**LAPPEENRANTA UNIVERSITY OF TECHNOLOGY**
LUT School of Business and Management
Industrial Engineering and Management

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# LEAN PRODUCT MANAGEMENT – ENHANCING PRODUCT MANAGERS' ABILITY TO CREATE VALUE

**Master's Thesis**

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# ABSTRACT

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**Hakusanat:** Lean, tuotehallinto, hukka, Lean toimisto, työkalut ja menetelmät

The purpose of this master's thesis was to study the opportunity to apply Lean practices to product management function which happens in an office environment. Since product management plays an important role in the company's success story, it's important to have it functioning as effectively as possible. The goal was to find those Lean tools and methods that fit the best to the needs of product management.

The research was conducted as a qualitative action research which comprises a comprehensive literature review and a single case study. Theoretical information about Lean Thinking and product management was collected from articles, literature and Internet sources. Moreover, empirical data was collected by conducting interviews in the Case Company's product management department in order to gain an in-depth understanding of product management's problematics.

The results indicate that most of the product management challenges could be overcome by applying Lean practises. Based on the usability rate, which has been discussed in the empirical part of this study, the most suitable Lean practises for product management function are: value stream mapping, Kanban and KPIs.

# TIIVISTELMÄ

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**Keywords:** Lean, product management, waste, Lean office, tools and methods

Tämän diplomityön tarkoituksena oli tutkia, voiko Lean käytäntöjä soveltaa tuotehallintoon, joka tapahtuu toimistoympäristössä. Koska tuotehallinnolla on keskeinen rooli yrityksen onnistumisessa, sen toimiminen mahdollisimman tehokkaasti on tärkeää. Tavoitteena oli löytää ne Lean työkalut ja menetelmät, jotka soveltuvat parhaiten tuotehallinnon tarpeisiin.

Tämä tutkimus toteutettiin kvalitatiivisena toimintatutkimuksena, joka sisältää kattavan kirjallisuuskatsauksen ja yksittäisen yritystapatutkimuksen. Työn teoreettinen aineisto koskien Lean-ajattelua ja tuotehallintoa kerättiin julkaisuista, kirjallisuudesta ja Internet-lähteistä. Työn empiirinen aineisto kerättiin suorittamalla haastatteluja Case-yrityksen tuotehallinnossa, jotta voitiin muodostaa syvällisempi käsitys tuotehallinnon problematiikasta.

Työn tulokset osoittavat, että suurin osa tuotehallinnon ongelmista voitaisiin ratkaista Lean käytäntöjä soveltamalla. Empiriaosuudessa tunnistetun käytettävyysasteen perusteella tuotehallintoon soveltuvimmat Lean työkalut ja menetelmät ovat: arvovirtakuvaus, Kanban ja suorituskyvyn mittaristo.

# ACKNOWLEDGEMENTS

The first time I heard the term “Lean” was while working for the summer in the Case Company’s production facility. Although, I became familiar with some of the Lean methods that were used in the production shop floor, Lean in its entirety remained a mystery to me. It was until I started my bachelor’s thesis, when I finally understood the purpose and true meaning of Lean. After seeing with my own eyes how the productivity and efficiency could be increased, I understood that the goal is to work smarter not harder. The words of my then sensei “Nina, remember Lean can be applied anywhere just use your own imagination” stuck with me and gave me the idea to research the topic of this master’s thesis.

I would especially like to thank my supervisors from the Case Company, Mr. Jussi Rantanen and Harri Mustonen, for giving me the opportunity to be a part of the company’s product management team and conduct this master’s thesis research. I would also like to express my gratitude to my co-workers – I really appreciate your time and support for this project. Furthermore, I would like to thank my 1st Examiner Professor Timo Kärri for giving me good advice and challenging me throughout the project.

Last but not least, I would like to thank my friends and fellow students at LUT for help and motivation along the way.

Nina Saavalainen
Helsinki, November, 2015

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# ABBREVIATIONS

| | |
|---|---|
| B2B | Business to Business |
| BG | Business Group |
| BU | Business Unit |
| KPI | Key Performance Indicator |
| NVA | Non-value-adding |
| OEM | Original Equipment Manufacturer |
| PDCA | Plan-Do-Check-Act |
| PLC | Product-Life-Cycle |
| PM | Product Management |
| R&D | Research and Development |
| RQ | