

I. OSOBNÍ A STUDIJNÍ ÚDAJE

Příjmení: **Lekýrová** Jméno: **Tatiana** Osobní číslo: **453014**
Fakulta/ústav: **Masarykův ústav vyšších studií**
Zadávající katedra/ústav: **Institut manažerských studií**
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Agilná transformácia v kontexte softvérovej spoločnosti

Název diplomové práce anglicky:

Agile Transformation in the Context of a Software Company

Pokyny pro vypracování:

Cílem této diplomové práce je agilní transformace týmu v softwarové společnosti. Konkrétně diplomová práce představuje a měří slabé stránky a výzvy, kterým tým musí čelit a poskytuje týmu doporučení jak zdokonalit transformaci v kontextu korporátní společnosti.

Osnova práce: 1. Úvod do agilní metodiky, 2. Agilní transformace ve společnosti a konkrétně v týmech, 3. Současný stav týmu v agilní transformaci, 4. Návrh řešení, 5. Implementace a hodnocení, 6. Závěr

Seznam doporučené literatury:

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2. KOTTER, J. P. Leading Change. Harvard Business Press, 2012.
3. SCHWABER, K., SUTHERLAND, J. The Scrum Guide. The Definite Guide to Scrum: The Rules of the Game. Scrum.org, 2017

Jméno a pracoviště vedoucí(ho) diplomové práce:

Ing. Gabriela Antošová, Ph.D., institut veřejné správy a regionálních studií MÚ

Jméno a pracoviště druhého(ho) vedoucí(ho) nebo konzultanta(ky) diplomové práce:

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Ing. Gabriela Antošová, Ph.D.
podpis vedoucí(ho) práce

Ing. Dagmar Skokanová, Ph.D.
podpis vedoucí(ho) ústavu/katedry

prof. PhDr. Vladimíra Dvořáková, CSc.
podpis děkana(ky)

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Master's thesis

Agile Transformation in the Context of a Software Company

Bc. Tatiana Lekýrová

Institute of Management Studies

Supervisor: Ing. Gabriela Antošová, Ph.D.

April 26, 2021

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Declaration

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Abstract

Agility is a lever allowing companies to adapt quickly to their environments, build close relationships with their customers and cultivate motivating culture to bring the best quality solutions to market. Scaling agile to large companies is possible via many frameworks now existing in the agile world. One of them is Large-Scale Scrum. The aim of this master's thesis was to assess agile transformation in a scaled company context. Specifically, underlying challenges, weaknesses as well as strengths were studied in the research part of this thesis. Furthermore, innovative ways from the studied organization and the effect of the agile transformation at scale were uncovered. A set of recommendations for other organizations as well as a strategy proposal based on the qualitative research for the studied software company are provided. This master's thesis brings empirical evidence of a Large-Scale Scrum transformation under specific conditions with the whole transformation being carried out solely remotely and online.

Keywords agile software development, LeSS, agile transformation, agile adoption, large-scale agile adoption, change management

Abstrakt

Agilita umožňuje spoločnostiam rýchlo sa prispôbiť svojmu okoliu, vytvárať vzťahy so svojimi zákazníkmi a pestovať motivujúcu kultúru, aby prinášali na trh riešenia v najlepšej kvalite. Na škálovanie agility veľkých spoločností existuje množstvo koncepcií. Jednou z nich je Large-Scale Scrum. Cieľom tejto diplomovej práce bolo zhodnotiť agilnú transformáciu v škálovanom kontexte firmy. Konkrétne boli preskúmané výzvy, slabé stránky a rovnako aj silné stránky vo výskumnej časti tejto práce. Zároveň boli odhalené inovatívne spôsoby, ktorými skúmaná spoločnosť pristúpila k transformácii a aj efekt škálovannej agilnej transformácie. Diplomová práca poskytuje sadu doporučení pre iné podniky ako aj navrhovanú stratégiu pre skúmaný podnik, zostavenú na základe kvalitatívneho výskumu. Zároveň diplomová práca prináša empirický dôkaz transformácie na Large-Scale Scrum za konkrétnych podmienok, kedy celá transformácia prebiehala výlučne vzdialene a online.

Kľúčové slová agilný softvérový vývoj, LeSS, agilná transformácia, agilná adopcia, škálovaná agilná adopcia, manažment zmeny

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Introduction

The ultimate goal of nowadays software companies is to bring value to customers. This essentially helps companies make money and be profitable. Agile is an approach which helps companies operate in the rapid pace of today's world and keep up with the crescendo of the ever-changing environment organizations live in.

When small teams start with agile, their endeavors are rather straightforward and simple. On the other hand, when large enterprises begin their agile adoption journey, the system comprises more complexity. Companies thus have to keep in mind that such an agile adoption requires patience and time.

This master's thesis aims to assess the agile transformation journey within the context of a large software company. Its goal is to uncover and measure the weaknesses and underlying challenges and provide the company with recommendations on how to improve the transformation as such.

The text of this thesis is structured into two main parts. Part one is the theoretical introduction to the topic, containing five chapters which offer the reader a wide range of topics which are then studied in the practical part. The chapters include basic ideas about change management, project management, agile approach to project management, strategic management and theoretical background for qualitative research. The chapter on agile approach particularly concentrates on Large-Scale Scrum (LeSS) framework.

Part two focuses on qualitative research carried out by the author of this thesis in order to study and assess the agile transformation within one department inside of a large software company. The results from the qualitative research are based upon the three main activities: (1) thematic analysis of semi-structured interviews with participants from the studied department, (2) analysis of observations of multiple activities of the researched department, and (3) analysis of artefacts, such as communication channels which the department used during the transformation. The synthesis of results can be found at the end of part two, in chapters Strategy Proposal, Findings, and Discussion and Limitations that summarize the benefits the master's thesis

brings to the academics and to companies.

The thesis provides the reader with a broader understanding of scaling agile on practical examples from the studied organization. On one hand these examples are compared with the theory to validate the correctness of the concepts. Au contraire, the reader is provided with innovative ways of developing agility within a scaled company context.

Part I

Theoretical Part

Change Management

“Once individuals have the motivation to do something different, the whole world can begin to change.”

– Cameron and Green [1]

Change management is a term that describes ways to prepare, support and help individuals, teams and whole organizations in making change. This chapter covers several approaches to the virtue of change management. Change starts with individuals. In the organizational context, it is a complex apparatus and has to be taken care of thoroughly.

To realize a change, it is important to differentiate between leadership and management. While the former is key to transformational change, the latter brings only little success to really convert and flip the company’s DNA. The keywords connected to leadership are “motivation” and “inspiration” [2]. Leaders provide their followers with a vision of how the future may look like. Management, on the other hand, entails a lot of planning, resource allocating and is dependent on having precise steps which should be fulfilled. Management controls the people, whereas leadership inspires these people to be innovative and willing to be part of the change. Leadership does not provide specific steps which should be followed. Leadership enhances continuous, brisk learning. The pitfall of change management is using managers to execute the change instead of leaders [2].

In 1995, Kotter [3] first published the eight-step model of successful transformation in organizations. The model is still valid and useful when executing change. The eight steps of transformation are as follows:

1. establishing anticipation for urgency,
2. forming a guiding coalition,
3. creating a vision and a strategy,
4. communicating the vision,

1. CHANGE MANAGEMENT

5. empowering others to act on the vision,
6. rewarding of short-term wins,
7. consolidating improvements to generate more change,
8. institutionalizing new approaches.

Kotter [2] further exemplifies the eight-step process using multiple case studies, a summary of which is provided below.

Establishing anticipation for urgency

Change endeavor's success rate increases when people "*have skin in the game*". This encourages people to put effort into the transformation and helps fight complacency in organizations. To raise urgency, a large enough crisis should be created and more discussion, information and transparency should be put into place [2].

Forming a guiding coalition

Change efforts are not lonesome attempts. Having a supporting coalition is necessary. The attributes of a strong guiding coalition lies in the power of each individual in relation to their position, their expertise, credibility and ability to lead [2].

Creating a vision and a strategy

A future state which an organization wants to achieve is represented by its vision. Vision sets a direction towards the anticipated future. Good visions are feasible, desirable, focused, flexible and explainable. Vision creation is a process of collaboration among multiple people [2].

Communicating the vision

Communicating the vision is a key task in a successful transformation and should take a large enough proportion of the company's overall communication towards its employees [3]. Messages should be simple and repeated across multiple channels [2].

Empowering others to act on the vision

Empowerment lies in eliminating barriers. The barriers can have many forms. Sometimes they are in a form of silos, fragmented resources, insufficient knowledge, dysfunctional habits or discouragement from the management [2].

Rewarding of short-term wins

Momentum is a key driver in a change effort. One of the ways to build momentum is through generating short-term wins as a reward for change agents

and people who are part of the change [2].

Consolidating improvements to generate more change

Important in a change effort is removing the interdependencies of multiple departments within an organization. Furthermore, management and executives should maintain a level of clarity in the change effort [2].

Institutionalizing new approaches

A change effort always brings with it a change of company culture, which should then be institutionalized to validate the new practices [2].

Cameron and Green [1] argue that a transformational effort is a continuous cycle rather than a linear process, as Kotter explains it. However, Cameron and Green's cycle of change has parallels to Kotter's eight-step model and its steps are namely as follows:

- establishing a necessity for change,
- building the team that will carry out the change,
- developing a vision and its values,
- communicating and getting others interest,
- empowering others,
- acknowledging improvements and energizing,
- consolidating, and then the loop again continues with the first point and repeats.

Lewin's change model has three steps. The model starts with unfreezing the state of equilibrium to generate momentum for change. Lewin suggests that during this step, the emerging resisting forces should be surfaced. The future desired state should be polished. Then the next step continues, whose core lies in moving towards a new state with the help of involved participants. Lewin suggests using an iterative approach. The third step aims to refreeze and make the new state permanent. This includes stabilizing new policies or processes [1].

Out of the several distinct roles in change management perhaps the most important one is that of a change agent. Change agency can be classified in many ways, what all of the classifications have in common is that a change agent should (1) be someone capable of grasping the full picture of the system in the change effort, (2) have expertise in the field and (3) be ready to take part and actively help and facilitate with all nuances the transformation effort brings [4, 5, 6].

There are several vital attributes of change. One of the key ones is the ability to learn. Learning should be encouraged organization-wide. Central to learning are feedback mechanisms, which lead to empowerment of individuals, teams as well as whole organizations. Another vital attribute change always brings is cultural shift. To shift the culture, one must obtain a specific mindset [1]. Being aware of one's culture, be it on the individual or organization level is crucial due to the fact that decision-making is culturally determined [7].

Cultivating culture is substantial as it has a direct impact on a company's performance. Culture should be coherent with the firm's business strategy. It is a predisposition for successful strategic planning to build a firm's competitive advantage. Reinforcement of prevailing patterns carries with it the hows and whys which the organization should aim to answer. Community of committed leaders is a necessity for cultural change. These leaders should be role models for the whole organization. Companies should remember that change efforts require significant resources and energy and take place in real time, real place, face to face and not through an array of abstract memos [1].

Changing the status quo however does not affect only organizations as such but also individuals who are part of those organizations. Individuals undergoing a change effort are influenced by their internal psychological processes. There are several models which describe this phenomenon [1]. The Kubler-Ross model originates in studying the terminally ill patients, however it shows to be applicable even to different use cases when people undergo change, such as in organizational contexts. It has five stages: denial, anger, bargaining, depression, acceptance [1]. Adams, Hayes and Hopson's model consists of similar stages: shock, denial, anger, bargaining, depression, acceptance, experimentation, knowledge gaining, integration [1]. The Virginia Satir model is comparable to the first two, and it starts with the old equilibrium, continues with an interruption of a foreign element, chaos, transformational idea, after which the new ways of working starts to be embedded into the organization and the new status quo is born [1]. All three models blended into one with their shared aspects can be seen in Figure 1.1.

1.1 Teams as an Essence of Organizations

This chapter discusses the essence of successful teams. Furthermore, it tackles on the point of virtual teams and online collaboration. Teams are the essence of organizations. Belbin came to a conclusion that when teams are created according to the preferences of each individual, they become more coherent [1].

1.1.1 Tuckman's Stages of Group Development

Formation and transformation of teams is a thorough task and one should keep in mind Tuckman's stages of group development when conducting a change ef-

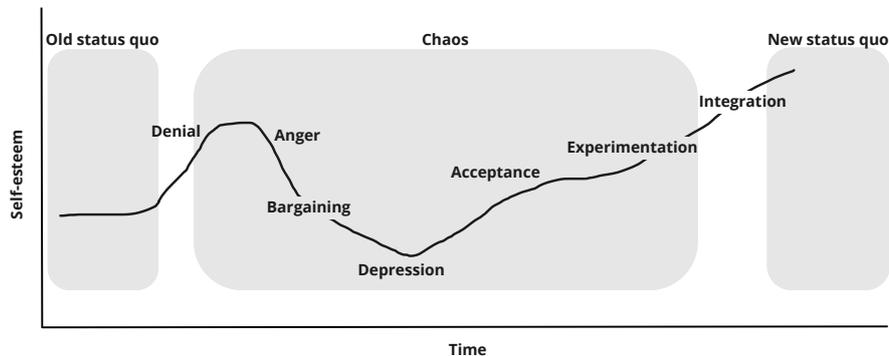


Figure 1.1: Summary of psychodynamic models of change - adapted according to Cameron and Green [1] by the author

fort which intervenes with the team structure. Team maturity can be mapped on the Tuckman's model. Tuckman [8] introduces five stages which the team evolves through:

1. At a **forming** stage, the team gets together. Team members are unfamiliar with each other and are dependent on a leader. During this stage, the team discovers the task and how much cooperation is necessary [8].
2. The **storming** phase is the phase of conflicts. Conflicts inside of the team become prevalent. Team members tend to express themselves emotionally. The leader should coach and help resolve disputes [8].
3. At a **norming** stage, consensus and mutual respect is achieved. The group cohesion is developed. The leader facilitates the group [8].
4. When the team is in **performing** stage, the effectiveness of the group is at its peak. The team members have a positive attitude towards each other. The leader of the team delegates [8].
5. **Adjourning** phase usually happens at the end of a project. The team breaks up and the team objective is fulfilled [8].

1.1.2 The Rocket Model

The Rocket Model framework [9] is a team diagnostic tool which is used to increase the performance of a team. Figure 1.2 displays the stages of the Rocket Model.

The model consists of eight elements. Each element uncovers the different perspectives with which one can look at teams. The elements are as follows [10]:

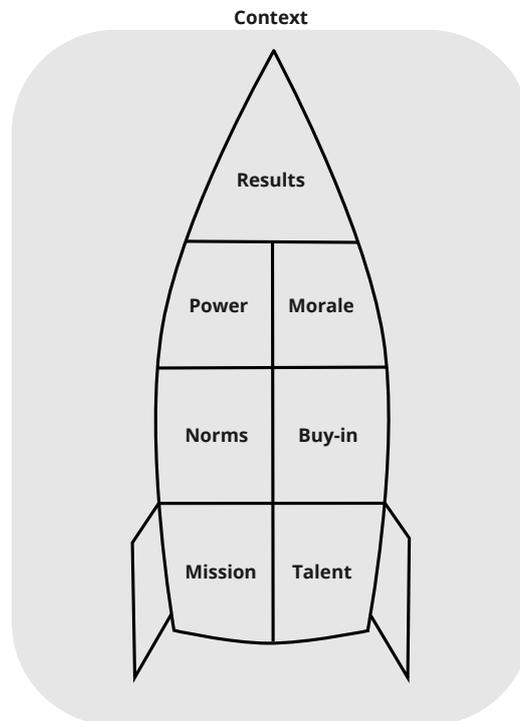


Figure 1.2: The Rocket Model - adapted according to Curphy and Hogan [10] by the author

1. **Context:** alignment of perspective and assumptions are the key aspects to be discussed within the context element of the Rocket Model.
2. **Mission:** is the most essential of all the eight elements. Again team alignment is necessary in terms of common purpose to proceed declaring the next components of the Rocket Model [10].
3. **Talent:** team members should be selected wisely with the right skillset as well as morale. Otherwise they would drain the team's energy which will become an obstacle in the team's future progress [10].
4. **Norms:** are a set of rules which the team members have not explicitly agreed on, however which become visible over time.
5. **Buy-in:** describes the intrinsic motivations of people to commit to the team goal. Buy-in can be cultivated via involvement of people in the decision-making [10].
6. **Power:** power element has physical as well as abstract connotations. Physical connotations include equipment necessary to carry out the

team's daily work, whereas abstract connotations hold authoritative power [10].

7. **Morale:** this step is connected to productive conflict, which is an important lever on how to avoid groupthink. Conflict however is not the ultimate goal and should be kept in balance with agreement [10].
8. **Results:** the last component builds on all of the previous elements. Team performance is being evaluated [9].

1.1.3 Virtual Teams and Online Collaboration

Virtual teams are teams whose communication and collaboration is enabled through the use of technology. Interactions in a virtual team can be synchronous and asynchronous [11]. While in the past years, virtual teams in software development were becoming very common [12], the work from home due to the pandemic situation catalyzed the need for the pure virtual setting [13]. In a purely online setting, effective knowledge share and transfer are topics which should be tackled carefully. Information share and transfer is connected to prioritization and categorization of knowledge [12].

Study by Morrison-Smith and Ruiz [11] unveils several hindrances of dispersed teams, such as awareness of others and motivation, establishing trust or informal face-to-face interactions.

Interactions shift to be conducted remotely and in hand with that come the tools which facilitate online cooperation. Emerging are the online whiteboards, such as visual collaboration platform Miro [14]. Online tools are more dynamic compared to the offline collaboration. Beneficial are low barriers of entry and no limitations in terms of physical space or time. In such a dynamic environment, the online canvas stays visible even after the workshop and participants can come back any time to the outputs that were previously produced [13].

Mancl and Fraser [15] support the premise of online collaboration through whiteboard tools. They point out what the essence of agile is - to experiment with tools and approaches, iterate and leverage what serves the teams well. Mancl and Fraser [13] and Morrison-Smith and Ruiz [11] further mention that however advanced the remote technology is, it still lacks the non-verbal cues which are part of the offline communication.

Comella-Dorda et al. [16] offer a tip for remote working. Agile teams should start with the outcome rather than the processes. Teams should recalibrate their Scrum events to yield the appropriate results. One of the examples they provide underlines the role of a moderator in online video calls. The video conferencing tools, such as Zoom [17], offer the breakout rooms feature, which allows the audience to split into smaller groups. The moderator is especially crucial to e.g. navigate latecomers to the right room or to host the discussion

1. CHANGE MANAGEMENT

once the breakout rooms close and the whole group comes back to the main room.

Comella-Dorda et al. [16] recommend having one source of information, having the backlog clean, and using asynchronous communication. However, they suggest that careful use of asynchronous communication is essential. Furthermore, Comella-Dorda et al. [16] mention that for efficient and effective use of online tools, such as whiteboards, familiarity with the tools is key and should be ensured to all participating team members.

Project Management

A project is a key element of project management and manifests an effort commenced to create a unique outcome, which can be a product or a service [18]. Project management may be described as a procedure of applying knowledge and techniques to achieve certain goals. Project's result must meet project requirements in a specified time. With help of project management, groups and individuals can find solutions to problems and issues, meet business objectives and answer stakeholder demands [18]. The list of aforementioned uses is not exhaustive but it shows the many ways in which project management can be of help.

When organizations use project management processes and tools, they have a solid foundation to achieve their goals and objectives. Projects drive change within organizations. Project management must take into account multiple variables, such as scope, cost and time, which are essential for project completion.

An elementary framework for managing projects is called project life cycle. Project Management Institute [18] introduces a project life cycle as consisting of phases that a project succeeds through from start to finalization. One or more phases contain development of an outcome and are part of a development life cycle. Development life cycles can follow multiple models [18], such as:

- **predictive** model which has scope, time and expenses determined at the beginning of the project,
- **iterative** model that has scope determined at the beginning, however the other two variables are refined frequently throughout the project,
- **incremental** model which undergoes a set of iterations,
- **adaptive** model which is agile, iterative or incremental; scope is elaborated before the start of each iteration,

- a **hybrid** development life cycle model that brings together predictive and adaptive models.

Project management comes with an array of approaches. Two of the most common ones are waterfall project management and agile project management. Waterfall project management is a sequential, linear method of project management. Several phases add up the whole process. Prior phase has to be completed for the following phase to begin. Each phase's completion is terminal and if one wants to go back to another phase, they have to start over at the initial phase. Stakeholder and customer requirements should be known prior to moving onto the next phase [19]. This master's thesis focuses on the agile approach, which is further explained in the following chapters.

