Tiia Mars

Product development projects and ways to improve and manage them - case company X

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VAASAN YLIOPISTO
School of Technology and Innovations
Author: Tiia Mars
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ABSTRACT:

This thesis work focuses on project management in product development projects. Meaning and
purpose of projects and project management is looked at, as well as different project management methodologies. The research section of the work presents a qualitative research done on the subject of improving project work in product development for a case company that wishes to stay anonymous. The study results are analyzed and from them a conclusion and recommendation delivered to the company.

The strategic starting point of this work is the case company's wish to gain more efficiency and tools to be used in product development projects. The theoretical framework is formed so that it gives a good understanding on the background of the research topic

KEYWORDS: Project, Project Management, Product Development, Agile, Scrum, Kanban, Waterfall, Project Management Methods

TIIVISTELMÄ:

Tämä työ käsittelee projektijohtamista keskittyen tuotekehitysprojekteihin. Työ esittelee projektien ja projektijohtamisen perusteet ja tarkoituksen. Tutkimusosuus koostuu anonyymina pysyttelevälle yritykselle toteutetusta kvalitatiivisesta tutkimuksesta jonka aiheena on projektityön kehittäminen tuotekehitysprojektien saralla. Tutkimuksen tulokset on analysoitu ja näiden analyysien perusteella on toimitettu suositukset yritykselle.

Strateginen lähtökohta tälle työlle on kohdeyrityksen toive kehittää ja saada työkaluja tuotekehitysprojektien tueksi. Teoreettinen viitekehys on laadittu niin että se tarjoaa hyvän ymmärryksen tutkimuskohteeseen.

AVAINSANAT: Projekti, Projektijohtaminen, Tuotekehitys, Agile, Scrum, Kanban, Waterfall

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1 INTRODUCTION

According to Milton (2010), the value in learning comes from the avoidance of repeating bad experiences and repeating successful experiences. If an organization can learn lessons from experiences, it has the key to eliminate repeating mistakes and reproduce success. Over time, learning and getting better can happen naturally without any conscious focus to lessons learned. However, learning can be accelerated by focusing deliberate focus on learning.

The aim for improving efficiency and processes is a general need in almost every company. In order to have working processes, they need to fit the purpose they are designed for. In order for a company to response to the changes in its business area and to new product and service needs, it needs to follow and monitor development constantly. (Villanen, 2016)

When keeping up with the development, different projects are undertaken in a company. The strategic starting point of this work is the case company's wish to gain more efficiency and tools to be used in product development projects. The company has undertaken many big scale projects and the models and function frameworks for different project types are to be found and fit for their purpose. However, for product development projects, the is still room for improvement. This is why this study is conducted. The goal is to learn the lessons of previous product development project and from these experiences create improvement suggestions to be used in future product development projects undertaken and add structure to project management among them.

This thesis work discusses and studies the development of projects, focusing especially on product development projects. Meaning and purpose of product management is looked at, as well as different product management methodologies. For the research section of the work is a qualitative research done for a case company that wishes to stay

anonymous. The study results will be analyzed and from them a conclusion and recommendation delivered to the company.

1.1 Purpose of the study

The study of this thesis will be done by conducting a “lessons-learned” study on a product development project that the case company has done recently. The case project and how it was executed brought the topic of process and project improvement up in the company and will be the source of information and development ideas for future.

The purpose of the study is to deliver a conclusion and recommendation for the company to be used as a tool in future product development projects by identifying the learning points from previous project and experiences of the participants.

The research method used is be qualitative research, conducted with a semi-structured group interview. The participants of the case project team are interviewed and from the data collected the analyzation and thereon the end conclusion and improvement recommendations are then made. The interview and sharing their experiences and opinions involves the people working among these projects in developing the processes they use. The data will be analysed in the light of the theoretical framework of the thesis.

The research method selected and details on the study are discussed and presented thoroughly in chapter three. The selection of the research methods used is done to fulfil the purpose of the study and to provide the needed information to answer the case company’s research request.

1.2 Objectives of the study

The overall objective of the study is to find working development proposals for the case company and analyze the experiences gathered from previous experiences. The goal is to find practical recommendations to be implemented in the product development project work based on real information.

With the conduction of the study and from the results from it the following research questions (RQ) are answered:

- RQ1: Can we learn from previous projects and use the information for future?
- RQ2: How can the case company improve its ways of conducting product development projects?

To answer the research questions, a qualitative study is done in the case company. The answers are formed after analyzation of the study results. The theoretical part of the thesis discusses projects and project management, different project management methodologies and product development projects as a whole to provide a clear understanding to the area of research.

1.3 Scope of the study

The focus scope in the work is to create a concrete end result for the company; a conclusion and suggestions for improvement to be used as support for product development projects, formed from the information gained in the previous project. The company does not yet have very fixed models for product development projects, this research will be the start of creating them. In other project areas there already are good processes and methods, so they don’t belong to the research scope.

1.4 Structure of the thesis

The thesis work is divided in to five chapters each covering different aspects of the work. The aim is to provide clear and well-structured presentation on the research subject with thorough theoretical framework and then moving on to the study section.

The structure of the thesis is presented in the table below:

Chapter	
1. Introduction	Introduction of topic and background. Purpose, objectives and scope of study. Structure of the thesis.
2. Literature review	Literature presentation and theoretical framework of the study.
3. Case study	Research sections of the thesis.
4. Results	Study results, analyse and key findings. Recommendation summary for the company.
5. Conclusion	Conclusion chapter of the work

First section presents the thesis and its structure. The background, purpose and objectives of the study covered in this chapter. The second section covers the theoretical framework of the thesis by going through the concepts of projects, project management in general and the characteristics of product development projects. Chapter two also present three different project management methods: Waterfall, Agile Scrum and Kanban project management. The literature review forms a thorough theoretical walkthrough to the research sections of the thesis and to the study area.

Chapter three is the case study section of the work. The chapter begins with presenting the product development projects in the case company and the goal of the study. The research method and process are presented as well as the reasons for their selection. In addition, the validity and reliability of the research method is presented.

In the fourth chapter of the thesis is presented the results from the research conducted. This section includes the analyzation and evaluation of the results, including the recommendations to the company. A marked-based validation is also presented on the results as well as the answers to the research questions presented.

Last chapter presents the overall conclusion of the thesis.

2 LITERATURE REVIEW

This literature review forms and presents the theoretical framework for the study of the thesis work. To form a logical walkthrough to the subject, this chapter has been divided in to three sections. All sections present different aspect of product development projects and different project management methods suitable for them. The aim is to cover the basic information of the topics with a clear structure and give good theoretical background and understanding to the research conducted for the case company later in the work. In each section, all concepts relating to the topic of the chapter are presented from the beginning to the end.

First is discussed project management itself to answer questions like what is a project and product management and why is it needed. Project management is divided to present first the concept of a project and project phases, to give a good understanding on the basic foundation of the research conducted in chapter three for the case company. In this chapter is also presented project and project management roles and governance.

In the second section of the literature review three different project management methodologies are presented. The three methodologies are Waterfall, Agile Scrum and Kanban project management. These three were selected for two reasons; they are among the most commonly used project management methods as well as all used in the case company. The three project management methods also present more traditional and modern ways to implement project management in an organization.

In part three we take a look at product development projects to find out the characteristics of a product development projects. Questions like what are the main similarities and differences of product development projects in relation to other projects and what forms the biggest risks are answered. This presentation is also started from the basics: what is product development as a concept.

The literature used in this thesis consist of several sources of publications from various authors. Books, articles and other sources are selected to contain up-to-date, reliable information. Projects, project management and methodologies as well as product development are topics that have been the inspiration and source of study for vast amount of people throughout the years, which means literature works around the topics are very easily to be found. However, to this work the sources used are selected deliberately in a way that the information is diverse, comprehensive and reliable by focusing on finding trustworthy literature that includes real time information.

2.1 Project management

"Project management is the discipline of planning, organizing and managing resources to bring about the successful completion of specific project goals and objectives. "

- Robert J. Collins

2.1.1 Projects

To understand the importance and meaning of product management, one must first have a clear view on what is a project, what it consist of and what is the structure of a project and project team. Understanding the basic nature and concept of project and project work creates the basic background to the whole of the thesis work.

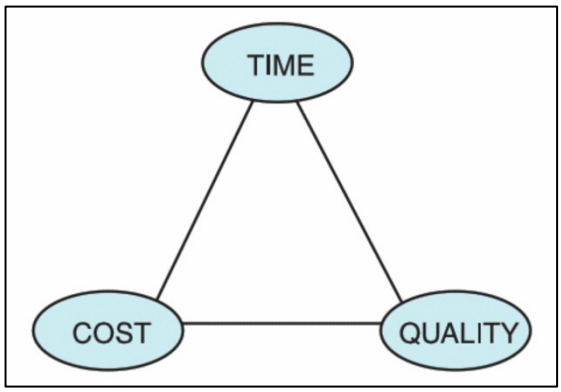
Marion (2018) defines a project to be a combination of functions done in order to reach a specific outcome in a defined time using a defined set of recourse. Projects can be described as an investment of time, effort and money in order to produce deliverables. Projects are used in a company to create results that support the company's strategy and business functions.

Projects can be found to support various different types of purposes. Project type of working is used in multiple actions done in a company like for product development, research, marketing, designing and IT. It can be targeted to create something new, improve something that already exists or even to let go of something no longer valid. (2016) Mäntyneva states that the starting point for launching a project is that there is a need for certain deliverable. On the other hand, a background for launching a project can also be a possibility recognized in the markers, a crisis threatening an organization or a positive change to be implemented. This serves as an example on the diverse nature of project work.

Despite the diverse and versatile scale of projects that exist, projects also share similar characteristics that form the foundation of project work. In a nutshell, all projects have generally three stages in common. In all projects the basic principles are:

1. The need or benefit is to be identified
2. Whatever will satisfy the need is to be produced
3. After this has been done, the result is used, operated or simply enjoyed

In practice, a project lifecycle and project phases have more sophisticated characters as presented later in the text. Projects can also have differences with each other depending on the purpose and environment where the project is conducted. However, these three stages give a high-level overview on how projects in general work and what are their basic principles. In addition to the stages, all projects also have three key factors that need to be taken into account: **time, cost** and **quality** (often referred also as **performance** or **specification**). These factors have a relationship between each other, often presented in a form of a triangle. (A & C Black, 2009)



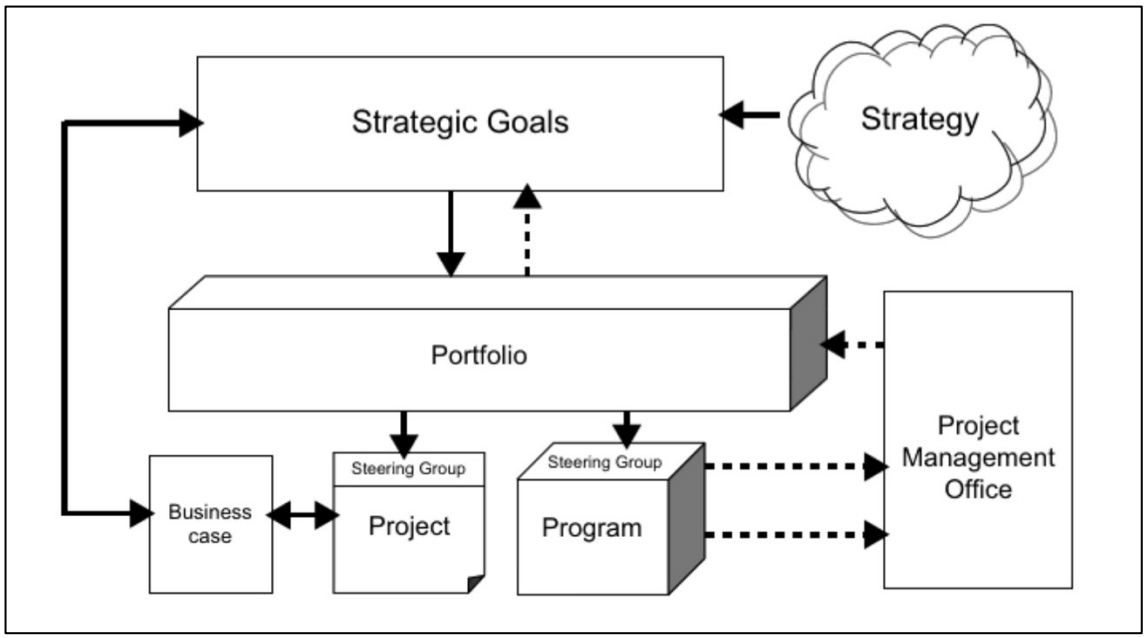
Picture 1 Project factor triangle (A & C Black, 2009)

Picture 1 presents the project factors and the relations between them in the shape of a triangle.

