure

The organizational structure has not changed much as a result of the identification of the value streams. They plan on organizing the IT-organization with a dual reporting structure, and include the business-processes where possible. However, this has not yet taken place. The network is also not clearly visible in the planned structure.

One part of the organization ran through a small transformation without other parts of the entire organization and made some changes however. That organizational part was not included within the whole transformation plan however, and will therefore not be included specifically.

One thing which Company F is still trying to achieve is cutting the hierarchical layers. Company F did introduce different clusters, which together can represent value streams. However, one cluster leader mentioned that: “the processes that I support are scattered over different departments.”

The clusters do mainly use agile practices, however in some cases it does not make sense to use agile, so waterfall-like projects are still executed. Each cluster consists of different cross-functional squads. Company F is also working on adding users to the squads. As the transformation is not yet complete, new teams are still being added, and teams can also still be changed. These teams can be categorized in four types:

1. Expertise teams
2. Functional teams
3. Platform teams
4. Product teams

The aim for the organizational structure is shown in Figure 19. Unfortunately, it is not possible to highlight the value streams in this structure specifically.

The model is largely formed around 6 principles:

1. Employees work in one team as much as possible
2. Teams are, where possible, are assigned to a value stream
3. Generic IT-platforms are centralized
4. Leads instead of managers
5. Managing on functional excellence via clusters
6. From projects to agile teams

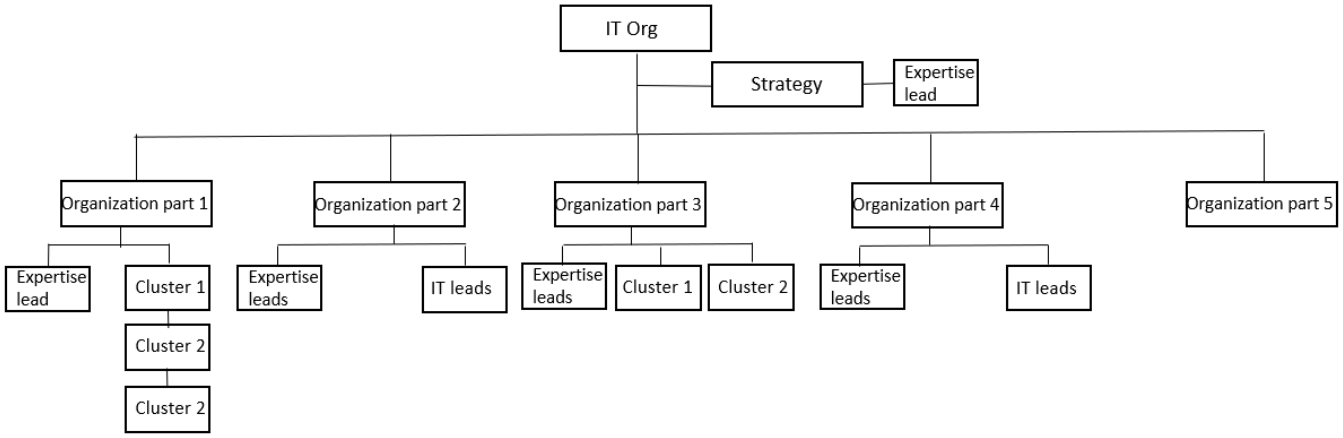

Figure 19 New structure Company F

4.7.3 Agile portfolio management

As with the structuring around value streams, agile portfolio management is also applied differently throughout the organization.

There is one common quarterly process on the highest level in which each part of the organization creates a report in which their desired projects are prioritized based on points for all the relevant areas for Company F. These areas are, for example, security, finance, strategy, etc. All these reports are sent to the executive team who makes the final decisions. The management team can still choose to execute projects with little points or to remove projects with a high number of points.

One part of the organization, which is internally considered as the money-maker, was in a state of abundance. They never had to delay or cancel projects because they were allowed to execute all the projects. After Covid however, this changed. Interestingly however, this department does not recognize the importance of agile portfolio management. Rather, they still keep the IT and business separated with different portfolio processes. The process they use works around a point system in which different aspects of a project get points and only projects with enough points are executed, similar to the process on the highest level. The main difference is that there is a clear separation between business and IT.

Only one part, which did the transformation themselves, is currently applying agile portfolio management. The other parts, which still have to be organized around the value streams, do not necessarily have to apply agile portfolio management. It will be advised by the portfolio management department, but ultimately up to the value-stream leaders.

Budgeting remains a challenge, as it is harder to define the return on investments with autonomous teams.

4.7.4 Impact

Company F, although they have only been transforming their organization for approximately two years, has already seen some impact.

A challenge for Company F was identifying the value streams to represent the actual value, instead of the existing departments which tended to get in the way. A reason for this was that the new way of working was not understood fully. People did not understand what a value stream is. That way of thinking had to be changed. The main continuous challenge, according to one interview, is to change the mindset of the people working in the organization. Especially of those that have been around for a long time.

Another challenge specifically for the portfolio management process is how to measure the success of value-oriented projects. There is uncertainty about how to measure the extent to which teams actually add value to the company.

The main perceived benefits relate to communication and awareness. Interviewees mention that Company F is now having the right discussion in regards to organizing around value. They furthermore mention that employees are becoming aware to work towards value delivery.

One interviewee also mentioned that he has seen some increase in flexibility, as he can now faster adapt to external changes.

4.8 Company G

Company G is a telecom provider who employs around 1600 employees. They started their transformation around 2016. For this transformation they used the SAFe framework, as it was the most well-known framework and had a lot of training available.

They started this transformation because projects were taking too long and prioritization was off, causing a lack of transparency. They furthermore wanted to become a united team with their external partners.

Currently, Company G is still trying to formalize the value streams. They already introduced nine agile release trains and a second hierarchy.

4.8.1 Value streams

For Company G, operational value streams largely reflect “where the money comes from”. So it is the process of having a customer-need, and then delivering it in order to get paid. The development value streams support the processes that serve the customer. Additionally, Company G makes a separation between regular customers, and corporate customers.

On the highest level, within Company G, four main value streams can be seen which roughly represent the main business lines. However, according to interviewees, you could get different answers depending on who you ask. What the exact value streams are is still under discussion. This is because the value streams have yet to be formalized. An interesting scenario, as the transformation started roughly five years ago.

Interviewees mention that the current organization around value is not yet successful. They have been reorganized once, as they were first organized around bulk and specific products.

4.8.2 Organizational structure

At Company G, there are four main business lines which represent the value streams. These are focused on corporate business, two types of consumer business, and the IT-department.

During the transformation, the hierarchical organization largely remained the same. The main difference came with the second organization, which is organized by nine agile release trains. These agile release trains typically consist of 10 teams and are around 100 people. The teams are stable and include business people, technical people, and people from the (external) IT organization. Due to the complex goals of Company G, there is also a triangle support function in each release train. These consist of product owners, technical specialists, and an operational development lead. One interviewee mentions that these development value streams largely reflect agile release trains.

Although they are organized in a second organization, the ARTs are still a bit siloed as they do not cut across silos. However, improvements are starting to come along as the first ART that cuts across the silos is being developed. One ART is currently being redesigned, mainly to reduce overhead as it was done both by business and IT.

One interviewee mentions that the idea of a dual operating model is not ideal, as priorities and end-responsibilities can become unclear.

Disruptive product propositions are left out of the main business functions. They are a separate part so that they do not have to deal with slow legacy systems and can be truly agile and innovative.

Unfortunately, Company G was not willing to share any figures regarding the organizational structure.