Agile Approach to Project Management

The word “*agile*” signifies the ability to move quickly and easily - to be nimble. Agile is an approach with an adaptive life cycle to project management [18]. The movement originated in 2001 in software development and helps teams deliver value to their customers faster. The basic values of agile approach are stated in the Manifesto for Agile Software Development [20] and advocates focus on individuals and iterations before focusing on the process management. Furthermore it focuses on working software, early delivery, customer collaboration and responding to change more briskly. The 12 principles of the Manifesto for Agile Software Development [20] that expand on the aforementioned values are the following:

1. Continual delivery of value to a customer.
2. The change as a key driver for advantage over competition. Change should be welcomed even in the later stages of development.
3. Continuous delivery of work in a scope of weeks to a couple of months.
4. Day-to-day cooperation among developers and business people.
5. Trust and a supportive environment unlock motivation in individuals.
6. Face-to-face communication is the most effective way of transferring information.
7. Fundamental measure of progress is working software.
8. Agility reinforces sustainable work pace for all stakeholders.
9. Attention to technical and design quality.
10. Simplicity is pivotal.

3. AGILE APPROACH TO PROJECT MANAGEMENT

11. Self-organizing teams are the core principle.
12. The team reflects on their actions regularly and adjusts them accordingly.

Agile approach was founded in software development, but it can be used for any kind of project. Agile breaks down projects into small chunks, known as iterations. At the end of each iteration, the result created should be ready to gain feedback from users.

Many companies nowadays see agility as critical to their firm's success. To reach agility in business, companies have to be full-stack agile across all layers of the traditional organizational stack, which includes culture, strategy, tactics and operations. The intended outcome of agile management is to be able to renew itself as a company, adapt, change quickly and succeed in a rapidly changing, turbulent environment [21].

The driver for success is innovation. Agile approach promotes innovation in bottom-up direction. Denning [22] mentions that when experiments are encouraged at the team level, the teams themselves come up with new ways of bringing value to the customer. Denning suggests that the bureaucracy, which is present in the organizations of today, should be reworked and removed to enable organizational agility and innovation from bottom-up.

Agile however is more than just an approach. Agile can reinvent one's way of thinking and some agile practitioners closely connect agile to the word mindset. Moreover, what is mentioned is the phrase "growth mindset". Rather than emphasizing the process details, agile focuses on one's attitude towards change or other people. In other words, this kind of mindset can be called a "growth mindset". Miler and Gaida [23] identified multiple elements of the "growth mindset" present in agile, such as looking for a solution of an issue rather than finding the guilty, openness to others and change, mutual trust, asking questions in case of lack of knowledge, focus on a common goal, direct communication and continuous learning and improvement. Denning [24] supports this idea with a key theme of an agile mindset, which is continuous innovation. Denning further describes that becoming an agile organization brings a shift in mindset, which is essential for a successful agile adoption.

Literature confirms that agile organizations have a big advantage over the firms that have a lot of bureaucracies in place. Denning [22] illustrates an example from Spotify's successful experiments. Spotify's inter-team transparency, attention to user experience (UX) and enablement of experiments helped the organization thrive using agile. Denning further mentions the three key elements which are at the core of agile. The three elements are: (1) small teams, (2) customer focus and the (3) network element.

The small teams element has multiple attributes and good practices. Rule of thumb in terms of size of an agile team is seven plus minus two members. The small teams are fully autonomous and they themselves decide what they

will do and how they will do it; therefore innovation comes from them and is not served to them top-down. Their work is done in small chunks, which provides space to produce shippable products within small periods of time. The teams are cross-functional and they limit their work in progress, so that queues can be eliminated. The teams have a common definition of what done means to its members. For example, in software development this means that the code is finished, tested with the unit and integration tests and the customer has accepted it [22]. Furthermore, teams collect customer feedback. In addition to that, the team does lessons learned, the so-called retrospective of what went well and what could be improved related to the elapsed iteration. Retrospective is further explained in the following chapter.

Aristotle project [25], a study conducted at Google determined central dynamics of team's effectiveness: (1) psychological safety, (2) dependability, (3) clarity and structure, (4) meaningful work and (5) the work impact. All these aspects are closely connected to the agile approach. In agile, teams should believe in the process. They should enjoy their work. This can be enabled by establishing creative environments without bureaucracies in place, where at the core is team and the innovation emerges from such a team [22].

Customer focus is another central theme in agile. Pleasing the customer should be the mantra of every individual in companies. Satisfied customers help companies make money. Companies sometimes use a Product Owner, whose role will be explained in the following chapter, as a proxy for customers. Having only such a proxy in companies is not sufficient. The customer should be present, researched and the ideas should be validated with the firm's clientele. The actions at all levels of firms should be aligned to bring value to its clients. The communication and actions should go both from top-down and bottom-up and the C-level management should pave the way for the organization [22].

The network element is connected to turning whole organizations into agile, nimble firms. These companies were previously assumed to be only monolithic machines. Turning them into agile organizations is a significant shift. The organization network should be interactive. Denning [22] uses a metaphor that organizations are organic living beings, where change, experiments and innovation can come from any level of their structure.

3.1 Scrum

Complex challenges can be solved through an agile framework called Scrum. Fundamental benefit of Scrum lies in the delivered value to the challenge an individual or an organization is solving. Scrum is an iterative framework. The iterations are named Sprints and their purpose is to deliver some value to the customer.

3. AGILE APPROACH TO PROJECT MANAGEMENT

Scrum is a team-oriented approach of typically maximum of ten people and requires several roles to be carried out [26]:

- a role of a Scrum Master (SM),
- a role of a Product Owner (PO), and
- a role of a Development Team.

Scrum Master is an agile advocate and a person who is accountable for the overall Scrum process. Scrum Guide [26] defines the Scrum Master's role as of the person who serves the Scrum Team, the Product Owner and the organization. Scrum Master coaches the Scrum Team to be self-managed. The difference between the Development Team and the Scrum Team is the following. Scrum Team is a team of a Scrum Master, Product Owner and developers. Developers alone, on the other hand, form the Development Team.

SM helps the team members to achieve cross-functionality, bring value to the customer and ensure the Scrum events are held according to the Scrum Guide [26]. Scrum Master helps the Product Owner facilitate collaboration and find techniques for effective **Product Goal** definition and planning. Scrum Master's role in the organization is to lead, coach and implement Scrum.

The role of a Scrum Master is sometimes not fully recognized, and is being assigned to another team member or a project manager. This fact can endanger the overall team's performance. Understanding of how the Scrum Master role is based on servant leadership is central to successful adoption of Scrum [27].

Product Owner attends to the value which is generated through the work of the Scrum Team and communicates the Product Goal and the Product Backlog to the team and to stakeholders involved. A role similar to that of PO outside of Scrum is the Product Manager (PM) role. The difference is that PM is usually not part of the Development Teams [28].

Developers, as was mentioned, are part of the self-managed Development Team and they commit to produce the value for the customer, otherwise called usable increments during a Sprint. They create the Sprint Backlog for each Sprint and ensure increments answer the Definition of Done.

Important aspect of the Scrum Team is to be self-organized and cross-functional. Self-organized, because the Scrum Team does not require the role of a manager as such. Cross-functionality is supported by the coverage of all necessary competences for a successful delivery of a product. Competences include a whole range of skills, such as frontend and backend development or end-to-end testing.

Product Goal is a desired aim to which the product progresses. **Increment** is a step towards the Product Goal; in software development this is usually a piece of working code. Definition of Done presents the quality requirements for the product. These are the requirements on which the Scrum Team agrees.

The backlog, where work to be done is stored, is called a **Product Backlog**. Product Backlog has to be ongoingly refined to break down features that have to be shipped into smaller items. Product Backlog items are created in a form of user stories, where user groups use the following phrasing [29]:

“As an XX, I want to YY, so that I can ZZ.”

The essence of Scrum is a **Sprint**. Sprints are commonly up to a month long. Each Sprint has its **Sprint Goal**, that creates focus on one activity instilling teamwork within Scrum Team members. Each Sprint has its Sprint Backlog, which consists of selected Product Backlog items for the respective Sprint. Each Sprint, Development Team focuses exclusively on the items in the Sprint Backlog in terms of what shall be delivered during the Sprint.

Sprint consists of a set of Scrum events. Scrum events ensure open discussion during the whole Sprint. Prior to every future Sprint, there is a meeting called **Sprint Planning**, during which a group of features are selected from the top of the Product Backlog. Features in the Product Backlog are ordered according to their rank, and that is the reason why during Sprint Planning items from top of the Product Backlog are selected.

According to the Scrum Guide [26], developers of the Scrum Team participate every day in a short **Daily Scrum** event. Each member of the team discusses and highlights their progress from the previous day and what they are going to do today towards the Sprint Goal. Developers furthermore mention whether there is any blocking activity stopping progress.

Sprint Review meeting is intended for a demo of something of value which was produced during the last Sprint. The key stakeholders are invited to this meeting. Feedback follows on what can be improved. Sprint Review is an active working session rather than just a presentation [26, 30]. For instance, Sprint Review in case of a frontend development team working on a website would most likely consist of demonstrations of graphical parts of that website.

Last but not least, there is the **Sprint Retrospective** event. During Sprint Retrospective, the team discusses what went well and what went wrong process-wise as well as regarding individuals and interactions among them. Potential levers to improve effectiveness are raised and they can even be added to the next Sprint as action items [26].

Scrum can be of enormous help when used correctly. It provides transparency and reveals dysfunctions quickly within the problem space a team is solving. It also provides room for quick experiments. However, it should be implemented thoroughly to provide its benefits in maximum length [26].

3.2 Kanban

“Kanban” as a word originated in Japanese and it literally translates as “sign board”. The basis of kanban lies in making otherwise invisible work visible. Kanban is a flow system. It uses visual signals called kanbans to display the

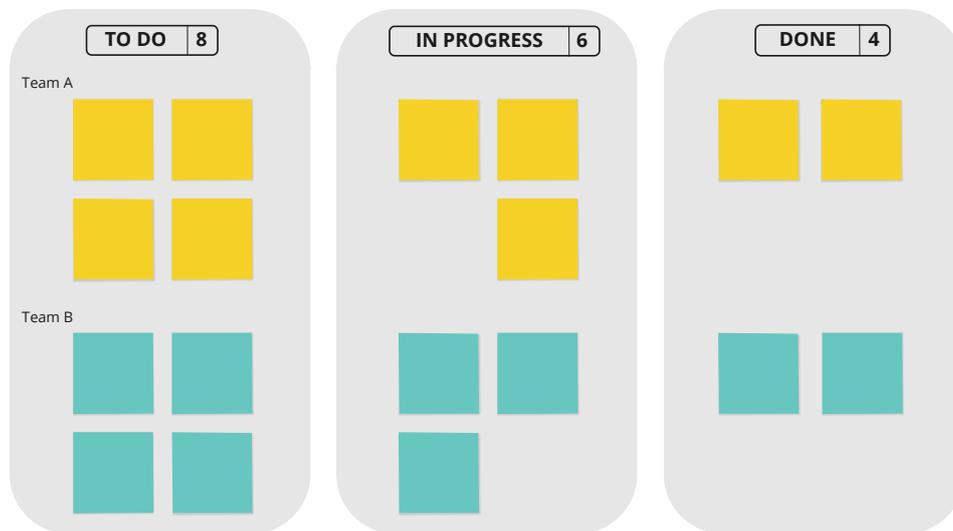


Figure 3.1: Kanban board - author's own work

amount of work in progress. A kanban represents a single unit of work in progress. Kanbans are visualized on a kanban board. Work is moved into the next state only when there is available capacity in this particular state [30]. An example of a kanban board is displayed in the Figure 3.1.

What authors Anderson and Carmichael [31] call the Kanban Method is established on values. Central to the Kanban Method is respect to all of the contributors that collaborate on a project together. The respect element is built on transparency, balance, collaboration, customer-centricity and leadership. Moreover, respect can be expanded as self-knowledge and agreement as well as understanding of flow as a stream of value.

Following kanban requires keeping in mind key activities which, paraphrased, are as follows [31]:

- Make visualizations.
- Restrict unfinished work (work in progress).
- Manage stream of work.
- Put into action repeated feedback.
- Prepare specific guidelines.
- Experiment and make synergetic improvements.

Kanban in connection with change management carries some principles, which are important to keep in mind when establishing a change within an

existing organizational setup. The principles of change start with “what you do now” [31]. It means to grasp the processes which are currently practiced and respect the status quo in terms of roles and responsibilities. The principles then highlight the agreement to pursue the change. Change or improvement themselves should be carried out in an evolutionary way. What comes together with respect in kanban is encouragement of leadership at any level.

3.3 Scaling Agile

Scaling agile became prevalent in software development companies in the recent years. Introducing agile in large organizations is complicated due to complexity of projects within such organizations. Large projects require a proper way of communication and coordination. Dependencies among several teams have to be managed.

Multiple frameworks were developed to expand agile to the large-scale environment. According to the 14th Annual State of Agile Report [32], The Scaled Agile Framework (SAFe) dominates the scaling methods and approaches of agile. The next most popular scaling method is Scrum of Scrums, followed by Disciplined Agile Delivery, Large-Scale Scrum (LeSS), Enterprise Scrum and Lean Management. Conboy and Carroll [33] add to the list Spotify Scrum, Nexus Scrum and Scrum at Scale.

Scaling agile is associated with many challenges. The summary of extracted challenges organizations face when scaling agile [32, 33] contains the following:

- resistance to making change,
- insufficient presence of leadership,
- identification of appropriate balance between bottom-up versus top-down approach,
- inconsistencies in processes across multiple teams,
- absence of experience with agile,
- inadequate preparedness for change,
- cultivation of autonomy of developers, and
- sustaining equilibrium between company-specific structures and selected agile scaling frameworks.

In the following subchapters scaling agile will be introduced within the LeSS and SAFe frameworks.

3.4 LeSS Agile

Large-Scale Scrum is a framework of scaling agile and Scrum to large product development groups. Large-Scale Scrum is built on the pillars of lean thinking. In LeSS, ongoing change is the status quo. LeSS is a framework used for scaling Scrum to multiple teams who work closely together. LeSS provides an option to choose two different Large-Scale Scrum schemes based on the team size [34]:

1. (basic) LeSS: which is a regular LeSS scaled up to eight teams,
2. LeSS Huge: is an extension of regular LeSS, where up to a few thousand people are working on a single product.

The full picture of Large-Scale Scrum begins with principles, follows with frameworks, guides and last but not least experiments [34]. All of these aspects are tackled in the following paragraphs. Critical to gaining the full understanding of LeSS is to know its principles well. Each paragraph in the subchapter below defines one of the principles of Large-Scale Scrum.

3.4.1 LeSS Principles

Large-Scale Scrum is Scrum

The corner-stone of LeSS principles is Scrum. Large-Scale Scrum is at its base, Scrum, as was introduced in Chapter 3.1. At its core is the Scrum Team. Through iterations the team is uncovering challenges within an organization and then aims to change the current state of affairs [35].

Empirical process supervision

Empiricism can be described as a philosophy that bases everything on an experience [36]. Empiricism applied to Scrum provides the teams just enough freedom to adapt and bend processes to their particular needs, to learn from previous iterations and clearly and easily inspect what is being done and how.

Transparency

In hand with empiricism comes transparency. Transparency means visibility in the range of the short loops established in Scrum which aim to inspect and readjust what is being done. The visibility reveals vulnerabilities within the system. Transparency is connected to the Definition of Done. Definition of Done aids to see and find where the weak spots are. The working group can thus easily identify things which were not finished [37] and which are yet undone.

More with LeSS

More with LeSS means as minimal a process as possible. Specifically it means less waste, less artifacts and not so tight processes. LeSS focuses on perpetual improvement aiming to iterate towards perfection. It is as well focused on customers. It promotes systems thinking, lean thinking and queuing theory [38].

Customer focus

Customer focus is a challenging part of developing products in organizations. With small-scale Scrum, customer centricity is simple and obvious, however when multiple teams work together in a Large-Scale Scrum network, focus on a customer may become blurry. To overcome these obstacles, Large-Scale Scrum uses teams that produce end-to-end features for customers [39]. The teams are called feature teams and they are explained in more detail in the further subchapter.

Focus on the product as a whole

The principle of attention on the product as a whole is based on a premise that every part of software should be integrated into the single, whole product to be considered useful for the end user [40].

Perpetual improvement

Perpetual improvement comes from lean thinking and has origins in Toyota. Several practices have to be maintained in order to achieve the flow which is so crucial for perpetual improvement. First of the practices is the idea of **Go See**. Go See implies for the management to be as close to the real workers as possible. In software development, Go See means to be close to the developers and it should be practiced in the physical space where Development Teams reside [41].

The second practice is based on kaizen, which is a Japanese word for perpetual, or continuous improvement [41]. Kaizen highlights the organization to patiently focus on experiments, and to establish the small, incremental change in all fronts of the business. That is the reason why kaizen can be understood as both a mindset, way of thinking, and a practice. In kaizen, people learn the art of seeing and distinguishing value from waste and to abandon waste in any form, such as delays, duplication of code or defects in software.

Queueing Theory

Queueing theory is based on a stochastic model that takes into consideration randomness and variability of probabilities with which events occur in the system. In a stochastic system, requirements arrive at different times and are of variable size. There is a general hypothesis which states that with higher utilization of resources (e.g. personnel participating in a product development) the delivery time becomes linearly higher [41]. Queueing theory

proves the hypothesis wrong and shows the nonlinear relationship between the increase of utilization and cycle time. The throughput of the system with variability decreases largely.

A system with stochastic probabilities has a negative impact on the overall delay. The size of the queue has an effect on the overall cycle time. Larman and Vodde [41] provide an example that when an individual or a team are ten times slower in finishing a requirement, the overall cycle time increases on average by twenty-five times as a consequence.

Connecting queueing theory to Scrum provides a thoughtful insight. Product Backlog in Scrum can be understood as a queue of queues. It consists of two distinct types of queues: (1) the batch of Product Backlog items, which have enough granularity to be delivered in one Sprint and then (2) the batch, which requires further analysis until it becomes the part of the (1) subgroup. However, it is recommended to keep the volume of clearly-tuned features at a certain threshold and not to decompose tasks infinitely [41].

Queueing theory thus offers multiple recommendations for Scrum that help reduce variability. The variability is one of the wastes in lean thinking [41], which is the LeSS principle yet to be introduced in the next paragraphs. The recommendations to cut down variability are the following. Keep the clearly-tuned subgroup of requirements small. Reserve five percent of time during Sprint for re-estimation and splitting of requirements. Stabilize the feature teams. Set well time-boxed and effort-boxed learning objectives [42].

The topic of queueing theory is closely related with the theory of constraints. An example of constraints are queues and bottlenecks. The chief idea in the theory of constraints is to identify the constraint, exploit and reduce the constraint, find a new constraint and repeat over again, infinitely [43].

Lean Thinking

Lean thinking is a concept closely connected with agile and scaling. Lean thinking aims at reducing everything that does not add value to the system and is considered waste. Lean thinking originated again in Toyota. The Japanese company developed a lean system known as the Toyota Way. The modern Toyota Way can be summarized into a “*lean thinking house*” [41], as displayed in Figure 3.2, which contains all of the aspects necessary for a successful lean system.

The roof of the “*lean thinking house*” represents the lean goal. The goal of lean is to deliver chunks of something valuable. This can be achieved through paying attention to development and production and continually learning and progressing up front.

At the base of the “*lean thinking house*” is a lean foundation. The key, foundational aspect in lean is the persona of manager-teachers. Such managers create a culture of promoting the lean thinking principles across all organizational levels. The manager-teacher aspect is interconnected with the ideas

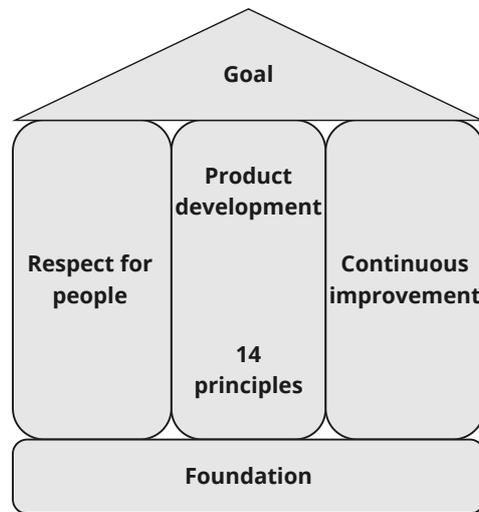


Figure 3.2: Lean thinking house - adapted from Larman and Vodde [41] by the author of this thesis

of Go See and kaizen [41]. These two ideas were already explained in the paragraphs before.

Lean thinking is then built on two pillars: respect for people and endless improvement. Respect for people means teamwork, integrity and development of people. It is thus supporting the agile principle of self-organizing teams. Endless improvement is again tied together with the ideas of Go See and kaizen. Continuous, or endless improvement regularly aims to question the existing conditions in order to achieve the anticipated ideal, perfect state. Therefore endless improvement comes hand in hand with a notion of a flow system [41].

At the core of lean thinking product development and lean principles are situated. Product development's focal point is learning and being better than competition. Crucial for continuous learning are several aspects [41]. One of them is cadence and time-boxing, which helps prevent scope creep and boosts focus. Larman and Vodde furthermore acknowledge visual management done usually in a way of a team room, where walls are displays of all information of a cross-functional team [41].