2.1.1.1 Project governance

According to Müller (2009), project governance presents the strategical starting point and how project work is governed in organizations. Like so many factors in an organization, projects receive their high goal from the organizations strategy. Strategy determines the necessary strategic goals that then determine the goals of *project portfolios* as well as the projects in the portfolio, each governed by their *Steering Group* that own the business case. The business cases come from the strategy of the organization and determines the scope of individual projects that are set up to contribute to achieving the strategic goals.

Picture two presents the relationship between organizational strategy and projects. As seen from the picture, strategy and projects are linked to each other. Strategy presents the high goal of the organization that is then formed in to strategic goals. From these goals the objectives go down, affecting eventually to the selection of individual projects. (Müller, 2009)



Picture 2 Relationship between strategy and projects (Müller, 2009)

Forming the core of the project governance and thus managing the priority of individual projects and other project governance elements are the project governance institutions:

- Project portfolio
    - A grouping of projects around particular skill set needed for conducting the projects. Projects in one portfolio are not necessary linked to each other.
- Project sponsor
    - A sponsor is typically a manager in charge of the owner unit of the project that receives most benefits from the project outcome.
- Steering group
    - Steering groups are committees set up to implement governance of the project, often chaired by the sponsor.
- Program management
    - Programs are groupings of projects with a common goal. Governance comprises the determining the framework for management of projects in the program.

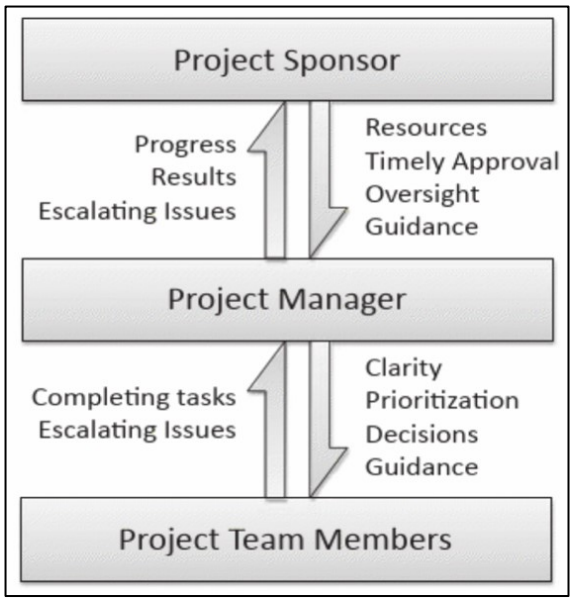
Knowledge on basics of project governance gives an understanding of where projects receive their high goals from, how they are governed and what are the governing institutions and actors in a company. In addition to understand the project governance, this helps later to understand the different roles in project management governance as well.

2.1.1.2 Project structure and team

According to Ellis (2016), projects are conducted in a project team including people who work on various tasks. Project team is led by the project manager (PM) companied by the project sponsor, usually a senior staff member to provide oversight and approval. These roles together create the basic of project structure. The project structure is formed by complex chain of commitments among the project team itself as well as between the project team and the rest of the organization. This commitment between the project team and the organization can be described as a way that the team will be given recourses and in exchange they will deliver an agreed outcome.

Important note to mark is that even if the structure of the project participants are clear, the people in the team can change. Individuals can join the project team to perform a specific task and leave when this pre agreed task has been completed. This is one example of the flexible nature of projects discussed more later. (Ellis, 2016)

In picture three is described the chain of accountability created by the project structure. As seen from the picture, the flow of information and responsibilities go both ways between the project members creating supporting functions in the project work.



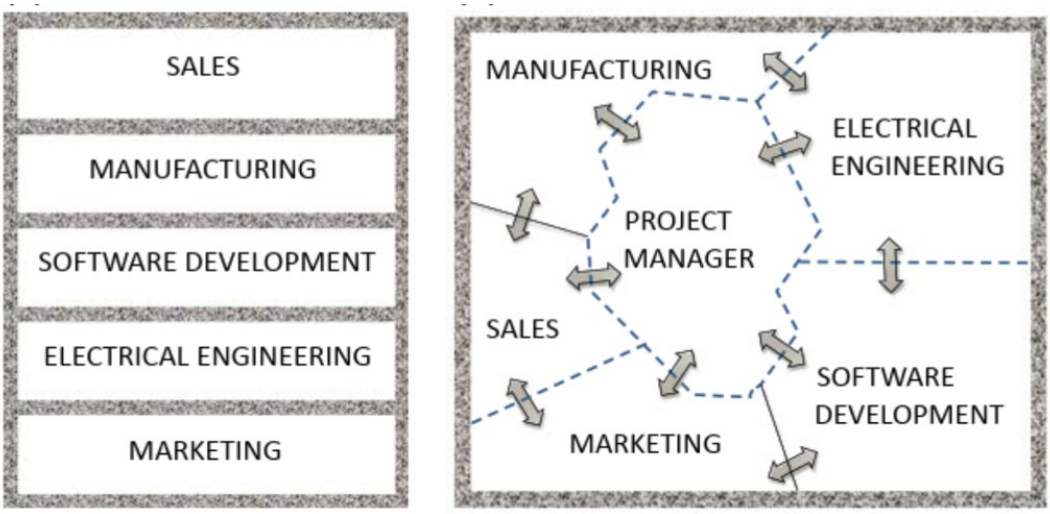
Picture 3 Project chain of accountability (Ellis, 2016)

Projects revolve around people. The PM should be able to manage the team if she or he wants to manage the project. Identifying or appointing certain people is also the key. These include for example the project sponsor and "champions" who are able to promote and support all different areas of the work. (A & C Black, 2009)

In modern business world, projects are very common and highly relied on due to their flexible nature. In projects, almost everything can be tailored to fit the need of the desired outcome; the size of project team, the length of the project and so on. In addition to the supreme flexibility of projects, the importance of them in business is also due to the fact that they brake the silos that exist in most companies. Projects make people that usually work in different departments with different objectives come together and work for the same goal. (Ellis, 2016)

In Picture four is described the silos formed by functional structures and how projects connect people across these functions. On the left side there are silos presenting the interaction and cooperation in a normal work situation where each unit performs its tasks to achieve its own goals in teams consisting only of individuals from that unit with not much communication with other departments. On the right, is presented project work where individuals from different units come together to work to achieve a shared

goal of the project. The project manager operates in the middle, having interaction to all participant sides in the project. What is to be noted is that project connections do not happen only with the PM but also to the participating sides to each other.



Picture 4 Functional structures and project connections (Ellis, 2016)

One reason for the effectiveness of the project structure is its transparency and the accountability it creates. The PM has the responsibility to report the progress of the project to the sponsor. Projects also use the work breakdown structure that is formed by series of tasks. Each of these tasks have a clear owner who is responsible for it. Like presented in Picture three, the chain of accountability is created from the sponsor through the PM to the team. This structure creates the accountability to the project. Since lack of clarity causes problems, it is important to have clear responsibilities. (Ellis, 2016)

2.1.1.3 Project phases by Mäntyneva (2016)

Like mentioned earlier, all projects have in general three stages. The project lifecycle, found generally in every project, defines the project conduction process on a more detailed level. A project lifecycle gives a good overall view of the project. Projects have

a start and an ending that form the length of the project. However, projects can also be prepared even for years until the official start which can make the defining of the project lifecycle and the time of the start sometimes harder to define. (Mäntyneva, 2016)

The project lifecycle divides the project to several project phases. These phases have different work tasks, functions and features. The phases and how they are presented can slightly differ, Mäntyneva (2016) divides the lifecycle to four sections:

1. Preparation

    - Includes the needs assessment and project selection. Depending on the nature of the product, this phase can last for years. Carefully conducted preparation phase helps the actual project planning.
    - In this phase also the project team is formed so that all needed skills are presented to reach the targeted end-goal.

2. Planning

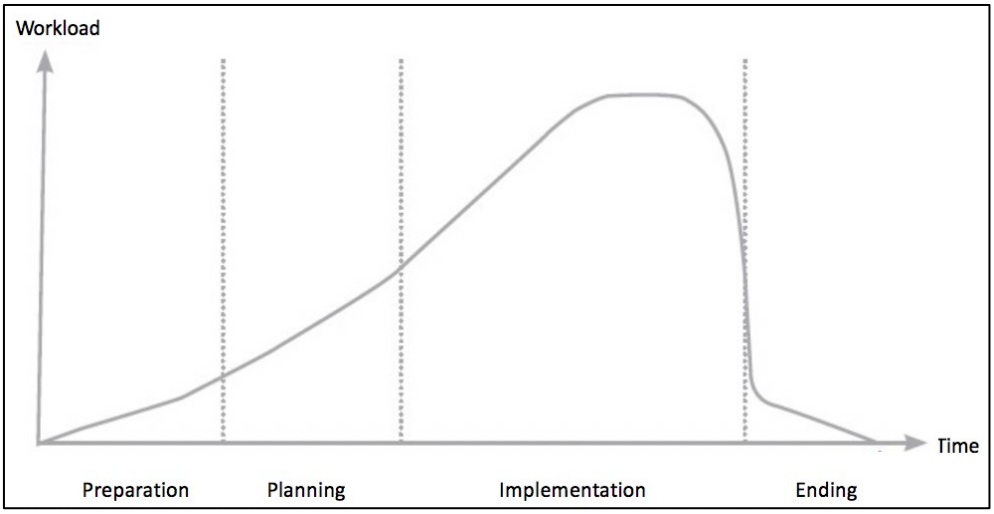
    - In this section the project is planned in detail. The specific goals, scope and budget are decided as well as the project team and recourses. All information is documented in the project plan.
    - For project risk management it is important to recognize the project related risks and possible problems and create a contingency plan.

3. Implementation

    - Next step is the project implementation in accordance to the project plan. If the need to change the project plan appears, corrective actions are taken. The use of recourses and progress of the project is supervised.

4. Ending

    - When the project goals have been achieved and the PM has done the project final report, the product ends. The final report is an overview on the product implementation and possible changes in reference to the project plan. Project sponsor checks the project outcome and makes sure that all tasks are done.



Picture 5 Project Lifecycle Phases (Mäntyneva, 2016)

In Picture five is presented the project phases and the relation between workload and time used to different phases. As seen from the picture, the implementation requires most of the workload and time since in phase the actual project work is conducted. What is to be noted is that ending and preparation do take their time as well and are not to be forgotten.