4.8.3 Agile portfolio management

Company G has tried to introduce agile portfolio management several times during the years of the transformation. Up to this point they have not succeeded. The given reason is that the business is too siloed.

Company G is getting ready to try again. One development is the inclusion of top management within the program increment planning. The top management is currently opening every program increment planning, which takes place every 10 weeks. Here they discuss the vision and the roadmap.

4.8.4 Impact

One of the main perceived benefits is transparency, Company G is better able to see the processes and delays. Also, they are now better able to prioritize the business. Third, they have seen some improvements in cycle times, but there is still some work to be done here.

One interviewee is very focused on business agility and is also giving workshops outside of development. A large part of the organization is becoming interested in what agile can mean for them.

One challenge for Company G was setting up the first agile release train. Currently, there are still discussions about where people should be moved within the trains.

4.9 Company H

Company H is an insurance provider that started their transformation around 2014. Their main goal was to decrease the time-to-market of different products. For this transformation, Company H used the SAFe framework.

Their transformation towards organizing around value was roughly executed in two main phases. Within the first phase they organized the value streams around business lines in order to be able to start. Thereafter they introduced a second separate hierarchy.

4.9.1 Value streams

Company H makes a separation between operational- and development-value streams. For Company H, the line-organization is more responsible for efficiency and therefore focuses on the operational value streams. The second hierarchy, which is referred to as a network, is responsible for innovation and value delivery by being responsible for the ARTs.

On the highest level, within Company H, five value streams can be identified. This value stream identification developed throughout the years. Generally, customer demands and future setup were the main influential factors.

When starting the identification, in the first phase, Company H used the existing business lines, products, and solutions to launch an agile release train and a value stream. The interviewee from Company H advises this, as experimenting and starting small helps with starting out. This however was not very detailed, as it did not represent the actual value, but rather the existing business.

This configuration, although not entirely focused on value, did show good results. So after four years they reevaluated the current implementation and decided to introduce a second hierarchy and reconfigure the value streams. After this reevaluation, the value streams actually represented the value flowing through the organization.

Thanks to the clear goal of Company H, which was decreasing the time-to-market, they had little problems in measuring the success of the value stream configuration. Besides this metric, they used flow metrics. These include flow time, flow distribution, flow velocity, and flow efficiency. To measure the outcome, they furthermore looked at the costs, the revenue, and customer feedback.

In the end, each of the value streams had its own budget. This budget will get reevaluated every 6 months.

The interviewee mentions that there is no successful configuration of value streams. Rather, value stream design is continuous, and organizations need to constantly rethink their approach.

4.9.2 Organizational structure

In this case the initial organizational structure did change, especially after the second phase with the introduction of the second hierarchy.

Company H aimed to minimize the line-structure, putting the extra capacity into the second hierarchy built around cross-functional teams. For example, they did not want the people that were leading the agile release trains to be in the line organization. Rather, it was distributed into the agile release train. To achieve this, Company H introduced a new role: the people developer role. This role is responsible for coaching and people-related topics of the employees.

The main difference between the initial line-hierarchy and the second hierarchy for Company H is the purpose. The line-hierarchy is focused on efficiency, while the network organization is focused on the delivery of value, and providing speed and innovation.

The interviewee mentions that often organizations fall into a trap where they use the dual operating system, but create double the effort because they keep the line organization in place. Also, organizations sometimes try to combine the above described efficiency and innovation, while the interviewee argues that this is not possible.

Unfortunately, due to anonymity considerations, the interviewee from Company H was not able to share any in-depth structural information.

4.9.3 Agile portfolio management

Company H used one central portfolio at the highest-level of the organization to manage the different value streams. They changed this to agile portfolio management to become more reactive and make the initiatives smaller. Also, they aimed to integrate innovation more.

Interestingly, the configuration of the value streams did not have a direct impactful result on the portfolio management process. The interviewee does mention that it increased the transparency, which according to the interviewee is a good first step towards creating business agility.

4.9.4 Impact

Company H managed to achieve their goal of increasing the time-to-market for different products. Additionally, they were able to create a focus of value within the organization. Employees are now having the right discussions, and people are starting to realize how the value flows.

A challenge for Company H was to align the structural changes with the HR-department. They furthermore, especially at the start of the transformation, noticed challenges regarding their goal of decreasing the time-to-market, as the definition was not clear for everyone.

4.10 Cross-case analysis

In this section the results from different cases will be compared and described.

4.10.1 Perceived benefits and challenges

Table 12 gives an overview of the challenges mentioned by interviewees from the different case-companies. The table is ordered by which challenge was mentioned most. Also, the table is color-marked by different structural approaches (blue = existing business lines, light-brown = second hierarchy).

Interviewees from this case-study most often mention challenges regarding budgeting and defining the correct value stream (4/8). Thereafter, middle-management resistance, complexity, and interconnectivity between value-streams are the largest challenge (3/8).

Organizations that use existing business lines to structure their value streams are colored blue, and organizations that use a second structure as a 'virtual' organization are colored grey.

Organization	A	B	C	D	E	F	G	H	Total
Budgeting	*x*	*x*		*x*		*x*			*4*
Defining the correct value stream		*x*		*x*		*x*	*x*		*4*
Middle-management resistance	*x*		*x*		*x*				*3*
Complexity		*x*		*x*	*x*				*3*
Interconnectivity between value-streams			*x*		*x*		*x*		*3*
Culture and habits	*x*					*x*			*2*
Organizing specialists					*x*		*x*		*2*
Wall between business and IT	*x*					*x*			*2*
Measuring the success of value streams						*x*			*1*
Organizing the first ART							*x*		*1*
Alignment with the goals								*x*	*1*
Alignment with HR								*x*	*1*

Table 12 Challenges

Table 13 showcases the perceived benefits from the different organizations based on organizing around value. As with the challenges, the Table is ordered by most mentioned perceived benefits. Also, the table is color-marked by different approaches (blue = existing business lines, light-brown = second hierarchy).

For this multiple-case study, the most mentioned perceived benefits as a result of value stream configuration is increased flexibility of the teams (5/8). Thereafter, better communication (4/8), and increased transparency (4/8). After that, the most common benefits are being better able to identify value, and the reduction of waste (3/8).

Again, organizations that use existing business lines to structure their value streams are colored blue, and organizations that use a second structure as a 'virtual' organization are colored grey.

Organization	A	B	C	D	E	F	G	H	Total
Flexibility of teams	x	x		x	x	x			*5*
Communication	x	x				x	x		*4*
Transparency		x		x			x	x	*4*
Identifying value	x		x		x				*3*
Reduce waste	x		x	x					*3*
Reconfiguration of value streams				x	x				*2*
Team engagement					x			x	*2*
Autonomy	x					x			*2*
Strategic alignment		x							*1*
Predictability					x				*1*
Stakeholder satisfaction					x				*1*
Awareness						x			*1*
Faster time-to-market				x					*1*
Focus on value								x	*1*

Table 13 Perceived benefits

4.10.2 Guiding principles for value stream identification and design

Based on the results, some guiding principles which organizations use to identify and design their value streams can be defined.

4.10.2.1 Identification approaches

Identification approaches vary, and it appears they are rarely formally defined. One method, which is applied roughly the same in 5 out of 8 cases is to start by looking at the existing business lines. Thereafter, organizations tend to start with the business line that shows the least resistance, or start the transformation parallel throughout all the departments.