The other part of lean thinking's core are the 14 lean principles, which support the already mentioned aspects of the "*lean thinking house*". The 14 lean principles can be summarized into the following pieces of advice. Organizations should find their long-term purpose and fully focus on it. This aids firms escape the local optimization. Organizations should keep in mind that lean is based on a continuous flow, which is the core of the system. Decisions do not have to be taken immediately, rather as late as possible. Problems and issues that arise should be corrected right away and in hand with that

learning ought to be the aim. Visual management is a key concept to lean. Before deployment, products should be carefully tested. Leaders should be cultivated from within and the companies should strive for excellence of its employees. Go See is a useful notion to be exercised. Cooperation with partnering parties should be bolstered [41].

Systems Thinking

One important asset of large-scale scrum is effective reasoning. Reasoning can be done through a set of tools, one of which is systems thinking. In an organizational context, systems are not static. They are dynamic. Organizational systems are not linear and there is a lot of causality of actions involved. The basis of the laws of systems thinking [44] consists of causal loops and local optimization. Systems thinking helps to identify insights where causal loops or local optimization are present and what the mental models behind them are.

3.4.2 LeSS Events

LeSS maintains numerous practices of regular one-team Scrum, such as a single Product Backlog, a single Definition of Done across all participating teams, one Product Owner, cross-functionality within teams, a single Sprint, one product increment which is likely to be shipped at the end of each Sprint. However, there are multiple differences in LeSS compared to regular Scrum and its definition in the Scrum Guide [26]. The array of differences is the following:

- Although a **Daily Scrum** is an autonomous event for each of the teams, which is analogous to the Daily Scrum from the Scrum Guide [26], a member of another team can observe the other team's Daily meeting to advance inter-team transparency.
- **Sprint Planning One** is a shared event with the PO and members from all teams. Team members select features from the Product Backlog that they will work on during the next Sprint. Sprint Planning One provides an opportunity to discuss intersections of cooperation and shared work.
- **Sprint Planning Two** is held freely by each team. Teams consider their strategies for developing selected features. Occasionally, for alignment, more teams may conduct Sprint Planning Two together. During the Sprint, teams collaborate together on continuous integration of the features [45].
- **Overall Product Backlog Refinement** happens among all teams and a Product Owner, when teams select which features they are going to implement. This event is optional.

- **Product Backlog Refinement** takes place halfway in the Sprint and is an event of multiple teams. Its purpose is the same as was described in Chapter 3.1 for regular Scrum, however presence of more than one team improves transparency and coordination.
- **Sprint Review** is again a shared event for the teams, where there are additionally the customers. Customers are represented by a PO. Attending stakeholders discuss the features that were shipped and discuss the increment that can be shipped next.
- **Overall Retrospective** is a meeting specific for LeSS. Its purpose is to explore how to revamp the systemic obstacles and focus inclusively on all teams and the way they deliver the value. Present are the Product Owner, Scrum Masters, management and rotating delegates from each team.

3.4.3 Feature Teams

Large-Scale Scrum supports overall coordination via talking, code, open space and communities. At the heart of Large-Scale Scrum are the feature teams. The following paragraphs expand on the topic of the feature teams.

A feature team is an autonomous, cross-functional, customer-centric team. Autonomous, because there are no managers or coordinators that would make decisions on behalf of the team. Cross-functional, because the team designs software, codes, tests and deploys all features by itself. Multiple different roles including UX (user experience) designers are required to be part of the team. Customer-centric, because the team's focal point is around end-to-end customer functionality and maximal customer value.

Each member of a feature team can specialize in multiple areas, i.e. a tester can be an analyst and vice versa. Scrum Teams are feature teams. Feature teams should operate across multiple components. By definition [34, 41] feature teams are co-located. Feature teams have seven plus minus two members, which is a typical characteristic of agile teams in general, as was mentioned in the chapter introducing agile project management. The aforementioned end-to-end functionality is determined by a process that aims to deliver features or solutions from the beginning to the very end to the customers.

Larman and Vodde [34] provide several tips for organizations with multi-site teams. The organizations should aim at decreasing the amount of time-zone differences and for co-locating whole teams. Co-location grows more trust among team members.

Feature teams setup may cause dependencies in between teams. For example, multiple feature teams are working on features that together create a component. This setup results in shared code. Shared-code ownership is thus one of the key aspects of Large-Scale Scrum in software companies. On the contrary, teams organized around components, so-called component teams,

have either individual or team code ownership [46]. As a consequence, hand-off is oftentimes present in organizational structure with component teams [47, p. 554]. Component teams are the characteristic which LeSS avoids.

As was mentioned, the essence of Large-Scale Scrum lies in the feature teams. LeSS promotes coordination among the teams themselves rather than having assigned coordinators in the system. Moreover, teams must take ownership of their actions, decisions and events. Large-Scale Scrum removes complexity, which goes back to the principle of “more with LeSS” [45].

Travelers

LeSS allows the product group to have a specific role of a traveler in place. This is usually a person with deep expertise in some field. A traveler stays with one of the feature teams during the Sprint and works exclusively with that one team. Anyone can do the role of a traveler, however the dominant characteristic of feature teams, i.e. longevity, should not be violated with too many travelers in place [34, p. 212].

3.4.4 Converting Teams to Feature Teams

Transforming an organization into LeSS is a thorough task and team creation is one of the underlying questions in such a transformation. Larman and Vodde [41] recommend letting teams form themselves. One of their recommendations is to have some rules in place when teams are in the process of self-creation. One example of such rules is letting teams be organized according to their skill sets [41] or preparing a template with pre-picked parameters the teams must adhere to [34, p. 53].

With LeSS or LeSS Huge transitions a question of how to convert the teams into functioning feature teams emerges. There are three conversion strategies for component teams to transition into feature teams [34, p. 83]:

- All-at-once strategy. The risk when using this strategy lies in underestimation of how much learning and coaching will be needed for teams to transform fully into LeSS.
- Slow extension of responsibilities in component teams strategy is based on gradually shifting component’s team focus by adding scope or roles into their pool of responsibilities. The weak point of this strategy is that the teams still may lack the required customer-centricity.
- Parallel organization has feature teams being gradually put into place. This strategy starts with e.g. one feature team and later transforms more and more component teams into feature teams. This strategy is recommended for LeSS Huge adoptions. Companies should however bear in mind that a shift to LeSS Huge via parallel organization is slow and takes a lot of time [34, p. 85].

In the new era of majority of software companies operating solely online, without their employees being able to meet in person due to the restrictions posed by the pandemic, some LeSS practitioners advise not to postpone LeSS adoptions and self-designing workshops and do them online [48, 49].

3.4.5 Communities of Practice

Coordination of the same skill set across all teams is necessary. It may even be beneficial to share skills and knowledge across whole companies. It enhances education and learning. Furthermore, common problems in one domain can be solved with coordination of skills. LeSS has communities of practice (CoPs) in place for such a purpose. CoPs share related concerns. Communities of practice meet to resolve emerging issues, may enlarge the knowledge among people with the same skill and simply enable people to talk about their interest or passion [41].

Communities of practice support the learning environment and lateral sharing of information [47, 50]. Communities of practice can aid when a unification of some aspect multiple teams are working on is needed, such as consistency of user interface (UI) [47]. Members of a community of practice decide themselves if and which CoP they will join [51]. An example of a community of practice is a CoP for quality assurance (QA) engineers. Such a CoP brings together QA engineers from across multiple feature teams and provides them with an instrument to discuss topics related to QA. Another example is a community around Scrum Masters, Product Owners or software infrastructure.

The notion of communities of practice, however, has been around even before LeSS and is known also in the areas outside of software development. One CoP can have members with varying levels of participation [51]. CoPs are dynamic, the need for them emerges from the situation's context and they can cease to exist if they are no longer necessary.

3.4.6 Adopting Large-Scale Scrum

LeSS adoption requires patience from all the participants and stakeholders. Structures and policies usually have to be changed to enable a LeSS transformation and to unleash the full potential LeSS brings to the organizations. Large-Scale Scrum provides the organizations enough freedom to adjust the processes according to their needs. LeSS is simple, but it requires a change of thinking, attitude and mindset. This is a typical feature of all agile methodologies.

Larman and Vodde [34] suggest three recommendations when adopting LeSS:

1. start small and go deep in the product,

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2. top-down and bottom-up approaches work well together, and
3. include volunteers in the work.

In point one the focus should be on a single product group or in LeSS Huge on one requirement area until this product group or area is handled well. The notion of requirement areas is explained in the one of the following subchapters. The supporting argument for starting small and going deep is that if the adoption goes well in one product group it provides a solid ground, example and trust for further transitions [34, p. 50].

Point two discusses the opposites: top-down and bottom-up management. Both of them must be applied in tandem to achieve a successful LeSS transition. If only top-down approach is used, the LeSS adoption becomes directive, victimized and slowly degrades. In a purely bottom-up approach, the change is not sustainable. Only a combination of both approaches will bring LeSS into successful fruition. The combination of both ensures there will be the enthusiasm of the regular employees and the support from the upper level management. The combined approach requires the management to be the drivers of change who need to educate themselves about LeSS via training as well as via thorough study of other supporting materials [34, p. 51].

Point three uses volunteers as a powerful tool of empowering and engaging others. Volunteers support the concept of a guiding coalition from Kotter's eight-step model [3] for change management which was explained in Chapter 1. Larman and Vodde [34, p. 51] provide some examples of volunteering, such as initial-product volunteering, initial-teams volunteering and teams-formation volunteering. Teams-formation volunteering is a driver for self-designing teams.

3.4.7 LeSS Huge

When the number of teams scales to eight or more, LeSS Huge comes into place. Additional structure is needed in such cases. This structure is brought in by requirement areas. A requirement area is a categorization of items in the Product Backlog. Clusters of similar requirements are thus created. This categorization leads to diverse perspectives on the Product Backlog. The perspectives aid to gain the necessary focus required for each category. Each area has its own Area Product Owner (APO). There is also the overall Product Owner who clusters each item into distinct requirement areas. The overall PO and APOs together create a Product Owner Team.

Besides an APO there is a role of supporting Product Owner who takes care of one to two teams in order to aid the overall Product Owner [47, p. 557]. This role differs in responsibilities from the role of an APO. The main difference is the focus of each of the roles. An APO focuses on the product, specifically in connection with the customer and with return on investment (ROI). By definition, an APO cooperates with multiple teams. On the contrary, supporting

PO works exclusively with one or two teams only. Supporting PO's focus is on the team and they do not have ROI responsibility. Larman and Vodde [47, p. 136] suggest that although both roles may be useful in certain contexts, organizations adopting LeSS should keep an eye on excess overhead of supporting POs. The excess of supporting POs can lead to sub-optimization in terms of priorities and the product vision.

In some contexts having multiple POs in place is beneficial. Pichler [28, p. 18] suggests that a Product Owner should work with one team only in order to cover all responsibilities they have. Pichler introduces a notion of Product Owner hierarchy, where one PO carries out the chief PO role, makes sure the overall product vision is aligned, and puts together all features into one product.

On top of what was explained in the previous chapter, LeSS Huge adoptions are done in evolutionary ways. Less Huge should be adopted gradually. Larman and Vodde [34] suggest two ways to achieve a successful adoption:

1. scale LeSS incrementally, and
2. adopt LeSS with profound focus on a part of the product group.

Option one brings quicker product-wide results, whereas option two is slower yet with less issues that emerge as the teams form and start working together.

Lack of cooperation between the specific requirement areas can pose a problem in LeSS Huge. This causes silos in between requirement areas, which should be avoided. Larman and Vodde [34, p. 114] offer several recommendations which help to break these silos, such as one Scrum Master who works with teams from distinct requirement areas, holding a Sprint Retrospective or Review among at least two requirement areas, or having one selected Scrum Master who works with the PO team and provide them with continuous feedback.

What sometimes occurs during LeSS Huge adoptions is the “undone department”. This is a department which is not part of the feature teams. Typical examples include QA, business analysts or UX [34, 52].

Rules for LeSS Huge

There are several rules for LeSS Huge. As was mentioned above, LeSS Huge applies to products where eight or more teams are involved. LeSS Huge uses requirement areas. The rules for LeSS Huge can be summarized as follows [53]:

- Each feature team should focus only on one requirement area.
- The number of teams in one requirement area ranges from four to eight teams.

- There is only one APO for each area.
- The overall Product Owner and Area Product Owners should synchronize and work closely together on one integrated product.
- Area Product Backlog is derived from the overall Product Backlog to achieve sufficient granularity.

3.4.8 Case Studies on LeSS Transformations

This chapter presents the reader with a content analysis of 32 case studies of LeSS transformations carried out by the LeSS practitioners from across the world which are provided by the official LeSS website [54]. The content analysis was done by the author of this master's thesis. What all of the LeSS adoptions from the case studies emphasize is the importance of one Product Backlog and the team creation aspect. Furthermore, the underlying factor that is always present when adopting LeSS is cultural change. If this factor is not supported by corresponding preparations, the cultural change can become lengthy and painful. In case of LeSS Huge adoptions, the case companies recommend incremental change [54].

The case study from Huawei [55] underlines the significance of Product Owners seniority as an important factor. Agfa Healthcare [56] highlights that a strong team of Agile Coaches is a must. Agile Coach role is yet to be introduced in the next chapters. Alcatel Lucent [57] underpins the importance of taking time to find out how to slice the work so it retains an end-to-end aspect.

The findings from the case studies [54] identify the following patterns which were repeated across multiple of the case companies and which caused them some troubles in their adoption journey:

1. inadequate agile knowledge and misconceptions about agile or Scrum,
2. team immaturity in connection with Scrum and agile,
3. insufficient support from senior management,
4. incomplete understanding of the customer perspective of the product,
5. non-transparency and silos,
6. challenges in the teams creation process,
7. obstacles in efforts to change the company culture,
8. appearance of new impediments and waste.

As the reader can see, the list of challenges is similar to the one from the Chapter 3.3. The case studies offer several mitigation factors which tackle the above patterns. The Table 3.1 summarizes the patterns and the mitigation factors which the companies used to tackle them.

All of the alleviation factors from the Table 3.1 are interconnected. At the start of a LeSS adoption, proper training and education is essential, which is aligned with the recommended “Step 0: Educate Everyone” from LeSS Guide [34, p. 222]. The education and training aids produce volunteers, who are important in eliminating impediments and waste.

The impediments and waste can have many forms in LeSS adoptions. Case studies include middlemen (e.g. business analysts) in between teams and the customers as an example of waste [58]. The impediments can have multiple forms, such as sceptics in the product group. They can be generalized into anything that is stopping the product group from progress towards perfection.

The impediments should be avoided. One way to identify impediments is via the retrospective events. The mitigation factor for impediments is then to use volunteers. Volunteers from the teams can help resolve these impediments. Volunteers moreover support transparency and visibility and aid to break the silos which may have emerged before or during a LeSS adoption.

Supporting self-organization is important for the teams to gain maturity. Furthermore, it can ease the self-designing team workshop. It helps teams gain autonomy and again to eliminate the silos as well as waste.

Direct collaboration with the customer brings visibility into the organization-customer relationship, enables the product team to understand the user and therefore build better value for the customer.

The above chapters characterized Large-Scale Scrum. To summarize, LeSS is a powerful framework that leaves product groups enough freedom to experiment while respecting principles and some simple rules. LeSS is in its essence Scrum. The good practice of LeSS is to carry out experiments within the elementary rules and find a suitable way of working for a particular product group. The bottom line is that this simple principle-based approach enables the teams to tailor the practices for their specific context.

Table 3.1: Prevailing patterns found in LeSS adoptions and their mitigation factors

		Mitigation factor			
		Training and educating people	Utilization of volunteers	Support of self-organization	Collaboration with the customer
Prevailing patterns	Agile knowledge and misconceptions	✓			
	Team immaturity in agile	✓		✓	
	Support from senior management	✓			
	Understanding the customer perspective				✓
	Non-transparency and silos		✓	✓	✓
	Teams creation challenges			✓	
	Changing the company culture	✓	✓		
	Impediments and waste		✓	✓	✓

3.5 SAFe Agile

Scaled Agile Framework, abbreviated as SAFe is a methodology aimed to guide organizations in scaling agile and lean practices. Invented by Dean Leffingwell, SAFe is based upon ten basic principles, which are organized around the following themes [59]: economic view, systems thinking, variability and choices, incremental learning cycles, evaluation of milestones, kanban, cadence, intrinsic motivation, distributed decision making, and value delivery.

There are four set-ups for SAFe framework: (1) Essential SAFe, (2) Large Solution SAFe, (3) Portfolio SAFe, and (4) Full SAFe. SAFe's recent White Paper recommends [59] to start with SAFe Essential when doing a Scaled Agile Framework adoption.

SAFe puts as its priority to help enterprises achieve business agility. There are seven aspects [60] which enable organizations to do so:

- agile product delivery,
- agility of teams and technology,
- enterprise solution delivery,
- lean management of portfolios,
- organizational agility,
- culture of ongoing learning, and
- lean-agile leadership.

The first two competencies are “agile product delivery” and “team and technical agility”. **Agile product delivery** consists of three dimensions, which are as follows: the first dimension means to be customer-oriented with the use of design thinking. The second dimension is connected to the SAFe principle of cadence, and further expands it with releasing on demand. The third dimension describes DevOps (Development and Operations) and Continuous Delivery Pipeline as instruments to bring value to the customer [61].

The aforementioned design thinking is an iterative process which seeks to build empathy and understand the users and to design a desirable solution for them based on that empathy and understanding. Through the iterative cycle, one is able to research the user, define the problem, ideate the solution, create a prototype and test it with the user and then loop again to whichever step is necessary.

DevOps has a goal of connecting development, quality assurance (QA) and operations across the information technology (IT) domain. It aims to combine and unify the processes and tools in between operations and development. Furthermore, it supports the continuous integration and continuous delivery (CI/CD).

The agile team is at the core of **team and technical agility competency**. The team can use either Scrum, kanban or their combination to manage the team's work. The team works closely with the Product Owner. SAFe suggests that the role of a Scrum Master could be only part-time for a team member, or one Scrum Master could serve up to three teams [62]. The work of the agile team is of iterative nature. The iteration, similarly to Scrum, starts with a planning event and ends with a review and a retrospective. The agile teams cooperate in an enterprise agile team, which is called an Agile Release Train, abbreviated as ART. ARTs are cross-functional and follow agile product delivery competency, which was explained in the paragraphs before. The whole ART group works within a program increment, which consists of multiple iterations and is structured into similar events like a regular Scrum.

Furthermore, SAFe introduces several new roles, such as the role of a Release Train Engineer, who has a similar role to a Scrum Master [62], however their role is extended to the whole ART. Then, there is a System Architect, who provides guidance for the architecture of all teams. The board which all the teams use to see the inter-team dependencies is called a Program Board. ART group's retrospective is called an Inspect and Adapt event. A role of the Product Owner is performed by a Product Manager.

A group of ARTs is called a Solution Train, which comes into existence when a single ART cannot deliver the value needed. Solution Train again has its own role of a Solution Engineer, Solution Architect and Solution Management [63]. These aspects which were just explained in the previous paragraphs can be summarized under a simple phrase - **enterprise solution delivery**.

Lean portfolio management connects strategy and portfolio vision and organizes around value streams. A value stream can be described as a set of actions which aids delivery of value to customers [59]. **Organizational agility** supports lean portfolio management via building an agile mindset across the whole company. Agility, as mentioned in Chapter 3, means adapting to change briskly and respond to emerging opportunities, or threats. Agile mindset therefore closely connects to the **culture of continuous learning**, continuous improvement to enable the organizations to become lean. Lean was in more detail explained in the previous chapter which introduced Large-Scale Scrum.

Leaders in the lean enterprise are the ones who drive the agile and lean mindset. **Lean-agile leadership** aims to build such leaders, who will lead by example, help establish the mindset needed for the SAFe way of working and last but not least, they lead change [59].

As opposed to feature teams in LeSS, teams in SAFe can be organized in four different topologies. Stream-aligned teams are the teams that are organized to develop and deliver value within the value stream. The second type of team is a subsystem, or component team, which becomes essential in SAFe, when solutions become larger. Then there is an enabling team, whose members are ambassadors and early adopters of new technologies and

practices within the firm. An enabling team then coaches the other teams in the new technologies. Last but not least comes a platform team, whose responsibility is to provide services, such as APIs (application programming interfaces) which the other teams can use. The benefit of a platform team lies in taking the cognitive burden from the stream-aligned teams [64].

In the previous chapters, LeSS and SAFe methods were introduced as examples of scaling agile to multiple teams. Choosing a framework or approach for scaled agile adoption always depends on the use case of the particular company.

3.6 Agile Transformations in Companies and Their Teams

The important phase of agile transformation is preparation and training. Dysfunctional training is a consequence of several factors, e.g. lack of time commitment, partial training and inappropriate content. If the training is dysfunctional, ad-hoc strategies can be employed to tackle this issue, one of them being experts and on-site coaches that fill the training and content gaps [65].

Agile transformations have several success factors, one of which proves to be coaching. This is done by a new coaching role of **Agile Coach**. An Agile Coach enables the change effort to become effective and supports the agile adoption. An Agile Coach's role is that of a servant leader and a mentor. It is a role intertwined with educating, supporting and giving feedback to teams. An Agile Coach removes barriers in effective teamwork and helps teams strive so that the team produces the highest possible value for customers. In case of a scaled agile adoption, multiple agile coaches are needed. Stray et al. [66] mention that an Agile Coach on top of their agile expertise should have strong leadership, project management and technical skills.