Common mistakes happening around the project lifecycle and managing the different project phases are important to identify and to avoid as much as possible. The main mistakes from the project management point of view are for example:

- Not enough planning
- Under-estimating the impact of a new project
- Getting lost in the details, forgetting the big picture

The project does not necessary flow through in one smooth sequence so evaluating and monitoring all aspects of the project like time, budget and workload is needed. Here is where project management steps to the picture. (A & C Black, 2009)

2.1.2 Characteristics of project management

Emanuel Camilleri defines project management to present and include all the tasks of coordinating numerous collections of related tasks that result in carrying out number of projects at the same time. These project also demand proper recourses like suitable project members, time and finance. Managing all these aspects is what project management is all about. (Camilleri, 2016)

Project management is a term first launched early 1960s. It was created by businesses realizing that organizing work into separate, definable units and coordinating different skills across departments and professions has a lot of benefits. The US space program was one of the firsts to use project management, before governments, military organizations and finally the corporate world following the lead. (A & C Black, 2009)

Even if the actual term of project management was launched in more modern times, according to Camilleri (2016) the actual use of project management in the some form has been around thousands of years. Modern project management started forming around mid 1950s when organizations started applying formal project management tools and techniques. The development of computers and associated packages specifying to project management supported the popularity of project management. Due to the cost and complexity of computers, it was until the 1990s that the project management theories, tools and techniques were widely spread across different industries and organizations. Despite the somewhat slow spreading of project management, nowadays the high development of internet and virtual possibilities have furthermore affected the project management functions making project work even more flexible, effective and versatile.

Nagarajan on the other hand argues that project management is an organized venture for managing projects. It includes the application of tools and techniques in planning, financing, implementing, monitoring, controlling and coordinating acetifies and tasks to

produce the desired outputs. For effective management of large and complex projects, systematically devised techniques are used. As a technique, project management aims at optimum utilization of recourses given. Noteworthy is that project management touches everyone in the project, not only the PM. (Nagarajan, 2005)

2.1.2.1 Governance of project management

According to the Association for Project Management (APM) (2011), governance of project management concerns the areas of corporate governance related to project activities. Effective governance of project management has the responsibility of ensuring that organization's project portfolio is aligned to the organizations and objectives. In addition, it supports the means by which the board and other major project stakeholders exchange relevant information. Governance of project management is a subset of activities involved with corporate governance.

Project management governance institutions are the groups in organizations that decide on the project management related aspects. Main institutions include *the middle managers* of the organization, being the ones responsible for the operational implementation of corporate strategy that is done with ongoing processes and projects. Middle management has the responsibility of building up a pool of project managers able to conduct the projects effectively. Another institution is the *tactical PMOs.* These individuals work with project managers to make sure all projects use the optimal depth of processes, techniques, tools and other management functions. Due to this role, tactical PMOs often provide training and consulting for project managers. (Müller, 2009)

There are many different views and guidelines for the governance of project management, all targeted to create smooth and working key elements for effective project management. APM (2011) defines thirteen principles of project management governance as follows:

1. The board has overall responsibility for the governance of project management.

2. The organization differentiates between projects and non-project-based activities.

3. Roles and responsibilities for the governance of project management are defined clearly.

4. Disciplined governance arrangements, supported by appropriate methods, resources and controls are applied throughout the project life cycle. Every project has a sponsor.

5. There is a demonstrably coherent and supporting relationship between the overall business strategy and the project portfolio.

6. All projects have an approved plan containing authorization points at which the business case, inclusive of cost, benefits and risk is reviewed. Decisions made at authorization points are recorded and communicated.

7. Members of delegated authorization bodies have sufficient representation, competence, authority and resources to enable them to make appropriate decisions.

8. Project business cases are supported by relevant and realistic information that provides a reliable basis for making authorization decisions.

9. The board or its delegated agents decide when independent scrutiny of projects or project management systems is required and implement such assurance accordingly.

10. There are clearly defined criteria for reporting project status and for the escalation of risks and issues to the levels required by the organization.

11. The organization fosters a culture of improvement and of frank internal disclosure of project management information.

12. Project stakeholders are engaged at a level that is commensurate with their importance to the organization and in a manner that fosters trust.

13. Projects are closed when they are no longer justified as part of the organization’s portfolio.

In the list of principles for project management, APM pursues to help to avoid the common causes of project failure. With the principles, structure is provided to help the company to attain objectives and monitor performance. (APM Knowledge, 2011)

2.1.3 Why project management is needed

As stated earlier, organizations today rely strongly on project work and trust on them to accomplish most important organizational goals. In addition, almost every product of any complexity is developed by a project team. Without appropriate project management, even the most intellectual or experienced project teams will face difficulties in succeeding in project work. Project management makes sure that all components of the project are brought together to perform achieving the goal. (Ellis, 2016)

Camilleri (2016) states that especially with the more aggressive competition of today's business word, the importance of effectiveness and efficiency has grown intensely. Project management can support the achievement of project and organizational goals. Using a formalized project management structure can achieve carious benefits like clarification to the projects scope, identifying recourses needed and encouraging the project team to focus on the end result. Project management should be viewed as a tool helping organizations to execute designated projects effectively and efferently. It is important to note that the use of this tool does not automatically guarantee project success but will act as a major help.

According to Müller (2009), organizations where the importance of following a strict project management process is emphasized to accomplish the targeted project goals are more *behavior oriented.* These organizations are ambivalent as to whether the project management is done internally or externally, important is that the process must follow given standards and policies. Organizations can also be *outcome oriented* where more

autonomy is given to projects and project managers and project management is perceived as a corporate core competency. In all cases, project management is still seen as a vital aspect of the project work, holding everything together in project work.

2.2 Project management methodologies

In this chapter, three different project management methodologies is presented. The PM methods are chosen to represent different types of approaches to project management as well as cover the project management systems and methods used in the case company. From the methods, the Waterfall project management present the more traditional way of conducting project management. Agile Scrum and Kanban on the other hand bring more lean aspects and tooling to project work.

2.2.1 Waterfall project management

Project Management Guide describes the Waterfall project management to be one of the most commonly used PM methodologies. In Waterfall, the way to plan out a project is to sequence the tasks leading to the final deliverable of the project and work on them in order. This is the so called traditional and probably the simplest to understand. Task begins after the task before it has been completed and so on. This way of working leads to forming a connected sequence of items adding up to the final overall deliverable. (Project Management Guide, 2021)

Waterfall is most suitable for projects that result in physical objects, like for example buildings, and for project plans that can be replicated in the future. The benefit of the method is that every step is preplanned and laid out in the proper sequence. Waterfall can be described to be the most simplest method to implement initially, however any change in stakeholder's needs or priorities will disrupt the series of tasks. This makes it

very difficult to manage. Waterfall excels in predictability but lacks in flexibility. (Project Management Guide, 2021)

According to Barbee (2012), the traditional approach to project management is proven to be working in well-established industries where additional flexibility is not needed. Other organization of project characteristics that support the Waterfall project management are for example:

- Highly defined and set requirements
- Widely distributed teams
- Rigid corporate culture
- New or less-experienced ream members
- High compliance regulations od government oversight
- Low risk of change

These characteristics all point to same root cause; in an organization where employees and management are very resistant to change or not very skilled and experienced, where the company operates in very strictly regulated business area or with operations that require little to no changes its sometimes valid to keep with what is proven to be effective. “if it ain’t broke, don’t fix it”.

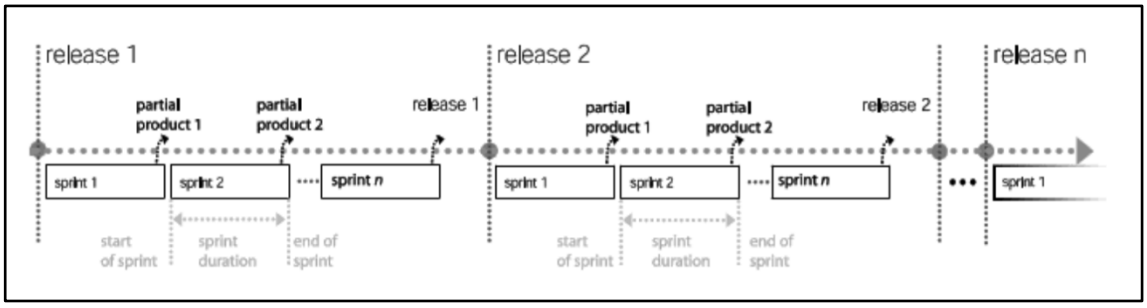
2.2.2 Agile Scrum project management

Emerson Taymor (2020) describes Agile as way to manage projects, nowadays used virtually for everything with increasing popularity but originally developed in software development. The founding principles of Agile is that it breaks down large projects to small, manageable tasks and task areas. Difference in comparison with for example Waterfall PM presented earlier, Agile does not have the same strictly sequenced nature. In Agile working there are people working on different tasks together simultaneously. This more flexible nature makes it possible to prioritize, add or drop features mid project,

not possible in Waterfall. Under Agile family there are various specific PM's, all based on the same way of working on projects. Here presented one of the most commonly used method: Agile Scrum.

Like stated, Agile project management has several characteristics. Ellis (2016) presents the sprint cycle in Agile Scrum as the single defining one. In Scrum, the project is divided in to sprints that are fixed-time iterations lasting generally around 2-4 weeks depending on the nature of the project. The length of the sprint is not to be too long since short iterations have the efficiency increasing benefits. On the other hand sprints too short make it difficult to execute the tasks in given time.

Deuff and Cosquer (2013) define Agile Scrum as a project management method a working framework championing an iterative and adaptive process. In a product development project, the version of a product delivered, the end result of the project, is called the "release". This denotation is also attributed to the period of time set aside to create a version of the product. This means that in Scrum a release as a whole is composed of a series of several sprints. Several releases of a product can also occur on the tail of each other.



Picture 6 Scrum Iterative process (Deuff & Cosquer, 2013)

Picture 6 presents the Scrum iterative process and the different releases and sprints. In each release, there can be several releases happening after each other. The sprint duration is typically the same in all sprint in one organization, agreed beforehand. The content of a sprint is discussed in detail later on.

Agile Scrum is based on three types of elements that frame the development process. These elements are:

1. The Scrum roles
2. The artifacts used
3. The ceremonies

According to them all the elements have a specific meaning and its essential to the method to bring these together benefitting the project. The process of the method consist of rules which forge connections between these different elements.

The Scrum roles:

- The Product Owner (PO)
- The Scrum master (SM)

Scrum, like all other methodologies includes different roles depending on the situation. The amount of the roles can vary, but for example Ellis (2016) presents the two primary leadership roles. These roles are the ones used in all presentations about Scrum. In addition, in Scrum there is naturally the project team included. Team members typically represent different know-hows and expertise.

