Haaga-Helia
ammattikorkeakoulu Oy

Product development governance with value centric practices

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Master's Thesis
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Abstract

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Ohjaaja
Pekka Kamaja

Tämän opinnäytetyön tarkoitus on tutkia kuinka tuotekehitysprosessin hallintaa voisi parantaa kehittämällä standardointeja ja validointeja. Kuinka tuotekehitys ja portfolionhallinta voisivat tukea toisiaan ja tuottaa arvoa hyödyntäen parhaita käytäntöjä Elisa OYJ:n yritysasiakasyksikössä. Tällä tutkimuksella on tarkoitus identifioida kuinka prosessit voivat parantaa tuotteiden tuottavuutta, ja mitä parannuksia tulisi tehdä jotta saavutettaisi liiketoiminnan tavoitteet ja tuoda arvoa organisaatiolle. Tämä opinnäytetyö tuottaa myös ehdotuksia tuotekehitysprosessin parantamiseksi. Mitä arvoa tuotekehitysprosessi tuo portfolionhallinnalle, ja kuinka portfolionhallinta voi tukea tuotekehitysprosessia? Organisaatiossa on käytössä standardoidut käytännöt, mutta käytännöt vaihtelevat ja eivät aina tue ketterää kehitystä ja Lean-ajattelua. Parhaat käytännöt ovat parhaita ainoastaan silloin kun ne tuottavat arvoa. Tästä syystä organisaatiossa koetaan tärkeäksi prosessien kehittäminen jotta saataisi enemmän tehokkuutta ja lean-prosesseja sekä standardeja liiketoiminnan hyödyn kasvattamiseksi. Portfolionhallinta linjaa strategiset tavoitteet konkreettiseen tuotekehitysprosessiin.
Tämän tutkimuksen teoreettinen viitekehys kokoaa yhteen konseptit liittyen tuotekehitykseen, tuotehallintaan, prosessikäytäntöihin ja niihin liittyvään kirjallisuuteen. Tämä tutkimus tuottaa hyötyä Elisa OYJ:n tuotehallinta- sekä porftolionhallintaosastoille, jotka nostivat esiin tarpeen menetelmistä joita voitaisi käyttää tuotekehitysprosessin parantamisessa. Tämä tutkimus on julkinen dokumentti poislukien Elisa Oyj:n luottamuksellisia osia.
Tapaustutkimuksen empiirinen osuus toteutettiin Elisa Oyj:n pääkonttorilla Helsingissä huhtikuun ja marraskuun välisenä aikana vuonna 2016.

Asiasanat
Tuotekehitys, prosessit, Lean, jatkuva parantaminen, portfolionhallinta

Abstract

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The aim of this Masters' Thesis is to investigate how product development process governance can be improved by standardization and validation; How product management and portfolio management can support each other and provide value utilizing best practices for Elisa OYJ corporate business department. The purpose of the study is to identify how the processes can improve the profitability of products, and what improvements should be made to achieve the business targets and bring value for the organization. The thesis also provides product development process improvement suggestions.

What value does the product development process bring to portfolio management and how can portfolio management support the product development process? Within organizations standardized practices are used, but the practices vary and are sometimes not supporting lean product development. Best practices are best practices only when they provide value. For this reason, the organization finds it important to improve the processes aiming to bring more efficiency and lean standard practices to create business benefit. Portfolio management aligns strategic targets to concrete product development processes.

The theoretical framework of the thesis compiles the concepts of product development management, development and process practices and related literature.

The beneficiary of the thesis is Elisa OYJ's product and portfolio management line, which established a need for a method that could be used for product development process improvement. The thesis is a public document excluding the confidential parts created for Elisa Oyj. The empirical part of this action study was conducted at Elisa Oyj HQ from April 2016 to November 2016.

Keywords
Product development, process, lean, continuous improvement, portfolio management

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1 Introduction

Process improvement, standardization, change management and agile development have been the key elements on my career path at Elisa Oyj. During my years in the company I have been working in multiple roles related to these, and have learned a lot about the essence of various management disciplines such as process improvement, standardization, change management and agile development. Especially the way how they interact with each other and create combinations have both fascinated and bothered me. This question is interesting and it has motivated me to understand more about it and improve my skills in mastering this area more profoundly.

I would like to start this thesis by thanking the people that encouraged me in this and enabled it. First of all, I thank Sujit Wings from Elisa for the valuable guidance and help, some people just have the skills to see things clear and sharp and help others with vision. I thank my great community of dear friends and colleagues at work, I have the privilege to work with wonderful people. Thank you for motivation, support and understanding. I thank my supervisor Pekka Kamaja from Haaga-Helia for valuable comments and suggestions.

The biggest thanks I owe to my family and close ones. Writing this thesis and spending valuable amount of time studying would never have been possible without the support. Thank you Vesku, Aura, Nuno and mom.

1.1 Background

In the case organization, there has been several projects within the domain of Product stream, which is the umbrella for Product and Portfolio management. Portfolio management and product development improvement project started in 2016 within Elisa Oyj at the corporate unit. It was preceded by earlier projects of product development improvement, product lifecycle management and a business change program which is still ongoing. (Figure 1).

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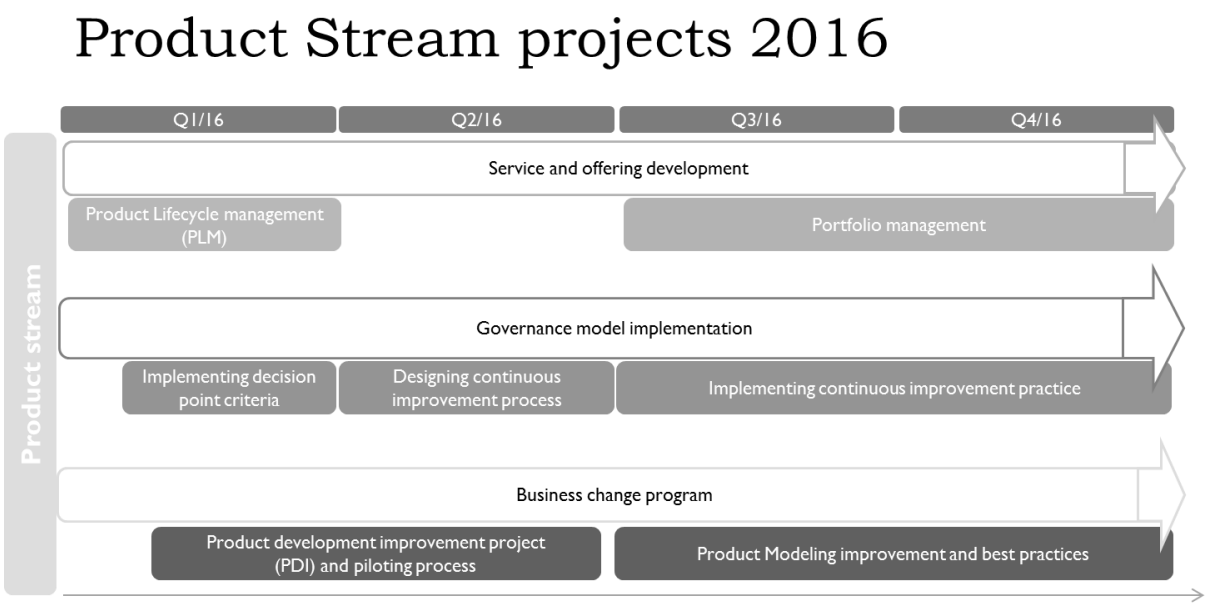

Figure 1: Product stream projects

As a result of the Product Lifecycle management (PLM, in the upmost stream in the figure above), and Product development improvement (PDI, in the lowest stream in the figure above) projects the current state analysis was done, data collected and a study made with suggestions to start piloting a new product development process within the Product development improvement project (PDI, as seen in picture above lowest stream). The suggestion was approved within the Business change program and the Product Stream management for the pilot to be started within the Business change program. This pilot was a continuum to the PDI project and was managed under the bigger Business change program, seen in the figure 1 lowest stream. With this process the target was to pilot more agile way of development and gain results from the pilot. The Portfolio management project (in the upmost stream in figure 1) started after these with close interaction to the Product modelling improvement project (in the figure 1 lowest row). These parallelly ongoing projects were interacting with each other, all managed under the same organizational umbrella and partly sharing the resources. The final outputs of completed stages in one project gave input to the next steps in the other projects.

The aim of all these projects was to improve the product development process for corporate business, to support the business change program and to reduce the time to market with a more efficient, lean and transparent process.

The PDI project results were analyzed to clarify how the product development process can improve the viability of a product by reducing the cost of delay, and what actions should be taken to achieve that. As the result, the current processes of the corporate unit product development process were defined and the needed improvement actions identified, a new product development process was suggested and approved and model created for piloting it in the Business change management program in case organization. The target of the new product development process within the PDI project and the Business change program was to reduce time to market from average 2 weeks to 1-2 days for standard changes, and reduce waste and costs in the product development process.

This thesis was preceded by a research study in one of the courses at Haaga-Helia where the object of the study was the aforementioned projects (Product Development Improvement and Product Lifecycle Management) by the author of this thesis. (Figure 1). The research questions of that study remained still partly unsolved but it helped formulate the research questions for this study. A result of the Product Development Improvement project was a new process for product development to be piloted in the business change program, but since the pilot process was only running for a short time, there were yet not enough results or metrics to be used for statistical measurement or to show improvement. The pilot was not continued due to changes in the organization and resources. Although the pilot process lived for a relatively short while, it gave clear evidence and feedback on how the stakeholders experienced the new process much more transparent, lean, and faster to react and bringing value to business.

Suggestion was to continue with the piloted development process until a sufficient amount of data could be gathered, measured and further analysed. To have usable and comparable metrics to measure the plan's success, it is important to follow the processes and methods in the plan as well as the best practices from the SAFe and Lean Development for the piloting period.

Another suggestion was to enhance the actions in portfolio management. Development funnel management and processing is the key factor to succeed in optimizing capacity usage for development and reducing the cost of delay. To ensure aligned understanding of SAFe portfolio management and lean development, the key stakeholders of the product development processes should be trained to get familiar with the methods.

In the product development area, the case organization has several stakeholders and development processes to handle when starting a new product development. There are different solution areas and contact points, different vendors and coordination. As the result of the previous project outcomes, it was identified that the business organization needed the product development processes to enhance product development throughput and transparency and decrease customization in product development.

This study is a continuation of the earlier research study and concentrates on investigating and adjusting the existing product development model in the case organization to meet the changing needs of the product development process. Product development is one of the core business processes that can be defined in several ways.

When discussing products, it should be stated that there are various views on what a product is, how it differs from a service, and what the relationship between the two is. In this study, a broad definition by Ulrich and Eppinger is used which defines a product as something sold by an organization to its customers (Ulrich and Eppinger 1995: 2). As for product development, we will use the following definition: Product development is the set of activities beginning with the perception of a market opportunity and ending in the production, sale and delivery of a product. (Ulrich and Eppinger 1995: 2)

The need for this research arises from Elisa OYJ corporate business product and portfolio management department. The thesis would support and benefit the organization by producing methods for portfolio management and product development. The described methods could be applied when improving the current portfolio management process and further roadmapping the improvement activities for reaching a target level of confidence.

1.2 Purpose

The purpose of this study is to identify the impact the product development process management and portfolio management have on each other, how they can support each other and how the processes can improve the profitability of the products, what improvements should be done to achieve the targets from the business.

I the organizations Product stream was identified the targets for the improvements based

on the learnings and results of the projects seen in the figure 1. The improvement targets are:

- Optimizing time to market
- More standardized changes and less development/projects needed for productizations by using modular components and standardized processes defined by portfolio management
- Standardized changes to have faster time to market by using modular components and productized processes
- Less development / configuration requests to billing and delivery
- One process, more transparency
- Improved quality
- Better product management and product lifecycle management

1.3 Objectives

The objective of the study is to provide recommendations for the improvements concerning the governance of portfolio management and product development . The objective of the study is to find and suggest methods for validation and standardization for portfolio management in the corporate business unit.

The study aims to clarify how governance of product data, best practices and productization can improve the viability of a product by reducing the cost of delay and time to market, and what actions should be taken to achieve that. The objective is to define the current processes regarding portfolio management and identify the needed improvement actions for the process to become more efficient, lean and transparent. As the result of the study there will be product development process suggestions and a model for implementing it in the organization.

The preceding study was aiming to clarify what kind of impact the product development process has on cost of delay and how can the product development process improve the viability of a product. The results given by the preceding study was that managing the funnel of the development projects and prioritizing them with aligned methods would ensure the focus on the beneficial projects and most likely reduce the cost of delay. But without actual metrics and correct measurement, the exact question could not be answered. Overall, the product development process can ensure the most likely viable products to have shorter throughput and therefore less cost of delay, and process improvements for relevant prioritizing the most viable products could be found in the earliest possible stage.