In comparison to Scrum Masters, whose role was introduced in Chapter 3.1, Agile Coaches' area of expertise is broader. An Agile Coach is able to offer and guide the team through adoption of new tools beyond Scrum. An Agile Coach works with multiple teams or with the organization as a whole and is an advocate of a collective organizational agile mindset. Shifting from a Scrum Master to an Agile Coach presents a shift to a more leadership-oriented role [67].

Denning [22] describes how Microsoft transformed using agile at scale and what drivers of successful adoption of agile at scale were identified. One of the drivers is to manage dependencies the way that all teams know what other teams do. The teams are self-managing and if a dependency occurs, the teams communicate it out by themselves. The other drivers are continuous integration, DevOps and continuous delivery. These drivers are explained further in the following subchapter. Furthermore, the teams should maintain the code in a healthy state without bugs and keep abreast of technical debt. Microsoft [22]

additionally let individuals choose their teams. This fact supports the idea of letting teams form themselves which was described in the Chapter 3.4.4. In Microsoft, this is done periodically. Most of the people prefer to stay within the same team. The individuals however have the option to try new team setups. As a result, most of the teams are stable and the overall performance increases.

3.7 Continuous Integration, Continuous Delivery and DevOps

This subchapter further expands on the terminology mentioned in the previous chapters. In software development, a version control system such as Git [68] is usually used to coordinate the work of multiple software developers. Such distributed versioning systems allow collaboration of many people. Developers commit their code to their respective code branches and then merge them with the main development branch.

As was already mentioned, continuous integration abbreviates as CI. CI is a practice of all developers merging their source code together continuously, every day, even several times a day to a shared, master code branch with for instance the aforementioned versioning system Git. Continuous integration helps teams prevent bugs or fix bugs in code immediately. In addition to merging source code branches, subsequent CI procedure is in place. Duvall et al. [69] explain a usual CI scenario, which is based on the following.

The CI server checks for the changes ongoingly, every couple of minutes. After a developer commits new change, the CI server detects the change and integrates the whole program together. Once finished, it yields the results and the process starts again with the server checking for the changes.

Continuous delivery (CD) ensures that software can be released to production at any time. With CD, software can be constantly deployed. Continuous delivery expects the software to be automatically tested before the release to production, which enables required quality. Continuous delivery may apply other practices, such as CI [70]. Continuous delivery improves efficiency of developers and ensures reliable releases. The amount of bugs in code decreases.

What further expands and is considered as a step further after CD is continuous deployment. Continuous deployment automates the last step of releasing software to the production environment, whereas in CD this can be done manually [70, 71].

As mentioned in Chapter 3.5, DevOps connects development, QA and operations. DevOps accelerates collaboration between teams as well as delivery of software changes [71]. It aims to combine and unify the processes and tools in between these players. Via DevOps, developers implement new features and deploy their code into production in a quick and safe way. When deployment happens, the operations can immediately start working on their part.

Whenever developers commit new changes, their code is validated and checked by automated tests. Automated tests aid developers quickly fix the bugs and decrease the pile of technical debt.

To summarize, DevOps can be understood as an umbrella term for a set of practices, such as CI/CD. DevOps helps increase throughput and decrease overall lead time of deployment of code. Furthermore, it supports growth in the market capitalization domain [72].

Lwakatare et al. [71] studied DevOps and its relation to agile software development. They concluded that agile and DevOps are fully compatible, due to the similar focus on cooperation among teams in both approaches. Lwakatare et al. described DevOps as an extension of agile principles and they concluded agile was required for DevOps adoption. From their research it also became evident that both DevOps and agile break silos and empower communication between teams. In DevOps case, specifically between development and operations teams. In addition, DevOps is connected to lean thinking. DevOps integrates lean thinking into the whole IT value stream.

3.8 Metrics to Evaluate Scaled Agile Transformations

According to the 14th Annual State of Agile Report [32], the most frequently used metrics for successful agile transformations, sorted in descending order, are customer satisfaction, business value, timely delivery, quality, productivity, company culture, and enhancement of processes.

Agile transformations can be measured in either qualitative or quantitative ways. One way of measuring agile transformation at scale is via a quantitative objective metric model [73] proposed by Olszewska et al. Quantitative metrics studied by Bergqvist and Gordani [74] and Mas et al. [75] share some similarities with the Olszewka's model. Summary of quantitative measurements from the aforementioned authors thus include financial resources spent or cost, throughput, quality and the amount of reports with external errors, cycle time and lead time. Visual representations such as burndown charts are also used to track progress of Scrum teams [76].

To measure the success of an agile or agile at scale transformation qualitatively is a different question. Qualitative metrics tend to be not easily determinable. Qualitative metrics include engagement, satisfaction or employee intrinsic motivation and are usually connected to the well-being of employees [74, 77]. For the most part, organizations aiming to qualitatively assess agile transformations must use surveys and directly inquire their employees about their perspectives on how engaged they feel during transformation [74].

Possible metrics to consider

One possible way to measure engagement of employees would be to use the Employee Net Promoter Score (eNPS). The Net Promoter Score answers the question whether the customer would recommend the products of a company to a friend. The Employee NPS uses the same question, which is however adapted for the employees of companies [78]. Although empirical research on eNPS is rather scarce, Sedlak's research [78] shows that eNPS is useful in measuring employee well-being. However, companies must remember that eNPS provides them a pointer that something is wrong in their company, but it does not say what it exactly is and how they should tackle it.

Strategic Management

Strategy can be understood as a method of gaining competitive advantage [79]. Furthermore, it provides a guideline for decision making in uncertainty [80]. Strategies are closely studied and analyzed in strategic management. Strategic management allows organizations to actively work on their desired future.

Barney and Hesterly [79] define the strategic management process, which describes the phases of strategic management as a sequential array of formulations and activities that support the achievement of competitive advantage and creative eradication of the competitors advantages. Barney and Hesterly [79] outline the strategic management process with the following six phases, which are also portrayed in Figure 4.1:

1. **Mission** - is written in a form of a mission statement and defines the purpose of a firm's existence.
2. **Objectives** - are specific targets which support the aim to realize the firm's mission. Fotr et al. [80] describe that objectives should answer the definition of SMARTER, thus they should be specific, measurable, attainable, realistic, time-bound, ethical and resourced.
3. **External and internal analysis** - is a stage of the strategic management process which aims to assess the internal and external environment of a firm. Analytical tool called the SWOT analysis which may be used during this stage is explained below.
4. **Strategic decision** - is a state when the firm is ready to discuss and select the strategy it will implement. The strategic choice should be aligned with the company's mission and objectives and should build on the analysis from the previous stage of strategic management process [79].

4. STRATEGIC MANAGEMENT



Figure 4.1: Phases of the strategic management process - adapted from Barney and Hesterly [79] by the author

5. **Implementation of strategy** - requires the firm to adopt and maintain practices which are aligned with the selected strategy. Particular schemes for strategy implementation include for example management controls or a specific organizational structure [79].
6. Once the company gains the desired **competitive advantage** through the strategy implementation, it should be able to produce more economic value than its competitors. Economic value is the difference between the costs and the firm's income from paying customers [79].

Strengths, weaknesses, opportunities and threats (SWOT) analysis is an analysis of internal and external factors of an organization. Strengths and weaknesses are the internal factors and opportunities and threats are the external factors of SWOT. SWOT is a powerful tool for examining the organization's capabilities, which then provide options to choose from in the strategic decision step of the strategic management process.

Once the organization has analyzed the internal and external factors into SWOT, it can use the SWOT as an input for the TOWS (threats, opportunities, weaknesses, strengths) matrix, which examines the different strategy variants. TOWS is a tool for situational analysis. TOWS matrix takes all the factors from the SWOT analysis and produces combinations of different strategy outputs. There are four strategies which the TOWS matrix produces [80]:

1. Strategy SO - the firm uses its strengths to leverage opportunities.
2. Strategy WO - strategy of eliminating weakness while opportunities are exploited.
3. Strategy ST - strengths of the company are used to eradicate threats.
4. Strategy WT - the firm's position is under risk. The company should aim to reduce its weaknesses and avoid threats on the market.

Objective and Key Results (OKRs) are an instrument to set goals, or objectives, for organizations. OKRs can further be applied at a team or individual level. Objectives describe *what* will be done, *what* should be achieved. They

should be specific and action-oriented. Key results explain *how* the company achieves the objective, or in other words, how the objective will be measured. Key results should be time-bound, measurable and realistic, however they should have the aggressive visionary aspect. Key results progress as the work progresses, whereas objectives are usually long-lasting [81]. OKRs align strategic objectives across whole organizations and their operations. OKRs bring clarity and unity. OKRs adapt to circumstances.

When companies use OKRs, it is crucial that the executives lead by example to get contributors from across all company levels on board. The OKRs should be transparent to everyone in companies. Transparency does not apply only to the C-suite level, but rather to employees across all company levels. One employee can see the OKRs of another employee and thus find common ground for collaboration. Feedback sharing is also easy with the OKR system. Therein OKRs assist to break the silos between departments or individuals. Companies with OKR systems become more coherent. When implementing the OKR system, an array of OKRs cascades from the top level to the bottom, however it is possible and sometimes beneficial when some levels are skipped. In addition, objectives can emerge from bottom up. The OKR system should provide organizations with alignment, autonomy and space for creativity [81]. Recommended number is three to five for objectives and then each objective should have three key results [82].

OKRs are essential for strategic planning. They tackle the second step of the strategic management process. On the contrary to SMARTER goals, OKRs dive more deeply into what each objective incorporates. SMARTER goals focus solely on the objective itself, whereas OKRs add the quantifiable, key results aspect [83].

Qualitative Research

Qualitative research uses empirical methodology that relies on observation, interviews, recordings, questionnaires, or document review [84]. It aims for discovery and in-depth understanding of a situation or a problem. This type of research is intertwined with situational serendipity [85]. Researcher is the instrument in qualitative research.

Stories provide an insight into other people's thinking. Through the use of language people can tell stories and inquire of each other. They can get the context of the other person's thinking and behavior. Observing provides access to the person's behavior too. In-depth interviewing helps put that behavior in context. Interviewing thereby uncovers the meaning of the other person's actions [86].

In terms of selecting a number of participants, Siedman [86] suggests that there are two criteria for selecting enough participants for an interview in qualitative research. The first is the criterion of sufficiency: to have a set of participants large enough so that others outside of the sample would connect to the experiences of people in the sample. The second criterion is saturation of information. Siedman points out that the interviewer reaches the upper saturation threshold when they are not learning anything new and the information becomes repeated. Siedman emphasizes that reaching an adequate threshold of interviewees differs for each research and the interviewer should recognize when enough participants were interviewed.

A research question in a qualitative research is an explicit inquiry to be addressed by the research. After data collection, research analysis takes presence in the research. Analysis is an interpretive process [85].

Thematic analysis is one of the ways to analyze the data in qualitative research. Literature considers thematic analysis to be an umbrella term for an array of analytic procedures [87]. Thematic analysis works with elements of data called codes and themes. Literature suggests that there are two types of codes: semantic codes and latent codes. Semantic codes are literal phrases the participant said. Latent codes are the codes that were assigned interpretations

by the researcher [87].

Braun and Clark [87] suggest the following process for thematic analysis:

1. Getting oneself familiar with the data by getting immersed in the data. This should be done via repeatedly reading the transcripts in several rounds. Analysis can be done inductively.
2. The second step of thematic analysis is coding. The coding process aims to reveal the pieces of data that address the research questions. Coding should be done across the whole dataset.
3. Theme gathering is the third step of the analysis. Themes are the patterns which are created by codes.
4. The fourth step of the analysis consists of continuous review of the themes found. The themes are merged or divided until they reach the last stage when they are finalized, defined and named.

Once the data analysis is finished, the results can be synthesized and an analysis report may be written.

Part II

Practical Part

Research Methodology

Scaled agile adoptions in distributed, fully virtual remote teams are novel due to the current situation at the time of writing this thesis and thus academic empirical research on them is rather scarce. This master's thesis aims to fill this gap by the research methodology described below.

The research goal of this master's thesis was to answer the four research questions which are introduced below. The research questions were formulated based on the studied theory which was presented in the literature review in the theoretical part of this thesis:

RQ1: What weaknesses and challenges occurred in the case department throughout the agile at scale adoption?

RQ2: What innovative ways of agile at scale transformation are specific for the researched department?

RQ3: What were the successes and their drivers in the case department's adoption journey of agile at scale?

RQ4: What effect does the agile transformation at scale have on the case department's effectiveness?

Sub-questions supporting the following research questions are as follows. They have the respective labeling, where e.g., RQ2-1 is the first sub-question supporting research question two:

RQ2-1: How do the innovative methods compare to the theory?

RQ4-1: What are the potential improvement actions to support RQ4?

Qualitative research was selected as a research methodology to fulfill the research goal. The research was conducted in a company from the cybersecurity industry whose name is not mentioned due to confidentiality reasons.

This thesis specifically relied on observation, interviews and their recordings, and artifact review. The research was done over a period of seven months. The qualitative research followed the below structure:

1. formulation of the aforementioned research questions,
2. data collection, which consisted of
 - a) semi-structured interviews,
 - b) observations,
 - c) collection of artifacts,
3. data analysis,
4. synthesis of findings.

The author of this master's thesis performed all of the parts of the research online, given the pandemic situation at the time of writing this master's thesis. They are explained in more detail in the chapters below. Online video conferencing platform Zoom [17] was used to carry out the interviews and with consent of the participants the interviews were recorded and transcribed. Transcription was done using the f4transkript [88] and SonixAI [89] softwares.

Overall, 16 interviews were conducted in two rounds with 11 participants in total. Two rounds were carried out due to the goal of the author of this thesis to find out how the perceptions of the participants changed over time. In the first round, five participants were interviewed and in the second round, 11 participants conducted interviews with the author of this thesis. The first five participants were included in the second round of the interviews.

Observations and artifact review aimed to closely monitor the context of the transformation by following the case department's activities and communication channels. Validation of the results was done against secondary sources of data which were described in the theoretical part of the thesis. Detailed timeline and analysis of the semi-structured interviews, observations and artifacts is outlined in full detail in the following chapters.

6.1 Case Company

The case software company in which the research was conducted is from the cybersecurity industry. To ensure the confidentiality of data, the company's name is not mentioned. Specifically, agile transformation of one particular department was studied. Agile transformation was focusing on adopting the Large-Scale Scrum framework which was elucidated in the theoretical part of this thesis. The studied department produces three flagship products of the case company. The vision of the transformation is to aid shifting towards a new product tailored to the needs of the customers.

This change required merging two sub departments and all of their personnel together, including managers, Product Owners, Agile Coaches and various developer roles. Developers in this case means members of the Development Teams from Scrum, with all kinds of roles directly taking part in developing the product, such as UX designers, QA engineers, data analysts to frontend or backend software developers.

The case company used the role of Agile Coach (AC) instead of a Scrum Master. The difference and scope of work of an Agile Coach versus Scrum Master was explained in Chapter 3.6. Furthermore, the department used Product Manager (PM) naming for the Product Owner role. Although in the theoretical part some differences between the two roles were pinpointed, the case department used the two names, PM and PO, interchangeably.

To keep the anonymity of data, in the following chapters the department will be addressed under the name Department Pro. The two sub departments will be addressed as Pro X and Pro Y. Pro X was developing one of the three flagship products and Pro Y was developing the other two products before the transformation. Pro X was bigger in terms of number of employees than Pro Y. The department structure after the change, in the current state is the following.

Department structure

The case department in this thesis had 85 members at the start of the transformation, during the Flip event, whose details are described in the following chapter. Five new members were recruited and four people left the Department Pro since the transformation began. Department Pro has six Agile Coaches.

The transformation removed one level in the structural hierarchy of the organization. With the transformation, the structure became flatter. Some Development Teams before the transformation had their technical lead, which was a managerial role focused mainly on coordinating the work with other teams and furthermore working on development tasks. With the transformation, these managerial technical leads came back to their development roles exclusively.

The technical leads were reporting to their respective engineering directors of Pro X and Pro Y sub departments. For simplicity, the engineering directors will be addressed as *managers* in the remainder of this thesis. These sub departmental managers stayed in place. With the transformation, the subordinates were split into parts two between the two managers, where each of the managers kept their former subordinates. The two managers' role is to mostly create the environment for innovation, coach their subordinates via one-to-one meetings and communicate with the higher levels of management. The new, flatter structure can be seen in the Figure 6.1.

As the theoretical part of this thesis explained, Large-Scale Scrum is in essence Scrum, an iterative framework whose iterations are called Sprints.

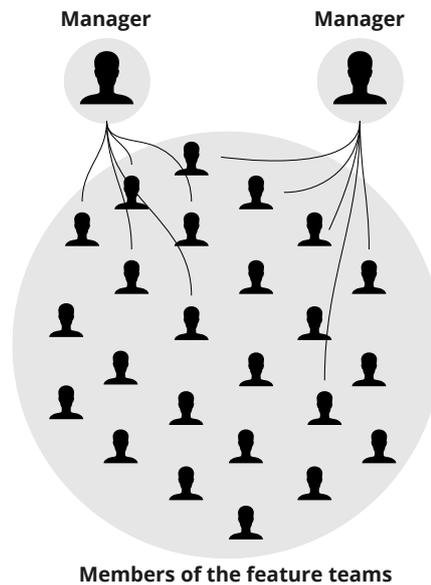


Figure 6.1: New organizational structure in the Department Pro, author's own work

Theoretical part of this thesis also explained that LeSS is focused on feature cross-functional end-to-end teams and so it was in the Department Pro. Ten feature teams were created when the Department Pro *flipped* from their old ways of working to LeSS. Each newly formed feature development team had six to nine people, which is the usual number for a feature team in LeSS. Some teams had a part-timer as part of their team, included in the six to nine people. One Agile Coach was taking care of each team. Some Agile Coaches had one team, some had two teams assigned. Agile Coaches were furthermore taking care of the well-being of the whole Department Pro organization and keeping an eye on LeSS adoption. Setup of an example feature team can be seen in Figure 6.2.

Team re-adjustment occurred after Sprint 3, when they were reshuffled into 11 new teams. Reasons for and more detail about the re-adjustment is explained in the following chapters. Some teams stayed in their former setup and some teams dissolved and individual team members created new teams. Department Pro had nine Product Managers in place, with one more Product Manager joining throughout the initial months after adopting LeSS.

6.2 Research Timeline

The research conducted in this thesis closely followed the events happening in the case company at the time when they were happening. The case company

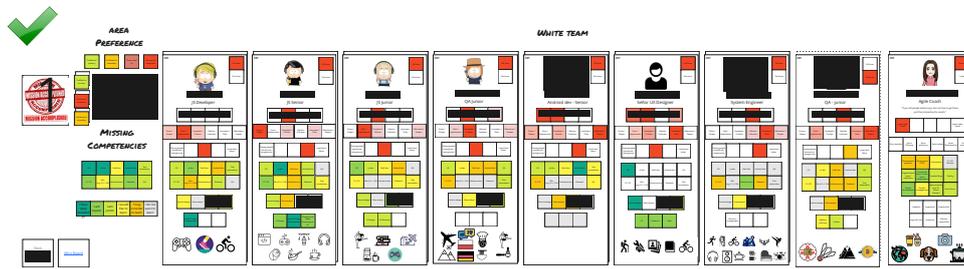


Figure 6.2: Setup of an example feature team, figure created by the Department Pro, anonymized by the author

was, and at the time of writing this thesis still is, undergoing a Large-Scale Scrum adoption. Large-Scale Scrum adoptions are rather long-term processes.

The case Department Pro started with the agile experiments in early 2019. At the time, the Department Pro was split into two sub departments. The Pro X sub department was continuously educating its employees in agile principles and several agile experiments were carried out, when the Pro X have experimented with cross-functional teams. No experiments were done in the Pro Y department.

The collaboration between the author of this thesis and the case Department Pro started in October 2020, when the LeSS transformation was about to begin. The primary point of contact for this thesis was one of the Department Pro managers. The Pro Department has used Slack [90] to share knowledge and spread information laterally.

Decisions to do a LeSS transition took place during summer and early autumn of 2020 and preparations for the LeSS adoption in the Department Pro began in autumn 2020. All activities related to the transformation were held online due to the restrictions given by the pandemic situation at the time of writing this thesis. In the course of writing this thesis, the whole company operates online.

The LeSS transformation of the department included two major events. The first event of the transformation was the Dry Run event. This is the name of the event which the Department Pro used. Dry Run happened in late November 2020. This event's purpose was to test the online collaboration tools, present the individuals with the LeSS structure in more detail, and go through the new setup of the cross-functional teams. Participation was recommended but optional. However, the majority of the people in the department attended this workshop. The Dry Run event happened over one afternoon and lasted four hours in total.

In the research part of this thesis, the author did two rounds of the semi-structured interviews with the selected participants from the Development Teams. The first round was carried out after the Dry Run event. The two

rounds were aimed to find out how the perspectives of the participants changed over time and what their perceptions were before and after the actual change to the new LeSS structure happened. More detail about data collection is written in the following chapter.