The Product Owner is the client that has commissioned the product. PO provides a vision for the product that is shared with the team. Product Owner is responsible for defining the content of the product, managing the priorities of the items and ensuring that all the priorities are understood by the team. *The Scrum master* is not to be mistaken with the project manager. Scrum master has the task of helping the team to apply the Scrum method to the project work and adapt it to the context. The duty of the Scrum master is to eliminate impediments, meaning the events that could slow down the working of the team. (Deuff & Cosquer, 2013)

There are some varieties on the artifacts of Scrum in literature, all however based to the same idea. Deuff and Cosquer (2013) present **the artifacts in Scrum PM** as the following:

- The product backlog
- The sprint backlog

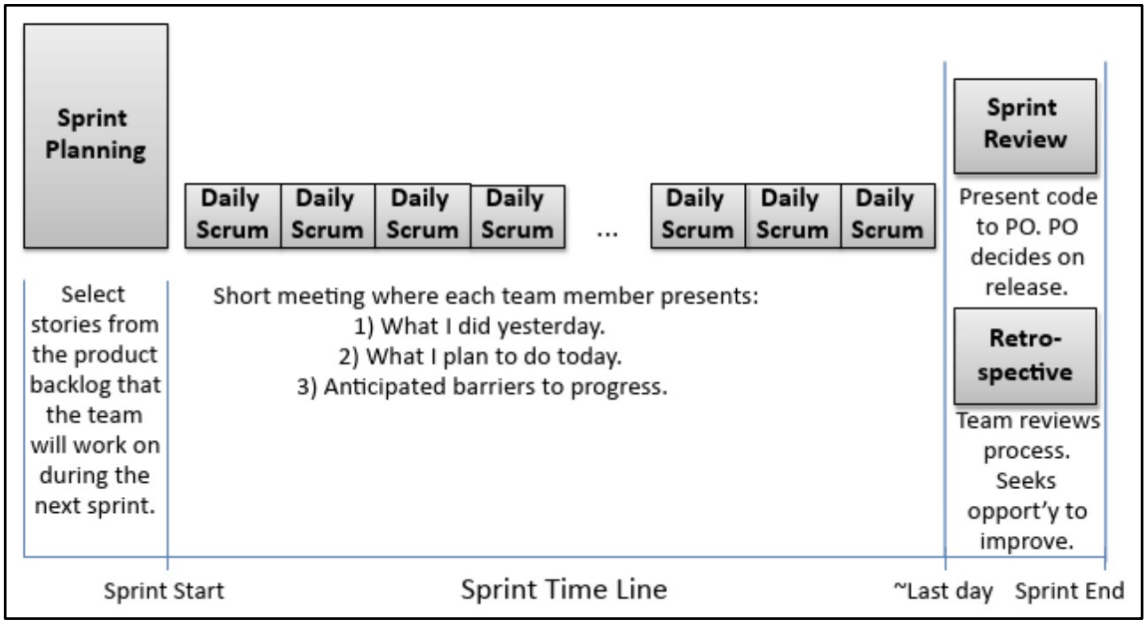
The product backlog is the prioritized list of items in the project, with the most important items at the top. The list represents the product's functional perimeter and evolves with the addition, elimination and decomposition of functional items and changes in priorities. Backlog items differ also from each other in levels of detail. The more important the item is the more detailed it is described. The number of detailed items increase when the project advances. *The sprint backlog* is represents the part of the product backlog processed by the development in the current iteration. It consist of the set of tasks that need to be performed during the iteration. This list is decided upon the beginning of the sprint and is typically not altered during the sprint.
(Deuff & Cosquer, 2013)

The ceremonies frame the progression of a Scrum process. There are four main ceremonies:

- Sprint planning meeting
- The daily Scrum
- The sprint review
- The sprint retrospective

Sprint planning meeting happens at the start of a sprint. In this ceremony the goal is to break down the items to short developmental tasks, generally brought together to a task board that organizes them to three categories; those to be developed, tasks in process of being developed and the completed ones. *The daily Scrum* is short meeting taking place daily in order to summarize each members tasks for the day and what has been done the day before. Daily Scrums are vital since they provide the opportunity to evaluate the project progress as well as increase communication in the team. *Sprint*

review is a meeting at the end of a sprint, demonstrating the state of the project at the end of a sprint. This is used in making decisions about the continuance of the project. *The sprint retrospective* is the final meeting of a sprint. The goal of this meeting is to identify what works well and what is needed to be changed. (Deuff & Cosquer, 2013)



Picture 7 Ceremonies (Ellis, 2016)

Picture 7 describes the ceremonies of the scrum project management. Visualized in the picture is on sprint and the ceremonies taking place during it. All starts with the Sprint planning and selection of the stories or tasks from the backlog that the team is targeting to accomplish during the Sprint. The daily Scrums where the team members present the actions they have ongoing at that time or what challenges might occur take place throughout the sprint and will make sure that the communication in the project team will stay on a sufficient level and that the project manager is aware on the situation of the project. At the end of the sprint is the Sprint review and retrospective. The goal of these ceremonies is to decide on the release and to review the process.

Agile also faces criticism and is not a working solution for all uses. With its complex nature, it is fit for experts with lot of experience on project work and for organizations where individuals are working closely together. Due to the complexity, if Scrum is not

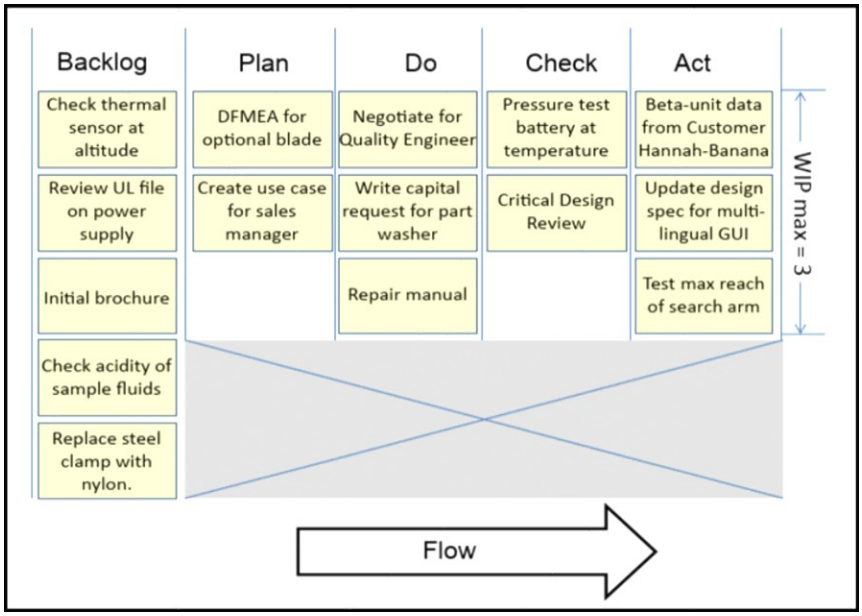
understood and educated well, it will not succeed. In addition, if the company is resistant to adopt new methods, Scrum is most likely not received and implemented efficiently to operations. (Barbee, 2012)

2.2.3 Kanban project management

Kanban is Japanese for signboard. According to Gross and McInnis (2003), the origin of Kanban project management (KPM) created in the late 1940s and early 1950s, can be located to the Toyota production system. Kanban's were developed to control the production between processes and to implement just in time (JIT) to the manufacturing. As a proof on its practical nature, Toyota still uses Kanban today for cost management and continuous improvement.

Also part of the Agile methods family, KPM is a simple and visual management tool for projects that have a low or medium complexity. Each task is listed separately and presented in a visual manner to a white board some sort, software or physical. Kanban board is typically divided to four or five sections or columns. The idea is that tasks start from the left side of the board and move to the right as they mature from one section to another. This visualizes the overall situation of the project and individual tasks in it. The goal is to provide a tool to manage the work in progress (WIP) and to keep the project team from having too many tasks in process at the same time. (Ellis, 2016)

Below is an example of a KPM board. The categories of the Kanban board can be tailored to fit the specific need of the project. In the picture can be seen the ongoing tasks on the board and the stages they are in. To be noted from the example board is that the amount of items are restricted from all other columns than the backlog.



Picture 8 KPM board (Ellis, 2016)

As seen in Picture four, KPM is a pull system. This means the amount of items in a column (expect for the backlog) are typically limited to about three items. Gross and McInnis (2003) have created seven steps for organizations to help in the implementation process of KPM:

1. Conduct data collection
2. Calculate the Kanban size
3. Design the Kanban
4. Deploy the Kanban
5. Train everyone
6. Audit and maintain the Kanban
7. Improve the Kanban

Gross and McInnis state that these steps help to take the most out of KPM. However, it is important to note that Kanban requires a team approach. The successful use of KPM obligates that all unique aspects of the project get tied into the Kanban. To make sure this will happen, the project team must be participating to all steps of the deployment process. In addition, despite the simple nature of KPM it is important to educate the

team when first implementing the KPM. Elements and the process for creating a Kanban should be covered in the training to the team. (Gross & McInnis, 2003)

According to George Ellis (2016), KPM has multiple benefits with simplicity being the first one. Easy to use and requires no lengthy training to be used, KPM is easy to include to the project work. In addition to this, KPM does not necessary require more than a white board, some sticky notes and a marker. Kanban boards can also be used in the communicating with the product stakeholders and inside the project team presenting everyone what everyone is working on. Another benefit of KPM is its support to continuous improvement. From the board is easy to spot the tasks that don't flow, hence finding the project bottlenecks becomes more effective.

As for the weaknesses of KPM, Ellis states that one is its simple visual nature. In addition, for more complex projects, KPM is not able to link together tasks in complex ways. In a situation where there is 50 or so tasks with numerous predecessor/successor relationships, managing the project with Kanban is most likely not practical. This is because Kanban does not show the relationships between tasks. Another challenge with KPM is managing to a schedule. From Kanban it can be seen the current state of the tasks but not directly predict completion times. (Ellis, 2016)

KPM is a practical tool for managing project tasks on a short time horizon. It can be used to manage more simple projects but is not the most suitable option for more complex projects used as the only project management system. However, KPM can be used along-side other Agile management methods as a support for example to manage weekly tasks and in the project team communication and information flow. In practice, projects or organizations using for example Agile Scrum, the Daily Scrums can have their structure by implementing KPM to use. (Ellis, 2016)

2.3 Product development projects

After looking at the concepts of projects and project management, next is to understand the characteristics of product development projects. Here first presented the concept of product development. After that is discussed the characteristics of a product development project and what is typical for them. The typical risks appearing in product development projects are presented, as well as how appropriate planning can be used to avoid the possible threats.

2.3.1 Product development

Ulrich, Eppinger and Yang (2020) define the concept of *a product* as something sold by an enterprise to its customer. *Product management* is defined as the set of activities beginning with the perception of a market opportunity and ending in the production, sale and delivery of a product.

Mital, Desai, Subramanian and Mital (2014) state that in order to succeed in the business world, companies must constantly operate in a state of innovation when it comes to the products they create. In addition to creating new products and services, companies need also to modify and improve the existing ones. According to them, product development can be described as a process that includes tasks like conceptualizing, producing and selling a product or a service.

When discussing product development, everything start with the information that indicates what potential customer want and what they are willing to pay for it. Recognizing the market needs is vital and a product development strategy not based on the market needs will not succeed. Innovation and new ideas are important and needed, but the foundation must be the customer and market need. This is the basic foundation both for physical product and service products. (Mital;Desai;Subramanian;& Mital, 2014)

To make product development projects to be as efficient as possible, attention must payed to project selection decisions. Very often companies undertake too many product development projects at once. In this scenario, the risk is that valuable resources are scattered to projects that are not likely to materialize. Product selections helps to narrow down the choice of products in a way that resources can be targeted to projects most likely to succeed. This requires decision making and selecting the projects so that good products are developed and suitable priorisation is made. Attributes like superiority to products already on the market, meeting customer needs and market attractiveness as well as reasonable production requirements for the company are to be considered. (Mital;Desai;Subramanian;& Mital, 2014)

Ulrich et al. (2014) state the characteristics of a successful product development to be:

- Product quality
- Product cost
- Development time
- Development cost

This shows that only creating a good product that answers to a need on the market is not enough to make product management to be successful. In addition, the development time and cost have to be in line. If these attributes rise too high in relation to the quality or prizing suitable for the product in question, the big picture is not on a sustainable level.

2.3.2 Characteristics of a product development project

Ellis (2016) states that projects that develop new products are fundamentally different from other project types. These projects are often dealing with complex technology, issues relating to patents, customer needs and legal questions. Hence, product development projects are among the most cross-functional activities in any organization.

For this reason, in project management many different aspects must be taken in to consideration.