Methods and tools that could be used in product development process to improve the lead time (time to market) will be analysed further in the development suggestions. The project aims to ensure strategic alignment and profitability of the service portfolio, by grooming the service pipeline and catalogue with more clear roadmaps, Lean start-up and related methodologies, aligning with commercial readiness audit and building more transparency of structures and cost allocations. The research questions of the study are:

- Research Question 1 (RQ1): How can portfolio management benefit from the standardizations in product development process?
- Research Question 2 (RQ2): What is the impact to lead time and development costs if validation of the processes is improved
- Research Question 3 (RQ3): What methods and tools could be used to support standardization and validation in product development process

1.4 Scope

The scope of the study will be on organizations corporate business product development process and portfolio management process. These processes are mainly owned and operated by Commercialization and Target groups department in the Corporate customers' unit as seen in figure 2.

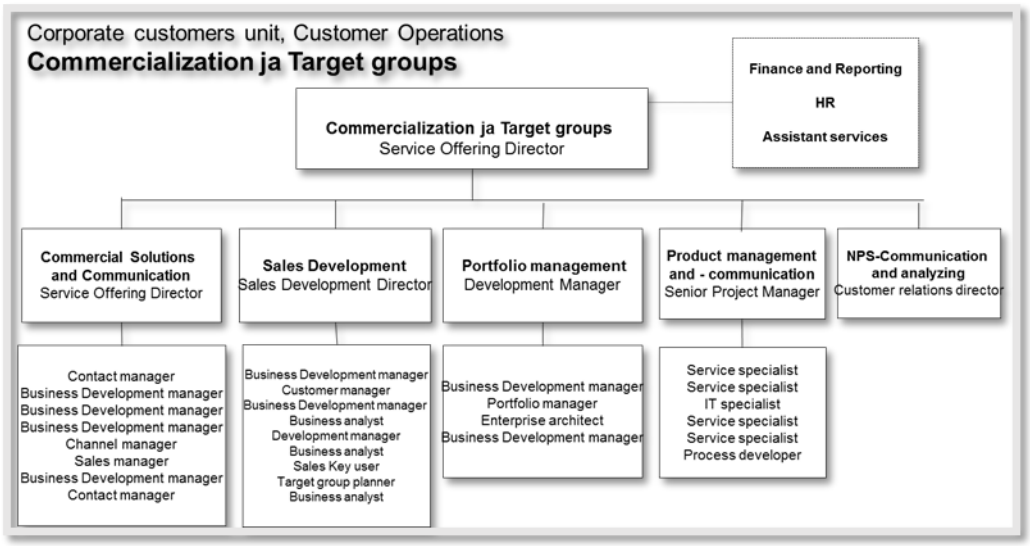

Figure 2. Organization chart

The Customer Operations unit is the key stakeholder for this study but in addition there are stakeholders, such as the related program organization for the business change program and process owners across the different units in the organization.

The main stakeholders of the study are the organization's corporate business department business managers, product data managers, and sales managers, development managers of the related development units in the IT department, who are the main roles in the product development process. Other stakeholders are the related reporting, marketing, finance, customer service, delivery and billing roles as well as the vendors. (Figure 3).

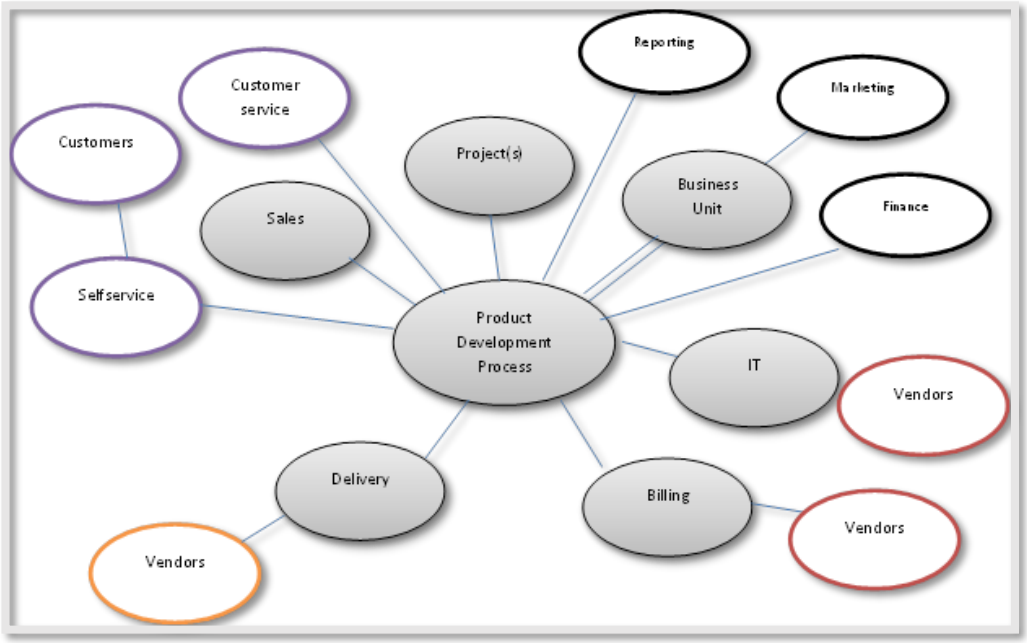

Figure 3. Stakeholders

As seen in the figure 3, there are many connections from Product Development Process to different units and processes within the case organization. The closest connections are to the units that either own, use or benefit from the Product Development Process, such as Sales unit or IT. These units have the management of the vendors and sub-processes which all have their needs and stakeholders concerning e.g. new product development.

This research study consists of 4 sections. First, the introductory chapter explains the background of the study, its purpose and objectives. It introduces the case organization and scope, the research questions and the aim for the study. The second chapter is about the

literature, frameworks and theories used for this study. The third chapter outlines the research methods and strategies, and the data collection plan and tools used in this study. The fourth chapter describes the research progress and results. The results are analyzed and the future improvement actions suggested. In the final part of this chapter the research process is discussed.

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2 Theoretical Study

I have considered the following areas to be the most important for the research: Agile and Lean Startup methods and ITIL® 2011. Although ITIL is not a theory, it is a de facto standard about the best practice processes in use in IT organizations. New Product Development (NPD) is a complete process of bringing a new product to market used in business. Agile methodology, Scaled Agile Framework and the traditional project management practices are used in the development processes in the case organization. None of these are theories as such, but frameworks and best practices used in the related scope of the study. Scaled Agile Framework, SAFe®, is a knowledge base of patterns for implementing Lean and Agile in development at enterprise scale. SAFe is created by Dean Leffingwell and the agile community, started 2011 (Scaled Agile Inc., 2016).

2.1 Lean Startup

Lean Startup method should be defined as the most recent and less covered area. Lean Startup method, created by Eric Ries defines the lean startup process as a combination of iterative agile methods and lean manufacturing practices in a framework of developing products and businesses quickly and efficiently. (Croll & Yoskovitz 2013).
Ries (2011) defines the Lean Startup method as a set of five principles:

1. Entrepreneurs are everywhere
2. Entrepreneurship is management
3. Validated learning
4. Build-Measure-Learn
5. Innovation accounting

The Lean Startup model is considered to be fast and flexible, bring value of work and provide the tools that will help increase the competitiveness and profitability (Blank 2013.)

Figure 4. Lean vs traditional startup (Blank, 2013)

In the figure 4 is described the differences between Lean and traditional startup, with the main differences highlighted. In the right side is the traditional startup strategies, ways of working, metrics and risks summarized and compared to the differences in Lean startup. The Lean strategy is hypothesis driven and based on business model, where traditional is based on business plan and is implementation driven. The ways of working differ in Lean process suggesting to go out and test the hypothesis where traditional way is to prepare offering and following a strict and linear plan. Measuring is suggested to be done very differently in Lean startup than in traditional development, including also the acquisition and lifetime measurements. Failure is expected and welcomed as learning in Lean startup, where in traditional development it is more of an exception followed by punishments.

In a way Lean startup is a way to build with minimal resources as a scientific process. Lean has an industrial background and aims to reduce waste and allocate resources the best possible way. Waste is one of the key concepts in the Lean Startup method. According to Ries (2011) and Maurya (2009), waste should be minimized in development work. Waste is described as work that is unnecessary or wrongly timed. Launching products with no potential market interest, creating features that will not be used, stocking an inventory - these are all forms of waste. Build-Measure-Learn loop is another key concept in the Lean Startup and it is used to manage and operate the organization in finding a sustainable business model. A key idea is to minimize waste and focus only on the necessary parts, the so called Minimum Viable Product (MVP). The MVP is used to test the hypothesis that there is a market, customers or sales for the product. Lean startup is based on customer driven development. If the development cycle is too long, the customers' needs will be completely different when the new feature or product is deployed. (Blank 2013).

An important concept in Lean startup is measuring. Measuring should be done from the start, and the measurements should be agreed on before development starts. Lean startup requests people to start measuring their productivity differently, as seen in figure 4 Financial reporting differences summary. Innovation accounting is an alternative system to traditional accounting, a systematic approach for discovering if the startup is making progress and achieving validated learning. Innovation accounting works in three steps:

1. Establish the baseline. This is done by using the minimum viable product to establish real data on where the company is at the moment. MVP is the first learning milestone.
2. The second learning milestone is the tuning of the engine from the baseline towards the ideal via optimization until the decision point will be reached.
3. The third step is the decision point: pivot or perseverance. Pivoting is about correcting the hypothesis accordingly based on the learnings and outcome of the launches, deciding if the strategy and direction need to be changed. (Ries 2011.)

Portfolio prioritization is important method for a lean process to actually reduce waste in the program and portfolio management level. Lean canvas, as seen in figure 5, is one good tool to be used for the portfolio level prioritization. The Lean Canvas was adapted from The Business Model Canvas by Ash Maurya and currently there are several versions of it in the market.

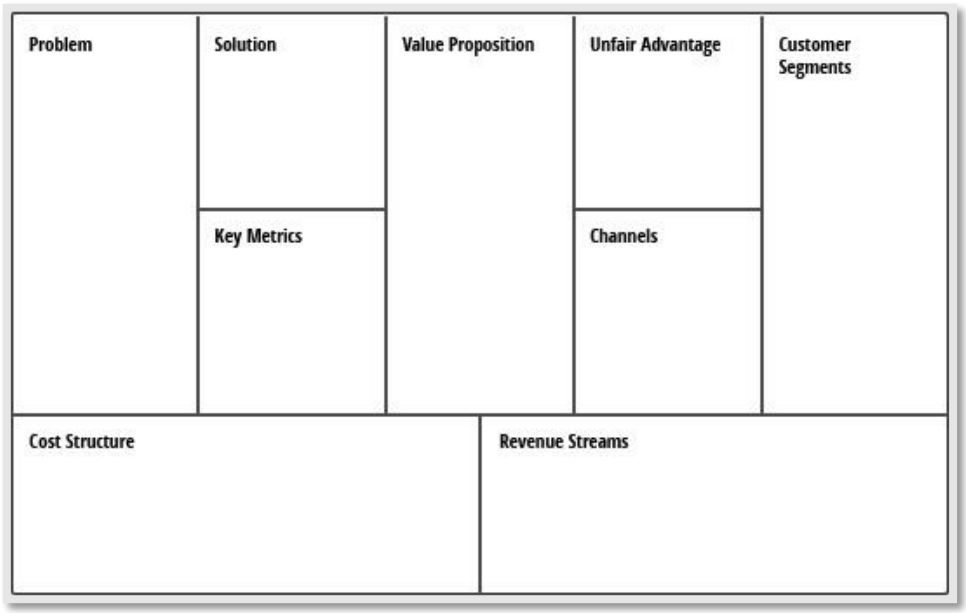

Figure 5. Lean Model Canvas

The Lean model canvas as seen in above figure can be divided to 2 different areas, the left side of the canvas being the product side and the right side being the market. In the left side is first the problem area, where can be listed the top problems for the product. In the solutions section should be then listed top features of the product to solve the problem. The key metrics should state what the key activities that will be measured are. In the cost structure section should be listed the costs, such as costs for customer acquisition, distribution, hosting, people etc. In the right side, the market area, are the revenue streams that should have the value of the product described, like revenue model, lifetime value, gross margin etc. In the right side is the box for customer segments that the product is targeted to. The channels section should describe the paths to those customers. In the unfair advantage section should be listed the advantages that the product has which cannot be easily copied or bought for other competitive products. (Figure 5).