After the Dry Run workshop, the Flip event followed. Flip presented the actual shift from the original way of working to the LeSS structure. Flip's purpose was to form new feature cross-functional end-to-end teams via the self-designing team workshop, which is according to the theory of LeSS. The product group agreed on one common Definition of Done for the whole department, which is showed in Figure C.1 in the Appendix.

Flip happened over one week at the beginning of January 2021. The main agenda block lasted for four hours in the afternoons of Monday to Friday during the Flip week. The start time was adjusted so that it would be suitable for the employees from across all different locations and time zones. Individuals from more than four time zones participated.

From Tuesday to Friday, before the main agenda block, optional sessions called *Product Managers Clinic* and *Agile Coaches Clinic* were held, where the individuals and the teams could come and get answers to their questions or resolve pain points that occurred in the main agenda block. The main agenda block was followed by *Socialization* blocks which were aimed at participants of the Flip event to get to know each other better and informally discuss whatever topic they wanted. This was an attempt to compensate for the natural way of getting to know the people in an offline setting. All the sessions were held online via Zoom [17] and Miro [14] tools. These tools are analyzed in more detail in the chapters below. Figure C.3 in the Appendix illustrates the full agenda of Flip.

After the Flip week, the team began with Sprint 0. The author of this thesis did a second round of interviews during this period and further in the periods of Sprint 1 and Sprint 2. The author interviewed all participants from the first round of interviews again and additionally interviewed other members from the team to cover the whole spectrum of roles that are in the product group. This included participants from the Development Team, Agile Coaches, Product Owners and management.

Data were collected over a period of seven months, starting in October 2020 and ending in April 2021. The Figure 6.3 below summarizes the timeline of the research conducted in this thesis.

As can be seen from Figure 6.3, literature research during which the author analyzed secondary sources of information was done first, according to which research questions were formulated. Observations and artifact collection was a continuous activity carried out throughout the period of several months.

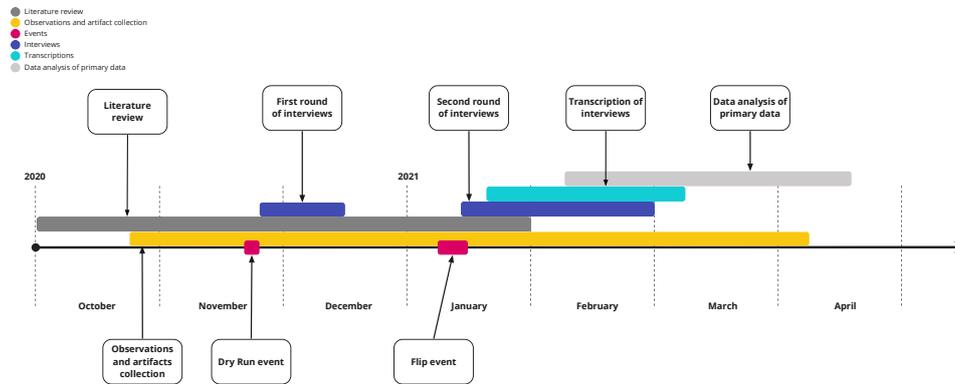


Figure 6.3: Timeline of the research, author's own work

6.3 Data Collection

As was mentioned, qualitative research was chosen as the methodology for this thesis. The data collection involved close cooperation with the Department Pro's product group. Collection of the data took place over a period of almost full seven months and included three primary activities:

1. semi-structured interviews,
2. ongoing observation of the team's activities, and
3. teams artifact collection, where artifacts included documents, communication channels, and online collaboration tools.

The nature of the semi-structured interviews allows the interviewer to follow emerging subjects and direct the interviewee deeper into promising topics. The situational serendipity enables for authentic responses. This is the reason why the author of this thesis chose qualitative interviewing as the backbone for the data collection.

The semi-structured interviews took place in an online setting. All interviews were conducted using online video conferencing platform Zoom [17]. With consent of the participants the interviews were recorded and transcribed. All interviews were recorded, except for one, when the participant did not consent to the recording. Transcription was done using the f4transkript [88] and SonixAI [89] softwares. Overall, 11 participants were interviewed, when five of them were included in two rounds of the interviews.

Transcribed data were used for further analysis. Interviews averaged at approximately 49 minutes in length, with the median of 52 minutes. The participants were selected to construct a varied sample representing multiple roles in the product group, competencies, seniority level, and cultural backgrounds.

The online setting facilitated interviewing of participants from across multiple time zones and locations.

Apart from the three aforementioned activities, the author used written communication via Slack to validate information that was not clear or inquire for more information.

6.4 Interview Questions

As the previous chapters explain, a subset of participants were asked a set of interview questions in several rounds. The interview questions started with the general questions about participants background in the researched team, including their role. These questions helped the author to understand each individual's position in the product group structure. The questions continued with participant's view on agile methodology and LeSS framework. Further, interview questions covered participants perspectives of the transformation's advantages and its pain points. Then the questions explored the knowledge of the next step of the transformation, confidence level in succeeding in the transformation and the vision of the future state. The semi-structured nature of the interviews allowed the interviewer to adjust and ask further questions according to the concepts which emerged during each interview. Several rounds of questions enabled the interviewer to see how the perceptions on the transformation in the team changed over time. The questions were mirrored for different team roles to provide multiple perspectives on the same aspect. The full list of the interview questions can be found in the Appendix B.1.

Data Analysis

This chapter provides the reader with detailed information on firm's implementation of the LeSS framework and qualitative evaluation done by the author.

7.1 Data Analysis of Interviews

Data analysis part of the research in this thesis was done using the open source qualitative data analysis tool Taguette [91]. Thematic analysis was used to analyze the data and followed the process explained in the Chapter 5. Analysis was done inductively. No predefined themes were used. According to the thematic analysis premise, the themes emerged from the data.

Below is the Table 7.1 with all interviewed participants. Scrum role from the LeSS structure of each participant is indicated. Members of the Development Teams are listed as “*developers*” regardless of their specific role. Overall, 11 participants were interviewed until no new information emerged from the data, which is according to the qualitative research premise.

The following themes were revealed in the analysis of the interview data. Each of the outcomes is written in connection with the research question it tackles. To keep the anonymity of data and privacy of participants, full transcriptions cannot be provided. Only excerpts of interviews are stated below.

7.1.1 Weaknesses and Challenges

RQ1: What weaknesses and challenges occurred in the case department throughout the agile at scale adoption?

Mindset shift and the importance of the culture

As was mentioned in the theoretical part of this thesis, company culture is the essence of organizations. Company culture has invaluable importance with

7. DATA ANALYSIS

Table 7.1: Summary of the participants of the qualitative interviews

Identifier	Role in the team	Number of rounds	Original team
P1	Developer	2	Pro Y
P2	Developer	1	Pro Y
P3	Developer	2	Pro X
P4	Manager	1	Pro X
P5	Agile Coach	1	Pro X
P6	Product Owner	1	Pro Y
P7	Developer	2	Pro X
P8	Agile Coach	1	other
P9	Manager	1	Pro Y
P10	Developer	2	Pro Y
P11	Developer	2	Pro Y

which the company presents itself towards its customers. Company culture has a direct impact on employee performance. Company culture affects how the company will formulate its strategy. Culture of the company is closely connected with mindset, when even a slight shift in the latter has influence on the former. Importance of the culture within the organizational context was also identified in the conducted interviews.

“It is not only about the skills, it is also about the culture. And culture is a very important thing for me. It is about the DNA that you have in the company.” (Developer, P3)

Readiness for change in terms of the culture is crucial. This embodies certain open-mindedness and agility towards change, specifically towards experimenting and learning by doing. One of the participants shared their view on how the overall company culture in the case company had shifted since the past towards this open-mindedness.

“And then of course you need to have many allies.¹ You need those people who will devote you time and will work with you at the beginning. To kick it off. And when we will have a few projects there then I think it can go out. And when there will be- you know I think that now is a good time for this because when I started at the company there was no space for experimentation. And now you hear it from all sides, you hear it from the top, you hear it from the bottom, right, left, let’s experiment, let’s try something new. Right now there is space for that here.” (Developer, P7)

Mindset shift encompasses agile transformations and is an ongoing, rather non-finite process. It is present at all stages of transformations. The following excerpts from interviews confirm the centrality of cultural change in transformations and expand more on this premise.

¹Participant’s answer to the question about transformations in general (author’s note)

“I think that the biggest challenge is in fact the change of mindset.” (Product Owner, P6)

“The biggest challenge is to make everyone happy and to start working just from one direction. Use the same tools, the same understanding of how it should work, because not everyone is on the same page, right? So this is the biggest challenge right now.” (Developer, P1)

There are several levels of challenges the Department Pro faced during the LeSS transformation. Some levels are more abstract compared to the others, however one is no less important from the other. Each of these levels connects to a different point in time during the transformation.

Inadequate preparedness for change

Cultural shift towards agility does not happen overnight and the process starts at the very beginnings of agile transformations with thorough preparations. The change agents, facilitators of change, should actively prepare and support the teams they are working with for agile adoptions. This can be done by multiple ways which all have one asset in common and that is increasing the awareness and know-how about agile and interconnected topics. In the case of the Department Pro it is the awareness about agile, Scrum, LeSS and their principles, such as lean thinking.

The ways to increase awareness and knowledge in the aforementioned topics include training, in case of Department Pro particularly LeSS training. Furthermore, the presence of a strong change agent persona is important. This can for instance be an Agile Coach, a manager or simply anyone from the Development Teams. There can be multiple change agents in place facilitating change and synchronous or asynchronous communication via which knowledge share is supported. All this can be summarized as preparedness for transformation, which was identified as one of the challenging factors in the Department Pro LeSS transformation due to its inadequacy.

There are several reasons for this. As was mentioned in the chapters above, LeSS adoption included two sub departments of Department Pro which before LeSS operated separately. Whereas sub department Pro X had run several experiments with the cross-functional teams before the LeSS transformation and educated its people in agile and Scrum, there were no such actions taken in sub department Pro Y. Although Pro X was a bigger sub department than Pro Y, at the beginning of LeSS adoption there were considerable differences in preparedness between them.

“We see perhaps that from the parts² which we did not work with, those who joined³, there were more pushbacks, there was a cultural misunderstanding and in fact some of the principles, many of those values have not got under their skin. So I think- but now we did this, when we formalized the organization so

²Parts of the sub department Pro Y (author’s note)

³The LeSS transformation (author’s note)

it somehow connected and now we see where are the differences. And I think that it is a really nice example of how necessary cultural preparation is for the organizational change.” (Agile Coach, P5)

Preparedness comes hand in hand with experience. Experience usually can be ensured via having external trainers that are qualified in the field of agile or LeSS adoptions or via having qualified Agile Coaches in the team, who have either gone through a LeSS adoption before or are LeSS certified or ideally are both LeSS certified and have previous experience with a transformation management. Data in this thesis have pinpointed this fact, as can be seen below.

“This is the biggest pain point for me that we do not have the experience. ... Overall, I lack some authority here whom we could rely on, so that they would help us. That they have already experienced it and they can tell us what to avoid.” (Developer, P7)

Preparedness furthermore includes **agile maturity**, which is the awareness and knowledge about agile and Scrum as such. This was a pattern in the data which connects back to the differences between sub departments, when the knowledge about agile methodology in one sub department was higher than in the other one.

“I do not know personally what exactly Agile Coaches should do.” (Developer, P1)

“We have to work on the relationship team-coach so that the people will understand that they⁴ are really the servant leader. That means something between a manager and between- because an Agile Coach is a managerial position. So that they will understand that yeah, I can really go to them⁵ and they will help me and I see the value here in that they are not just the person who organizes meetings and asks us some questions.” (Agile Coach, P5)

Another aspect of preparedness and awareness raising is informing the product group why the change is being implemented. The product group should be introduced to the **vision of why the change is happening**. Communication of the vision should take a large enough proportion of the overall communication targeted towards the participating crowd and should be done across several channels. Importance of showing people why the change is done is emphasized in the fourth step of Kotter’s eight-step change model [3] - **communicating the vision**. The Department Pro spent a good proportion of their time communicating the vision and educating their employees about why the LeSS adoption is happening, however data showed the overall message might have not been clear enough.

“It is important to have something specific to talk about. I missed this a little bit here, that we mostly talked about some ideas, you know. That when someone comes and starts telling you: “We want to be agile, we want to be

⁴The Agile Coach (author’s note)

⁵To the Agile Coach (author’s note)

agile, we want to be agile.” and you know it is great but so what?” (Developer, P7)

“The difference between this transformation⁶ is that it was clear for us why we were doing it and what we wanted to achieve. We had measured in what ways we were good and bad in the existing setup and we wanted to improve in some indicators, mainly in some simplicity of prioritization and in the speed of how we are able to deliver. Deliver things to market. Which is here too but all of these motivations are a little bit hidden here. It is hidden in all this amount⁷ and there it was really explicit.” (Agile Coach, P8)

Violation of LeSS advice and rules

Advice for adopting LeSS Huge is shifting by one requirement area at the time or gradually moving and expanding the scope of work of the team. This is something that LeSS practitioners underline and recommend to do. The Department Pro did an all-at-once strategy when it *flipped* the whole structure altogether into the new setup during one week. Department Pro disobeyed the gradual LeSS Huge adoption advice which proved to be painful in terms of smoothness of the whole LeSS adoption.

“We violated two big rules about the Flip and we did so knowingly. The first rule is that you first should do LeSS, regular LeSS and you should not do LeSS Huge, which we did, we took too many people. And the second rule is that the Flips take place in person. That means that all the people meet in one place for one week or a few days and there it takes place. We were not given this luxury.” (Agile Coach, P5)

“It did not make any sense to me when I found out that we are doing LeSS Huge straight away. This change is too huge for such a short period of time. So we should have done it differently, but it does not matter. We should have gone gradually, that means create one area which makes sense to us. ... Work like this for half a year and then add the other teams or resolve it somehow gradually. I think I told you this before that I do not know- do not have information about LeSS Huge being implemented straight away.” (Agile Coach, P8)

“I would have followed the advice we were given. Try it first at a smaller scale for example in your Pro X team and then you can try to extend it. This is the general advice that everybody gives and we proudly and knowingly ignored it and just went for the Huge⁸.” (Agile Coach, P5)

One of the above passages moreover tackles the aspect of **co-location** which is one the rules for LeSS teams. Department Pro was not able to fulfill this rule due to the global pandemic situation at the time of their LeSS adoption. As was mentioned in the theoretical part of this thesis, LeSS trainers

⁶Difference between this LeSS transformation and the other one the participant had experienced (author’s note)

⁷Amount of information (author’s note)

⁸LeSS Huge (author’s note)

now encourage self-designing workshops for teams remotely and to abandon the co-location aspect of the teams in this new age of purely remote working.

It is noteworthy to mention that in the era when the majority of software companies operate in fully online environments and support home-office work of their employees, the premise of co-location is rather obsolete. However, co-location can have multiple connotations as the data showed.

“Co-location is actually the fact that the people are in one team. For me that is the minimum. For the team to be completely virtually bound by saying: “You are one team.”. For me that is the minimum for co-location.” (Manager, P4)

Too many requirement areas

The number of teams in one requirement area is recommended to be between four to eight. Fewer than four teams increase complexity of coordination. This is exactly what happened in Department Pro. Department Pro started with three requirements areas after the Flip, with two to four teams in each area. This later proved to be too much for a group of about 80 developers (developers in this context refer to any member of the Development Teams regardless of their specific role). This meant that not all members of some of the feature teams were able to work on the same requirement area. This is against the rules for LeSS Huge. LeSS rules were explained in detail in the theoretical part. Development Teams members many times focused on multiple areas which led to local optimization, coordination complexity and the lack of flexibility. As a consequence, developers had to attend high amounts of meetings from multiple areas. Data from the interviewees touched on these pain points several times.

“But what will the other five people do?”⁹ (Developer, P1)

“I do not have too much to do in my team right now.” (Developer, P3)

“The atmosphere- I honestly do not know because I spend most of my time on my tasks and I do not communicate with my team because they work on something else than me.” (Developer, P11)

“We are finding out after those two three sprints that the institute of areas is not bringing us anything extra or we do not know about a problem that it would solve for us and give us the reason why we want them. ... The problem is that we do not have enough teams for the amount of areas we have. ... We are talking about cancelling these areas.” (Agile Coach, P8)

“The bad thing, like bad things are, that for example, there are some borders between these areas which I do not understand, for example, why not to allow people to work, to jump between areas and do some of the tasks, but we are closely attached to some of them.” (Developer, P1)

⁹When one of the developers from the team will focus on one particular requirement area (author’s note)

“So we did the areas artificially. ... It is not a nice area, it is simply artificial, it smells.” (Manager, P4)

As observations of the Department Pro showed, too many requirement areas were causing issues and silos in synchronization between teams and PMs. Department Pro decided to abandon requirement areas after the Sprint 3 and merged all areas altogether, into one group.

Teams setup

Department Pro used a self-designing workshop to create new end-to-end feature teams during the Flip event. End-to-end feature teams were created fully cross-functionally. The Department Pro aimed to have each skill on each team, including UX, Javascript, Swift¹⁰, Android, test automation, CI/CD, Windows platform (either C++ or C#¹¹), infrastructure, backend, and QA. Majority of the teams ended up having these skills covered. The data showed dissatisfaction with this particular team setup.

“This is the problem that first of all the objectives we created are too wide and second is that the teams were created from many competencies that in reality do not make sense in relationship with the objectives which are ahead of us.” (Agile Coach, P8)

“With all the chaos that there was and how the teams self-organized, I do not think that they will be able to be autonomous and that is important to me. So for the team to be autonomous, it is able to work, take the objective and finish it from A to Z. ... I think this should be the goal.” (Developer, P7)

The sixth step from Kotter’s eight step change process [3] recommends to reward short-term wins. In this step the small, momentary wins should be recognized, rewarded and celebrated to produce more momentum for the change. The goal of the Flip event was to create teams, which Department Pro successfully achieved at the end of the Flip week. However, data showed that Department Pro lacked the **reward short-term wins** aspect at the Flip event which could have potentially generated more momentum and energy for the weeks ahead.

“...similarly is the “celebrate”. ... It is that moment when you allow yourself to stop for five minutes and celebrate that you actually managed it. ... That the effort is completed and the realization comes, realization of the change, which I think we failed to do.” (Agile Coach, P8)

The overall dissatisfaction with the teams setup was further connected with the aspect explained above and that is, too many requirement areas. As was mentioned, although individual members of the feature teams could find work to do on the products within the specific area, the full teams sporadically focused on one requirement area.

¹⁰Javascript and Swift programming languages

¹¹C++ or C# programming languages

“Our manager was saying that they are thinking about making teams which will focus in one direction. ... Well, as you remember, this is something I was talking about a lot. Because I really think it will be much more effective.” (Developer, P1)

Department Pro decided to re-shuffle the teams’ structure and thus created more focused teams. Some teams stayed in their original state and some were changed. This change was aligned with the abandonment of the requirement areas and happened at the same time, after Sprint 3. All teams, including those that stayed with the original setup and newly created teams were able to choose new objectives they wanted to work on. The author’s observations of Department Pro’s events, particularly retrospectives, confirmed teams reshuffling was a good move and can be considered as a major improvement during the early weeks of LeSS adoption.

Unification of used technology

Online technology is an efficient lever to use when transformations and change efforts take place remotely. To some extent, online technology can replace the offline environments. Although there are some disadvantages to solely remote work, such as lack of the social aspect that occurs in offline environments, there are advantages too. These advantages are further discussed in the following Chapter 7.1.2.

That being said, there must be some rules and policies on what specific tools to use and when to have them unified across the product group and company. Otherwise if there are no policies or they are too benevolent, in a product group of scale of Department Pro, this non-unified approach may cause some troubles. Following passages show the preference for a single unified source of information. The online tools the Department Pro used are described in more detail in Chapter 7.3.

“I prefer just one place and I do not care which one, because I am okay with Miro as well as Jira. However if half of the people will use Miro and the other half Jira, then it is a big mess.” (Developer, P11)

“Maybe we should have some kind of source of truth. ... Like for example ... the whole structure of the LeSS framework, what could you do, like individual contributor in the LeSS framework or with your role in the LeSS framework, then how the LeSS framework works for our team or for our Department Pro? And then what is your position in that? Like what could you do inside the LeSS framework. You can talk with this person or with this team, you can do whatever you want. You can take the initiative for this, I guess we are using Miro for that. ... But Miro is pretty disorganized, a little bit like you do not know exactly how to find something, maybe with a table of contents will be better. But again, it is like just to put that there somehow.” (Developer, P3)

The Table 7.2 below summarizes the challenges that occurred during the Department’s Pro LeSS transformation and how they compare to the theory

Table 7.2: Summary of challenges in the LeSS transformation from interviews

Theory	Case department
Cultural shift in change management and agile/LeSS adoptions is a challenge	The biggest challenge is cultural shift
Thorough preparedness for change (takes time)	Inadequate preparedness for change, very short in one sub department
Gradual shift to LeSS Huge	All-at-once shift to LeSS Huge
Requirement areas	Only one requirement area after the reshuffling of teams
Fully cross-functional feature teams	Fully cross-functional feature teams
Unified source of information	Disunified source of information

of LeSS, agile and change management.