Products are not typically developed by a single individual. In an organization, product development is an activity that requires skills an input from nearly all functions. Collection of individuals developing a product forms the *project team* for product development projects. Like in project typically, the team has a single leader, the project manager. Often the product development project team consist of a *core team* and an *extended team.* In many cases the team within the organization is supported by individuals or teams in partner companies, suppliers or consulting firms. (Ulrich;Eppinger;& Yang, 2020)

Product development does not happen overnight. Very few new products can be developed in under a year. Often three to five years is required, sometimes even more depending on the product. Understandably, this takes money. The cost of product development is roughly proportional to the number of people on the project team and to the duration of the project. As the need of different skills and so the amount of individuals taking part in the project work grow bigger, so does the cost of the project. In addition, other costs like possible investments to tooling or external expertise will affect the budget. When the costs of the development of the project grow higher, the price and profit to be gained from the finalized end product must be in line. This puts a lot of emphasis to the correct prizing decisions as mentioned earlier.
(Ulrich;Eppinger;& Yang, 2020)

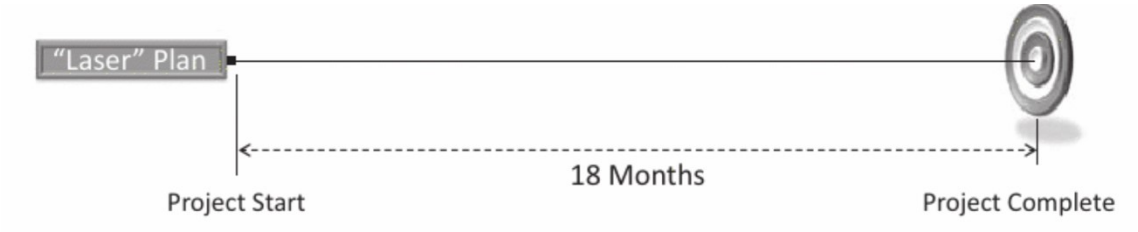
Ellis (2016) states that product development projects have many similar characteristics as other product types like event planning, marketing projects or election campaigns. The similarities lie in the basic nature and features of a project; customer (internal or external) goal, list of tasks, budget and a targeted completion date. The nature of the work in projects is similar to all projects, the biggest differences can be found in more detailed characteristics.

Despite the various aspects in common with all projects, product development projects have special requirements:

1. Extra efforts to innovation management
2. Unusually high level of collaboration
3. Low level of determinism at the outset
4. High reliance on technical experts

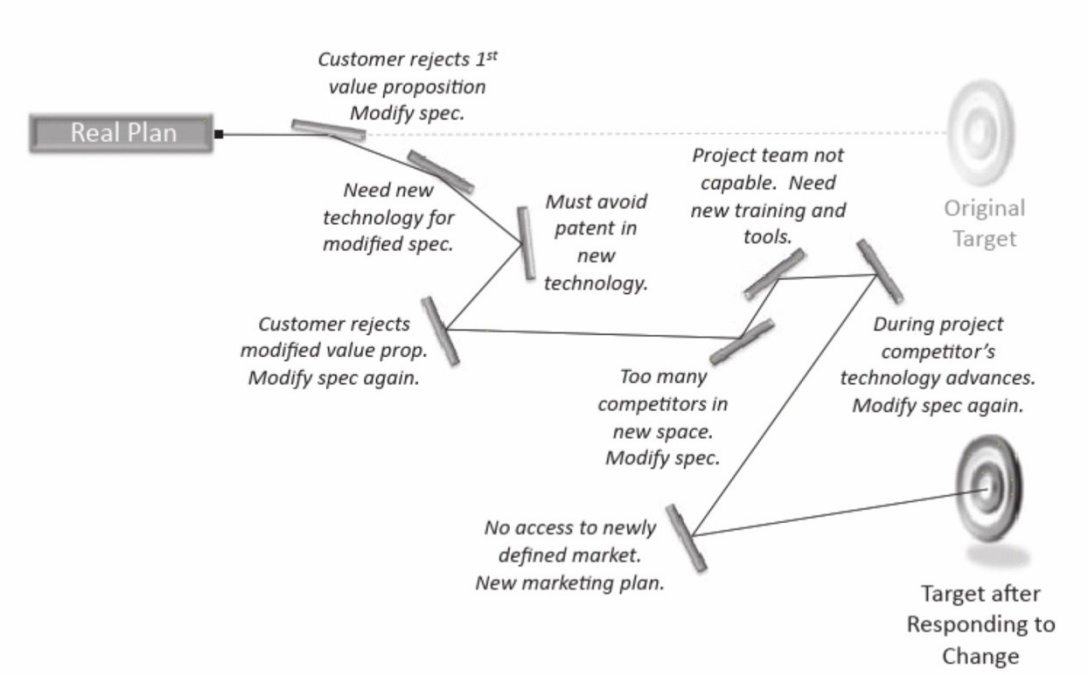
These differences are caused by the more complex nature of product development projects that exist for the purpose of creating something new. This is the reason for the extra need for innovation. The high level of collaboration is due to same reason; even if a single unit will create the actual end-product, input is needed from other teams for decisions of prizing, creating the marketing plan, selling the product to clients and so on. In more complex products, different skills are needed already in the creation of the product. Due to these characteristics and needs of a product development project, these differences must be taken in to account also in the project management. (Ellis, 2016)

Product development projects, like all projects, also include risks. Biggest cause is the amount of unknowns at the project start. Since in product development there are multiple questions to be answered and criterion to be considered, the amount of unknowns can grow notably higher than in other types of projects. Often the success of the project can depend on the project management's ability to respond to changes happening in the project, since often the original plan will face transformation. If changes cannot be reacted efficiently and resources are used in vain, this affects the overall cost and duration of the whole project. This, in addition to other reasons mentioned earlier, is the reason for the great importance of working and efficient project management in product development projects. (Ellis, 2016)



Picture 9 "Laser" plan (Ellis, 2016)

Picture 9 presents the ideal "laser" plan where the project runs smoothly from the start to the end as planned without any changes happening in the middle. This is how projects are often planned and pictured to happen, not taking in to the reality and different changes happening there as presented in the next picture.



Picture 10 Real plan (Ellis, 2016)

As seen in Picture 10, the original plan is often notably clearer than what the reality proves to be. In reality, target is typically reached when the changes happening are being responded to successfully. Issues happening during the project can be caused by all kinds of reasons; the project team is not able to provide the targeted product with all planned

features, there are too many competitors in the market or the marketing plan needs to be created again.

The basic principles of risk management in product development projects are:

- Preparation
    - Avoidance of as many risks as practical with selecting the right team, using the right processes and planning the project thoroughly.
- Responding
    - Dealing with the risks and issues that do occur after the project starts with identifying the unknown risks and issues and tracking them during the project, reacting to risks that affect the project goals and reporting the exposure of risks to project management and sponsor.

Careful planning will help to reduce the impact of risks. In addition, preparing for appearing changes and problem situation when creating the timetable for the product development projects helps to keep the project on track in these situations. This is true for all types of projects, but is especially vital for product development projects due to their complex nature of them. (Ellis, 2016)

3 CASE STUDY

Background for the study is the case company's wish to take a look at conducted product development projects in order to have a better understanding how projects could be done more efficiently and create working procedures for them.

From the four project lifecycle phases by Mäntyneva (2016) presented in the literature review, the case study focuses on the project ending. This phase is to be done in a diligent manner, as one of the goals of the final reporting at the end of a project is to highlight the development points of the project and specify the things that should be done differently in the future. This promotes learning and helps future projects. When a thorough project ending is conducted, future projects will consume less recourses in vain. A lessons learned is one function that can be used in project ending or even after the project has ended, targeting these results. Despite the study itself locates to the last phase of the project, when conducting the research all phases must be taken into consideration.

The case company this lessons learned study is conducted for is an international company that wishes to stay anonymous. For this reason, all detailed data is cleared from the thesis work. Main contact persons from the case company were the CBO of the company, a sponsor for the target project and the Business Development Manager of the company, acting as the Project Manager (PM) for the project.

At the start of the case study, several discussions were held with the contact persons about the need for the study. It was noted in the company that improvement on product development projects is needed, since there is no a finalized structure on how to conduct such projects. The study was performed so that the experiences of project done could be used gain improvement ideas for the future.

The case project to which the lessons learned study is conducted of is a product development project the case company conducted in 2020. The end product of the project was a new service provided to clients.

The research method was qualitative research, conducted with a semi-structured interview among the project participants. The information collected was then analyzed and thereon summarized to improvement suggestion for the case company and to answer the research questions. The results of the study and the improvement recommendations are presented and discussed in chapter four.

3.1 Product development projects in the company and goal of the study

The case company has not conducted a large scale product development projects in a long time, resulting to a situation where there is no ready-made structure for such projects. The company has good expertise in conducting projects otherwise, like large scale IT projects, so the only project work area in need of improvement is the product development.

The goal for this study is to find out the experiences of the project team and from those determine what is done correctly and what aspects should be improved for future product development projects. The end goal is to deliver the case company concrete practical improvement recommendations to be used in future product development project work. The research questions (RQ) for the study are:

RQ1: Can we learn from previous projects and use the information for future?
RQ2: How can the case company improve its ways of conducting product development projects?

All aspects of the study and research methodologies selected were targeted to not only to provide concrete improvement suggestions for the company but also to give answers to these research questions.

3.2 Research method

To find the answers to the research questions, the research methods were chosen so that as much of experiences and lessons learned could be collected from those who took part in the case project. In this chapter is presented the research method used and the reasons for choosing it. The process of lessons-learned is covered, presenting the nature of it and how the process in the company will proceed after this research. The interview method is also discussed, presenting how the actual study was conducted in the company and reasons for choosing this mode of research interview. All selections related to the research method were done targeting to gain sufficient material and analyze for the case company as well as answering the research questions. In addition, all methods chosen promoted good discussion among the participants. The goal was to have as much of conversation as possible, and to bring out experiences and thought from the participants, not beforehand anticipated by the researcher.

3.2.1 Qualitative research method

The research method used in this study is qualitative research method. Hammaberg, Kirkman and Lacey (2016) describes the use of qualitative methods as a “way to answer questions about experience, meaning and perspective, most often from the standpoint of the participant.” Data with this kind of nature is usually not amenable to counting or measuring that would be required in quantitative research method that processes different kind of data.

According to Hammaberg et al. 2016, typical and most commonly used qualitative research techniques include for example:

- Small-group discussions
    - For investigating beliefs, attitudes and concepts of normative behavior.
- Semi-structured interviews
    - To seek views on a focused topic or, with key informants, for background information or an institutional perspective.
- In-depth interviews
    - To understand a condition, experience, or event from a personal perspective.
- Analysis of texts and documents
    - Documents such as government reports, media articles, websites or diaries, to learn about distributed or private knowledge.

The technique used in this study is a semi-structured interview in order to raise as much discussion on the experiences as possible to have all data required for the lessons learned study and analyze.

Choosing the right research method has to take in to consideration the purpose of the study and the nature of the information and data collected with the research. With this criteria in mind, qualitative method was chosen to be used in the case research due to the nature of the study. Qualitative research method can be used for example to reveal potential problems and collect experiences, and this was the target in the case company's study. The collected information from the research did not include any numerical data to be counted or measured, but the experiences from the case product development project work. This information was then analyzed and formed in to improvement suggestions.

3.2.2 Lessons learned -process

The research process in the case company's study was conducted via a lessons learned study. Lessons learned is a term that has some fuzziness around it, but the goal in this study is to promote good delivery of value through effective learning in an organization.

Learning in an organization can happen in various ways. Different authors and researchers might have slightly different ways of describing this learning process. However, altogether all definitions target the same goal. Milton (2010) describes the process as follows: "a lessons learned is a change in personal or organizational behavior, as a result of learning from experience".