The three other cases within the results are:

1. Based on interviews with employees and release trains engineers from different workstreams create a portfolio canvas. Then use this portfolio canvas to categorize services and processes based on what type of value they add.
2. Use a step-by-step approach in which you:
    a. Define customer groups
    b. Find out why these customer groups are approaching your specific organization
    c. Define what type of value is being created, and where.
3. Issue a project to the IT-architecture department to take an external view on the organization and create a process model with the different value streams. Based on this process-model, tribe leaders can define granularity.

Based on these different approaches, in all cases the high level value streams represent the main business lines that were already in place. Therefore, existing structure, systems and departments mainly influenced the identification and design.

Other influential factors on the value stream design are:

- Starting with least resistance from department (Company A)
- Mindset (Company B)
- Size of the value stream (Company D)
- Interdependencies between streams (Company D, E)
- Customer demand (Company G)
- Future setup (Company G)

4.10.2.2 Measuring success

Something that has been a struggle for some organizations (especially Company F) has been how to measure the success of value streams. An interviewee from Company F mentions that "value measurement is hard to quantify, especially in regards to return on investment". In this case-study, several methods for measuring the value streams have been observed:

- Added value on customer need (Company B)
- Metrics described in SAFe[9] (Company C)
- Strategic themes (Company C)
- Dependencies between ARTs (Company D)
- Lead time and cycle time (Company D)
- Throughput of value to customer (Company E)
- Percentage of an epic being done (Company F)
- Flow metrics (Company G)
- Time-to-market (Company G)
- Revenue and costs (Company G)
- Customer feedback (Company G)

[9] https://www.scaledagileframework.com/metrics/

4.10.3 Structural approaches; hierarchy versus network

In the results about half of the companies (4/8) are applying the dual operating structure with a second hierarchy, and one company (F) is planning to apply it in a later stage. The other companies are using existing business lines to create a value stream. They are changing the nature of the departments and introducing cross-functional stable teams that are responsible for a part of a value stream.

4.10.3.1 Structuring around existing business lines

An interesting trend within this structuring approach is to create a tribe or a cluster (hereafter referred to as a unit), and make it responsible for a value stream. This approach is used by Company A, B, and C. When closely related, one unit can also be responsible for two value streams as is the case with Company B. Often this unit represents an entire business line. A visual representation of how this structure looks is shown in Figure 20.

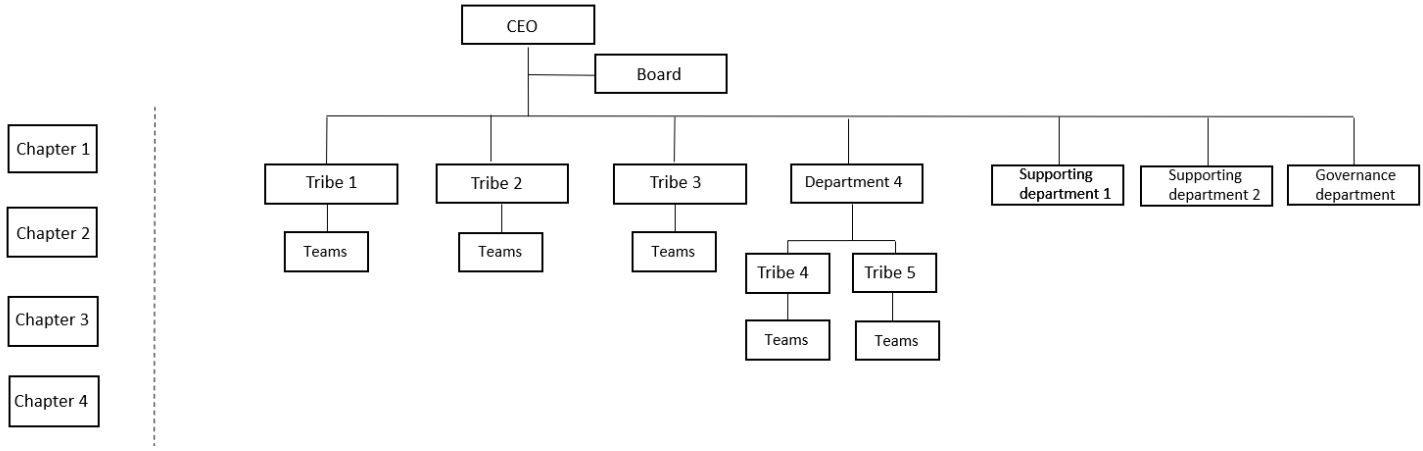

Figure 20 Example structure 1

Within these units are different cross-functional semi-autonomous squads that are responsible for a specific part of the value stream (product, service, or customer). In one case, a cross-functional squad was able to be responsible for the entire value stream. This is of course ideal, but only possible when a value stream is small enough to be represented by only one team.

Additionally, organizations tend to keep supporting departments and governance departments in place, and keep them out of the transformed organization. These are, for example, legal, human resources, or finance departments. From the cases, Company F made a clear distinction between value-added processes, governing processes, and supporting processes.

Company B made a clear distinction between their value streams, which represented the customer needs. Here, the enabling teams and supporting teams represent the customer values. With this approach Company B decreased hierarchical layers from 7 to 3.

During the interviews, different interviewees were also asked what they thought about the idea of structuring around existing business lines, instead of separate value streams. Here, some criticism was found. For example, one interviewee mentioned: “so it ticks in the box, and they think the problems are solved, but it’s not and you’ll end up in more serious problems”. Indicating that it is an easy solution to gain political acceptance from people that want to initiate a transformation, but that it will not actually solve the problems, and will not create organizational agility.

4.10.3.2 Existing business lines: benefits and challenges

Organizing the value streams around existing business lines brought organizations varying benefits. The benefits for organizations that are applying these are summarized in Table 14.

The main perceived benefits relates to an increased flexibility within the teams, and better communication as employees are having the right discussions regarding value. These will be discussed more thoroughly in section 4.12.3.

Thereafter, the most recurring benefits relate to being better able to identify value, being able to reduce waste, and creating autonomy within the organization.

Organization	A	B	C	F	Total
Flexibility of teams	x	x		x	3
Communication	x	x		x	3
Identifying value	x		x		2
Reduce waste	x		x		2
Autonomy	x			x	2
Transparency		x			1
Strategic alignment		x			1
Awareness				x	1

Table 14 Benefits existing business lines

Companies that use existing business lines as a basis for organizing around value face several challenges. These challenges are summarized in Table 15.

The most recurring challenge is budgeting (3/4), thereafter these organizations find defining the correct value stream (2/4), middle-management resistance (2/4), rebellious culture and habits (2/4), and a wall between business and IT (2/4) a common challenge.

The main challenge regarding budgeting refers to the estimation of the budget needed to provide value, and the pay-off it gives. As it is often iterative, financial departments in case organizations notice that they can not use known metrics any longer. Furthermore, short-term budgeting around value is especially challenging when working with external vendors.

The transformation consultant of Company C made an interesting statement regarding middle-management resistance, he argues that the transformation: “is a cultural shock to managers, because they think about their self-worth based upon how many people report to them, and they are very reluctant to give up their power.”

Rebellious culture and habits also play a common role for these organizations. Company A, and F mention that employees that have been in the organization for a long time and have an established role tend to be reluctant to change. Similarly, they mention that the wall between business and IT remains a challenge. A possible explanation is their focus on IT during their transformation.