7.1.2 Innovative Aspects

RQ2: What innovative ways of agile at scale transformation are specific for the researched department?

Online environment as an advantage

One of the innovative ways which the Department Pro used for Large-Scale Scrum adoption is connected to the online environment. Fully virtual LeSS adoptions and specifically Flips are rather new in the LeSS community and Department Pro can thus provide an example and lessons learned of what innovative ways were used to carry out the whole LeSS transformation and adoption. Department Pro proved to be very agile in terms of using online communication and collaboration tools, such as Zoom [17] for video conferencing, Miro [14] as a collaboration whiteboard and other tools which are analyzed in more detail in Chapter 7.3. Department Pro was able to adjust the format according to the particular need that always occurred at a specific point of time during the LeSS adoption.

Although a fully online environment is something many companies are still getting used to, in the case of the Department Pro’s LeSS transformation data showed that the whole transformation was handled well using the online tools mentioned above.

“Miro board visualization, the way how the cards¹² were prepared, that was pretty good to me. One could have a quick overview of what the other people have put there, like what skills they have and then it enabled¹³ to quickly see

¹²Cards for teams creation are displayed in Figure 6.2 (author’s note)

¹³Enabled the participant (author’s note)

who is where and what teams we have." (Developer, P2)

"That everyone had the consensus and had a feeling, not just a feeling, but that everyone could participate and contribute with their opinion in some way and at the end to have uniform output, some uniform output which to me was great, I liked that a lot." (Product Owner, P6)

Data showed that the new ways of collaboration in an online setting, specifically Miro are interactive enablers of communication even for people who may be more introverted or shy to speak in front of a group of people.

"Even people whom I would not expect to participate, participated, for example there were introverted people who normally do not communicate. There¹⁴ they communicated quite actively, I liked that. That was when I said to myself that it is good." (Manager, P4)

"Putting our views, writing on sticky notes, for the people who are not able to talk openly, it is good for them." (Developer, P10)

The online setting of the whole transformation was well-prepared and data showed that the participants enjoyed it. Agile coaches prepared some games which were good energizers for the whole Department Pro group during the Dry Run and Flip event.

Dry Run event

As the previous excerpts and sections mentioned, Department Pro did a rehearsal of the transformation on an event called Dry Run. The purpose of the rehearsal was to get everyone familiar with the online collaboration tools, present the new LeSS structure and go through the new setup of teams. For these reasons it was a successful event.

"Definitely kudos for how the Dry Run was designed." (Developer, P7)

"Dry Run was interesting because it was a mirror for us. ... If somebody asked me if Dry Run was a good thing, I would say hundred percent yes and I would maybe say on the contrary not one Dry Run, but even two, yeah, because preparation is key." (Product Owner, P6)

"The Dry Run was a great thing." (Agile Coach, P8)

The more specific circumstances of Dry Run were tackled in the passages from interviews in the previous section.

Measurements of success

Department Pro aims to measure the success of their LeSS transformation in innovative ways through the eNPS and the "shovel index". With both metrics, Department Pro aims to survey its employees. Shovel index is a loose translation to English of the actual name used by the company for this metric. ENPS answers the question whether an employee would recommend working in their team to their best friend¹⁵. "Shovel index" as the participant whose

¹⁴At the Flip (author's note)

¹⁵This information was taken from the department's pulse survey

excerpt is below called it, answers the question: *How much in control of your work do you feel you are?* Specifically, it tackles the aspect of freedom and control over work¹⁶.

“Via engagement¹⁷. We got to eight out of ten, eight and a half on the shovel index and NPS. I would like to get to nine out of ten. So that it will increase. ... If this does not fail and if it stays and the engagement trend will be increasing and it will be so even in the new departments, then to me it shows that it is possible to do these transformations this way, when the bigger units are merged, that when one unit is bigger and prepared more and a smaller unit- So we are able to infect the smaller unit with the culture. Because if it will work out, if it works then it shows the way for the company how to do it further.” (Manager, P4)

Department Pro collected the engagement metrics on a weekly basis via a pulse survey, which was being sent to employees via Slack.

RQ2-1: How do the selected methods compare to the theory?

Before the new era of working solely online, LeSS practitioners encouraged the Flip events to be held in-person, when even people from multiple locations met in one place to transform to a new way of working over a period of several days. Now, when a company operates across multiple continents, has a product group scattered across the globe and in addition amidst the current era of pandemic restrictions, the in-person meetings over several days are rather a luxury. Therefore doing agile shifts purely online may turn into new innovative ways of doing transformations.

This connects to the aspect which was mentioned under RQ1. One element which the Department Pro disobeyed was the co-location of teams. Co-location facilitates the social aspect and meeting and interacting with people face to face. This aspect may however become negligible.

Teams setup

Furthermore, initial teams creation, which was mentioned under RQ1 appeared to be not so well suitable for the Department Pro’s and company’s objectives, therefore the teams had to be re-adjusted. Department Pro came up with innovative ways of creating teams based on focus, such as teams focusing on the desktop side of applications, mobile, frontend, Apple-focused or Windows-focused teams or even teams that were fully cross-functional stayed in place. The focused teams contain multiple roles to fulfill the cross-functionality aspect, such as Swift¹⁸ developers, QA engineers or UX designers. The Table 7.3 provides a summary of innovative aspects of the Department

¹⁶This information was taken from the department’s pulse survey

¹⁷Participant’s answer to how the LeSS adoption’s success will be measured (author’s note)

¹⁸Swift programming language

Table 7.3: Summary of innovative aspects in the LeSS transformation from interviews

Theory	Case department
In-person Flips	Fully online transformation
Fully cross-functional feature teams	Focused cross-functional feature teams
Does not mention rehearsals as such	Rehearsal of the transformation (Dry Run)
Mostly quantitative metrics, empirical research on eNPS is scarce	Engagement metrics for LeSS adoption assessment

Pro’s LeSS implementation. As can be seen, after teams re-shuffling, teams became more focused and thus the table mentions the teams after they were changed.

Although LeSS literature and online materials do not mention carrying out rehearsals of the transformations as such, in the case of Department Pro this proved to be a useful event. Dry Run aided to give people a look into their future way of working.

Metrics chosen by the Department Pro for assessment of the LeSS adoption are very unique and literature on agile adoptions does not mention them. Thus, the chosen metrics, eNPS and “shovel index”, can be considered as aspects innovative to the researched company. “Shovel index” is an index purely innovative for the case company. Some empirical research covers eNPS, however it is scarce.

7.1.3 Successes and Their Drivers

RQ3: What were the successes and their drivers in the case department’s adoption journey of agile at scale?

Some of the successful elements of the Department Pro’s LeSS adoption were described in the RQ2, such as the Dry Run event. Similarly, Flip event was successful in terms of that new teams were created, although there were challenging consequences of teams creation after the event. The aforementioned successes happened due to well-mastered online technology. The set of other success drivers is further discussed in the sections below.

Enabling continuous improvement

The LeSS transformation of the Department Pro happened fully in an on-line environment. All employees of the Department Pro were working from home during the months when the transformation was taking place. This was something new for such a scaled transformation to take place fully online.

However, Department Pro managed to stay organized, deliver products, form new teams and exercise continuous improvement which is one of the key principles of LeSS. The LeSS adoption of the Department Pro has been overall, according to the LeSS principles, successful. The following excerpts from the interviews support this statement.

“It will turn out well, hundred percent. Because we have retrospective in place, as I said we have the cycle there, that naming of the problem, improvement, validation, application of change ... that cycle will already be there and therefore it is not possible that it will turn out badly because it will already be started.” (Manager, P4)

“You know, generally, the more people you talk to and you solve problems every day, every week for sure, you make changes. You cannot be afraid to make changes, shuffle the team around, shuffle, shuffle the structure around, put new mandates in place to ensure that we all have a consistent goal here and we all work towards the same thing.” (Manager, P9)

One of the tools to continuously improve is the Sprint Retrospective. As one of the participants recommended, retrospective is a powerful instrument to see the problems which may occur in the system. Out of retrospective, impediment backlog can be created and impediment items can be resolved continuously, one by one.

“I now recommend everyone to first make a list of all troubles which are there. Something like a huge retrospective. And make an impediment backlog out of it. And this impediment backlog is extremely useful because it shows- it is like a report card for the manager with all that is wrong with that department.” (Manager, P4)

Shift towards new product

What the data showed to be a good move was merging the two sub departments into one Department Pro. This is a shift aligned with the overall company strategy to support the company OKRs.

“I have much more insight into the Pro X side of things, the engineering delivery is there. ... So I’m learning more about that individual product, much more so than I had in the past, learning what engineers are working on the various things over there and what deliveries are coming down the pipe and most important- So I would just say much more experience and hands on day to day work with the Pro X side.” (Manager, P9)

The feature teams, even with their initial setup were able to deliver value at the end of each Sprint.

“During those two Sprints, and I say it was rather a smaller initiative, however during two Sprints, they were able to achieve the main goal which was there. Even though some set of stories¹⁹ is open, that is not the key. The key is that the main goal is done, which means a new website is out, deployed

¹⁹User stories (author’s note)

and redesigned.” (Product Owner, P6)

Breaking the silos

Letting the sub departments combine, enabling people to have more discussions and gradually shifting work towards one product perspective were all factors that helped break the silos which had existed in the department before the transformation.

“In our previous setup, I used to talk only with my nearest team or my team or some people in the office, but then I was talking with a lot of people. ... And it was so nice, like to see the vision that they have about the company, about everything that is happening with this transformation. ... or that things like some of them complain a lot. The other ones, they were like, you know, this is the future. We will do it. So it was. It was. So how could I say this? Like when something gives you a lot, like this very rich experience.” (Developer, P3)

“Good thing is that we are working with new people, which is good. I really like to meet new people, work with them. Also, I was able to work on a totally different project, which, for example, I did not have this ability in the past.” (Developer, P1)

“We were able to connect to many people all over the company team.” (Developer, P10)

“I mean John²⁰ my boss was like, yeah, I totally get it here. Let’s go ahead and do it in Department Pro. You guys can be like the kind of hotbed to test it in here. We will see how it works with you, see what we learn there. And if it works well, six months down the road, we can do the same Flip over in other departments as well to try to mirror what you have done and remove some of the hurdles or some of the downsides that we currently have here at the company given the previous structure, the siloed product based structure.” (Manager, P9)

Solving technical debt

The new structure of the teams helps them focus more on delivering the value to the customer in the best possible quality. Technical debt to some extent was present in the Department Pro before the Flip and now the LeSS adoption is enabling the Department Pro to resolve it. The following excerpt discusses the state before the transformation and points out the problem which LeSS aims to solve.

“I can talk only for Windows and we have a lot of technical debt. We cannot be as innovative as we would want to be. This is related to the cross-platformity that when we develop some component it can be only shared with the Windows products. It is not common here to do the code cross-platform, so that Apple or Apple platforms or Android would be able to consume it for

²⁰The real name was changed to keep the anonymity of data (author’s note)

Table 7.4: Summary of successes and their drivers in the LeSS transformation from interviews

Theory	Case department
Does not mention rehearsals as such	Rehearsal of the transformation (Dry Run)
Continuous improvement	Aligned with the theory
Focus on one product	Aligned with the theory
Breaking down the silos	Aligned with the theory
Solving the technical debt	Aligned with the theory

example. I think that it is a big pity that there is aversion about it here." (Developer, P2)

The expected benefits of the Large-Scale Scrum are further supported by passages from interviews with the following participants.

"I think we are solving a lot of long term problems that we have had, namely tech debt and efficiency problems that should be pretty solid after Q2.²¹" (Manager, P9)

"We will try to eliminate more and more of the technical debt which we currently have in the Department Pro. That is actually the reason why we did the Flip." (Product Owner, P6)

"The one thing that we are missing now is the ability to create the automated tests that can run and basically remove the need for manual QA testers, which is kind of a brutal, monotonous job. So what we have done is we have tried to have some insights about the LeSS. Now, too, we have some folks with some QA automation experience on the Pro X side, and they are teaching the QA engineers on the Pro Y side or the guys that were on Pro Y before the Flip, how to write these scripts and how to create these automated QA test cases. So you are seeing that already happening now. And the QA engineers that were manual testers are learning how to create these automated scripts and basically just learning new technology there." (Manager, P9)

The Table 7.4 provides an overview of success drivers identified in the case department.

7.1.4 Effect on Effectiveness

RQ4: What effect does the agile transformation at scale have on the case department's effectiveness?

Data showed that the immediate effectiveness of the Department Pro decreased. The interviews were conducted, as was mentioned, during the Sprint

²¹Second quarter (author's note)

0, 1 and 2 so the effect captured during this period was very short-term. People described the situation as “*chaos and confusion*” at this time.

“When we talk about the short horizon the effect is indeed negative. At the moment, everything is broken. We do not deliver, let’s say everything has stopped or if it has not stopped, it is only thanks to the 50% maintenance or what to call it, you know that people are still finishing their old projects.” (Developer, P7)

The ineffectiveness was interconnected with disruption of the status quo and moreover with the numerous requirement areas which caused local optimization and thus did not enable full teams focus on one objective.

“I do not know, I am not too effective in my team because I do not test what the guys are doing and I do not want to immerse too much into Javascript, because I do not find it too good. So I am not a very effective member of the team for now because I am not doing the objective.” (Developer, P11)

Although the short-term impact was rather negative, Department Pro did not stop delivering, as was explained above within the context of the RQ3. Data showed that people still had in mind the long-term benefit which will outweigh the short-term pain. Specifically, delivering more of value, increased customer-centricity and reduction in the bottlenecks was anticipated. The second excerpt tackles the importance of sharing tacit knowledge.

“If we were in the short-term it would be a disaster. We expected this and tried to communicate it as much as possible. Simply with every change comes decline. ... I think the effect will take a few months rather than a few Sprints. It will come though that suddenly we will be able to add more value to the product and it will not be that somebody is saying what you should do suddenly.” (Agile Coach, P5)

“A lot of people have to learn a lot of new things, they have to pass to each other some experience, but it will actually strengthen us, we can be stronger. That means the outlook of this is that in some horizon, and it is a question indeed what the horizon will be, but also from some case studies we know that we are talking about the fact that the start is slower during the first quarter after the transformation or the Flip. After that though the effectiveness should rapidly increase. That means that we do not only expect that the effectiveness will increase, but we also expect that the quality of work will increase. It will be more meaningful from the architecture standpoint that we will be able to reuse the components which will lead to higher effectiveness and the focus, mainly the customer focus will be better.” (Product Owner, P6)

“I guess this freedom and autonomy that we have somehow should help us to deliver. To deliver better solutions, because we are more like cross-functional right now, so we can ask for help from a lot of people, not only our team, so maybe for effectiveness, I guess it could work. For productivity I am not pretty sure right now. Maybe it will take some time while we get used to the methodology and the framework and understand every single member of the

Department Pro team or Department Pro business unit. How could we work in that way?” (Developer, P3)

“There would be a big slowdown if someone was sick, someone was out of work in training or left for the day, you name it. But if they were not in the office and available, there would be a big slowdown. Now after the Flip we are sharing all the knowledge and one person is not responsible just for one aspect or one product or that one module, and they share the information about how that module works, why the code was built, the way it was, where the Git repos are. How to build an integration into the various products. When you share that knowledge to a variety of different engineers that slow down no longer occur. So I think that we will function much more efficiently.” (Manager, P9)

The ultimate goal of agile adoptions or particularly LeSS adoptions is to give the innovation responsibility to the feature teams. Data supported this statement.

“I think as the teams get refined a little bit, I think the PMs will become a little bit more delivery focus, bringing new features and functionality. And I think that R&D²² and proposals from the individual developers will increase because we are giving them the autonomy to work on kind of new things and do innovation. So we will have a lot more kind of bottom-up suggestions for innovation, whether it is new features or functionality or improvements to the process that will come from the bottom up as opposed to the top down, which I think is great. I think we will be much more agile.” (Manager, P9)

The Department Pro experienced resistance to change at the beginning of their LeSS transformation journey. This was also identified as one of the most prevalent challenges when scaling agile according to the 14th Annual State of Agile Report [32], which the Chapter 3.3 covers. Going back to the psychodynamic models of change, Department Pro was perhaps at the peak of denial phase of change, beginning to ascend to the anger phase and gradually over the time during which the author of this thesis followed the Department Pro, shifting through bargaining and depression phases to acceptance phase. Things started to settle down and improve over time.

RQ4-1: What are the potential improvement actions to support RQ4?

RQ3 discussed the success drivers of the department’s transition to LeSS. One of them was continuous improvement, which can be enabled by tools such as retrospective. One participant mentioned that retrospective is useful for creating an impediment backlog which can help out by removing the barriers which were identified during retrospective. This procedure of holding a retrospective, creating an impediment backlog out of it and then resolving the obstacles that are stopping progress may be useful even for improving the short-term downward effect which participants identified during interviews.

²²Research and Development (author’s note)

Department Pro has been actively listening to its people and perpetually improving weak points along its transformation journey. This aspect was confirmed by the observations and artifact review.

As was also previously mentioned, Department Pro carried out some major improvement actions after the Sprint 3, when it abandoned requirement areas and reshuffled the teams setups. As the observations of the author showed, this helped to increase the individual effectiveness of team members and break silos which started to appear with the institute of requirement areas.

As with every change, some slowdown during the first weeks after the Flip was anticipated and is expected to improve over time, as the understanding of the new LeSS structure and overall agile maturity improves within the team.

To support this, the Department Pro was taking actions in order to provide official LeSS training to more people. In addition, it was actively educating people via organizing sessions focused on various aspects of the LeSS structure, for instance about communities of practice or the Scrum roles.

7.2 Data Analysis of Observations

The author of this thesis conducted observations of the Department Pro's events as one of the primary research activities. Observations were done in such a way that no interruptions were made by the author of this thesis into the context in which the observation was taking place. Observations covered the following activities:

- the Dry Run event,
- the Flip event,
- feature teams Daily Scrums,
- Sprint Planning Ones,
- Sprint Planning Twos,
- overall Product Backlog Refinements,
- Product Backlog Refinements,
- Sprint Reviews,
- feature teams retrospectives,
- overall retrospective, and
- other meetings.

From the list above can be seen that the author observed all types of events which are specific for LeSS, which the reader can find in the Chapter 3.4.2. Furthermore, the author specifically focused on the Dry Run and Flip events.

The Dry Run event was successful in terms of fulfilling its goal of trying collaboration in Zoom and Miro and introducing the LeSS structure and cross-functional teams setup to the people in the department. During the Dry Run, however, from an observer's perspective one could see resistance to change to some extent. This was already mentioned in the analysis of interviews and observations only confirmed this factor.

Moreover, individuals were lacking autonomy and were waiting to be given rules rather than being proactive. Team setup was one of the aspects that people were raising questions about. This aspect was the reason for many discussions taking place in the upcoming weeks, after the Dry Run. At the time of Dry Run, the Department Pro did not have enough Agile Coaches and furthermore not all PMs were yet part of the department. This was all resolved till the Flip.

The Flip's goal was to design the new cross-functional end-to-end teams and to start discussing the objectives that were ahead of the whole Department Pro. The Flip event was well prepared and handled by the Agile Coaches, the Product Managers and management. During the event, ACs or PMs constantly informed people via a Slack channel what was happening and helped the product group when they had technical problems or questions. Flip's goal was fulfilled.

Additionally, other types of meetings were observed by the thesis author, such as the meeting called *Extended group - Regular session*. *Extended group* was a recurring meeting whose purpose was to increase transparency and aid coordination of the whole Department Pro group operations. The audience of the meetings were the management, Product Managers, Agile Coaches and delegates from the Development Teams. The *Extended group* used a kanban board to keep track of operational tasks and priorities which were to be solved. Tasks could be e.g. "Adjust JIRA without areas", "How to manage cross-team code reviews", "Adjust feedback collection on ceremonies" or "Kick-off communities of practice".

Department Pro has other recurring meetings in place, whose purpose is to educate people and enable them to have bi-directional communication with their managers. These meetings help increase knowledge share and transparency. Additionally, these meetings are a good lever to tighten the product group together, especially in the solely online environment.

Another advantage of the online meetings was a possibility to record the sessions, which Department Pro did for some of the Zoom calls. This allowed for more open and asynchronous communication with individuals who could not attend meetings in real-time.

The other ceremonies which are in the observations list at the beginning of this chapter and which were not yet described were run according to the LeSS

theory and allowed for active discussion among Development Teams, Product Managers, Agile Coaches and management. The observations confirmed the patterns which arose from the interviews. Furthermore, some more patterns in connection with RQ1, RQ2, and RQ3 were identified which are tackled below.

7.2.1 Weaknesses and Challenges

RQ1: What weaknesses and challenges occurred in the case department throughout the agile at scale adoption?

Undone department

Department Pro did not have enough UX designers. Moreover, some UX designers shared responsibilities even outside of the Department Pro and thus they were not able to dedicate one hundred percent of their time for the feature teams. Some UX designers did not become part of the feature end-to-end teams and thus they stayed in the undone department. This is a pattern typical of LeSS Huge adoptions when some parts of the product group stay outside of the feature teams. Active discussions were being held to resolve the undone UX department issue.