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2.2 ITIL® 2011

Another concept to define is ITIL and The ITIL Service Lifecycle. ITIL is a framework of best practices about processes, procedures, tasks and checkpoints. The rationale behind applying first the LEAN framework and then ITIL best practices is, that LEAN reduces waste while best practices reduce variance. According to common practices when LEAN is applied, waste is reduced first before variance is minimized or processes optimized.

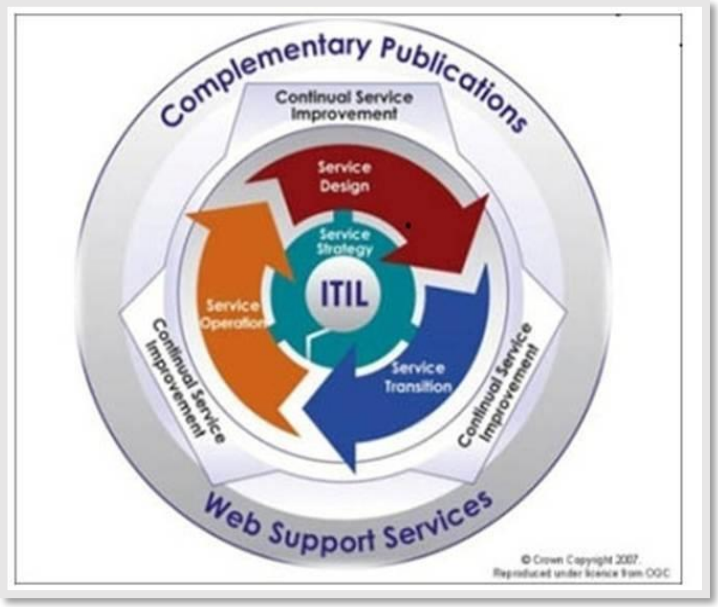

Figure 6. The ITIL service lifecycle (ITIL® 2011 Edition)

The above figure 6 shows all services lifecycles and their relations to each other. The entire framework of ITIL is segmented into five components, lifecycle stages as seen in the figure:

1. ITIL Service Strategy
2. ITIL Service Design
3. ITIL Service Transition
4. ITIL Service Operation
5. ITIL Continual Service Improvement

These components form the ITIL Service Lifecycle. The full concept of ITIL is vast so within this study the focus is on the Service Design, Service Catalog Management, Service Portfolio and ITIL Lifecycle areas. ITIL Lifecycle aims to help organizations sustain high levels of business performance, where they need to offer competitive products and services that

customers will value, buy and use. ITIL Service Management supports this through the lifecycle stages where each stage relies on service principles, processes, roles, and performance measurements, and each stage is dependent on the other lifecycle stages for inputs and feedback, with constant checks and balances throughout the Service Lifecycle ensures the services can adapt and respond effectively to them.

The Service design essentials are the 'Four P's of Service Design', which represent areas that should be taken into consideration when designing a service:

1. People – Human resources and organizational structures required to support the service
2. Processes – Service Management Processes required to support the service
3. Products – Technology and other infrastructure required to support the service
4. Partners – Third parties which provide services required to support the service.

There are five aspects to Service Design Results-driven approach:

1. Service Solutions
2. Management Systems and Tools
3. Technology Architectures and Management Architectures
4. Process required
5. Measurement Methods and Metrics

ITIL Service Catalog Management provides best practices for ITSM. It defines a common language and terminology to be used and drives continual improvement. However, these best practices do not include methodologies to implement. The Service Catalog is the subset of the Service Portfolio that contains services currently available to customers and users. The objective of Service Catalog Management is to contribute value to the organization by alignment of IT & business, increase efficiency both for cost/time and meeting quality requirements (ITIL® 2011 Edition).

2.3 New Product Development (NPD)

The New Product Development process is often referred to as the Stage-Gate innovation process, developed by Dr. Robert G. Cooper as a result of comprehensive research on reasons why products succeed and why they fail. When developing new innovations, the following eight ingredients are aiming for marketability to happen quickly and accurately (Cooper, 2008). The new product development process has 8 steps or stages:

1. Idea generation
2. Idea screening
3. Concept testing
4. Business analysis
5. Product development
6. Test marketing
7. Commercialization
8. Review of market performance

The first step in new-product development is idea generation. New ideas can be generated by conducting marketing research, inviting suggestions from consumers or employees, brainstorming, getting feedback or e.g. studying the new products of the competitors.

The second phase is to screen the idea. Most companies have some kind of a committee for screening and studying the ideas. They select good ideas and reject bad ideas by asking questions about the necessity and feasibility to introduce the product. If the answers to these questions are positive, then the idea of a new-product development is selected, else it is rejected. This step is necessary to avoid product failure.

Concept testing is done after idea screening. It is different from test marketing. In this stage of concept testing, the company finds out whether the consumers understand the product idea or not and whether they need and approve the product or not by selecting a small group of consumers to test and give feedback.

Business analysis is an important step in new-product development. A detailed business analysis is done and the company finds out whether the new product is commercially profitable or not. If the new product is considered profitable it will be accepted, else it will be rejected.

In the Product development stage, the company has decided to introduce the new product in the market. The company will take the needed steps to produce and distribute the new product in the production, marketing, finance and advertising departments.

Test marketing is done to introduce the new product on a small scale in a small market. If the new product is successful in this market, then it is introduced on a larger scale. If the product fails in the test market, the company sets out to find the reasons for the product's

failure. The company can then make the necessary changes in the new product and introduce it again in a small market. If the new product fails again the company will reject it. Test marketing reduces the risk of large-scale marketing.

If the test marketing is successful, then the company introduces the new product on a larger scale. The company makes an investment in the new product for producing and distributing the new product on a bigger scale.

The last phase is the review of market performance to answer the following questions:

- Is the new product accepted by the consumers?
- Are the demand, sales and profits high?
- Are consumers satisfied with the after-sales-service?
- Are salesmen happy with their commission?
- Is the marketing strategy changed according to the changes in the environment?
- Are competitors introducing a similar new product in the market?

The company must continuously monitor the performance of the new product and adjust their position with necessary changes in the marketing plans and strategies (Brands, 2013).

2.4 Traditional waterfall

Traditional project management practices for large development projects in the organization are based on waterfall methods, ITIL, ISO and CMMI qualified methodologies. Common to all these are that they emphasize detailed documentation and formal processes (Kussmaul 2004, 126). They are also all based on the assumption that everything can and will be very accurately defined and estimated already in the planning phase and that the scope, cost or resources are not changing (PMBOK 2000). It has been seen over the years that these variables are not carved in stone and they are changing more often than not. In the case organization, as well in many other business areas and organizations, software requirements can be changing and are sometimes very abstract. Traditional project management uses control methods that are disciplined and deliberate, and assume that the project has distinctive phases (Hass 2007, 1). This aims to deliver quality through a series of prescribed processes, documentation, and monitoring (Loeser 2006, 3).

In waterfall methods, projects run through phases of establishing business requirements, designing the project, implementing, testing and delivery. Each of these phases has defined

inputs and outputs (West 2009a, 2). 10 years ago, the waterfall model used to be the most common way for large organizations to write software (Heusser 2006, 1). Organizations have tried to make the waterfall work as an assembly line with requirements analysts, architects, coders, testers, and project managers who oversee all the assembly (Szalvay 2004, 4). But unlike manufacturing, software projects have a lot of complexity and abstractions, frequently changing requirements and new and immature technologies and methods (Stepanek, 2005, 8- 22).

Along with the project managers, there are always several other stakeholders. This causes challenges in managing the communication and the flow of information between project members and its stakeholders. There have been attempts to tackle this with very detailed documentation practices (Heusser 2006, 1). The documentation still has risks. It can be misunderstood or found to be missing information, which might lead to severe errors. Also, documentation with the required level of detail takes a lot of valuable time and resources (Kussmaul 2004, 126).

The Waterfall method was the first modern approach to systems analysis and design to build a system. The Waterfall method was defined by Dr. Winston W. Royce in 1970 publishing "The Waterfall Development Methodology".

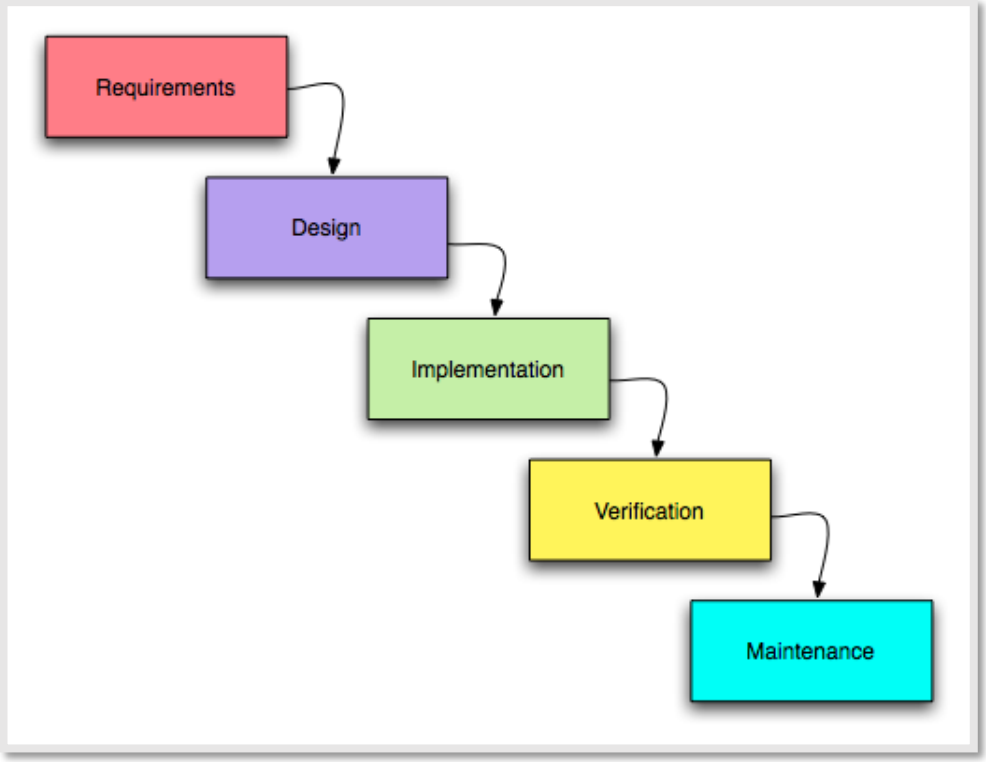

Figure 7. Waterfall method (The Waterfall Development Methodology, 2006)

As seen in figure 7, the waterfall model is set in phases that follow always each other and are not overlapping. Each phase has to be completed first before getting into the next phase. The method represents that the whole project is planned and defined up front.

The Waterfall method assumes that the requirements can be gathered up front during the first phase, with the project manager, stakeholders, and designers communicating to acquire a shared, detailed understanding of the requirements. The design phase can be split into separate design phases where the system's analysts transform the design requirements into a design document. In the implementation phase, the programmers are writing the code based on the specifications. The Verification phase aims to ensure that the project meets customer expectations. In this phase the testers are testing the applications and the code against the requirements. After the Verification phase is passed, the project can be delivered to the customer, and moved over to the Maintenance phase. (Figure 7).

2.5 Agile and SAFe

In the past 10 years, agile methods have been applied in some units and development areas of the case organization. The Agile manifesto was introduced in 2001 (Agile Alliance, 2016):

"We are uncovering better ways of developing
software by doing it and helping others do it.
Through this work we have come to value:

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

"That is, while there is value in the items on
the right, we value the items on the left more."

The middle part of the manifesto states the 4 foundational values in Agile. To support these, there are listede twelve principles that support them, and these together lead the agile approach. The 12 principles are guiding and describing the agile movement, where the

change is welcomed and the focus is on the customer. The aim for the Agile Manifesto and the 12 principles was to change things, make software development faster and improve the quality.

The 12principles behind the Agile Manifesto are:

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

The purpose of the Agile Manifesto is to deliver better software, to focus on value and results that add value. Communication and people are the key factors in succeeding in agile.

In the beginning, agile development was often used in organizations and projects for pilot projects at the enterprise level. Agile practitioners were experimenting with lean and agile methods and best practices that could work in their environment. These experimenting pioneers developed frameworks and strategies for adopting agile. Once enterprises decide to adopt agile, they have several methodologies and frameworks to choose from. Experts and consultants often tend to specialize in one single method, and there is no universal agreement on the best framework or method. Agile project management introduces clear roles and responsibilities, artifacts, and procedures to manage projects in less intrusive manner. These practices are based on experience rather than theory (Stepanek 2005, 65). Some of the commonly known and used agile methodologies are e.g. Scrum, Extreme Programming (XP), Test-driven development (TDD), Lean Software Development and Lean startup.