Organization	A	B	C	F	Total
Budgeting	*x*	*x*		*x*	*3*
Defining the correct value stream		*x*		*x*	*2*
Middle-management resistance	*x*		*x*		*2*
Culture and habits	*x*			*x*	*2*
Wall between business and IT	*x*			*x*	*2*
Complexity		*x*			*1*
Interconnectivity between value-streams			*x*		*1*
Measuring the success of value streams				*x*	*1*

Table 15 Challenges existing business lines

4.10.3.3 Creating a second hierarchy

A similar approach, used by Company D, E, and G, is to start transforming the organization by using a 'virtual' organization, creating a second hierarchy. With this approach, the initial line-hierarchy remains in place and the initial structure does not have to undergo any changes. Rather, the organization can introduce a second hierarchy, often referred to as a 'network', in which people from the organization are assigned to cross-functional teams and are scattered across the organization in a cross-silo manner. An example of such an organization is shown in Figure 21.

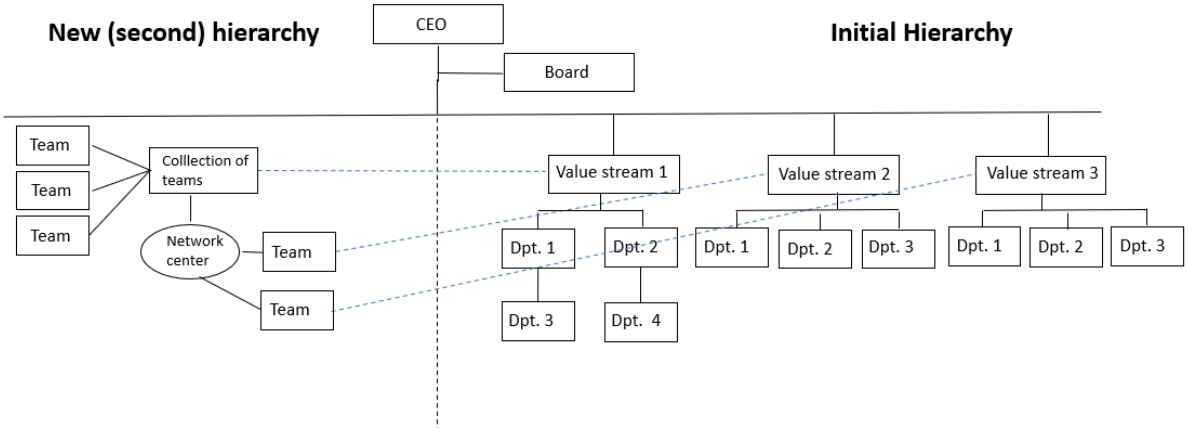

Figure 21 Example structure 2

Within the second hierarchy, either a collection of teams consisting of several teams or a single team can be scattered across the different value streams, which are often represented by a product or a service. As these teams are not in the formal initial hierarchy, they can easily be reconfigured, as HR or work-unions do not have to be included.

These teams are created by a central unit in the network. Interviewees give an example for how they created the first team when they required a release train engineer. To do this, they approached the line manager and asked him if the person would be available for the role. The person would also have to be willing for the role in the network. They repeated this process and based it on two factors:

1. Required knowledge for specific content
2. Characteristics required for a successful virtual role

Company G applies this in a similar fashion and the interviewee mentions that teams, and people, can easily be moved around from one train to another without having to move managers around.

Company D is enthusiastic about this approach. Interviewees mention that it allows for very easy reconfiguration, as you will not have to deal with HR or unions. The same goes for the interviewee from Company E. The interviewee argues that if you can decouple your value stream design from your hierarchy, organizations can better learn and have more options to change.

Interviewees from Company C and Company G on the other hand are negative about the application of such a structure. While they do believe it might provide organizations some benefits, they argue that it is a transitional state while the organization is redefining itself. One interviewee referred to it as a "middle phase" and mentioned that it is not an efficient way to run an organization in the long run.

Furthermore, the interviewee from Company G mentions that there are cases where the line-manager requires work from employees, but they are also needed in their network role at the same time. When this is the case, priorities become unclear. This is especially challenging when organizing specialists, which is something Company E also noticed.

4.10.3.4 Creating a second hierarchy: benefits and challenges

The virtual organization brings some specific challenges with its structure as well. These are summarized in Table 16. The main perceived benefit is transparency (3/4). Thereafter organizations notice an increased flexibility within the teams (2/4), being able to more easily reconfigure the value streams (2/4), and more team engagement (2/4).

The main perceived benefit for organizations is an increased transparency, especially within the portfolio management process. This is discussed more thoroughly in section 4.12.3.

As expected, one of the other main perceived benefits from organizations that use the virtual organization is that they are better able to reconfigure their value streams as needed. The interviewee from Company H even mentioned that it is standard procedure to reconfigure every 9 months. However, it is interesting that not all of the organizations have perceived such a benefit.

At organization E and H team engagement went up. They both mentioned that they were specifically aiming for this.

Organization	D	E	G	H	Total
Transparency	x		x	x	3
Flexibility of teams	x	x			2
Reconfiguration of value streams	x	x			2
Team engagement		x		x	2
Communication			x		1
Identifying value		x			1
Reduce waste	x				1
Predictability		x			1
Stakeholder satisfaction		x			1
Faster time-to-market	x				1
Focus on value				x	1

Table 16 Benefits virtual organization

There are also some specific challenges. These are summarized in Table 17. The four main challenges relate to defining the correct streams, inherited complexity, interconnectivity between different value streams, and organizing specialists.

Defining the correct value streams was especially challenging for Companies D and G. Interestingly, these are both telecom companies. During the interview, an interviewee from Company D emphasized that the problem mainly related to the nature of their product offerings. Within the telecom industry the organizations do not really provide products, rather they are more services.

Inherited complexity gave Company D, and E some troubles. For company D this related more to inherited organizational complexity and legacy systems. For company E this was mainly the complexity within their products that made it harder to organize.

Interconnectivity between the value streams, mainly for Company E, is related to this complexity. These specialists are needed across the different value streams. For Company D the challenge with the interconnectivity between value streams related to the dependencies. Their main reason for reconfiguring the organization is to make sure these dependencies get minimized.

Organizing specialists was a great challenge for Company E, and G. They had limited capacity, and the specialists were needed in different teams. In the end, both decided to partly place them within the ARTs and partly keep them within the existing structure.

Organization	D	E	G	H	Total
Defining the correct value stream	*x*		*x*		*2*
Complexity	*x*	*x*			*2*
Interconnectivity between value-streams		*x*	*x*		*2*
Organizing specialists		*x*	*x*		*2*
Budgeting	*x*				*1*
Middle-management resistance		*x*			*1*
Organizing the first ART			*x*		*1*
Alignment with the goals				*x*	*1*
Alignment with HR				*x*	*1*

Table 17 Challenges virtual organization

4.10.4 Implications for agility

Within different organizations that are already applying principles from agile portfolio management, there is evidence of increased agility within the portfolio management process based on value stream design. The most recurring benefits refer to an increased flexibility within teams, being able to change requirements, and better transparent communication.

4.10.4.1 Flexibility of teams and being able to change requirements

In most of the cases (5/8) there is an increased flexibility of the teams. This flexibility is often a result of the cross-functional and semi-autonomous nature of the teams. This allows them to be deployed within different parts of the organization. It also allows them to more easily adapt to new situations, and for example, learn additional relevant activities.

For example, interviewee of Company A mentions that new disruptive product propositions are less of a problem, as they are more able to easily swap the teams around between value streams. This prevents them from needing to reconfigure structures.

Organization B emphasizes that they created a more organized flexibility through the introduction of rituals which provided clear governance. In this case there was already some flexibility in place, after the transformation however it became more organized and clear.

At organization E, within one business line, the teams that are responsible for their own products see that they can provide increased flexibility to the business, and that they are dramatically improving the whole system.