Overload of information and meetings

Due to the new structure, people were introduced to a lot of new information, which caused, as people put it, overload with “*too much vague information*”. The change to the structure furthermore caused overload with meetings. The Development Teams were not used to having so many meetings during their workweek. This fact was multiplied by the requirement areas aspect, when individuals had to attend their team’s requirement area meeting as well as meetings of the requirement area which they were actually working on. This issue improved with the dissolution of requirement areas. Company-wide policy with no-meeting Zoom-less Friday, which came into existence during Sprint 3, also helped. The company introduced the policy to establish one day per week during which employees can focus on deep work. However, Overall Retrospective of Sprint 4, which was the first Sprint after requirement areas removal, showed that the issue with overload of meetings is still prevalent although to a lesser extent. Table 7.5 provides a summary of observed difficulties.

7.2.2 Innovative Aspects

RQ2: What innovative ways of agile at scale transformation are specific for the researched department?

Table 7.5: Summary of challenges in the LeSS transformation from observations

Theory	Case department
Undone department sometimes present	Undone department present
This particular aspect was not mentioned	Overload of information and meetings

Product Management team

The Department Pro team had ten Product Managers in place during the LeSS adoption, starting with nine Product Managers in the Flip plus one PM joining later, during the initial Sprints of LeSS. When the requirement areas were still in place, each area had their own Area Product Owner and some supporting Product Owners. Furthermore, there was an overall Product Owner.

With the dissolution of requirement areas and teams re-shuffling, which occurred after Sprint 3 as well, a new structure of PMs came into being. What Department Pro implemented after Sprint 3 was a rotating goalie Product Manager, which was a role of a chief PM rotating among members of the Product Management team. The hierarchy of PMs was flat, thus the Product Managers were not reporting to the goalie Product Manager. The role of the rotating goalie was an innovative aspect specific to Department Pro.

RQ2-1: How do the innovative methods compare to the theory?

As Larman and Vodde [47, p. 136] declare and as was written in the theoretical part of this thesis, in Chapter 3.4.7, when there are too many POs, sub-optimization may come into place. Product vision should be driven by one person only. Department Pro ensured this aspect by putting the PM goalie into place. How efficient the rotating aspect of this role is will be seen over time.

As Pichler [28] and the theoretical part of this thesis introduces, organizations can have Product Owner hierarchy in place, which can be useful to aid POs not to become overworked and have enough time for collaboration with their respective teams. Department Pro has a PM hierarchy in place, which is according to the theory.

However, Larman and Vodde [47] explain that organizations should keep the number of POs in place low due to the risk of sub-optimization which may occur because of too divided labor among the Product Owner Team. This would be a recommendation for the future not to further extend the Product Owner Team and occasionally revise if sub-optimization is not in place due to the surplus of POs. Table 7.6 provides a summary of observed innovative aspects.

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Table 7.6: Summary of innovative aspects in the LeSS transformation from observations

Theory	Case department
Product Management Team	Aligned with the theory with a warning remark

7.2.3 Successes and Their Drivers

RQ3: What were the successes and their drivers in the case department's adoption journey of agile at scale?

Single Product Backlog

What the observations revealed to be a good move was a shift towards LeSS structure in terms of having one Product Backlog in place. This enabled the talent from both sub departments to be joined together and provide them with more transparency product-wise. This factor is showed in Table 7.7 with observed successes and their drivers.

Table 7.7: Summary of successes and their drivers in the LeSS transformation from observations

Theory	Case department
One Product Backlog	Aligned with the theory

7.3 Data Analysis of Artifacts

The following artifacts were analyzed:

- Slack channels,
- Miro boards,
- Jira,
- Confluence,
- other.

Slack channels

The company uses communication platform Slack [90]. The Department Pro team uses multiple Slack channels. There is one main channel **#pro-general** which contains new and general updates for the whole department.

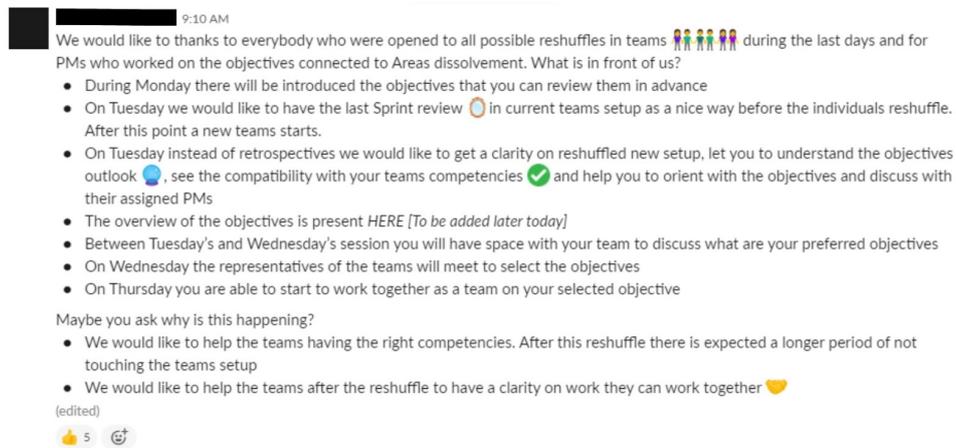


Figure 7.1: Example post from Department Pro’s Slack channel, anonymized by the author

The channel has an informative character and contains a link to the department’s main Miro board. Example post from this channel can be seen in Figure 7.1.

Except for the main channel, the department used several temporary channels during the Dry Run and Flip events. Each requirement area had their own channel, which were discontinued with the dissolution of requirement areas. Department Pro furthermore established **#help-pro** channel, which was a support and help channel for Department Pro product (former Pro X and Pro Y sub departments). In addition, **#pro-kudos** was started with the purpose to recognize, appreciate, and give kudos to any employee in the Department Pro organization who helped any other employee in the organization. CoPs as well as *CoP Stream group* whose purpose was to kick-off the communities of practice in Department Pro had their respective Slack channels. The list of channels aforementioned is not exhaustive, rather informative. All the channels were useful for the asynchronous communication and knowledge share of the Department Pro group.

Miro boards

The Pro Department is using Miro [14] as a tool for online collaboration. Agile Coaches, Product Managers and management prepared the Dry Run and Flip Miro boards which were used during the respective events. The Miro board which was used for the Flip event is displayed in the Figure C.3 in the Appendix.

Department Pro used Miro as a single source of truth for the information regarding the new LeSS structure. All information regarding new cross-functional teams setup, tactical objectives, Product Management principles,

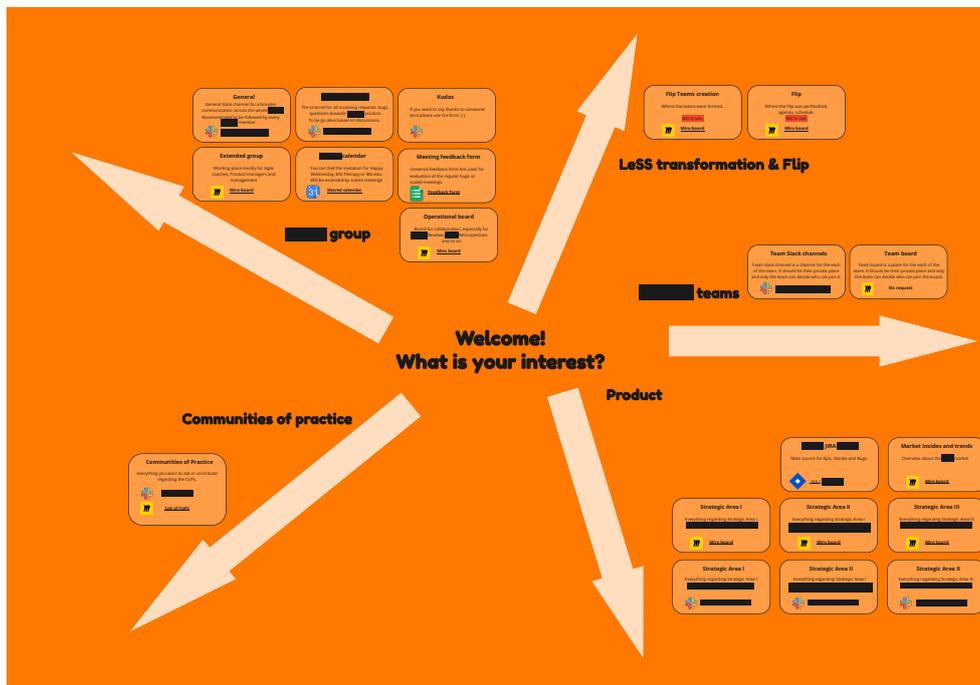


Figure 7.2: Welcome frame from the main Miro board of the Department Pro, anonymized by the author

Definition of Done, communities of practice as well as other information were displayed on this board. Figures 7.2, C.1 and C.2 show examples from the main board. Figure 7.2 illustrates the “welcome frame” and as can be seen, contains links to other parts of the main Miro board or even links to other boards and communication channels. Some feature teams from the Department Pro even used Miro for tracking the tasks they were working on.

Jira

As was mentioned, some teams used Miro for tracking the tasks they were working on - not all the teams however. Some teams were using Jira [92] during the initial weeks after Flip for tracking their tasks. This caused some confusion within the Department Pro, as the data from the interviews showed. Data furthermore showed that people of Department Pro would have preferred one, unified source of information rather than having multiple in place. Excerpts supporting this statement can be found in Chapter 7.1.1. The use of more unified sources of information improved over time.

Confluence

Confluence [93] was one of the sources of truth which the Department Pro used. Confluence contained the department’s vision, strategy, goals, roadmap,

main initiatives, information about policies and other useful links such as recordings of some of the recurring meetings.

Other

The other tools that the Department Pro used to facilitate Q&A (Questions & Answers) sessions and gather feedback included Mentimeter [94], Google Forms [95] for after-meeting feedback gathering.

To summarize, all the tools the Department Pro used are great helpers and enablers of communication and effective teamwork in the online environment. Department Pro has used them effectively and efficiently. Although some unification of in what situation to use what tool may clear out some confusion, overall, the tools chosen were helpful and eased the whole LeSS adoption.

7.4 Additional Information

The chapter tackles how the perceptions of the interview participants changed over time. Additionally, it provides the reader with information regarding the transformation that were not mentioned elsewhere in the text.

Two rounds of interviews were done in the practical part of this thesis. As was mentioned, the first round of interviews was done after the Dry Run event and the second round after the Flip event. Five of the overall 11 participants were part of this sample. The analysis of the interviews showed that the feelings and perceptions of the participants deepened.

Interview participants gained more insight and understanding into the LeSS structure after the Flip event as they had before this event. More understanding of the LeSS structure also brought more questions and uncertainty of the individual's position in the team.

As became clear from the interviews and observations, the product group and its respective teams were going through the Tuckman's stages [8]. At the beginning, during the Flip week and in the first weeks after that, the teams were in the forming stage. Gradually, some teams started to undergo a storming phase, or other teams skipped this phase and went to the norming stage. Over time, teams began to slowly reach the performing stage.

During the period of time when the author followed Department Pro, some CoPs started to arise, such as QA CoP, Infrastructure CoP and others. Furthermore, Department Pro had a DevOps working group in place.

As interviews showed, many participants had experience with agile transformations. Agile Coaches and management from the department had experience with or considered using SAFe framework, however, they found it restrictive for the company context and decided to go with the more suitable LeSS framework.

7.5 Summary of Results

To summarize the analytical part of the research conducted, Department Pro's LeSS transformation has been successful. Continuous improvement has been exercised and the department was able to remove some of the challenges that occurred on the way. Effective bi-directional has been established and thus enabled the department to progress towards a more ideal anticipated state of their ways of working.

The summary of results from the analyzes is visualized in the concept map attached in the Appendix C.4. As can be seen, some concepts relate to other concepts. The main studied concepts were weaknesses, innovative aspects, successes and the impact of the transformation on effectiveness. The conceptions directly connect to the research questions. As the concept map shows, both weaknesses and successes had an impact on the overall effectiveness of the department.

Strategy Proposal

This chapter is connected to the data analyzes and aims to provide the studied department and the company as a whole with a strategy proposal. Proposed strategy is closely connected to the main topic of this thesis which was *agile transformation in a scaled company context*. Proposed strategy can be understood as a set of recommendations which the department can leverage according to the conducted research and data analyzes.

Figure 8.1 shows a SWOT analysis of the agile transformation with inter-connection to the whole company context, as well as the external and internal factors of the organization. Strengths include combination of success drivers and innovative factors that were identified during the data analysis part:

- online environment, which in the studied department's case proved to be an advantage and the effective use of online communication channels,
- rehearsal of the transformation in a form of Dry Run event,
- innovative engagement metrics to measure success of the transformation,
- enabled continuous improvement thanks to agile at scale adoption that is based on lean thinking,
- single Product Backlog which allows for an opportunity to shift towards new product,
- flatter organization which aims to break the silos in the product group,
- formation of communities of practice. The company already has some CoP-like groups at the whole organization level, such as the CoP of agile enthusiasts.

Opportunities that result from the transformation are based on the increasing understanding of LeSS structure and principles. In connection to this comes the opportunity of the cultural and mindset shift towards agility as well

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Figure 8.1: SWOT analysis based on the data gathered in the research, author's own work

as shift towards the new product. The new structure seems to be helping break down the existing silos between departments, which can help the company as a whole if scaled to more departments. The transformation indicated where the technical debt is and the studied department started to solve it. Department and the company have the chance to bring products to market faster because of the scaled agile framework used. LeSS brings an opportunity to be more customer-centric and hence can help strengthen the overall company reputation and trust. The short increments and focused cross-functional teams allow for better design and architectural alignment throughout the department and eventually throughout the whole company. The biggest opportunity lies in scaling the LeSS structure to other departments in the company and hence becoming more agile organization-wise.

Weaknesses that the LeSS adoption brought are mainly connected to insuf-

ficient preparedness for change. The studied department knowingly violated some LeSS advice and rules, for example in terms of having too many requirement areas in place or creating the teams by the book rather than adjusting the teams setup to their specific context. Furthermore, the new structure and excess of requirement areas caused an overload of meetings to individuals in the product group. Moreover, the studied department lacked UX designers and thus not all teams could have their own UX designer. This caused UX designers to be part of the undone department. Except for the undone department the studied department managed to resolve all the identified weaknesses during the period when the research in this thesis was conducted.

Identified threats can be divided into two categories. The first category contains a threat that have already occurred in the studied department. The second category comprises potential threats that may occur in the future and are of hypothetical nature. Initial chaos and decrease in effectiveness is a threat that has already passed and seems to be improving over time. Potential threats that may arise are connected to the Product Management team and the role of rotating goalie which may bring sub-optimization and misalignment of the product vision. Another potential threat would occur if the upper management above the two departmental managers started to push back the studied department into the old ways of working. This might cause more chaos and create ineffectiveness. What may further occur is the misalignment between the two departmental managers that will have an effect on the department or more people may leave the department and hence the department may start lacking talent in some areas.

As was mentioned in the theoretical part, output from the SWOT analysis provides an input for the TOWS matrix. The TOWS matrix's output can be seen in Figure 8.2. As can be seen from the figure and from what was mentioned in the analytical chapters, the studied department has already used strategy WT during the initial weeks after the Flip event and has managed to solve the most burning pain points. To exemplify, the department re-adjusted the teams setup, reduced the number of requirement areas and was successfully sustaining initial chaos and resistance to change via educating people and thus eliminating the initial unpreparedness for change.

Based on the analysis provided in the previous chapters and due to the stabilized position of the department after the initial weeks of transformation, the author of this thesis proposes the department and the company to use the SO strategy, when the organization and department would use its strengths to leverage opportunities. Specifically the author proposes following steps:

1. Use Dry Run events in other departments to scale LeSS to the whole company.
2. Leverage continuous improvement to accelerate the shift towards agility, shorter time to market, and towards design and architecture unification to enhance the relationship with customers.

8. STRATEGY PROPOSAL

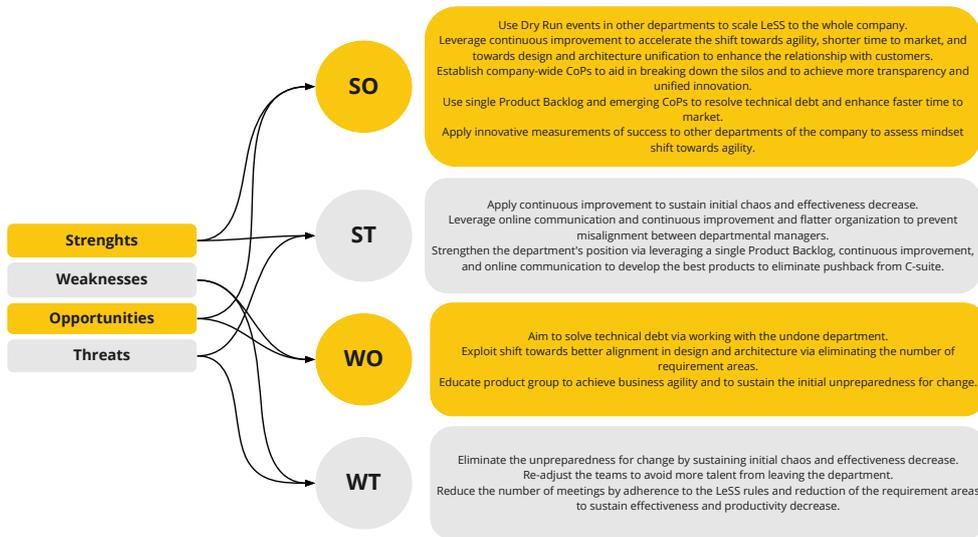


Figure 8.2: TOWS matrix based on the SWOT analysis, author's own work

3. Establish company-wide CoPs to aid in breaking down the silos across organization and to achieve more transparency and unified innovation.
4. Use single Product Backlog and emerging CoPs to resolve technical debt and enhance faster time to market.
5. Apply innovative measurements of success to other departments of the company to assess mindset shift towards agility.

In addition to the proposed strategy, in case of further challenges connected to the teams, the researched department may benefit from using the Rocket Model [10] to assess the teams' state and make adjustments accordingly. The aforementioned strategy can be implemented to the studied department and re-evaluated after some period of time.

Findings

The qualitative research conducted in the company and specifically the case department revealed challenges and success drivers of a Large-Scale Scrum adoption in the context of a software company. Innovative ways typical of the studied department were identified as well as how the effectiveness of the department was affected during the LeSS transformation. This thesis studied the department operating in the fully online environment, which aided the author to fill in the gap in empirical research of fully online agile transformations.

Because the department has exercised continuous improvement throughout the months the author had followed the LeSS adoption, it has been able to eliminate the majority of the anti-patterns that occurred. The LeSS transformation can thus be considered successful.

This chapter provides a summary of the findings which were in full detail and context described in the chapters above and further provides the other departments of the researched company as well as other firms with recommendations on how to do adoption of agile at scale. The order in which the set of recommendations are written does not mean that one is superior to the other. To successfully carry out an agile at scale adoptions, companies and their departments or teams should take all of the recommendations into account and analyze and adjust them to their specific needs and context. The recommendations and good practice from the studied company are thus as follows.

Recommendation 1: Cultivate the culture

Organizational culture affects how well the company performs and how successful it can be. Culture prepares the base for change and agility. Research conducted in this thesis yielded cultural change to be one of the biggest challenges. Therefore companies should educate their people in the culture they aim for.

Recommendation 2: Consider LeSS for scaling agile

In the studied company the LeSS structure brought many benefits. LeSS helped two sub departments cooperate, break down silos and create a more tangible vision of the future product portfolio thanks to the single Product Backlog. LeSS allowed for more bottom-up innovation, faster time-to-market, better prioritization and more efficient collaboration between PMs and the feature teams. LeSS improved product focus. It allowed the department in the researched company to enhance quality and solve technical debt. All of these aspects have a consequence in more customer centricity.

Recommendation 3: Identify the whys and work with the (LeSS) rules

Any change effort should have a strong reasoning for why it is necessary, and what it brings. So are the particular aspects of the transformation effort required having such a reasoning. As research in the case company showed, aspects of LeSS such as teams setup or the layout of requirement areas within LeSS Huge are factors to be discussed and thoroughly analyzed before flipping the old structure. These layouts and setups should be supported by explaining what problems they are prioritizing in order not to create local optimization or silos. Furthermore, it is beneficial to take into account advice from LeSS trainers and not to start with LeSS Huge all-at-once as this brings slower start and more pain points on the way.

Recommendation 4: Reserve a lot of time for preparations of change

Change efforts such as agile transformations and adoptions take a significant amount of time. Preparing the base for such a change, which is connected to agile maturity, communication of vision why the change is happening and enhancing the “growth mindset” are not simple tasks. They require time, patience and aligned communication and action from the management towards its employees. Agile coaching, training and yet again educating in agile or LeSS are an important parts of raising the level of agile maturity.

Recommendation 5: Do a rehearsal

Preparation for a structural change can be supported via a rehearsal. Rehearsal serves as a mirror of the current state of working which is beneficial for detecting some initial obstacles and spots that need attention in the preparations phase. Furthermore, it can allow for more constructive feedback from the targeted product group.