In addition, he presents that this learning process can be divided to three steps forming the learning loop of lessons learned:

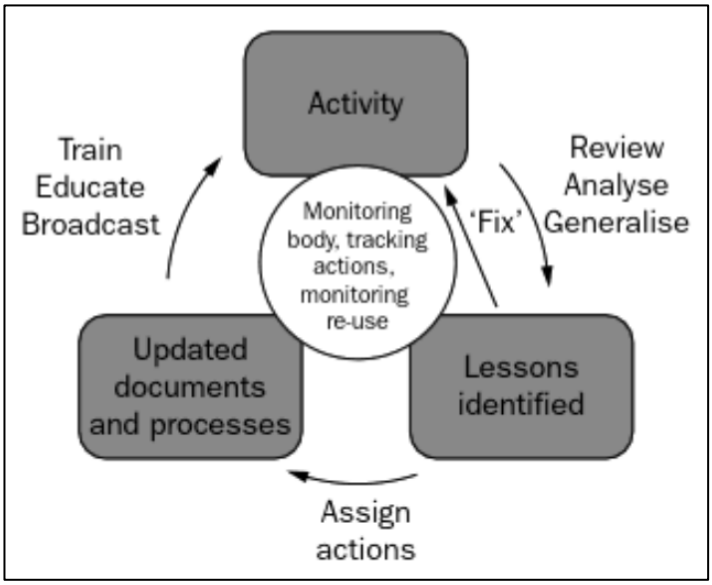
1. Identifying lessons
   - A project or an event is looked back. Activities and tasks are identified where there was a difference between what was planned and what actually happened, positive or negative. The root causes behind happenings are analyzed and the lessons identified.

2. Assigning action
   - The identified lessons are accompanied by assigned actions to bring the learning in to practice. Improvement suggestions or positive notes on things to hold on are presented.

3. Implementing the change
   - On this stage the learned information is implemented to the actual work. This often requires training and education to the organization as change does not happen on itself.

In Picture 11 is presented the learning loop and the ongoing nature of learning in an organization. In the case company, lessons learned is a normal process that is done after projects and conducted tasks. The nature of the process is familiar, and the information learned is implemented to use. This research included the identifying of the lessons by analyzation of the study data. From this analyzation, the actions were assigned to the

company to implement to future use. These action assignment are included in the improvement recommendations delivered to the company.



Picture 11 Lessons learned learning loop (Milton, 2010)

Going forward, if the company wants to keep up with the learning loop and implement the assigned actions, it has the responsibility to update its processes to include the new recommendations and actions as well as train employees to change their actions in future product development project work. These actions must also be implemented to project management.

3.2.3 Organizing and conducting the interview

The research was conducted via a semi-structured group interview with the project team, including the project sponsor and the project manager. The selection of interview type was made to support the goal of the research; to identify the lessons and learn from them by forming the improvement suggestions and remarks for the future. This requires the collection of experiences that are most easily brought up during a conversation.

3.2.3.1 Semi-structured interviews

According to Kathryn, Newcomer, Hatry and Wholey (2015), semi-structured interviews typically employ various types of questions including a suitable blend of closed-and open-ended questions accompanied by follow-up why or how questions. Semi-structured interviews (often called SSI's) are superbly suited for a number of valuable tasks and despite their labor intensive nature, they bring great insight and information on the studied topic.

Semi-structured interviews differ from formal interviews that follow a rigid format of sets of questions by focusing on specific themes but covering them in a conversational style. Participants of the interview are encouraged to share their thoughts and experiences that form the date collected from the research. The goal is to provide information that was not beforehand anticipated by the researcher but brought up during the interview by the participants. (Oxfam GM, 2012)

Semi-structured interview was chosen to support the research target of collecting experiences from previous product development project work and to identifying the lessons that can be learned from them. The goal of the interview was to gain as much discussion among the participants on the experiences they had. In addition, using semi-structured interview provides information not beforehand anticipated by the researcher and this was the goal.

A questionnaire was used to form the structure of the interview, but the participants were presented with the opportunity to talk about all things that came in to their mind relating the case project work and experiences they had from it. The role of the researcher in a semi-structured interview is to act as leader and ask supporting questions when needed.

3.2.3.2 The interview

In the research interview there were nine participants from the project team. The number of participants presented a good proportion of the whole of the project team, including members from different units with different tasks and responsible areas. From the project management side, the project manager and the project sponsor attended the interview.

All participants had been beforehand provided the interview questionnaire (Annex 1) and the original timetable of the project (Annex 2). The original timetable was shared as a reminder of what was originally the targeted schedule, since there were changes happening later. Participants were asked to review the material beforehand. The goal was to make sure that in the interview itself, the discussion would run as smoothly as possible and the participants were oriented to look at the project from start to ending and share their ideas and experiences so that they have had the chance to think them through first.

The interview questionnaire and questions used in the discussion were decided based on discussions with the contact persons from the company. Questions were presented in a way that would lead the participants to discuss on relevant topics but to leave room and promote good discussion. For example, the questions were presented so that they would not lead the participants to any direction but to raise their own thoughts and experiences.

The questionnaire was divided to sections based on the four project phases by Mäntyneva (2016), presented earlier in the literature review. The four sections are preparation, planning, implementation and ending. Under these sections were discussed relevant aspects and actions of each project phase. This enabled to locate and recognize where the problem situations happened in the project and thus provide more accurate improvement suggestions after the analyzation of the results.

The interview results were collected by recording the interview as a whole and this recording was then transcribed in to literature form. This was done to make sure that the results were not only based on the memory of the researcher but to reliable notes and recorded information. From this basis, the final analyzation was then made.

3.3 Validity and reliability of the research method

Kirk and Miller (1986) describe the reliability and validity in qualitative research as targeting the objectiveness of the study and thus providing reliable results. What needs to be taken in to account is the “naturalness” of the measurement procedure employed. The research method and how the actual study is conducted needs to serve the goal of providing reliable and valid results.

The validity and reliability of the research method was confirmed in various ways. The research method was chosen to meet the requirements and purpose of the study and to collect the information needed. Since the goal from the study to the case company is to identify the learning points and from those to create recommendations, the results collected have to be in a qualitative form.

Group interview was chosen so that the questions would not only create specific answers to specific questions, but to also create discussion among the project participants. This on its own will develop new ideas and viewpoints to things. The questions in the questionnaire used for the purpose of creating structure to the semi-structured interview were created in cooperation with the contact persons of the case company, the sponsor of the project and the project manager. The questionnaire and questions in it worked as a confirmation that the relevant information needed was received and that the discussion in the interview stayed on the topic. The questionnaire was tested before the actual interview with another colleague not part of the project team, to make sure that the structure and questions were understandable and served their purpose.

Majority of the project team members were able to attend the interview. This adds to the validity and reliability of the results gathered and method used since a reliable portion of the team delivered their input to the data. In the interview itself, when needed, extra questions were asked to get thorough arguments on the statements made. This was to reduce the amount of researcher interpretation to minimum. The analyzed results are fully based on the information collected from the participants. Recording and transcribing the discussion in the interview and conducting the analyzation based on these instead of relying on notes made by the researcher was also a control done to minimize the researcher interpretation.

The results of the discussion and interview showed strong reliability since majority of the comments made and issues raised were in line with each other. This is further discussed in the results review in chapter four. The results also proved validity by showing clear linkage and correlation between the issues in the project. The results also showed possible generalization of the issues raised to be related to other processes and operations in the case company too, so the improvement suggestions delivered to the company may be useful in other purposes as well.

4 RESULTS

This chapter presents the results collected from the study. The chapter is divided so that first the analysis and key findings are presented from each project phase in their own section. After that the results are evaluated, following the recommendations to the case company. There were three main founding areas identified from the results and the recommendation are presented accordingly. After thorough presentation of the founding's and recommendations, a market-based validation of the results is done and finally the research questions are answered. In the end of the chapter there is also a discussion section of the results, including follow-up research recommendations to the case company.

The project team was very active in the discussion, presenting their experiences and opinions very clearly. The key findings were relatively easy to detect from the material, since lot of the points made by the team members were similar to each other.

4.1 Analysis and key findings

The analysis of the study was conducted in three sections. First, during the interview the discussion was recorded. Afterwards the recorded material was transcribed to literature form. From the literature transcription was then determined the key words that appeared most in the discussion. Those were for example resource, workload and plan/planning.

The analyzation follows the same structure as used in the interview, the project is divided to four sections based on the Mäntyneva (2016) four projects phases.

4.1.1 Phase 1 – start of the project (preparation)

With the first project phase, the discussion started with the target of the project. The target of the project was clear to the team on a high level accuracy. However, it quickly became clear that the target and scope needed clarifying and the details were not that distinct. As a member of the project team noted, “on high-level I think the product management had a vision and a clear idea but then the devil lies in the details and I think that was one of the issues.“

Already early on in the project, estimations were showing that the IT workload was higher than could be delivered in the given time. This was one of the reasons the targeted end-product had to be re-scoped at a quite an early stage, leaving some planned features behind. A participant noted that “from customer perspective, the goal was broader than the end-result".

After the early changes, once the actual project execution started, the workload and timetable were more or less in control according to participant. The situation on the markets due to Covid-19 was unclear, which also affected the sense clearness in the beginning of the project. This was something that could not be helped from inside the organization and room was left on purpose for the changes happening in the business area due to the pandemic. “It was unclear on purpose”, as one participant noted.

The start of the project and aspects relating to it raised a lot of discussion. In addition to changes in the end-product and lack of clearness with the details, the original estimation of workload and the timetable for the project was not considered realistic. The main problem causing the problems with the scheduling was the lack of resources in the company in general, not only in the project team.

Like stated earlier, this was one the most mentioned single point appearing in the interview 22 times. In the project there was external resources used, but the shortage of people in different units caused problems. There were many things in which input was

needed from other units, and when that did not happen on the schedule needed, it caused problems. It was stated that this was not understood early enough or planned sufficiently.

Reasons for the original estimations of the workload not being realistic was mainly due to the lack of understanding of the amount of business workload with the emphasize being too much on the IT delivery. The PM stated: “I feel that as a project manager, I did not have enough time for estimating the needed workload on business side and we just needed to go on with all those tasks.” This aspect is being discussed further on the planning phase as it was related to many problems.

The project budget caused similar comments; the budget was realistic when it came to the IT delivery of the project. However, the estimation process of total workload could be improved. The project sponsor noted that “the emphasis was very much on securing the external budget and the IT delivery. -- Same amount should have been spent on the internal work as well”.

Comments relating to what could have been done differently in the beginning of the project, suggestion about focusing more to all the work that is needed for the project to be delivered, rather than looking at the IT and external costs that much. The PM also mentioned difficulties with using some new tooling, which has been getting easier since. As a proposition on the recourses, one member suggested getting a firm commitment from other units on their input and promised time on the project in tasks needed from them.

Use of external help and expertise was considered to be useful, but in the beginning it caused a lot of work for the PM with onboarding and different processes and issues relating to it.

4.1.2 Phase 2 – Planning

Planning of the work was the other point considered to be the major affecting factor in the project and issues in it, mentioned in the interview also 22 times. Issues and comments related to planning were also linked with other factors in the project and were discussed in other phases as well.

The PM noted that in the project it was used an opportunity sheet and project approval memo instead of a specific project plan document. The project participants did not feel the lack of specific project plan had a negative effect on the project work and documentation was felt to be sufficient. The PM noted that “we had the resource planning document, we identified the resources and their roles and roughly estimated workload but I agree that this was not enough”.

The main problem with the planning was again that too much emphasis was put to the IT delivery and several other tasks and the workload they caused were not taken in to consideration enough. As point for this, a member of the team noted that “there were tasks surfacing only later, --- of course it would have been helpful if we had been aware of all those things in the beginning and been able to kind of find out the resourcing for all those thing instead of taking them as they come basically”. This was also mentioned in the first phase as well.

The understanding of roles of each member in the project was clear and did not raise much discussion. Referring to the amount of workload not prepared for, the project sponsor stated that “I felt that maybe the rest in the project team went beyond their roles trying to secure that the project gets delivered and will be launched in the timeline that we had so we were not restricted by the roles and people we committed in making sure we get this launched”. Question about clear instructions did not receive much comments either. One participant mentioned the 15 (often more) minute meetings held by the PM every morning where list of tasks were discussed together as a good and

helpful tool to understand what is to be done and what has been done. The overall feeling was that once the targeted goal was clear, everyone were aware what was expected from them.