Organization D and F notice that through the autonomy and product focus of teams they have created some sort of flexibility to play around with the teams. An interviewee from Company F already personally experienced some of this flexibility when a project changed last minute.

Inherent to the flexibility of the teams, organizations notice they are able to more easily change their requirements. This is not only a result from the changed team composition, but also a result from the short iterative nature from agile portfolio management. For example, before the transformation Company A executed projects in a waterfall manner. The business would send the IT-department a set of requirements, and after a certain period of time the IT-department would have to deliver the final product. After the transformation however, IT-departments worked more closely together with the business, often in the same teams. This, in combination with shorter cycles, allowed for easy changes in the requirements when necessary.

4.10.4.2 Identifying value

Three out of eight organizations mentioned concretely that they are, after the transformation, better able to identify where the value is within the organization. They see where the value lies within the company, and can also use this information to optimize the value.

Company A mentions that as a result of the value stream configuration, they were able to identify the value in advance. They created a focus on value, rather than a focus on the silo.

Similarly, Company C, through the identification and value stream mapping, was better able to identify bottlenecks and see where processes were getting bogged down. Based on this identification, they could eliminate those bottlenecks and reduce waste.

Company E saw a massive increase in predictability. They were better able to predict what value should be delivered to customers. Along with that, they are better able to measure the value.

4.10.4.3 Transparency and communication

Five out of eight total cases saw better communication within the portfolio management process as a result of the value stream identification. As a result of bringing the right people together (discipline and value stream), employees are better able to have the right discussion.

A direct result of this for Company A is that they are now better able to reduce waste. The interviewee from Company A mentions that by bringing the right people together, they are getting new insights. For example, employees from development noticed that some systems that were still being developed are never used.

Company B noticed similar results. Before, during projects, actors had to communicate and explain the projects to different people from different silos. This was very time-consuming. After the transformation, people from different silos are in the same squad. One interviewee mentions that this was the largest perceived benefit.

Company D actually formed agile release trains within their second hierarchy to enhance communication within the organization and across the different value streams as shown in Figure 18.

Interviewees from company F mention that as a result of the value stream identification they are now having the right discussion. Previously, there was no uniform model which provided them any guidance. Now however, everyone is working with a shared model and working towards the same goal.

For Company G, transparency was the main perceived benefit. The interviewee mentioned that it had improved dramatically. The business has great visibility on the progress of the developments and as a direct result communications are running more smoothly.

The interviewee from Company H mentions that there was an increased transparency within the portfolio. Additionally, the interviewee says that transparency can be used as a basis for achieving business agility, if an organization is able to respond to the insights it provides adequately.

5 Discussion

In this section the researcher will discuss the interpretations and implications of the results in light of relevant empirical research. The discussion viewpoints are validated by industry-experts.

5.1 Understanding value streams in practice: a process or organizational design

According to practitioner frameworks, value streams are a hot topic associated with beneficial change (Knaster & Leffingwell, 2020). However, it appears there is some unclarity about the definition. For case-organization, definitions and actual applications tend to differ. To elaborate on this, the two will be described and compared.

5.1.1 Formal definitions

The term 'value stream' has roots in lean thinking and was introduced by James Womack and Daniel Jones (Womack & Jones, 1996). They define a value stream as: "*the set of all the specific actions required to bring a specific product (whether a good, a service, or, increasingly, a combination of the two) through the three critical management tasks of any business*". These management tasks refer to problem-solving tasks (1), transformation tasks (2), and information managements task (3). Usually, these value streams have a highly cross-functional nature and include activities that precede customer requests (Martin & Osterling, 2014). An organization's value streams can run through the organization parallel or sequentially, and one organization can have many value streams (Narasimhan, 2004).

Practitioner framework SAFe[10] refers to a value stream as: "*the series of steps that an organization uses to implement solutions that provide a continuous flow of value to a customer*". It distinguishes two types of value streams: operational and development. The operational value stream refers to the streams that deliver direct value to the customer. The development value streams are the support which are used to build the systems and provide capabilities to enable the operational value stream.

Another practitioner framework, the DAD framework (Scott W. Ambler, 2012), refers to a value stream as: "*the set of actions that take place to add value for customers from the initial request through realization of value by the customers*". Other frameworks generally use the principles of a value stream, but do not have their own definition.

5.1.2 Understanding participants

Interviewees in this case study generally describe a similar definition as proposed by practitioner frameworks, they describe value streams as a sequence of steps, or activities performed, to deliver a product or service. One interviewee from Company B describes a value stream as: "an end to end service process that delivers value to customers, towards employees, or towards both". For Company A, this may include value stream mapping, and making a roadmap of all the processes within an organization. Other companies (D, E, G, H) make a clear separation between operational and development value streams like in SAFe.

However, while all organizations give a process-like description, they still tend to include organizational design practices in reality. In fact, six out of eight organizations use existing business lines or departments to represent a value stream on the highest level. Such a difference in granularity is emphasized by a remark from an interviewee from Company H, who mentions that: "There are always different perspectives ... you can look at value streams in so many different ways".

[10] https://www.scaledagileframework.com/value-streams/

As a result of identifying and sturcturing around value streams, organizations perceived several benefits. The main perceived benefits relate to an increased flexibility of the teams (5/8), having increased transparency with improved communication (4/8), and being better able to identify value (3/8).

5.1.3 Perceived challenges in defining and designing value streams

Throughout the interviews from the multiple case study it becomes clear that there is hardly a step-by-step approach for identifying the value streams within the organization. Interviewees are able to broadly define some steps, and generally mention they looked at existing business lines, but do not offer structured approaches. Furthermore, often metrics based on the goals are not defined concretely at the start of the transformation, which leads to troubles for measuring the success of value stream design. Finally, there is unclarity about the continuity of value streams.

More specifically, six out of eight organizations were unable to provide a detailed step-by-step approach when asked to describe the value stream identification process. Case-studies describe the same struggle. Although there are limited cases available, they argue that the identification process provided by SAFe is substandard (Gusch & Herbai, n.d.; Holdorf, 2011; Putta et al., 2019; SEI Global Wealth Services, n.d.).

The other most common challenges relate to budgeting (4/8) of the different value streams, and identifying what the correct value streams are (4/8). Defining the correct value streams was especially challenging for Company D, as they do not deliver specific products to customers. An interviewee mentions that: “For us it is not easy. We are in the service business, that's where we are basically, we are not selling any goods, our products are continuous services that we want our customers to consume every day”.

Regarding the initial identification of value streams, the interviewee from Company H recommends starting with small experiments in order to find out what works within the organizational context. This is supported by a statement from an interviewee from Company E: “It’s going to be wrong anyway ... if you can not figure it out, then it is probably not so relevant with which one we start, we have to learn”.

Also, value streams, as is often the case with principles from lean, tend to have a continuous nature (Shou et al., 2017). This is supported by an interviewee from Company E, who mentions that: “value stream design is a constant sport that you can start with, but you can never stop.” However, not all organizations seem to realize this. Especially the organizations that created a structure around existing business lines and have done no, or little, reconfiguring of the value streams.

On a final note, it should be mentioned that an important aspect of proper value stream design is clear goal setting. For example, when interviewees were asked to state a goal for the transformation, the answer could be varied or it was unclear. At the same time, case organizations (Company F, G) have trouble measuring the success of a value stream. For Company H, the goal was a clear metric: time-to-market. In this case, measuring the value stream was no problem.