Recommendation 6: Create more focused teams

LeSS recommends to create feature teams which are fully cross-functional. For some organizations this full cross-functionality can work. However, for some the full cross-functionality can pose a barrier to end-to-end delivery.

Then, as the case company showed, focused teams can operate more efficiently. Focus however does not mean the teams are not cross-functional, it only means that not all spectrum of programming languages, QA and UX is necessary in some contexts.

Recommendation 7: Use online environment as an advantage

In the era of remote working, an online environment can provide companies an advantage for enabling people from multiple locations to participate in activities without any extra expenses. Although the social aspect cannot be fully replaced in an online environment, collaboration tools provide enablement to hold events online, interactively and entertaining for all. By the means of these tools, even people who are more introverted may be proactive and participate. Companies thus do not have to wait for this era coming to an end. On the contrary, they can use the full potential of the online environments and online communication channels to carry out their change endeavors.

Recommendation 8: Use continuous improvement as a tool

Continuous improvement is the corner-stone of LeSS and agile. It allows for constant experiments, seeing their results quickly and re-adjusting accordingly. One of the powerful tools in agile is a retrospective. Consider gathering the feedback from the whole product group via a retrospective and continuously improve respective pain points that appear in the feedback sessions.

Discussion and Limitations

Results from the analytical part of this thesis show that Large-Scale Scrum is a powerful framework which companies can use for agile at scale. Its benefits outweigh the initial struggles that every disruption to the status quo brings. Triangulation of the three sources of primary data was used to develop the comprehensive dataset for the research: (1) semi-structured interviews with the participants, (2) observations of the research department, and (3) review of the internal artifacts. All of the three primary sources provided the base for the evaluation of results, a strategy proposal and findings summary in a form of recommendations.

The aim of this thesis was to evaluate the agile transformation in a software company and measure the weaknesses and underlying challenges and provide the studied product group with recommendations. Eight challenges were uncovered during the LeSS transformation: (1) inadequate preparedness for the change, (2) violation of the selected framework's advice and rules, which further contains (3) too many requirement areas, (4) overload of information and meetings, (5) initial teams setup, (6) undone department, and (7) unification of used technology. All of the concepts have connotations to (8) cultural and mindset shift. These challenges adhere to the patterns from Chapters 3.3 and 3.4.8.

The author further studied innovative aspects specific to the case department. Five innovative elements were identified. Perhaps the most innovative was accomplishing the whole LeSS transformation remotely with the use of online technology. This showed to be an advantage in the studied department's case. Another aspect which proved to be useful was a rehearsal of the transformation which let the department prepare for change. Studied product group furthermore used innovative engagement metrics to measure how successful the transformation is. Although the initial teams setup was a challenge, over time with some re-adjustments to the teams, it turned to an innovative aspect. Last but not least, a Product Management team was in place with the rotating role of one PM goalie.

In terms of successes, the analysis of three sources of data uncovered five success drivers: enabled continuous improvement which allowed for the other successes to arise, such as for shift towards new product, breaking down the silos, solving technical debt and all of these drivers were supported by the single Product Backlog given by the LeSS structure.

Some of the studied patterns had an effect on the product group's effectiveness. The initial slowdown in effectiveness was caused by the inadequacy of preparations and the original setup of teams. The negative effect was short-term and effectiveness is expected to improve over time. Some improvement has already been visible at the time of writing this thesis. Factors supporting the improvement are breaking of the silos and enabling continuous improvement.

An array of limitations pertains to this master's thesis. The research uncovered many patterns within the case company. However, the author of this thesis was the only researcher doing the data analysis, particularly that of semi-structured interviews. Although the author kept distance in terms of making her own assumptions, there was no other researcher to validate the results and therefore some bias might have interfered with the analytical part. Secondly, the qualitative research was conducted entirely in one company and thus for more generalized results, further research would have to be carried out in more firms.

There are two possible extensions to the research conducted within the context of this thesis. One would be to do research within other software companies or even companies outside of the software development field. Results and patterns from multiple companies could be compared and thus more universal advice could be given to the organizations pursuing an adoption of agile at scale. Another possible extension would be to follow and to qualitatively assess the LeSS adoption within the same product group for a longer period of time to grasp the longer-term effect the transformation brings to the company.

Nevertheless, the research conducted by the author of this master's thesis provides a solid base for the studied company itself. Firstly, the thesis provides the researched department with the evaluation of results and thus the department gains an overview from an outside researcher's perspective on what it did well and what could be improved. Secondly, the research conducted gives the company a foundation on how to successfully scale the LeSS framework within its other departments. Both the department and the company can benefit from the strategy proposal, which is specifically focused on agile at scale adoption. Thirdly, other companies can take into account lessons learned from this thesis. Last but not least, the thesis assessed the agile transformation under specific conditions when the whole transformation was realized online and thus fills in the gap in the empirical research conducted about this topic. The results provide evidence that it is possible for companies to execute their transformations remotely with the use of online technology.

Conclusion

This master's thesis goal was to assess the agile transformation journey within the context of a large software company. The objective was to determine the weaknesses and underlying challenges the department within a company faces and to provide the product group with recommendations on how to improve the transformation planted in the context of a corporate firm. In these terms, the thesis fulfilled its goal. Furthermore, the thesis indentified the strengths, innovative aspects as well as effect on effectiveness of the studied agile transformation.

The author studied the current state of the department in the agile transformation as well as evaluated the firm's implementation of a selected scaled agile framework. Based on the evaluation of the implementation, the author developed a strategy proposal. Qualitative research was conducted to aid answering the research questions supporting the above mentioned objective. The thesis additionally assessed the transformation under specific conditions of operating exclusively online. The master's thesis thus filled the gap in empirical research in fully online agile adoptions.

The case department within the studied company has been adopting Large-Scale Scrum framework, specifically the LeSS Huge version of the framework. Large-Scale Scrum was hence studied in extensive detail in the thesis to help answer the following research questions.

RQ1: What weaknesses and challenges occurred in the case department throughout the agile at scale adoption?

The difficulties that the scaled agile transformation brought to the researched company can be summarized into the following concepts: (1) inadequate preparedness for the change, (2) violation of the selected framework's advice and rules, (3) too many requirement areas, (4) overload of meetings and information, (5) initial teams setup, (6) undone department, and (7) unification of used technology. All of the concepts connect to (8) cultural and mindset shift. All of the challenges except for the undone department were

already resolved.

RQ2: What innovative ways of agile at scale transformation are specific for the researched department and how do the innovative methods compare to the theory?

The researched department has been using engagement metrics to measure the success of the transformation. Furthermore, it did a one-day rehearsal of the transformation and has an effective Product Management team in place. Purely an online environment, which is nowadays prevalent, was an advantage for the research company.

RQ3: What were the successes and their drivers in the case department's adoption journey of agile at scale?

There have been several drivers for successes in the case department's transformation journey. One of them was enabled continuous improvement. Second driver of success was a shift towards a new product in terms of resource pool of employees available to develop the new product. Talent from two siloed sub departments merged into one department and thus has been able to shift focus towards a unified product. Single Product Backlog was a helper in this aspect. The third success driver was the ability to break down the silos and the fourth driver was solving technical debt. All of the successes were enabled thanks to the organizational structure which was established via Large-Scale Scrum.

RQ4: What effect does the agile transformation at scale have on the case department's effectiveness and what are the potential improvement actions to support them?

The short-term effect of the transformation was negative, however the department anticipated long-term benefits. These benefits have already started to become visible due to the silos breaking down, more autonomy and substitutability of people under the LeSS structure.

The results were validated against the studied theory and synthesized into a strategy proposal for the researched department, which yielded SO strategy as optimal for the point of LeSS adoption the studied department was at the time of finalizing this thesis. Moreover, findings were provided in the form of advice for other companies. The set of recommendations contains eight elements which the research showed advisable in order to successfully carry out a scaled agile transformation. In summary, outcomes revealed that LeSS is a considerable framework for scaling agile and the studied department has successfully implemented it despite some challenges on the way. Some adjustments may be essential for a successful LeSS adoption based on the specific company context. Cultivating company culture is important, as well as reserving enough time for transformation efforts preparations and rehearsal of

the transformation proved to be beneficial in terms of allowing people gaining initial insight into what is awaiting them down the road. Companies should identify the whys before attempting a transformation endeavor, and last but not least constantly improve according to the feedback from their employees. The results showed that it is possible to do agile transformations online which may be crucial for the new era of purely remote work.

There are two options for the possible future research. The first option would be to extend the current research into multiple software companies to gain more generalized results. Second option would be to follow the same company over a longer period of time to assess the longer-term effect of the transformation on the same product group.

Companies interested in gaining a deeper insight of the agile at scale adoptions and their dynamics are encouraged to take the recommendations and lessons learned from this master's thesis and apply them to their specific context.

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Acronyms

AC	Agile Coach
APO	Area Product Owner
ART	Agile Release Train
CD	Continuous Delivery
CI	Continuous Integration
CoP	Community of Practice
DevOps	Development and Operations
eNPS	Employee Net Promoter Score
IT	Information Technology
LeSS	Large-Scale Scrum
NPS	Net Promoter Score
OKRs	Objectives and Key Results
PM	Product Manager
PO	Product Owner
Q	Quarter
Q&A	Questions & Answers
QA	Quality Assurance
R&D	Research and Development
ROI	Return on Investment

A. ACRONYMS

RQ Research Question

SAFe Scaled Agile Framework

SM Scrum Master

SMARTER Specific, Measurable, Attainable, Realistic, Time-bound, Ethical and Resourced.

SWOT Strengths, Weaknesses, Opportunities and Threats

TOWS Threats, Opportunities, Weaknesses, and Strengths

UI User Interface

UX User Experience

Interview Questions

B. INTERVIEW QUESTIONS

Table B.1: Full list of interview questions

General questions for all respondents
Let's start by having you describe what you do here?
Can you define agile in your own words? What is your experience with agile?
Can you describe LeSS principles in your own words?
What were your initial thoughts about the transformation?
What were your expectations and thoughts before Dry Run? Were your expectations fulfilled?
What went well for you during the Dry Run?
What were the main pain points for you during Dry Run?
What is the next step of the transformation now?
Can you describe in a few words what happened during the Flip?
What are your takeaways from the Flip?
What was your most favorite part of the Flip?
Can you elaborate on what were the biggest challenges during Flip for you?
What do you think will be the effect of this transformation on the effectiveness and productivity?
What are the potential improvement factors in your opinion to mitigate risks? (In connection with previous question)
Can you tell me something about CoPs? (What is your knowledge of them? What is your engagement in them?)
What is your opinion on technical debt in the company and department?
What do you think is the biggest challenge overall?
What is your opinion on working with the Backlog?
What is your vision of how your team will work together in the following months?
What is your confidence in succeeding in the transformation as an individual and as a team?
Can you describe to me your perfect workflow? How do you imagine that processes should work?
Do you have any other thoughts on the overall process?
Role-specific questions
Management
How did the idea of the transformation come into being?
Why did you decide to implement LeSS in particular?
How do you know if your team has the necessary knowledge about LeSS?
How will you measure success in establishing a new way of working (LeSS)?
How do you communicate the change outside of the team, in the context of the company?
How did your role in the team change during the transformation?
Product Managers
How do you communicate with other PMs? How did the communication change since the Flip?
How will you measure that the product was successfully delivered?
Agile Coaches
Can you describe your team right now? (Who are you working with? How are the competencies spread? What is the overall atmosphere?)
How do you communicate with other ACs? How did the communication change since the Flip?
Developers
What are your competencies?
What team were you previously part of? (What was your role in your old team?)
Can you describe your team right now? (Who are you working with? How are the competencies spread? What is the overall atmosphere? Who is your Agile Coach?)
Which requirement area is your team focusing on right now?

Additional Figures



Figure C.1: Definition of Done frame from the main Miro board of the Department Pro

C. ADDITIONAL FIGURES

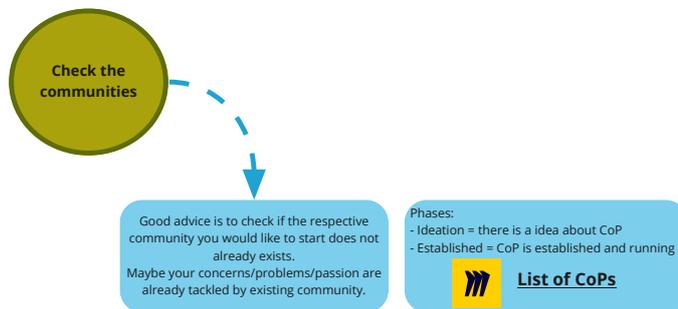
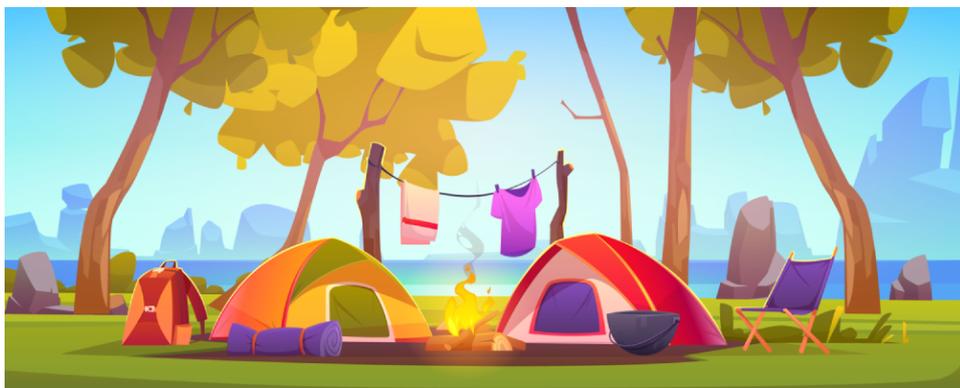


Figure C.2: Part of the communities of practice guide from the main Miro board of the Department Pro

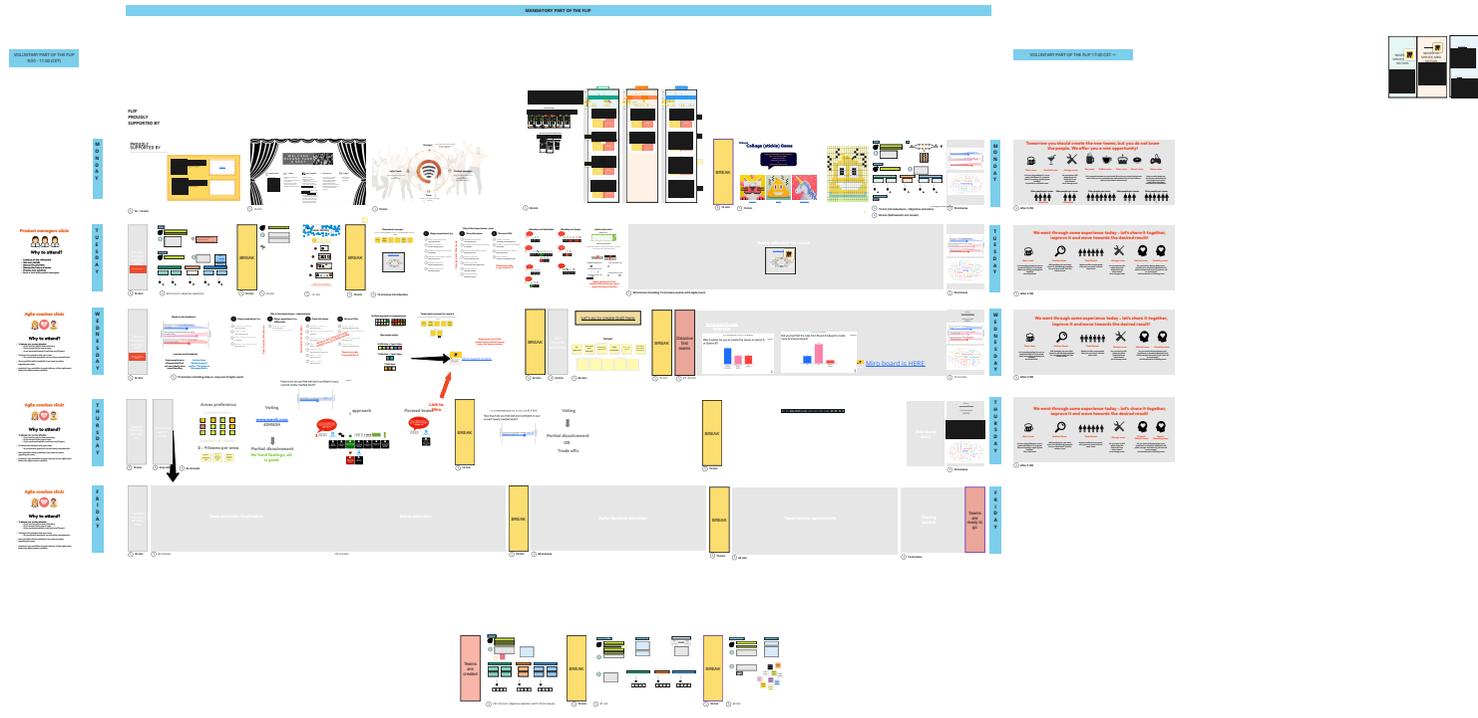


Figure C.3: Department Pro's Miro board from the Flip event, created by Department Pro, anonymized by the author

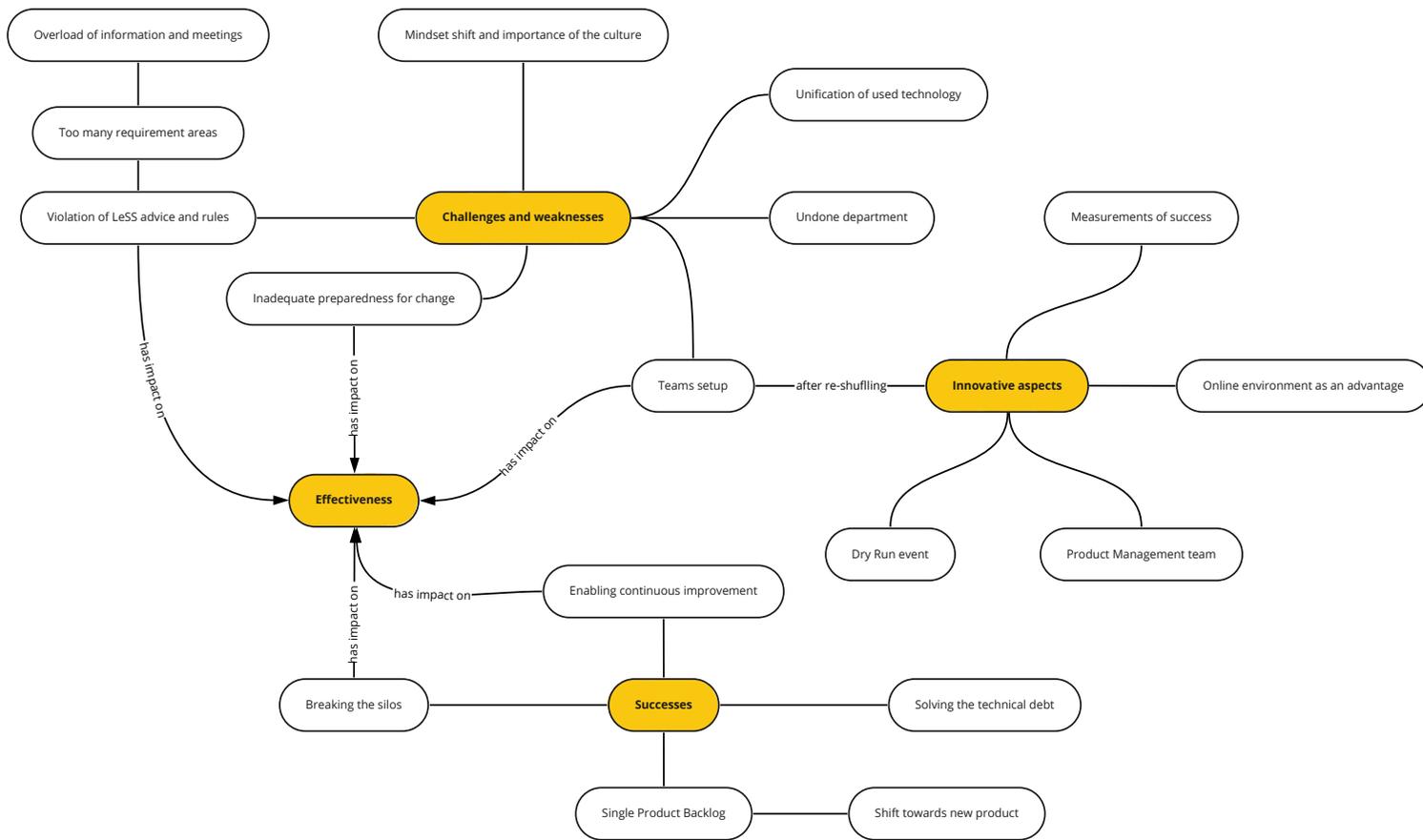


Figure C.4: Concept map of the results from the analytical part