4.1.3 Phase 3 – Implementation

In the implementation phase, the discussion started with the topic of biggest surprises during the project. The participants agreed that the biggest surprise was the amount of uncertainty in the project, caused by the problems in for example lack of recourses and surprisingly big amount of workload. Another thing a participant mentioned was the effect the other ongoing projects in the company caused to this project. The original planned time table was strict and there was no room for the surprising tasks that appeared. This forced the project participants to bend and be very flexible in many cases. The situation with Covid-19 was also a cause for uncertainty, with temporary laws and unclear client needs.

The problems with the lack of overall workload estimations on all tasks (not only IT related) and lack of resources not taken into consideration in the beginning of the project appeared as negative surprises and problems during the implementation phase. It was stated that the estimated resources and estimates of the project (timetable, workload, budget) did not correspond with the reality because “there were many things that were kind of popping up later in the project so obviously those were something that did not correspond with the reality in the beginning of the project so those had to be tackled then somehow during the project” as stated by one team member.

What become very clear in the discussion was that despite all the problems and changing situations, the cooperation and communication in the project team worked very well. The project sponsor stated that the participants were “really working outside their boundaries and finding solutions and doing things not normally part of their job description at all to get the product launched”. The PM also received several thanks from

the team. Even if the project was fully conducted with remote working, the effect on the work was not major. Rest of project management received thanks also from the PM, who noted that “the management support from the steering group side was very good and when I escalated something they responded immediately and we managed to solve the issues very quickly”.

When discussing the communication, there were some problems with having a good cooperation with other units in the company. Like stated earlier, input for this project was needed when it came to for example agreements or testing. The lack of resources and other ongoing projects in these units delayed the needed input which then affected the projects scheduling. The feeling was that with some teams the cooperation was more challenging than with others.

In the project implementation, an external service designer was used. It was agreed that the input from this person was crucial and that the help received with business requirements was much needed. It was noted that in the future, more documentation on onboarding an external expert would make the process more easier.

4.1.4 Phase 4 – Ending

In discussion about the ending of the project, it was asked was the outcome of the project what was expected. Like it was mentioned right in the beginning, some aspects of the product had to be de-scoped since they were not possible to include in this time frame. The project sponsor stated “we didn’t have enough resources to go through the process of learning and understanding everything related to the descoped feature ourselves”.

It was agreed that the decision of rescoping the features of the product had to be made but it has had its effect; “our clients are looking for a provider that provides them a full package including the features we don’t”. One member of the team summarized this: “I

think maybe we sought the moon from the sky at the beginning. But anyway I have to say that the minimum wishes were fulfilled".

Even though the resulting end-product was not completely what originally designed, the customer perspective was strongly included in the project work. One member stated that "the communication to our customers was continuing". It was agreed that a lot of time was spent on securing the understanding of what is the service portfolio that should be in place from customer's side. There were even some last minute changes made based on client feedback. The things that caused struggle with clients were due to internal causes; for example the client agreements and pricing decisions and their scheduling. It was noted that "the pricing decision was made too late which resulted clients switching to competitors. This is something we must change in the future".

4.1.5 Additional comments

In the end of the interview, when all four phases were discussed, there was specific room reserved for additional comments and free speech. The project sponsor started by noting that "in the future structure and more time and preplanning is needed because I think that this project was successful due to the dedication that people had but in the next round I think we really want to do things differently". Individual things like starting earlier, reserving enough time and reserving the right resources both budget and people vise to do the work were mentioned. All of these came up earlier in the discussion as well. The project was described as a "roller-coaster" twice, to describe the appearing surprises and ups and downs in the project.

All in all, in the end discussion the themes and appearing factors were the same ones discussed in all project phases; lack of overall planning and understanding of all workload, lack of recourses in several units. One new aspect that appeared in the additional comments was the mention about moving towards the Agile practices and

project models with Epic features and so on. This was considered positive but onboarding new competences takes time and is not very easy, as one member stated. This move towards the use of Agile Scrum and Kanban serves as a link to the literature review and theoretical part of the thesis work.

4.2 Evaluation of the results

The collected information, remarks and improvement suggestions from the project team were in line and agreed on among the team members. All members taking part listed similar remarks. Most of the problems in the project where caused by lack of estimation on all workload and focusing too much on the IT delivery.

In the team, there was not a good overall idea on all tasks needed to take care of in the beginning, so the time and other recourses needed were not taken in to consideration. This then lead to surprise tasks surfacing throughout the project, forcing people to do more work than was originally supposed to. Since all members of the team were willing to be flexible and step outside their normal work tasks, the project did reach its goal in the given time. With more understanding on the actual workload in the beginning already, more realistic planning could have been done to avoid these issues.

Resourcing in the project team but also in other units in the company is another main concern affecting the project work. It was known that input from other units was needed, but the situation in these units in terms of recourses available for the needed tasks was not confirmed beforehand. This caused problems with the scheduling, when tasks were delayed due to this issue. At the same time, there was other projects going on in the company, having also an effect on the project work. This was not prepared for.

The lack of clear overall estimations and recourses traced back to what was generally considered to be the most surprising thing in the project: the amount of uncertainty. Uncertainty was also added with the ongoing Covid-19 situation. Like one project

member noted: “The Covid-19 situation continued and varied in different countries and it became clear that the situation will remain but still the clients didn’t know what they needed”.

The targeted end-product was also not realistic in terms of what could actually be achieved. The original goal features of the service had to be de-scoped.

On the positive remarks made in the study, the communication and cooperation in the project team collected several mentions. In the interviews, participants also thanked each other on many occasions, which shows a good spirit in the team. Willingness to be flexible and do everything that is to be done in order to achieve the goal was the spirit of the team. Even the expectational situation of working completely remotely did not have a major effect on the work in the team. Perception of what is expected from participants was on a good level, and project management worked well. Special mention and positive comments was shared on the short daily morning meetings hosted by the PM. This was considered very effective and helpful. One project participant summarizes this well by thanking the PM for the atmosphere in the meetings. “Even though things were hard”.

Maintaining good client connections and ongoing communication is also an area where positive comments were made. Client wishes were listened to and changes made based on the feedback received. Even if some de-scoping had to be done, the spirit in the project was to create a product that really serves the need of the clients. It was however noted that at times, the internal problems did show to the client side for example with late pricing decisions and client agreements.

4.3 Recommendations to the company

Based on the results gained from the study, the most important improvement areas for the company concern overall workload estimations and resources. To tackle these

difficulties, more focus on early planning and thorough estimations should be done. Here presented the improvement recommendations to the company in three sections: early estimations and planning, monitoring of the progress during implementation and holding on to good practices. The main reasons for the problems in the project were related to each other, so as a corrective solutions adding more structure to these will create a big difference to the overall work.

4.3.1 Early estimations and planning

In the beginning of the project, the PM together with the project team should make clear planning on what is the targeted goal of the project and what are all the task areas needed to reach the goal. This would increase to the much needed structure that appeared in the experiences of the case project participants. The timetable for the project is to be designed so that, when possible, there is some slack for the surprises that may appear. As the planning and estimations are already in place for the IT delivery and securing the external budget, more emphasis need to put in the internal work as well. This preplanning should also take in to consideration and list all the input that is needed for the other units in the company as they play a role to the project plan and time table as well. In addition, other major projects ongoing in the company at the same time that may require the same resources should be listed.

Hand in hand with the structured planning, the amount of resources needed for conducting the tasks should be estimated carefully. With these estimations, other units that input is needed from should also be included. When the preplanning and estimations on the tasks are done, these other units should be notified on the upcoming tasks and the rough estimations on the workload needed from then including the schedule. In short: what and when. This notification should include a confirmation request on the resources from each unit so possible shortages affecting the project work can be detected early on and planning adjusted accordingly.

The targeted idea on the planning would be to determine the goal and the tasks required to achieve this goal. After this the tasks are to be divided to sections, first to big and rough ones then becoming more accurate as details turn more clear. These tasks create a complete big picture on all sections of the project work. It is recommended to implement the Agile Scrum project management for the case company's product development project work. These divided tasks can be used in the Scrum model during the implementation phase, as presented in section of "monitoring of the progress during implementation".

4.3.1.1 Project Task Estimation Form

As a tool to be used in the preplanning and start of the project and helping the company to implement the suggestions is the Project Task Estimation Form (Appendix 3). The form is used to create more structure needed to the preparation phase, and to increase the realistic and even estimations on tasks and task areas. Since the form is to be used in the preplanning and preparation phase of the project, the tasks and task areas are to be listed only on high-level accuracy. Later when the project proceeds to the planning phase, more accurate and detailed action plans are already used in the case company project work.

In the form, the project has been divided to the four phases and for each phase, it is to be stated as follows:

- Task/task area
    - Here named on a high level the tasks or task areas known to include in the project. Task areas can later be defined when project proceeds to planning phase.
- Timing
    - Here presented the timing of each tasks or tasks areas. Timing is stated on the accuracy level known at this stage (for example; 3/2021, H1/2022, Q4/2021).

- Workload estimation (per hours)
    - Here to be estimated the workload of the task or task area per hours.
- Resource need
    - Here named the persons or units where input is needed from to conduct the stated tasks. Important is to also state the input needed from other units in addition to the actual project team.
- Other comments
    - Other remarks or comments can be stated here.

By using the form as a support tool in the preplanning, all task areas and the required workload that goes in to conducting them is considered and taken to account early on. When the tasks requiring input from individuals from different units not part of the actual project team are also filled to the form, these tasks are recognized already in the beginning of the project and enough time can be reserved as well as notifications sent to these units to give heads-up and receive confirmation on their input.

4.3.2 Monitoring of the progress during implementation

During the actual project work, the PM will monitor that all task areas will progress on the same level and that possible surprising tasks are noticed as early as possible so they can be reacted on and so minimizing the effects on the project work and schedule.

As a tool for the monitoring the tasks, the Agile Scrum can be used. Scrum would fit to the needs of the company's product development projects as it would provide structure to the project teams work working as a continuum to the planning. When the project work is divided into sprints and in the beginning of each sprint is presented what tasks are planned to be conducted during it, it is more practical to monitor that tasks from all areas receive enough attention and recognition. For example, if sprints would be filled mainly on tasks related to the IT delivery, assessment on the prisonization can be done to make sure that the resources are also used to other tasks.

One aspect of monitoring the progress is the ongoing communication among the project participants and from the project management side. Since this was already on a good level in the case company, this is further discussed in the next chapter.

4.3.3 Holding on to good practices

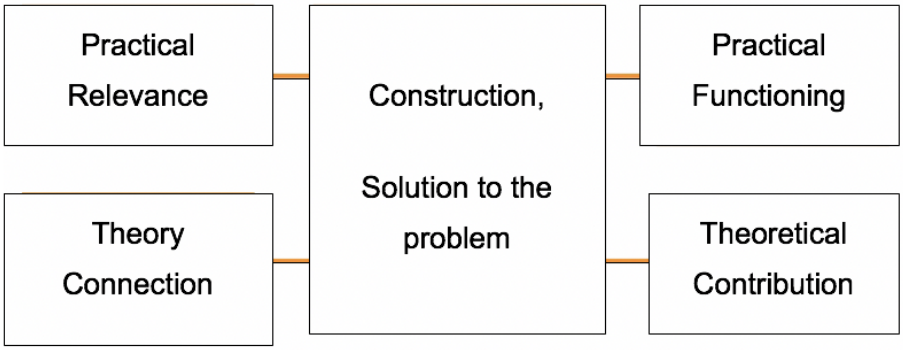
As shown in this research, there are already good practices in the product development project work. These should be maintained and focused on. Daily morning meetings varying from 15-30 minutes depending on the situation are proven to help the project members in keeping up with tasks and what is expected from everybody. Especially during the remote working period, all actions that have an increasing effect on the communication level are highly important. In the meetings, it is recommended to use the Kanban board as a tool to help the project team to visualize all ongoing tasks. This also supports the monitoring process discussed earlier. In Agile Scrum, one of the most important feature is the daily meetings called Daily Scrums so moving towards using this method would fit the already existing customs in this area well.