Figure 8. House of Lean (Scaled Agile Inc., 2016)

Lean thinking is present in the SAFe House Of Lean. In the figure 8 above can be seen the key constructs. The key constructs are the roof, representing the goal of delivering value, the pillars supporting the goal via respect, flow, innovation and relentless improvement. Lean leadership provides the foundations for all this to be built. (Figure 8).

Agile project management does not support traditional project metrics and documents, like estimating workload, costs or resources. Instead, there are practices and metrics for how workload and productivity can be measured. These are e.g. velocity, which describes how much work the team can produce within an iteration. Story points are used for estimating work load etc. This is in alignment with new management paradigm, according to which it is less important to measure and guide the results, but more important to measure and guide the actions that lead to the desired result.

Although agile is providing a lot of methods and practices and tools for team level development process, it has not been providing the same for the enterprise level management or larger projects that have hundreds of members. According to Scaled Agile Inc., The Scaled Agile Framework (SAFe®) is perhaps the most widely implemented Scaled Agile framework (Scaled Agile Inc. 2016).

SAFe framework describes the levels of scale. In Fig. 9, SAFe big picture, can be seen the four levels of SAFe: Portfolio, Value Stream, Program, and Team. SAFe® aims to help in aligning the team-level development to business strategy, provides practices for PSI (potentially shippable increment) and Release Planning. SAFe® is a freely revealed knowledge base of integrated, proven patterns for enterprise Lean-Agile development (Scaled Agile Inc. 2016).

The SAFe portfolio level vision comprises epic, strategy and value streams. In the small to midsize enterprise, one portfolio can be used to govern the entire solution but in the larger enterprise there can be multiple portfolios, one for each line of business. The program level, where usually 50-125 people at a time work on a specific program, is well-represented in the framework (Figure 9, SAFe big picture). A portfolio is a collection of these programs, and per SAFe the Program portfolio management should be the office with the total budget of IT development- SAFe Program portfolio management assumes responsibility for strategy and investments as well as program management.

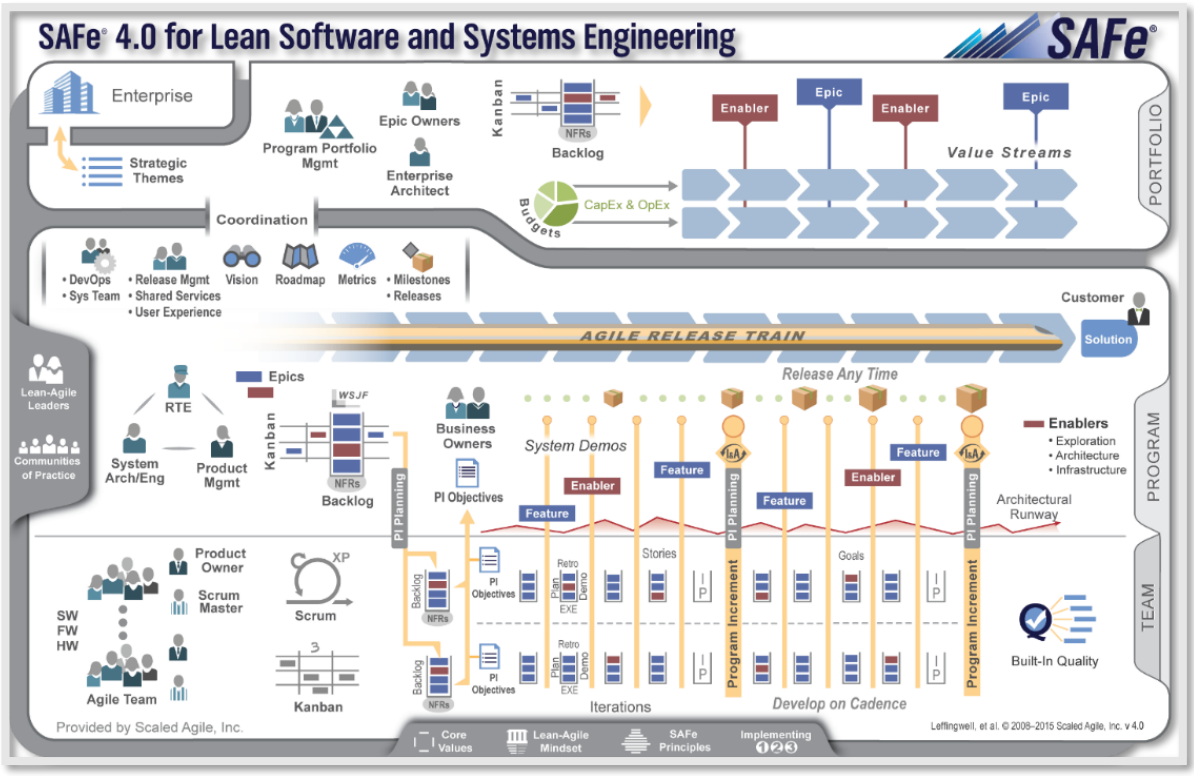

Figure 9. SAFe big picture. (Scaled Agile Inc., 2016)

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Below the program level in the picture (figure 9) is the team level. A team in SAFe means a small group of people, with the combined skillset needed to deliver software end-to-end. The same team handles requirements, development, testing and deployment. Several teams create a release train, which organizes itself around a program.

The team and program levels form a virtual organization, the Agile Release Train (ART), which can be seen in the figure 9 in the middle section. The ART plans, commits, and executes together. In SAFe, the Release Trains are delivering a Program Increment (PI). The Release Trains are on a schedule, though the schedule can be flexible. The release train supports a long-term program that may have many teams and projects onboard. The teams synchronize, coordinate and align with sprints and releases.

To ensure quality, SAFe suggests practices that are aimed more at prevention than traditional test/fit testing. SAFe starts with agile architecture with the idea that architecture is emergent, but it also claims that the system architecture needs to evolve ahead of the newest features in order to make those features possible.

At the portfolio level, SAFe is essentially looking at the IT organization's ability to deliver, and perhaps support/maintain, working software. Safe suggests metrics like employee engagement, customer satisfaction (these may be internal), agility, time-to-market, quality and the ability to work with partners outside of the software organization. These terms may seem a bit light, or qualitative, but SAFe provides a specific, clearly measurable meaning to each of these terms.

In addition to these hard measures, SAFe suggests burn-up charts to manage the process of an individual epic and a bar chart showing actual and to-be-done work for comparing the progress of multiple epics at one time. Where most agile development organizations focus on the team level, on sprints or iteration, SAFe focuses on the program, which could be five to 15 teams. The "program-level sprint" in SAFe is the Program Increment (PI), also known as the Potentially Shippable Increment (PSI). The goal of the PI is to accomplish the PI objectives. Release Planning defines the objectives for the Agile Release Train, which is then built during the Program Increment. The ART takes a systems view throughout the layers such as business, product management, architecture and the phases like testing and deployment.

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In the figure 9 is presented the different roles for people in SAFe framework. In the team level there are small cross-functional empowered teams who can make localized decisions related to the work. Each team can operate on the chosen method, Kanban, Scrum, etc based on the team's decision. Each team has a scrum master, product owner, developers, testers, and other necessary team roles. At the program level there is the release train engineer who facilitates the activities of the Agile Release Train, like the scrum master facilitates the activities of the team. Product management is responsible for the program vision and roadmap. They prioritize the work in the program backlog, like product owners do in the team backlog, The system architect/engineer is helping to align teams in a common technical direction. Business owners share responsibility for the value delivered by a specific ART. (Figure 9).

The roles at the value stream level are similar to those at the program level, where the value stream engineer has responsibilities similar to the release train engineer, solution management has responsibilities similar to product management and the solution architect/engineer has similar responsibilities as system architect/engineer. At the portfolio level is the program portfolio management team, who is responsible for strategy and investment funding, program execution, and governance. (Figure 9).

The enterprise architect works across value streams and Agile Release Trains to provide strategic technical guidance. The epic owner is more of a role than a title, taking responsibility for the business case and implementation guidance of initiatives, called epics in SAFe.

In SAFe framework there are four levels of backlogs which comprise the enterprise backlog model: the portfolio backlog (epics), solution backlog (capabilities), the program backlog (features), and the team backlog (stories). First epics are broken down into capabilities that will be prioritized by the vision and roadmap. Capabilities are broken down into features which are broken down into stories which are executed by the agile teams. (Figure 9).

The SAFe core values, Lean-Agile Mindset (represented by the House of Lean), and SAFe Principles can be seen at the bottom of the figure 9.

SAFe claims to build more value than traditional waterfall project management (Scaled Agile Inc., 2016). In the SAFe big picture (figure 9) is the Built-in Quality icon which describes

the practices such as continuous integration, test-first development, refactoring, pair work, and collective ownership, early iterations, frequent integration, testing and verification. The above mentioned roles are the gate keepers for quality. At the portfolio level the enterprise architect, at the value stream level the solution architect or engineer, and at the program level the system architect or engineer. There are also user experience designers, the system team, and release management to insure quality. SAFE confirms quality through frequent demonstrations of the solution being built. As the Agile teams build the architectural runway, which is the code that is needed for supporting the coming functionalities, they validate the architectural guidance provided by the architects on different levels of SAFe. (Figure 9).

2.6 Summary of the theories and frameworks

In this section is described the introduced the benefits and challenges of the theories and frameworks presented in the previous sections. The listed benefits and challenges are researchers own opinion and view based on the learnings in theory and in practice. Within the case organization are used different methods for different areas of developments, projects and units. In general, the IT governance practices are based on the frameworks such as COBIT and ITIL but more and more the agile methods are taken in to use within the organization.

As can be seen from the summary below, Lean Startup and Agile methods appear to be more suitable and usable for development projects than ITIL and Traditional Waterfall due mostly to the needs for scalability and responsiveness to change.

Theory/ Framework	**Benefits**	**Challenges**	**Suitable for**
Lean Startup	Eliminate Waste Deliver Fast Build Quality In Respect People Create Knowledge Optimize the Whole	Big organizational processes and validation points	Development projects Processes and management for optimizing the flow

ITIL	Big organizational processes and validation points	Heavy and bureaucratic, slow	Big organizational stable, standardized and structured processes
New Product Development	Creating a sense of urgency and creating the guiding coalition Effective gate keeping Guidance, checklists, templates and examples of the work required within each stage	Top down model Mechanistic Not suitable for all businesses and for all projects Not a project management or micro-planning model	holistic process to idea-to-launch projects and macro-planning
Traditional Waterfall	Easy planning, design and implementation Concrete output at the end of each stage Provides a baseline to move forward on Ability to visually see and communicate a target delivery / end date based on scope agreed.	Not responsive to change Change in scope can seriously impact time/cost/quality. Risks in certain phase can have severe impact to the entire project Dependencies - internal or external	Very static, long projects with very little changes
Agile	Highest priority is customer satisfaction Progress measured by working software Welcome changing requirements Sustainable development pace Frequent delivery of software Continuous attention to technical excellence	Planning can be sometimes be difficult Business representation Training and education is needed Team members must be highly skilled / cross skilled in competencies as core teams are small. Lack of predictability	Development projects, management processes, can scale

	Business people & developers cooperating daily Simplicity Build projects around motivated people Self-organizing teams Face-to-face conversation is best Regular reflection & adaptation		
SAFe	Involves all levels in organization Promotes collaboration amongst teams Keeps everyone focused on the release Focus on architechture and roadmap	Complex and difficult to adapt upfront planning and structured processes that are not completely agile and reduce flexibility	Provides structure that may make for a smoother transition to an agile framework

Table 1: Summary of the frameworks

2.7 Theoretical framework

Along with the theoretical information related to leading change, agile development, waterfall practices and ITIL standards there was formed a view on the improvement of the product development processes and the challenges related to that. Theoretical information was gathered from literature, articles, studies and internet publications. These sources served as a basis for concrete ideas and solutions for the product development process improvement. With the vision, theoretical information and learnings and experiences from the case organization the process improvement points were identified and using the methods learned from theory the planning was carried out.

The case organization has wide experience in process improvements and change programs but the theory provided by new studies and literature ensures better progress and success. Before starting the development actions, the case organization's product development processes were walked through and key processes studied. This gave a good understanding of the big picture and served as a reference to be used in this project.
The current processes were compared to best practices and the gathered theoretical understanding was used in the process improvement planning.

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3 Methodology

Research methodologies can be divided practically in two groups, quantitative and qualitative. These approaches have several differences. A quantitative study is more explanatory whereas a qualitative one more about understanding. In turn qualitative study is more dependent on theory, while quantitative depends more on the representativeness of the sampling.