5.1.4 Need for a more extensive definition

As organizations are applying value stream in the context of organizational design, one could argue that value streams should be more broadly defined, as it is now more geared towards processes. A more extensive definition is required which includes granularity, and shows that a value stream on the highest level can be more than a sequence of steps or activities representing a process, and that it instead can also be represented by a department or a business line.

5.2 Value streams and process improvement: A new wave of business process-reengineering?

According to practitioner framework SAFe (Knaster & Leffingwell, 2020), one of the proposed benefits gained by organizing around value is the ability to easily reconfigure value streams. According to the interviewee from Company E, such reconfigurations are generally executed when new value streams are identified, or when there are conflicting priorities and increasing inter-team dependencies.

The concept of value stream reconfiguration is similar to something that has been applied in organizational design for tens of years; business process re-engineering (BPR). Already in 1990, Michael Hammer introduced the concept by arguing that processes should be continuously reengineered around a focus on customer value. As such, he claimed that processes that do not add value to customers should be removed (Hammer, 1990). The later defined, exact definition of BPR is: "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed" (Hammer & Champy, 1994).

Three years after the initial introduction, Davenport (1993) built upon the sentiment around BPR. Among other things, he argued that: "how people are organized and managed and the degree to which they are empowered to do their work are critical to the success of process design" (Davenport, 1993). He furthermore argues that approaches to enable innovation in process design include creating autonomous teams, allowing workers to handle entire processes, and creating process-oriented organizational structures.

Another recognizable remark is a famous statement from the book Hammer later co-wrote. He stated that: "managers have to switch from supervisory roles to acting as facilitators, as enablers, and as people whose jobs are the development of people and their skills so that those people will be able to perform value-adding processes themselves" (Hammer & Champy, 1994). This is especially similar to the people developer role, introduced by Company H who is responsible for coaching and guiding people within the network.

To get a further understanding of how business process re-engineering is executed, the INSPIRE framework is showcased. In the framework INSPIRE, Chakravarti (2013) (Table 18), describes the general process which process analysts can use to perform BPR.

INSPIRE **(Chakravarti, 2013)**
1. **Initiate** a reengineering process
2. **Negotiate** to get approval
3. **Select** key processes that require reengineering
4. **Plan** what reengineering activities have to be executed
5. **Investigate** processes to define bottlenecks
6. **Redesign** processes that require redesigning to improve performance
7. **Ensure** a successful implementation of the new processes

Table 18 INSPIRE Framework

After the steps from initiation to redesigning and ensuring have been executed, it can become clear the processes run across functional silos. This was the case with an example process from the article written by Childe et al. (1994) (Figure 22) in which they describe a hypothetical process representing an “order flow”. This example process shows stunning likeness with the way value streams often go through organizations.

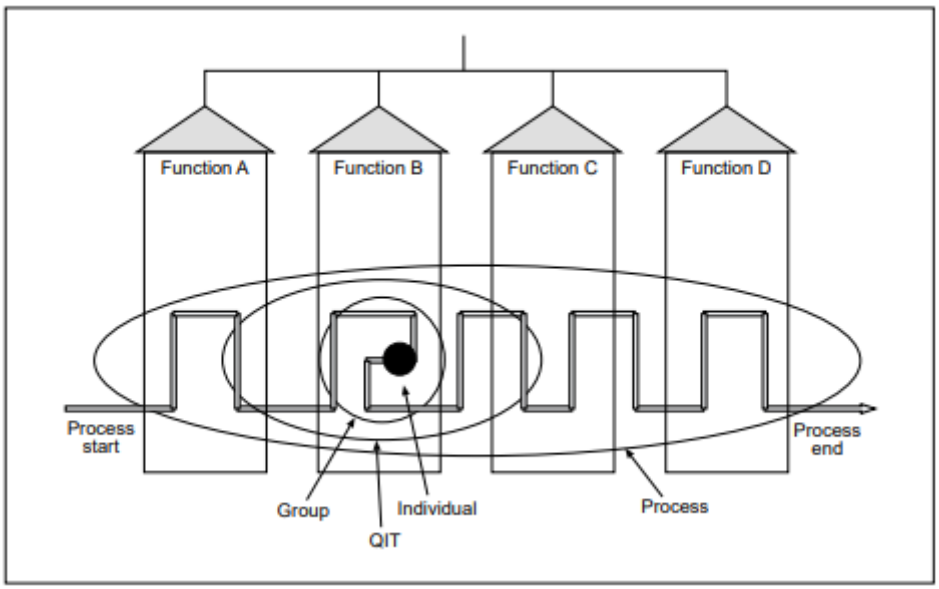

Figure 22 Processes in a functional organization. Excerpt from (Childe et al., 1994).

Unfortunately, after its peak from 1993 to 1996, BPR’s life cycle started to run out (Leonard J. Ponzi, 2002). It was heavily criticized for being an excuse for executives to start downsizing, disregarding the aspect of the human dimension (Whitestaff, 1996).

In this case study, Company F had a similar problem, which resulted in resistance to the transformation. They coped with this by promising everyone that took part in the transformation no lay-off for at least the coming four years.

Comparing the above description to results in this case-study shows interesting likenesses. Especially to Company D, who mentions that they have done lots of reconfiguring, and that the dual operating model made this possible as: “no single union dialogue and discussion with any employees was required”.

Would it be possible that a new, and adjusted way of BPR which includes up-to-date IT capabilities is upon us? If it is, it should make certain to keep in mind the human dimension when improving processes or reconfiguring value streams.

5.3 Value streams and organizational structures: Matrix versus Dual operating model

A large part of the organizations within this study aim to introduce the dual operating model (Company D, E, G, H) in accordance with SAFe. To showcase to what extent this approach differs from existing approaches, these cases will be compared to existing literature.

When analyzing literature it becomes clear that the dual operating model, to some extent, resembles the multidimensional front-back structure introduced by Galbraith (2002). The front-back structure also makes a clear distinction between two structures. The front-end focuses on customer relationships and mastery of different channels, while the back-end focuses on products and development. However, the main difference is that with the dual operating system both sides of the organization are working in one shared structure, where one dimension is functional departments and the other dimension is cross-functional product-based teams.

Therefore, one could argue that it is more similar to the matrix organization, as it has a horizontal and a vertical dimension. However, with a matrix organizational there is often a project dimension and a functional dimension. Although organizations that apply the dual operating model also have a functional dimension, the other dimension is generally dedicated to products executed by a collection of cross-functional teams. With the dual operating model, these teams are not changeable and stay together for as long as possible. Additionally, the focus of these teams is not on projects, but rather on (parts of) the value streams which often represent a product. As such, the dual operating model changes the matrix organization from a project-focus, to a team-based product focus. To further compare these structures and substantiate remarks about the dual operating model, Table 19 has been drafted up.

The relation between the approach by the case companies and the different matrix forms is similar to the ‘productized’ approach described in Table 6. The project manager’s role is switched towards a more coordinating role of product-based teams. The teams represent a part of the value stream, which can be a product or a service. The need to switch from projects to products is emphasized by a remark from an interviewee from Company C who mentions that: “unless you truly go from projects to products, and more accurately from projects to value streams, it’s really hard to take advantage of the benefits of value stream management”.

The general aim for the dual operating model has commonalities with organizational ambidexterity, which refers to: “an organization’s ability to be able to explore new future businesses while exploiting day-to-day businesses” (R. B. Duncan, 1976). This is especially clear for Company H, who is reconfiguring their structure approximately every 6 to 9 months. More specifically, this represents sequential ambidexterity: shifting an organizational structure sequentially (R. B. Duncan, 1976).