Client communication and participating the client in to the project is also at a good level in the case project team work. Since clients are ultimately the ones deciding whether the end-product is what it should be, their wishes and feedback is important to take in to consideration. Like done already in the studied project, when feedback is gotten from the clients it should be put to action and conduct the necessary changes.

What makes all work also, and perhaps especially, in difficult situations pleasant and effective is the approachable and skilled project management. From the results of the study on the project it was clearly shown that this is something already done good, from the PM and Steering Committee side. This should be maintained at the same level in the future as well.

4.4 Marked-based validation of results

Kasanen, Lukka and Siitonen (1993) present the concept of constructive approach as managerial problem solving method through the construction of models, diagrams, plans, organizations and so on where the construction works as a solution to a problem. However, the practical functioning of a construction is not always working since complex organizational processes can be resistant to change and other real-life challenges may occur. For this reason, a construction that is considered adequate in technical terms and in theory, may not necessary work in practice. This dilemma is what the constructive approach has been created for. The constructive research take to consideration not only the theory connection and theoretical contribution but the practical relevance and functioning of the constructions created as a solution to a practical problem in an organization.



Picture 12 Elements of Constructive Research

In Picture 12 is described the elements of constructive research where construction, the solution to the presented problem, is in the middle and attached to it are the other elements of the research. These elements include both theoretical and practical aspects.

A construction is a solution to a real problem of an organization. Construction are tested on the basis of how they work to solve the problem created for. The actual usefulness of a construction is not proven before it has passed a practical test. This is why the primary

criterion to assess the results of a study is its practical usefulness. Therefore the relevance, simplicity and easiness of operation of the results are the issues to be discussed. Here, the tool to be used is the marked-based validation that reviews the pragmatic adequacy of a construction. (Kasanen;Lukka;& Siitonen, 1993)

The results of the marked-based validation are:

- Weak market test.
- Semi-strong market test.
- Strong market test.

A weak market test shows that the organization whose problem the research was conducted to solve has accepted the solution and will use the construction in its future operations in one or more teams or functions. A strong market test means that in the case organization there has been proven financial or operational benefits with the use of the construction created from the research. A semi-strong market test is in the middle, showing that the construction has been widely taken in to use in the company but not necessary proven as strong positive effect as in the strong market test. Noteworthy is that often the operational benefits are not easy to be proven useful and highly beneficial and that even the weak market test is considered to prove that the construction works in practice and is useful. (Kasanen;Lukka;& Siitonen, 1993)

For the case company, the problem needed a solution for was the second research question; how can the case company improve its ways of conducting product development projects? The construction answering to the problems was the collection of improvement suggestions presented the company to work as guidelines for future product development projects. The Project Task Estimation Form was also added to bring more concrete and practical aspect to the results, providing the missed structure for future product development project planning. When presented the results to the company, they were accepted and agreed on to be useful and serving the purpose created for.

The construction from the research done passed the weak market test. The results were accepted by the contact persons and the construction, the improvement suggestions, will be implemented to product development project work in the company to bring operational benefits. The construction may not bring major benefits or be widely used in the organization, but is considered to be useful.

4.5 Answers to the research questions

In addition to the improvement suggestion for the case company, the goal of the whole work is also to give an answer to the research questions presented in the beginning of the thesis. These were:

RQ1: Can we learn from previous projects and use the information for future?
RQ2: How can the case company improve its ways of conducting product development projects?

As for the RQ1 the short answer is the famous yes, we can. As presented in the work, ending a project is an excellent chance to determine the factors for success in the future. For example, by conducting lessons-learned studies or collecting participant experiences otherwise, important knowledge is gained on what worked well and what caused issues and how these issues were reacted to. When the information is not only collected but also analyzed and documented for future use, it is available when the next project starts. In time, experiences create the best practices that save lot of time and recourses in a company, making product development project work as efficient as possible. If the need for change is not recognized and noticed, no improvement happens. Learning is a process that starts with identifying the lack of knowledge. Next step from learning is to change the lessons in to actions, this is done with education and training and must include all participants in an organization to work.

The second research question is thoroughly answered in the recommendations to the case company. In short, the case company can improve its ways of conducting product development projects by notifying and taking care the issues brought up during the case project work and the study of the experiences, focusing on the aspects that already are in place and continuing to do lessons-learned studies and paying attention on the possible needs for improvement.

4.6 Discussion

The case study collected information on a product development project conducted in the case company. The targeted result was to provide the company improvement suggestion to be used in future projects, based on the experiences gained from the case project.

During the research, close connection to the case company was held with several meetings with the main contact persons to ensure all needed basic information and understanding of the study and the case project was taken to consideration. From the wishes and set goal, a semi-structured interview was held with a questionnaire and structure based on different project phases.

From the conducted case study, the collected data was analyzed and then formed in to improvement suggestions for the company to use in the future. Three main founding areas formed the suggestion structure. In addition, to help the preplanning in the company was created form to be used as a tool. This tool was to give the needed planning structure that based on the study results was at the moment lacking. Proposals about suitable project management methods were also included to add even more structure for forthcoming projects.

Follow-up studies in the case company could be done on the implementation of the improvement suggestions from this research. Were they implemented on a sufficient level and how did they improve the actual project work. In addition, studies relating not only project work but other topics emerging from this case study would be beneficial to conduct. As an example, study on how to improve communication among different units to make cooperation more effective and practical or the ways to improve and ease the onboarding process of external experts.

Additional follow-up research in the company could also be done from the market-based validation. The construction, the improvement suggestions for the company, passed the weak market test with the acceptance of the results and their implementation to the company's product development project work. After two to three years, the test can be conducted again to see how the construction has worked in the company as a long-term solution to the problem and will the result be different.

With the research of the thesis, all targeted goals were able to be filled. The case company received the improvement suggestions needed and the research questions were thoroughly answered to. The case project task estimation form was also created to bring even more practical support for the company.

5 CONCLUSION

Product development project work and how to ensure project management is on a sufficient level is an area of constant interest and target for discussion and studies. As projects play an important role in modern work life, also in product development, paying attention to how they are conducted an save a lot of recourses in a company.

In this thesis work was first presented project management and its defined characteristics. Product development projects were discussed in their own chapter to gain an understanding of the special features related to them. After gaining the basic information on projects, project management and product development projects, different project management methods were studied. The literature review section presented also the four different project phases by Mäntyneva. This was used as a structure tool for the case research.

From project work and project management methods, various studies from different angles have been made for years. Possible topics for further research would be for example:

- How the change of project management method affects the work in a company, for example from Waterfall to Agile?
- When implementing new project management method, how to conduct an initialization so that the change will go as smoothly as possible?
- What are the risks in adapting a new project management method and how to minimize their affect?

The research done for the case company produces the needed outcomes to be used in the company in future product development projects. In addition to this, the research questions presented were thoroughly answered to. The literature review presented a good theoretical framework from which the research results were reviewed.

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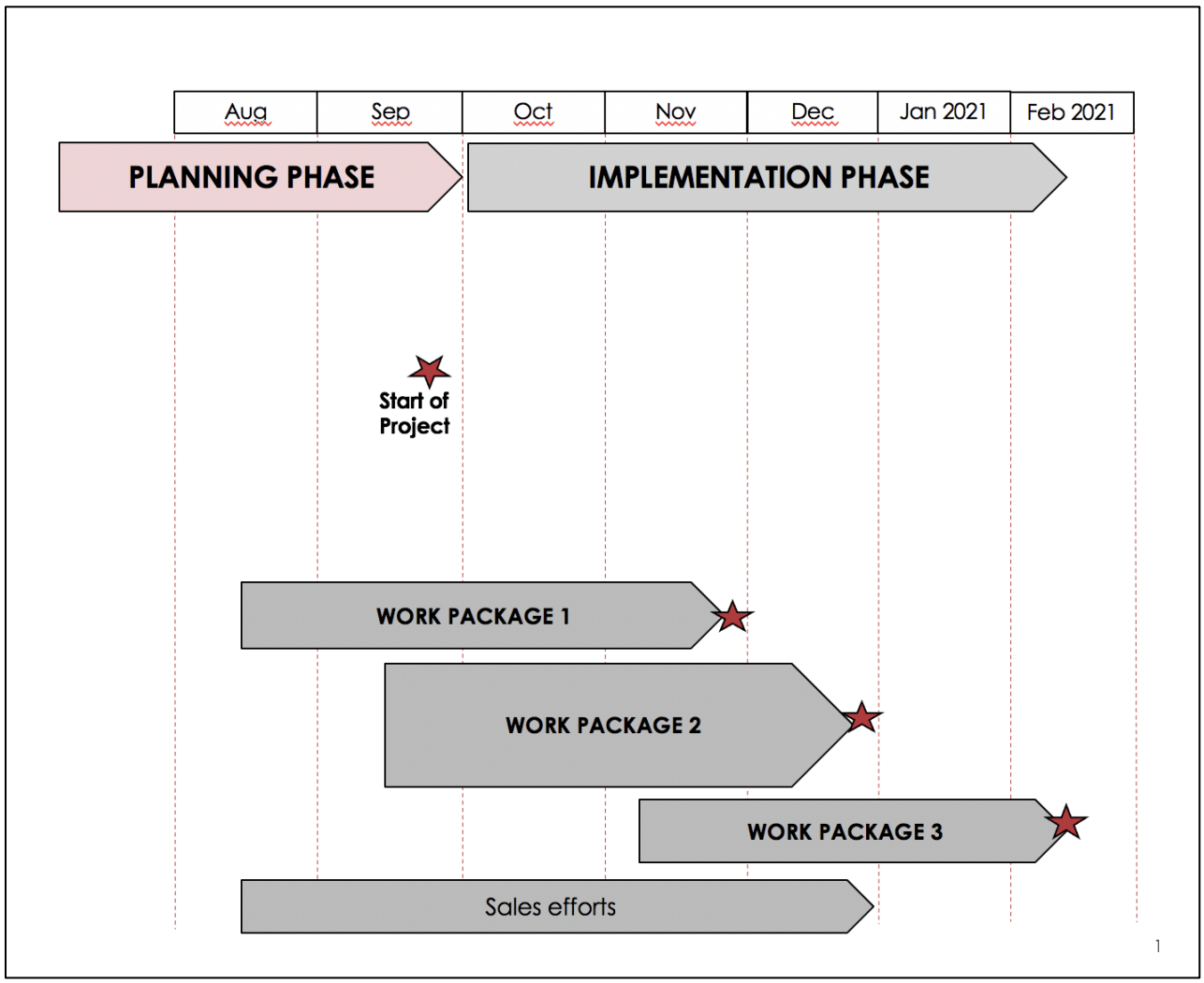
APPENDIXES

Appendix 1. Original Project Timetable



Appendix 2. Interview Questionnaire

Group Interview

Start of the project

- Was the project goal/targeted end product clear at the start of the product?
- Were the estimated workload and timetable for the project realistic and in line?
- Was the project budget realistic?

Project planning

- Was the project planning clear?
- Did all participants have a clear understanding as to their role in the project?
- Did you receive a clear and thorough instruction to your duties?

Project implementation

- What were the biggest surprises ?
- Did the estimated resources and estimates of the project (timetable, workload, budget) correspond with the reality / if not, why?
- Did the project proceed in line with the plans?
- Was the project management efficient?
- Did the communication in the project work well (among participants, from project manager to the team etc.) / If not, why?
- Did the cooperation with other departments work well?
- How was using external service designer for the project?

Ending the project

- Was the outcome of the project what was expected / if not, why?
- Was the customer perspective included in different project phases ?

Additional comments

Appendix 2. Project Task Estimation Form

Project Task Estimation Form					
	Task/Task area	Timing	Workload estimation (per hours)	Resource need	Other comments
Preparation					
Planning					
Implementation					
Ending					