These methods are often represented as alternatives to conducting research, but they can also be seen supporting each other as both can be used for analyzing the material in a single research (Alasuutari, 2011, 32-33).

This study employed the qualitative research method. The aim for a qualitative study is to interpret events and phenomena based on empirical data (Leskinen 1995, 13). The qualitative study in question is supported by quantitative material gathered from the case organization as described in data collection plan chapter.

A case study can be used to investigate how a corporate business organization operates, and how the challenges are seen in the organization's activities. In addition it is necessary to have information of the experiences via questionnaires and interviews, and statistical reports from the organization. Compared to other methods, the strength of the case study method is in its ability to examine, in-depth, a case within its real-life context. The term case study can refer to either single- or multiple-case studies, which represent two types of case study designs. The case study can also be holistic or it can have embedded sub-cases within an overall holistic case (Yin, 2004). A multiple case method was used in this study, since there are subcases to study and the data is collected from multiple sources. Additionally, the researcher has a variety of different roles within or participating in a study situation.

An interview method is well suited for an unknown and less structured area. A thematic interview is a semi-structured interview which allows the interview to be focused in certain themes (Hirsjärvi & Hurme, 2000). This interview method is good for this study, where the target is to conduct interviews with the stakeholders to find out critical themes for assumptions to be based on, and then validated based on earlier interviews.

Action research is one of the orientations of qualitative research, where both actual improvement actions in the case organization and research are happening. In action research,

different research methods can be combined. With an action study the aim is to improve the case organization by influencing ways of working. This strategic method involves people from the working environment and focuses on providing solutions to practical problems. The aim is to involve the stakeholders of the problem to participate on the improvement actions and solution. Change is an element of action research requiring knowledge of the phenomena related to the change to achieve the change. Action research is an ongoing process with cycles of planning, action and evaluation (Kananen 2009).

Constructive research is a method that enables iteration and opportunity to provide suggestions for improvements. Constructive research allows the use of different sources for gathering the theoretical framework for the study. Previous researches, frameworks, standards and theories can be applied as a theoretical base for the development of the specification methods. The theoretical part of the study of is supported by qualitative interviews as one source for creating solutions to the research problems. Per Lukka (2014) a constructive research method leads to true actions in the case organization and to a thorough analysis of these actions.

3.1 Strategy

The preferred methodology choices for conducting the research strategy for this study are (multiple) case study and (constructive) action research. The case study is done by interviewing key persons from the case organization and its business change management program. Key persons are selected to represent relevant viewpoints on the topic. Every relevant level and associated parties in the organization are represented.

Source material is focusing on publications about change processes, development frameworks, and product development processes that are considered to serve the objective and scope. The empirical and theoretical parts of the study are linked with the framework created by the research questions.

Methodologies of a descriptive study, an exploratory study and an explanatory study can be found in this research.

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3.2 Data collection plan

The data for this study is collected from interviews and the organization's internal statistics data derived from the product development metrics. The data is collected in order to gather the business information and analyze it with different methods and tools in workshops and interviews.

Data collection for the empirical part of the study is done via interviews and workshops with a predefined target group within the organization as primary data. These interviews were conducted in two separate projects in the organization - Product Lifecycle management project and Portfolio management - that were done earlier in the year 2016. These projects provided material for this study as the current state analysis and improvement analysis within the organization.

The interviews were conducted with relevant predefined stakeholders listed in Appendix 1, and they mainly focus on the business manager interviews. The interviews were individual and loosely structured, leaving room for open answers. The questions in the interviews were focusing on the current procedures and actions of the interviewee's role in different steps and phases of the product development process, described in Appendix 2.

The data was gathered from the results of the interviews in 2 phases. The first phase was to define the current stage of the processes related to product development and product lifecycle management. The interviews served to gather the steps, actions, criteria, systems and actors related to different parts of the process. Based on this data the current process was described and modeled. The second phase was to gather information of the expectations of the processes. The questions were aimed to clarify the expectations for the actions and procedures in the different identified phases from different business units' processes and stakeholders.

The workshops, for their part, used lean canvas methods and iterative sessions. Within the workshops the theoretical framework was discussed and the best practices for conducting the work selected. Statistical data was gathered from business reports and analyzed. The workshops were conducted with the intent of creating a product modeling and development process centered on value centric practices and to facilitate the chosen methods in practice during the iterations of these workshops.

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Secondary data and the quantitative material for the study are the statistic reports and documents of the organization. The reports gathered and analyzed for the study consist of the organization's internal business critical information, and contain statistics related to products, customers, sales and turnover. The data cannot be used as such or revealed in this study.

In addition to these are the researcher's own observations, based on different product development projects and business change management projects the researcher has participated in within the last 10 years.

Based on these learnings and the theoretical framework, workshops were conducted during the second half of year 2016. Case organization members, stakeholders and business change program organization were included participating in these workshops. The workshops are described in the table 2 below.

Workshops conducted for Product Data management and governance improvement were more of a type of discussion forum than workshop. In the workshops the statistics, data and principles were presented and analyzed and discussed. The Portfolio and product management stakeholders discussed about product data modeling, analyzed and defined the current product data models, and planned and discussed about the to be –model. (Table 2).

Simultaneously the Product modeling workshops were conducted with inputs from business and portfolio and product management teams to provide product modeling documents, reference model documents, designs, product modeling checklists. With participants from development project team, product managers, portfolio and product management stakeholders, the current product data was analyzed, product model needs (business scenarios, use cases) discussed and analyzed, product reference models planned and analyzed and designed. (Table 2).

Business scenario workshops were started to implement the methods for creating business scenarios, gathering teams for workshops with participation from business stakeholders, product development and portfolio management stakeholders in aim to define business outcomes, constraints, business scenarios and use cases for prioritizing and further implementation in development. (Table 2).

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Methods, data	Participants	Topics	Documents and outcome
Product data workshops - **discussion forum** - **statistics, data and principles** - **tools: whiteboard, excels, databases** - **weekly meetings, duration 1-3 hours**	Portfolio and product management stakeholders	Product data modeling	Current product data analyzed models defined, to be -model planned and discussed
Product modeling workshops - **development and design workshop** - **inputs from business and portfolio and product management teams** - **tools: whiteboard, excels, Confluence** - **3 times per week, duration 4 hours per workshop (participants may vary according to agenda)**	Development project team, product managers, portfolio and product management stakeholders,	Current product data analyzing, product model needs (business scenarios, use cases) discussed and analyzed, product reference models planned and analyzed and designed	Product modeling documents, reference model documents, designs, product modeling checklists
Business scenario workshops - **business scenario methodology** - **value creation framework** - **OPERA method**	Business stakeholders, product development and portfolio management stakeholders	Business outcomes, constraints, business scenarios, use cases	Use cases and stories for prioritizing and further implementation in development

Table 2. Workshops

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4 Analysis and background

This chapter summarizes the outcomes and learnings achieved within the improvement projects in the Product stream (figure 1) for this study. Results from the earlier phases and projects related to this study as described in section 1.1. Background, are also analyzed as a part of this study's data.

4.1 Findings and connection points with earlier study

The starting point for this study were the results from the earlier study based on the Product Lifecycle management and Product development process improvement projects. (Figure 1). The learnings and outcomes clarified the targets for this study and the other improvement actions started within the organization. (Figure 1).

As a project manager for the PLM project and Product owner for the new product development process the author of this study possessed an excellent viewpoint on the object of this study.

The data for the study was gathered from the results of interviews carried in two phases. First interview round was done in the spring 2016 for the PLM project data and then in the fall 2016 for the Portfolio management project and Product modeling improvement and best practices (Figure 1). The first phase was to define the current state of the processes related to product development and product lifecycle.

The earlier PLM project brought forth new understanding and knowledge for improving the ITIL practices exercised in Elisa Corp. The results could be utilized in defining e.g. actors and tools for the process. In the PLM project results was identified the different phases of the product lifecycle process:

1. Idea
2. Development
3. Launch
4. Active
5. Maintenance
6. Ramp down
7. Inactive

The product lifecycle process phases can be mapped to the portfolio management process, following the ITIL model of Service Portfolio Management (ITIL® V3 Service Design, 2011). From each of the phases was identified the actions, actors, criteria and systems that were used.

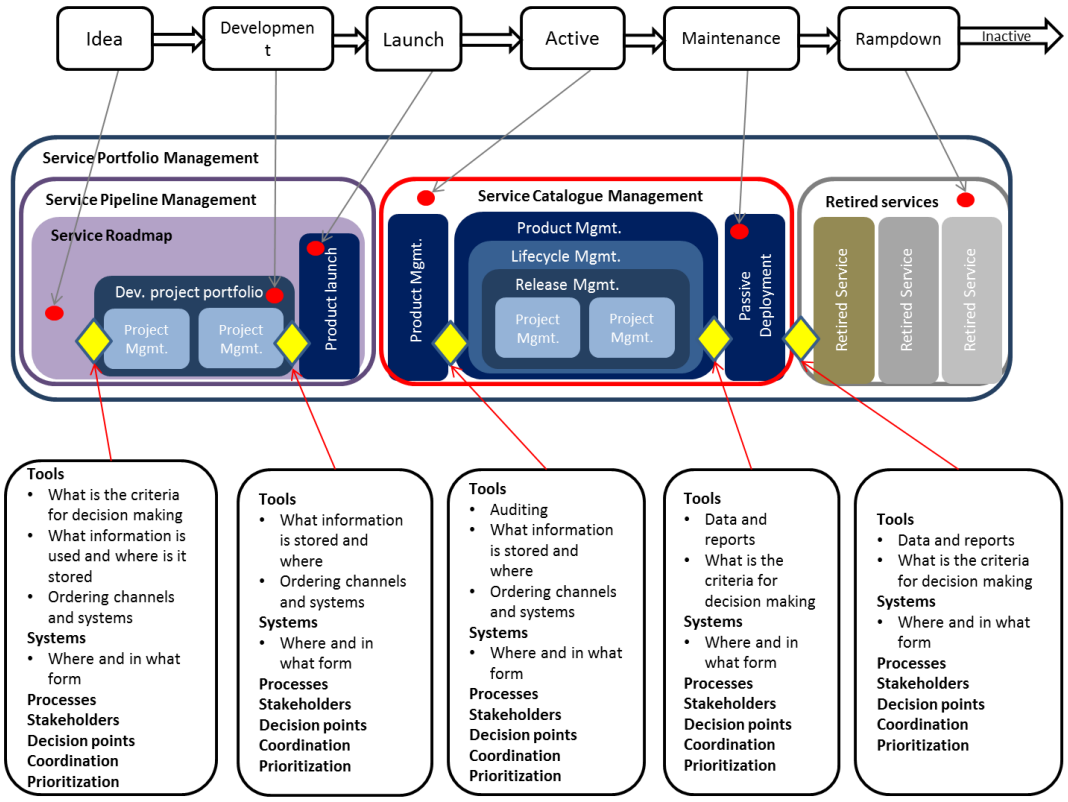

Figure 10. Actions, actors, criteria and systems in Product Lifecycle phases

With this information, the data about the actors, tools, information, statistics etc. could be modeled in a process model diagram with key information of decision points and criteria, and the current process flow throughout the organization. (Appendix 4: Current state analysis of product lifecycle process (Confidential)).

In the figure 10 above is seen the identified lifecycle phases marked as dots in the ITIL process structure, and the key decision points marked with diagonals to the process. The used tools and systems were also identified and documented.

The different phases for the product in its lifecycle were identified. The first phase for the product is when it is born, first as an idea from where the design starts. The next lifecycle

phase is achieved when the product has a draft design and the decision for implementing it. The third phase starts with the development of the product and ends when the product is ready and launched to market. After the launch begins the fourth phase, the active phase of the product. Active phase continues until the last phase of the lifecycle, shutdown, is reached and the product is killed.

As one key learning from the PLM project was that with the process diagram and key points from different phases the big picture was easier to communicate to the stakeholders, identifying their roles and actions in the process. Bringing the diagram and the process model to the interviews and workshops it was easier for the stakeholders to explain their needs and expectations of the ideal process for product development as well as management for the lifecycle and portfolio.

The essential expectations for process improvements were met in the new product development process. The aim was to create a process for handling the operative change requests for new products coming with the business change program, include the product lifecycle process in the product development process, simplify the ordering channels, improve the coordination between development in change program and operative business development, support more standardized changes, reduce development and project needs, improve the time to market with the standardized changes, and enable better capabilities for business to react on the changes in market.