To further make the distinction between hierarchy and network, a concrete definition of the network needs to be analyzed. The network organization in organizational design literature is characterized by: “flexibility, decentralized planning and control, and lateral (as opposed to vertical) ties” (Baker et al., 1992), where the main characteristic is the emphasis on integration across formal boundaries. Furthermore, it should be clear that all organizations have networks, as they are all a collection of patterns among roles and relationships (Cunliffe, 2008). However, they are not all a network organization. Furthermore, building upon Lawrence & Lorsch (1967), a network organization extends the concept of integration across hierarchical levels and geographic locations. Kotter (2014), when describing the network as part of the dual operating model, refers to a network as something that is built up from employees all across the organization in order to mimic entrepreneurial phases, has no formal job descriptions, and is able to morph with ease. With this, he describes something similar to the network organizations in organizational design literature, but puts less emphasis on decentralized planning and control, and lateral ties.

	Matrix	Front-Back	Dual operating model			
			Company D	Company E	Company G	Company H
Reporting structure	Dual (or sometimes triple)	Context dependent, but commonly to one manager.	Dual (Functional and product/service)	Dual (Function and product)	Dual (Functional and product/service	Dual (Functional and product)
KPI's	Profit and loss may be on both dimensions, and may overlap	- Profit and loss may be on both dimensions - The structure allows independent KPIs	- Dependencies - Flow metrics - Throughput of value to customer - Customer feedback - Revenue - Costs	Throughput of value to customer	No KPI's in place	- Flow metrics - Time-to-market - Costs - Revenue - Customer feedback
Organi-zation of resources	Within each unit	Within each unit	Within each portfolio representing a value stream	Allocated budget per value stream	Within each business unit	Allocated budget per value stream
Organi-zation of "front end"	No particular requirement	Always defined according to market segments	No particular requirement	No particular requirement	No particular requirement	No particular requirement
Key advantage	Increases lateral coordination	Reduces complexity and clarifies sub-unit roles	- Transparency - Flexibility of teams - Transparency - Ability to reconfigure value streams - Reduce waste - Faster time-to-market	- Flexibility of teams - Ability to reconfigure value streams - Team engagement - Identifying value - Predictability - Stakeholder satisfaction going up	- Transparency - Improved communication	- Transparency - Team engagement - Focus on value
Key limitation/ challenges	- High complexity due to overlapping functions and goals - Creating a balanced matrix results in higher costs (more management resources) - Easily leads to asymmetries in the composition of leadership teams	- Low degree of resource flexibility - One dimension (product or market) will usually dominate - Intend of model often undermined during implementation	- Complexity - Budgeting - Defining the correct value stream	- Complexity - Middle-management resistance - Inter-connectivity between value stream - Organizing specialists	- Defining the correct value stream - Inter-connectivity between value streams - Organizing specialists	- Aligning the structure with the goals - Aligning the 'virtual' network with HR

Table 19 Comparing dual operating model. Adapted from Worren (2018).

Regarding the hierarchies, the interviewee from Company H argues that some sort of hierarchy in a coordinating context, is required. The interviewee argues that the network typically does not reorganize itself, and that some sort of coordinating initiatives are required. But at the same time, creating a second structure in parallel creates overhead. Therefore, Company H is minimizing the line-structure while the collection of cross-functional teams is growing.

Another change in these hierarchies, emphasized by Company E and G, is the introduction of stable teams. Where individuals would previously be swapped between different projects and could be allocated to several projects, they are now part of stable teams that remain together for as long as possible. This is possible thanks to their cross-functional nature.

Regarding the management of these teams, Company E is aiming to make these teams as autonomous as possible. Company D does not specifically mention autonomous teams, but emphasizes that the different agile release trains have full autonomy. For example, an interviewee from Company D mentions that: “line managers don’t know how their employees are doing ... they approach product owners and product managers to ask how they performed”.

Putting these concepts together, it appears that case organizations applying the dual operating model are aiming to achieve sequential organizational ambidexterity by introducing a virtual network organization which supposedly acts as a network organization and coordinates cross-functional product-based teams. In some cases these teams are stable (Company E, G), and geared to being autonomous (Company E).

However, the organizations keep the line-management intact (Company H excluded), which may lead to overhead. Also, because the network still has a coordinating mechanism, there is no fully decentralized planning and control. Therefore, one could argue that organizations are only creating a second hierarchy, which together with the initial hierarchy, represents a productized matrix with more stable teams and a management approach more geared towards collaboration and coordination.

If that is the case, organizations should be aware of the additional complexity such a coordinating approach brings (Jones, 2013).

6 Conclusion

In this section the research will be concluded. As such, the research question will be answered, validity considerations will be mentioned, recommendations for practice will be offered, and any relevant future work will be discussed.

6.1 Answering the research question

Research question: *What are characteristics of value streams in practice*?

Initially, a value stream referred to: "*the set of all the specific actions required to bring a specific product (whether a good, a service, or, increasingly, a combination of the two) through the three critical management tasks of any business"*

Practitioner frameworks (Knaster & Leffingwell, 2020; Larman & Vodde, 2010) see the potential of value streams, and argue that organizations such build their structure around them. This will supposedly bring organizations a reduction in delays between functional areas, an increased customer-focus, and easy reconfigurations to ultimately provide business agility. According to practitioner framework SAFe (Knaster & Leffingwell, 2020), which 7 out of 8 case organizations use, a value stream refers to: "*the series of steps that an organization uses to implement solutions that provide a continuous flow of value to a customer*"

Organizations that have identified and designed value streams within their structures generally give a process-like description similar to the description from SAFe. They refer to a value stream as the sequence of steps or activities performed to deliver a product or service. However, although the case-companies give a process-like description, they still tend to include organizational design practices in reality by structuring department or business lines around value streams.

Additionally, companies in this case-study hardly use a step-by-step approach for identifying the value streams within the organization. Interviewees are able to broadly define some steps and generally mention they looked at existing business lines, but there is often no clear governance. Furthermore, often metrics based on the goals are not defined concretely at the start of the transformation, which leads to troubles for measuring the success of value stream design. Finally, six case companies (Company A, B, C, E, G, H) structure the high-level value streams around existing departments. They do however not see the need to reconfigure these value streams (with the exception of Company H) after a certain amount of time.

Two case companies (Company D, H) do see the need for reconfiguration and have reconfigured processes several times. According to interviewees, the separated network allows for easy reconfiguration and prevents trouble with unions and the Human Resource department. This concept of reconfiguring value streams has commonalities with business process re-engineering, a trend for improving business processes around 1990. Specifically, business process-reengineereng refers to: "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed" (Hammer & Champy, 1994). Although it was promised to bring great results, the hype around business process re-engineering died out because it disregarded the human dimension of reconfiguring processes (Whitestaff, 1996). If value stream reconfiguration is similar, it would be best to keep in mind the human dimension of reconfiguring processes.

On a higher, organization-wide level, companies that are designing their value streams in accordance with the dual operating model see results that are similar to a matrix organization. The first, functional dimension remains the same. However, the second dimension is geared towards products/services representing the value streams, instead of projects. Additionally, some case organizations (Company E, G) tend to focus more on creating stable teams, instead of moving individuals across projects.

Using value stream based structures provided the case organizations with various benefits and challenges. The main perceived benefits relate to an increased flexibility of the teams (5/8), having increased transparency with improved communication (4/8), and being better able to identify value (3/8). The main challenges relate to budgeting (4/8), and defining the correct value stream (4/8).

6.2 Validity considerations

To describe the validity consideration, the different dimensions as proposed by Yin (2015) will be described.