After the expectations were gathered, the outcome of the project was a design for a process model to communicate to core process stakeholders and the change management program. The content of the plan was:

- Goals
- Summary of what the new process will provide
- Product management process change
- From idea/request to service/product to sell - modes
- Resource requirements
- System and applications related requirements
- Deployment plan

The new product development process suggestion (Appendix 3: A model for improvements in product management process (Confidential)) was approved to be piloted in the program and resources were allocated to it. The product development team in the business change

program was already very familiar with the organization's business and development needs, and had already participated in the product development process in key roles. With these experienced resources the new piloting process could be set up quickly in the program and the process was refined further for implementation.

The new process (Appendix 3: A model for improvements in product management process (Confidential)) stated a list of goals to be achieved within the process improvement. The improvement actions were started in different areas in the organization. The Governance model implementation as seen in the figure 1 middle stream, as well as in the Business change program actions.

One of the key elements for the new process was to have one process and more transparency. Handling operative change requests for new products was one of the goals to achieve that. Business need was clear to have a single point of contact to request the operative changes such as new products or changes to products across the different units. Ordering channel using JIRA and a template for the standard requests was also provided to ensure easy and standardized way for the most common requests.

Coordination between project development and operative changes to ensure alignment and quality was important to be built in the process, to enable the single point of contact and coordination experience for the business and users of the process. This was achieved in the pilot by implementing clear focal points, a team, and informing the team mailbox address to the stakeholders, and communication was done via JIRA and mail. (Appendix 3: A model for improvements in product management process (Confidential), Appendix 6: Product modeling and development process and validation points (Confidential)).

Modularity for the components and productized processes in was identified as one of the key element to decrease big developments/projects for productization and to improve the time to market. Modularity is also the key to have more standardized changes. As one of the key results for the process was to enable small standard changes to be made directly to the sales application by business managers.

Improved quality by built-in testing and QA process was set to be an important goal to improve the customer satisfaction. When the quality of the product development process is good, there are fewer contacts from customers to customer service and higher customer

satisfactory level. This goal of built-in-testing with testing resources and environments was not able to be achieved within the piloted product development process due the organizational changes and resource changes.

Defined roles and responsibilities were to be agreed within the different units for the process. It was considered to be very important to have clear roles for e.g. product owner, who has the responsibility of return of investment, as well as the business stakeholders, developers, testers and other key roles in the process. As the result of the piloted process, the suggested and piloted roles and responsibilities gave good results and suggestion is to create similar structure within the organization, following the agile and SAFe practices.

As overall results and learning from the PDI project and the new product development process pilot was more understanding and clarify on what are the most important improvement actions that would bring the most value to the organization. As was identified, currently most actors in the product development process didn't have clear roles and responsibilities. There were several different processes for product development, and many separate contact points. There was no common documentation process, no E2E view or holistic product management. These deficiencies should be improved by defining clear roles and responsibilities, a controlled and measurable process, fewer points of contact, a documentation model with change logs, and adding testing and quality assurance as standard built-in phase for the process. Creating more modularity and standardized product models the business stakeholders would also improve their understanding of product models and features.

As the market demands quite rapid reactions, and the processes need to improve to support this, the ideal processes should be simpler and more transparent and the prioritization methods across different units applied to same development areas need improving.

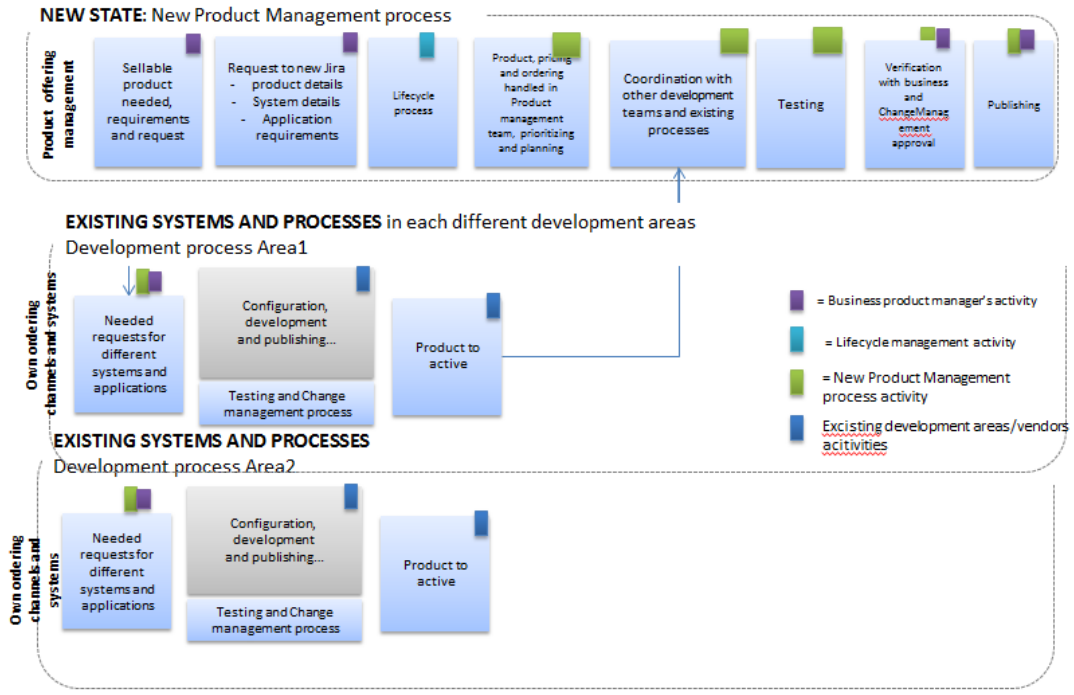

Figure 11. New Product Management process pilot

The new improved process was designed (Figure 11) and the needed tools and applications implemented. Process was introduced to stakeholders and the resources for pilot were agreed and trained.

Piloting was a good way of implementing changes to a process for a trial, to get results and adjust the process based on the learnings and statistics. The methods to gather information for planning the pilot process and the needed improvement actions were good and practical. The resources for the process were mainly the same as before which gave the process more efficiency, as participants already knew the background, the current processes and the other participants of the development project. The pilot was conducted within a development program for 2 months, and yielded good results on transparency and efficiency. The project scope and resources changed and the piloting process was discontinued but the learnings, methods and tools remained in organization to be utilized again.

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4.2 Results from the workshops in Product development and Portfolio management processes

As the key objective of the study is to provide recommendations for improvements in portfolio management and product development governance, the Portfolio management improvement project (figure 1) was very important for this research study. Within this project was defined the current processes regarding portfolio management, identified the validation and standardization possibilities and analyzed the needed improvement actions for the process to become more efficient, lean and transparent.

The Portfolio management improvement project was concentrating on finding answers to issues related to commercializing products. The purpose was to ensure the strategic alignment and profitability of the service portfolio by grooming the service pipeline and service catalogue, and to find tools for that. The tools considered good to be used for this were roadmap creation, using Lean start-up and related methodologies, auditing commercial readiness and improving transparency of structures and cost allocations.

Portfolio management set the projects targets to align with the company's' strategy:

- Build value on data
- Accelerate new service businesses
- Improve performance through
  customer intimacy and operational excellence

As per ITIL, the Service Catalog Management provides best practices for ITSM, and the objective of ITIL Service Strategy is to decide on a strategy to determine which services the IT organization is to offer and what capabilities need to be developed (ITIL® 2011 Edition). This is one of the main purposes for the Portfolio management. The parts of the case organizations service portfolio were identified per the identified lifecycle phases (figure 10) and the costs identified to the phases. The biggest cost allocations by far were identified in the development phase in the product lifecycle, where the product is designed, developed and tested before it can be launched and become active. The costs then become as input current in the following lifecycle phase, where product is in active marketing and selling status and then turning again to costs in the retiring phase, as seen in Figure 12 below.

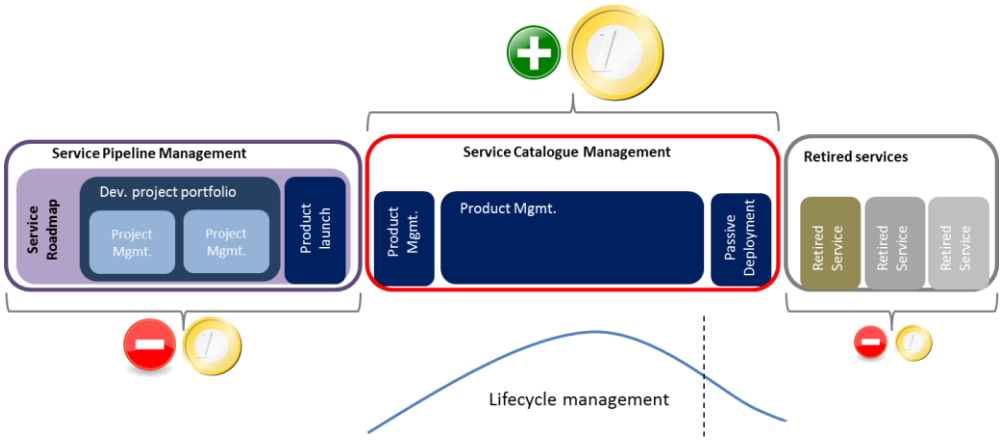

Figure 12. Parts of the service portfolio and costs

Some product developments in the organization are bigger and require more heavy processes across the different units and vendors, and the whole process can include several large and standardized sub processes. There are also smaller and more agile product development projects and processes within the organizations Commercialization unit (figure 2), called the Lean Startup –type of productizations. The Lean Startup development is following more the methods and practices defined by Blank (2013) and Ries (2011). These Lean Startup phases were identified to fit in to the same service portfolio process with validation points as seen in the figure 13 below.

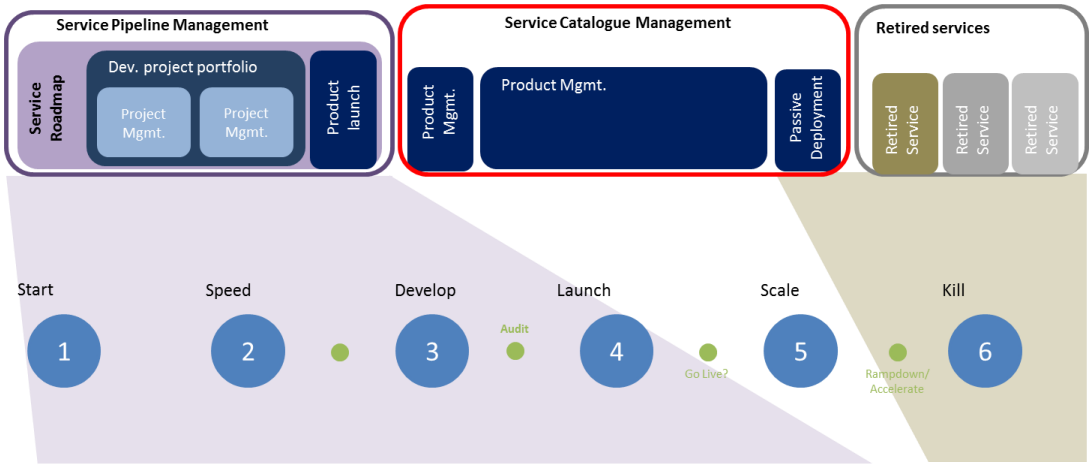

Figure 13. Lean Commercialization process

In the case unit, there were 130 product development ideas within the two years long review period. These were new ideas for new products or services that could be developed

and launched to the market. As described in the product lifecycle management, there are certain criteria and validation for the product idea to pass to the next lifecycle phase and be developed and launched. From these 130 ideas within the observation period, within Start or Speed phases (figure 13), 72 turned into projects that could pass the validation points to development phase.

The development time is estimated and planned according to the processes within the organization, and the budgeted revenue of the product is calculated based on the viability assumptions, development costs etc. criteria. Within the two years long review period the actual revenue was only 36% of the budgeted revenue for a newly developed service. This would mean that the annual revenue loss would be 32%.

The root cause for the revenue loss was analyzed, and the identified reason was that development projects have an average delay of six months. This led the project to assumptions that if the organization only selects half of the development projects for implementation, the potential revenue would drop by 50% and the increased available capacity would allow all the selected projects to finish on schedule. As the result of these the assumption is that the actual annual revenue would be 39 % higher than currently.

If the developments and costs would be analyzed this way, the cost of delay can be calculated and it becomes more transparent to the total costs of productization and development. Accelerating the development pipeline would decrease cost of delay and add capacity, following the lean flow efficiency target. As seen in very simplified picture below, in the left is the funnel of ideas targeting to achieve the development pipeline. The pipeline is narrow and the capacity of the development should be allocated to the most viable product developments. If all ideas can pass to the pipeline, it will get stuck and cause delay in the development. Therefore, the funnel of ideas should be accelerated for the flow to be better in the actual development phase. (Figure 14).