6.2.1 Construct validity

For the explorative context of this research, the most fitting method of data collection was applied. In this case, it were semi-structured interviews with room for follow-up questions. These semi-structured interviews were only used with experts on the topic. These were generally transformation leaders or transformation consultants.

One consideration could be the mono-approach for data collection, which are only semi-structured interviews. To cope with this, when required, interviewees where approached with follow-up questions.

6.2.2 Internal validity

To ensure the internal validity, a protocol was followed for each interview. The interviewer starts with anonymity considerations and personal introductions. Thereafter, the interview will be conducted via a semi-structured approach.

Based on these semi-structured interviews, the researcher is able to summarize each case and describe it in visual and textual form within the results. When describing the cross-case analysis and giving specific examples, the researcher will refer to the specific case.

If data was unclear at any point, transcribed interviews would be revaluated. Unfortunately, interviewees were not always able to respond to questions. When information was uncertain, it was left out of the results section.

6.2.3 External validity

To ensure that the results can be compared to other contexts, the researcher included several external perspectives. Results were compared to available literature, SAFe case studies, and validated by interviewees if time allowed it during the interviews.

The main external validity consideration relates to the fact that some organizations are only represented by one interviewee. As previously mentioned, in such cases an industry expert is interviewed and asked if he remembers a relevant case for this study. However, with this method it is often hard to gather recent data from multiple perspectives.

6.2.4 Reliability

To ensure reliability for this research, 16 interviews were conducted that took approximately 1 hour each. These 16 interviews are scattered across 8 organizations that are stationed in 5 different countries across Europe and America. They are also sector-wide, as 5 different sectors are represented.

The main risks regarding reliability relates to the anonymization of the data before analysis. Data might be lost in this process. Furthermore, a signific amount or organizations did not agree to share specific insights regarding the organizational structure and developments. This may have prevented the researcher from analyzing specific patterns.

6.3 Recommendations for practice

During data-analysis several interviewees gave recommendations for practice. When these recommendations align with findings and literature, they will be drafted below. Furthermore, recommendations based on the discussion and the research question are stated:

- When agility is required, odds are that value stream design is to some extent going to be continuous. Therefore, do not structure around a set value stream identification and realize that some value streams after a period of time will have to be reconfigured.
- When starting with implementing value streams, it is advised to experiment and start small. Additionally, consider mistakes a learning opportunity.
- When using the existing business lines as a basis for your value stream configuration, be careful not to create new silos around steps of a value stream.
- An important part of value stream configuration and measuring the success is clearly stating the transformation goal beforehand. This prevents trouble with measuring the success of value stream configurations.
- Decide what is right for your organization, there is no one-size-fits all. It might be possible that the dual-operating system does not fit your organization needs. For example, when the organization is rather flat and small.
- When applying a second (virtual) hierarchy, one should ensure balance between the two systems.

6.4 Future Work

This thesis gives insights into how value streams are being applied in practice and provides academic context into how they relate to organizational design literature. More specifically, it gives insights into what identification and structuring patterns are being applied within different organizations, in different countries, and in different sectors.

However, other more specific research would also be beneficial to see to what extent observations made within this explorative research hold up on a larger scale. Interesting follow-up research topics could be:

- A study on the positioning of value streams in organizational design literature
- A study on the effect of clear governance for different value stream identification approaches
- A thorough study of a configuration approach within a single organization (monitoring)
- The possibility of organizing value streams around existing business lines.
- Beneficial differences within structuring around existing business lines versus using a second separated hierarchy
- The way different organizations measure the success of value stream design
- The way different organization measure the success of teams/squads that are geared towards value delivery
- Differences between business process re-engineering and value stream reconfiguration

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8 Appendices

8.1 Appendix A – Semi-structured interview guide

Introduction

- Before we start off the interviews, there are some ethical considerations:
  To respect the interviewee's privacy, this interview will be anonymised. Answers cannot be traced back to the interviewee. Furthermore, if uncomfortable with a question, the interviewee may choose not to answer. Finally, the interviewee can choose to leave this interview whenever.
- To analyze this interview to its full extent I would like to record this interview. If you agree and give consent I will now start the recording.
- Start recording
- Explain the structure of the interview

Personal introductions

- Personal introduction on my role, experience, and the research topic.
- Could you please introduce yourself (background, experience, job title)?

Organizational & Agile introduction

1. **Could you introduce the organization (services, products, applications, systems)?**
2. In what department are you active?
    a. How large is this department?
3. How is agile being applied within your organization?
    a. How long has it been applied?
4. When did you start transitioning towards agile?
5. What is the goal of your agile transformation?
6. **What were milestones in the transition and approximately when did they happen?**

Value streams

1. How would you define a value stream? (Value streams refer to the collection of activities performed by an organization to deliver value to a customer, from initial customer request to final delivery and support of the product)
2. Has your organization identified value streams?
    a. How do you measure the success of value streams?
    b. How would you define a successful value stream design?
3. **How were the value streams identified (approach, guidance, patterns)?**
    a. Could you write down a step-by-step approach?
    b. Did you experience any problems with identifying the right value streams?
        i. How did you solve these problems?
    c. Would you consider this method for identifying value streams successful?
4. **What influenced the design of these value streams? (Structure, technology, architecture, people etc.)**
5. How are the identified value streams related to the organizational structure and the organizational processes?
6. To what extent do the value streams cut across the formal departments (if yes which and how)?
    a. Would you consider the current design of your value streams and how they relate to each other to be successful?
7. What, in general, do you consider to be a successful configuration of value streams?
8. What would you consider to be a bad configuration of value streams?
9. How large is the organization within a value stream?
    a. How many teams, teams of teams, tribes, are within a value stream?

b. How many levels of value streams are there? (e.g. sub-value streams, what patterns do you see)

Organizational structure

1. Could you draw the general structure of the organization?
2. **(If not answered above) Could you indicate how the work processes or value streams relate to the formal structure?**
3. Could you give a general description of the structure of the organization?
4. Has your organization or department used some sort of scaling agile framework?
5. How are different departments organized?
    a. Did the configuration of the value streams have an impact on the way that departments are organized?
    b. Did the configuration of value streams have an impact on roles and responsibilities (e.g. line-management, group leaders)?
6. How are the products that you develop mirrored in the organizational structure?
7. How do the departments and products relate?
    a. What if a customer is interested in a combination of different products?
8. **Has the organizational structure undergone any major changes due to value stream mapping?**

Impact and relations

1. **What impact did the configuration of value streams have on the organization as a whole?**
    a. Why did you change?
    b. What was the result? (benefits, drawbacks)
2. **Were there instances where organizing around value streams conflicted with your organization design?**
3. Was there a moment in time where you had to redesign your value streams?
    a. If yes; What were the reasons for doing so, and how often did you revisit these?
    b. How was this process executed?
4. How do new product propositions relate to existing value streams?
    a. What if a new product proposition influences existing value streams?

Agile Portfolio Management

1. **How does your organization manage its portfolio?**
    a. What type of framework/process do you use to manage your portfolio?
    b. Does the portfolio management process go across value streams or is it happening within?
2. **What impact did the configuration of these value streams have on your portfolio management process?** (specifically the agility)
3. How do the two (value streams and portfolio management) further relate within your organization?
4. How are your value streams and the underlying release trains budgeted

Future

1. **What are future plans regarding organizational structure?**
2. **What are future plans regarding agility?**
3. Is it okay if I approach you for any follow-up questions in the future?
4. Do you have any ideas for follow-up interviews? (people from other transformations)
    a. Alternatively other people from the same transformation.

Stop recording