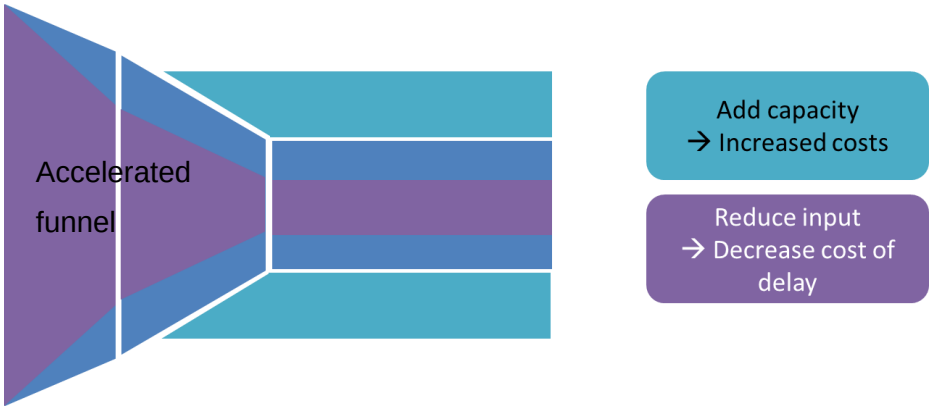

Figure 14. Acceleration for service development

4.2.1 Further improvement actions on the product development process

With the learnings from the researches and analyses above, the workshops were conducted with stakeholders on topics related to portfolio management and product development. The results of these workshops gave valuable findings that were input for the subsequent workshops. The improvement suggestions were tested for validity against theoretical proof of concept models within the workshops. This way Portfolio management project team could give input for product development and the lessons learned were used directly. The aim was to create models for easier and more accurate validation of the product development process and to accelerate the development pipeline and gain modularity and re-usability for the products. The business stakeholders' participation in the workshops also enabled the visibility and transparency between operational planning, business and development.

As the result of these workshops there are several outcomes in different areas. One of the key outcomes of the Portfolio management project is a product management team, which has stated the Product Master Data principles for the product development and governance. The principles are based on the criteria that the master data must be understandable, so that the underlying tenets can be quickly grasped and understood by individuals throughout the organization. The intention of the principle is clear and unambiguous, so that violations, whether intentional or not, are minimized.
The product master data should be robust to enable good quality decisions about architectures and plans to be made, and enforceable policies and standards to be created.

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Each principle should be sufficiently definitive and precise to support consistent decision-making in complex, potentially controversial situations. It should be complete, meaning that every potentially important principle governing the management of information and technology for the organization is defined.

The principles cover every situation perceived. It should be also consistent and stable for strict adherence to one principle may require a loose interpretation of another principle. The set of principles must be expressed in a way that allows a balance of interpretations.

Principles should not be contradictory to the point where adhering to one principle would violate the spirit of another. Every word in a principle statement should be carefully chosen to allow consistent yet flexible interpretation.

The principles should be enduring, yet able to accommodate changes. An amendment process should be established for adding, removing, or altering principles after they are ratified initially.

The team stated also principles for managing product master data. The first principle is that product master data is an enterprise level asset that is shared and easily accessible. Product master data is an asset that has value to the enterprise and is managed accordingly. Data is the foundation of our decision-making, so we must also carefully manage data to ensure that we know where it is, can rely upon its accuracy, and can obtain it when and where we need it. Data accuracy is defined as compliance with the all of the following criteria:

- accuracy (data is correct)
- completeness (all required data is available)
- accessibility (data can be accessed by the people and processes who need it)
- timeliness (data is up-to-date)

Master data management supports Elisa's strategic goals of customer intimacy and operational excellence. The implication is that there is an education task to ensure that all organizations within the enterprise understand the relationship between value of data, sharing of data, and accessibility to data. The Data Steward role must have the authority and means to manage the data for which they are accountable. Since data is an asset of value to the

entire enterprise, data stewards accountable for properly managing the data must be assigned at the enterprise level.

The second principle is that product data has to have an owner. Each element of product master data should have an assigned owner. Without an owner who is accountable for accuracy of product data the data will be fragmented and thus violates the other principles. Product owners are accountable for the product data. Product data stewards are responsible for managing that data. Proper tools and process are required for this collaboration.

The third principle is that product data should be created only once, and reused or consumed many times. Product data attributes are created once in the source system and shared to consuming systems to be reused/ consumed several times. During the product lifecycle, the product data is consumed thousands of times. It is better to do it first time right than fix problems afterwards several times. Productizations must be standardized. The organization should have a holistic view to end-to-end processes that product data supports. System integration changes from point-to-point to reusable integrations.

Make it hard to make mistakes is the fourth principle. Product data creation and update processes should be designed so that it will be very difficult to make mistakes. When product data creation and updates (incl. Delete) are forced to do it right it lowers the quality issues in downstream processes. Data updates are forced to have all the mandatory fields filled or if there are multiple overlapping option to delete the outdated options.

Product is unambiguous, is the fifth principle, stating that product is defined each time in a standardized fashion. Processes that consume product data can automate the process concerning product data. There is no individual heuristic to interpret the product data. Product modelling is standardized way to implement the products.

Principle 6 states that there should be one product/solution for identified customer problem. There should be no over-lapping in product portfolio to ensure there is no overspend by running overlapping products. Overlapping products need to be identified and select the continued products.

Principle 7 is about modularity for product structure. Product variety can be mass-customized by reusable customer-facing services to enable the changes of the product offering to be fast to execute and the costs to be under control.

Principle 8: Only do things that are worth doing really, really well. Only well maintained product data has value. To prioritize the product master data activities the focus needs to be on the items that create value. The products that pass the previous principles are worth to maintain product data really well.

4.2.2 Business scenario method

The Portfolio management improvement project was mainly conducted by workshops. Within these workshops was conducted the Business scenario method with aim of getting an effective and standard way of identifying the business outcomes, the enablers and constraints, the use cases and priorities for the developments to be executed. The selected strategic intent for the workshops was to enhance the modularity and re-usability of products, checking for alignment with Elisa strategy, Customer needs & expectations and Business environment with focus on the aspect: Product data needs to be mastered and centrally managed.

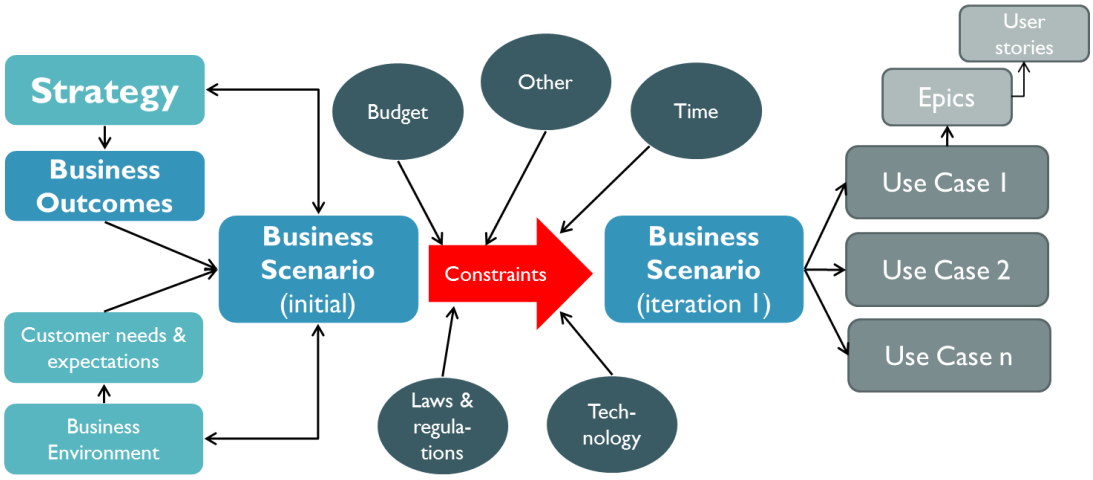

Figure 15. Business scenario method

The workshops started with defining business outcomes. In figure 12 can be seen the plan and structure for the workshop. The process starts from the upper left corner in the picture;

first needs to be understood what the strategic intent is. When defining outcomes, the participants were stating the outcomes were created with regards of the stated strategic intent. Key questions to ask were:

With regards to realizing the strategic intent:

- What value do we create for Elisa?
- What value do we create for our customers?
- What value are we creating for other (business) stakeholders? (suppliers, partners, shareholders, etc.)
- What value do we create for a regulating body? (not always applicable)

After selecting the strategic intent and the stated the related business outcomes, the business outcomes were prioritized:

- What are the “must haves”? → Need to be included in some way, even with a limited scope
- What the “should haves”? → Consider limiting the scope drastically or dropping it totally.
- What are the “nice to haves”? → Drop this – only to be added if all “should haves” have been included

The remaining business outcomes were then to be scoped and enriched with statements that qualify them and focus them.

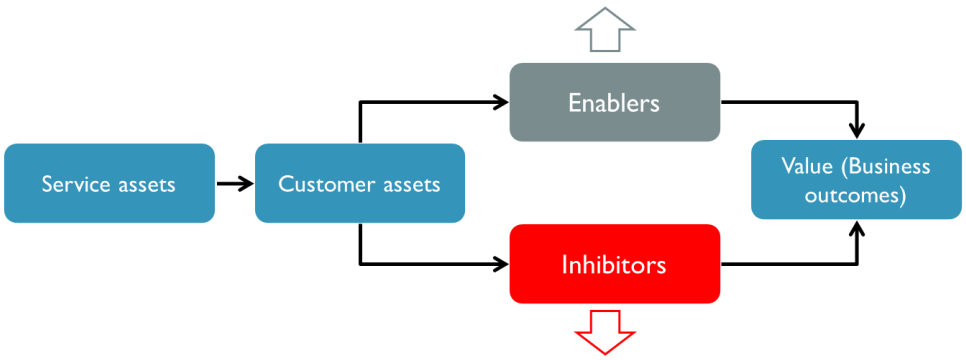

Figure 16. Value creation framework

After having selected a strategic intent and the stated the related business outcomes and applying constraints, the first iteration was to be done with the following steps:

- State the business scenario and all related business outcomes

- List the business outcomes in order of priority. If prioritizing isn't possible, create at least a chronological order or theme-based clusters.
- Mark the business outcomes as enablers or inhibitors (Figure 21) to facilitate the next steps.

When these exercises were done, it was time to create the use cases. This began by identifying and listing the internal or external users, the people who will use the service/process/system, they can be internal

The creation of the use cases started with defining the contents of a use case. Use case should be written from the user's point of view. A good use case should be user centric and contain the benefit or goal that the user wants to achieve, the actions that the user does in his/her operational role, the statements about what happens in case of exceptions. They can also describe what the user sees and does on the screen. The use case should not contain technical details and specifications or solutions. These are to be defined later.

The use cases are often crossing multiple business outcomes (figure 15). They can be used to map e2e value creation, so called value trains, loosely applied from the SAFe framework and lean process. Value trains show value creation e2e and combine multiple business outcomes into a coherent. Value trains are particularly useful for identifying capabilities in user stories. The benefits for value trains are that they can be used for release planning and demonstrating the business stakeholders that value is created throughout the project.

Following the development practices from SAFe, the use cases were further refined into epics (figure 15). An epic is a breakdown of the use case into its smaller components

- Goals are divided into sub-goals
- Processes are split into individual steps
- Still a higher view of requirements. Details are not described.
- Later the epic will be broken down into user stories. The creation of user stories is left to the development team(s).
- Mark on the epic to which use case it belongs
    - best done in a suitable system, e.g. JIRA) to enable tracking
- The system/process view is introduced
- Based on what the user does, the epic describes what the system/process needs to be able to do

An epic consists of two statements:

- What does the user/system/process do when the epic is implemented?
    - Example: The product manager can create a new product description already in the idea phase.
- How to verify this
    - Example: The unique product code of a product can be tracked from the beginning.

The participants then were to group the epics per common topics and decided on relevant topic categories, such as product data, UI, reporting, finance, etc. During the grouping epics from different use cases might end up in the same group, and then actions are needed to identify dependencies and/or overlaps, mark dependencies for future reference and when applicable, epics can be merged. The epics were organized into value trains with rules:

- A value train is delivering e2e value
- The value delivery is incremental
- Map dependencies between different value trains
- Adjust release cycles accordingly

The methods of the workshops were found useful and productive, and they should be in use when starting a product development process.

4.2.3 Product modeling and development process and validation points

The product modeling and development processes continued to evolve in the business change program. New products were defined, modeled and designed based on the learnings and methods as described in above chapters.

The teams used the checklists and validation points (Appendix 6. Product modeling checklist and Appendix 5: Product modeling and development process and validation points) to enhance transparency and quality in the development, but some challenges were still faced due to non-static resourcing issues and informal processes. The defined and approved process was tested and validated in action for product development and considered a good practice to follow. It clearly gave visibility to the process for the stakeholders and ensured that design and development are aligned with business requirements and best practices from application vendors. Additionally, development in different solution areas is following the same alignment. This will enhance modularity and speed in future developments.

The challenges were communicated to management and stakeholders and an agreement was reached to create a virtual product governance team to handle productization validation in different phases, steps and organization units. The agreement was to define owners for product models and product data to support governance and make the development processes smoother. The product data ownership and governance roles were defined by the end of the year 2016, with more detailed roles and responsibilities for them to be defined in the next phase.

5 Conclusions

This chapter analyzes the results achieved in this study and assesses their capability to answer the research questions.

Conducting of the study itself turned out to be more cumbersome than expected. There were changes in schedules, scope and resources within the organization. Creating a model for product development governance is big effort in an organization as big as the case organization. It is not enough that the insiders understand the need for governance, but the rationale for it must be deployed to all areas related to development processes. The understanding of the concept, its rules and processes must be deployed to stakeholders, development teams and everyone in the process. This takes time, patience, resources and good materials. This study hopefully provides information, learnings and tools to use in the deployment and utilization of governance within the company in this work.

The identification of the current lifecycle management processes gave insight and input for proceeding with the product development process improvement project. The interviews resulted in not just data and material, but knowledge transfer and innovations spanning many areas. The writer of the thesis was doing the interviews and depicted the processes, which helped with the following improvement phases.

Among the outcome from the product development piloting process were tools and methods for the product development requests and a validated process for proceeding with the requests in a transparent and agile manner. The process implemented standardized validation points and checklists. The pilot team grew business understanding and the business change program gained understanding about the importance of a good product development process, as the needs were raised and there was a process in place with knowledge

for handling the requests. Urgency often burdens particularly vendors to fulfill the needs from business. Requirements can be misunderstood and the result might cause more problems than solutions if the requests are not understood and handled properly. The new Jira and confluence tools that were created, trained for and used in product development helped here, granting visibility to all relevant participants about the requirements, solutions and progress of development. Change management process was employed for these requests. Within that the team informed the requesters and the responsible participants of the product developments and changes in the process. Documentation templates and principles were introduced to help all interested parties find the needed information of the product, data models, structures, designs and technical details as well as the development and the testing documentation. The writer of the thesis is a part of this team and has created the Jira and confluence tools tailored for this need based on hands-on experience. The tools are thus more useful than an out of the box solution provided by external party might have been.

A product modeling governance team was created and the responsible persons there communicated within the organization as the focal points and data stewards for product development process. The writer of this thesis is a member of the governance team and created the materials e.g. for the checklists and documentation templates together with other members of the team in the same role.

Portfolio management improvement project provided input for the needs of product modeling governance and the validations related to product development. The writer of this thesis is a member of the project and participated in creating the materials and facilitating the workshops.

5.1.1 Answers to research questions

In the domain of product development and portfolio management, there is always an ongoing debate whether flexibility is more important or standardization. While both outcomes are desirable, they are often mutually exclusive. The ideal is the proper balance between allowing flexibility and ensuring standardization in order to enable products and processes to scale.

From this study, it can be concluded based on the feedback from organization that the benefits from standardizing data structure, customer facing service components, process decision points and selected process steps by far outweighed the impact on flexibility. Standardization created visibility throughout the entire portfolio and enabled its strategic management.

Research Question 1 was: How can portfolio management benefit from standardization in the product development process? From this study, it can be found that portfolio management can benefit from standardization in the product development process a lot. A good product development process makes development projects and changes to go through the pipeline effortlessly and in a more controlled fashion. When the product development process governs the rules, models, and structures, it is easier for the business to adhere to the portfolio strategies. The business product management benefits from the product development process because of the structure it provides: There are more structured procedures for requesting products and the steps are clear and simple to follow. The whole process is transparent and validated. Portfolio management has better capabilities for modeling the product portfolio when there is less variation and fewer different interpretations and structure options for products. Furthermore, better portfolio management enables better strategic alignment.

Research Question 2 was: What is the impact to lead time and development costs if validation is improved? The study states a hypothesis as an answer to this question; if the amount of development required for new products less, it will reduce the costs and lead time drastically. For the time being the improved process has not been used for long enough time to have reliable statistical data to prove the hypothesis. What can already be said is that the improvements in the product development process improve the quality by way of validation and standardization. This results in fewer problems in the testing phase and in production. The reduced amount of post-deployment incidents also has impact on lead time and costs: Fewer fixes are needed in the later stages of the development process, and the fixes that need to be done are quick and easy.

Research Question 3 was: What methods and tools could be used to support standardization and validation in the product development process?
This study introduced the following methods:

- Jira and confluence for the request management, workload handling, validation points, documentation, communication and change management
- focal points and roles for governance in the product development process for enabling the ownership
- product modeling checklists and templates
- business scenario planning methods and templates

These methods were tested and validated throughout the process and were found to provide better ways to facilitate the work and communicate. The tools and methods have already yielded improvements on the results of the work and have gotten very good feedback.

5.2 Development suggestions

The introduced and implemented changes have already yielded improvements on the results of the work, and should be continued with continuous evaluation and improvement. Measurements should be created and agreed on for the processes in order to gain better understanding on the possible bottlenecks and further improvement opportunities.

Resources relevant to a given domain should be permanently allocated to enable the teams to build more motivation and commitment. With permanent team allocation the knowledge and velocity continues to grow and that will have a clear impact on the measurements regarding the costs and time to market.

Product management improvements should be continued with a Product Data Management system and clear ownerships of product data. Modeling should be also improved with easier tools for documenting and modeling products, in order to create understanding and visibility throughout the organization related to products, their features, and resources. This understanding and visibility would also improve the early stages of the product development.

5.3 Discussion and personal reflection

Being involved in the hands-on work and as a member of the development groups and the improvement project gave better visibility for the whole picture and helped knowledge transfer and deployment, as well as in all the phases and steps. This involvement also created

challenges regarding time and resource allocation for the different tasks for these teams, groups, projects and study research but they also all served each other and made it possible to combine together the large scope; gathering the information and understanding this project.

Writing this thesis and doing the research for it has been a journey where I have learned more than I expected about myself, my capabilities, the organization, the great minds and persons and vision that we have within the organization and the quality that they all bring to the work they perform. It has been a great journey.

What many people often seem to forget in their daily routines, the development hassle and the ITIL castles is that we do all this to find solutions for the customer. The customer is looking for a solution to his/her problem when the consumption process starts. What we need to do, is to provide the solution. And not just any solution, it must be exactly what is needed, when it's needed, and it must be cost-efficient so we can provide it to our consumers with a competitive price. Customers' needs are often complex and that presents the requirement for different choices. And choices, as wonderful as they are, actually require a lot of time for the customer to understand and choose the wisely. On the other hand, there's the effort and cost for the provider.

Following the lean principles, the solutions can be simply customizing for the customer as service, building choices that are easy to develop and easy to choose from. Creating value for everyone.

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Appendixes

Appendix 1: Interviews of the stakeholders
Appendix 2: Interview questions
Appendix 3: A model for improvements in product management process (Confidential)
Appendix 4: Current state analysis of product lifecycle process (Confidential)
Appendix 5: Business scenario method (Confidential)
Appendix 6: Product modeling and development process and validation points (Confidential)
Appendix 7. Product modeling checklist

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Appendix 1 Interviews of the stakeholders

The respondents for the interview were from various units and roles

Department	Unit	Role
Corporate business department	C.Business Unit B	Business manager
Corporate business department	C.Business Unit B	Business manager
Corporate business department	C.Business Unit C	Head of department
Corporate business department	C.Business Unit C	Business manager
Corporate business department	C.Business Unit C	Business manager
Corporate business department	C.Business Unit C	Business manager
Corporate business department	C.Business Unit D	Business manager
Corporate business department	C.Business Unit D	Business manager
Reporting		Development manager
Quote to Cash	Backoffice	Planner
IT Development	Development solution area 1	Development manager
IT Development	Development solution area 2	Development manager
IT Development	Development solution area 3	Development manager
IT Development	Development solution area 4	Development manager
IT Development	Development solution area 5	Development manager
IT Development	Development solution area 6	Development manager
Portfolio management	Product management	Head of configuration management
Portfolio management	Process management	Development manager
Portfolio management	Process management	Portfolio manager
Portfolio management	Process management	Solution manager
Residential business unit	R. Business Unit A	Channel developer
Residential business unit	R. Business Unit A	Business manager
Residential business unit	R. Business Unit A	Demand manager
Residential business unit	R. Business Unit A	Tester
Residential business unit	R. Business Unit B	Channel developer
Residential business unit	R. Business Unit B	Business manager
Residential business unit	R. Business Unit B	Demand manager
Residential business unit	R. Business Unit B	Tester

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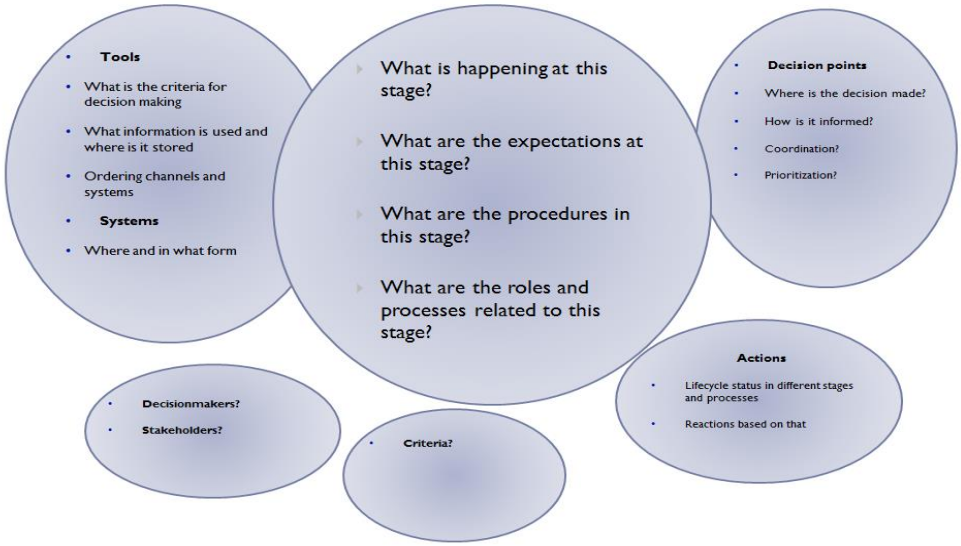
Appendix 2: PLM Survey: Interview questions



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Appendix 7. Product modeling checklist

Product Modeling Checklist

Marketing Product Composition

- How is the product marketed to the end customer - Marketing product name
- Have all constituent parts of the product (sales items) been identified
- For all sales items, have all price determining attributes been identified
- For all sales items, have all order fulfilment attributes been identified
- Have all mandatory attributes been identified before a sale is considered closed from a sales person standpoint

Pricing and Discounts

- Describe the pricing definition process associated with the marketing product
- Where are the prices mastered, who are the key users who participate in the pricing process
- How are the prices arrived at for a sales item
- How often do list prices change
- Is customer specific pricing norm or the exception
- Have all pricing types been identified for the sales item (i.e. OC - One-Off charges, RC - Recurring Charges, UC - Usage Charges, Service modification charges)
- What are the different discounting mechanisms?

CASE rules

- What are the business rules that govern product category selection - **S**ellability rules
- What are the business rules that govern product selection **- A**pplicability rules
- What are the business rules that govern the attributes (price and fulfilment attributes) that make up a sales item – **E**ligibility rules
- What are the business rules that govern the different sales items - **C**ompatibility rules

In Life Changes

- What are the different types of changes (add, modify, delete) that are possible during the lifecycle of the service
- What are the business rules that govern the change process scenarios (is there a minimum contract period when changes are not allowed etc)
- What changes must be supported across different sales channel

Reporting

- How does the business want to categorize the product (i.e. product category hierarchy structure)
- How does the business want to report on the product and its sales items
- How does the business want to forecast on the product, whether at product family level or not
- How should the product and sales items associated with the product be represented in customer documents (quote/proposals, contracts, invoices, change order forms etc)

Service Modelling Guidelines

- Service understanding from Delivery perspective i.e. how its being provisioned on the actual network
- Service can be sold independently or can be bundled with other service
- Important from Service transaction perspective i.e. can be added or modified independently
- Helps in matching the technical capability to customer needs
- Modelled from reusability perspective i.e. ResourceFacingService or CustomerFacingService can be reused for other products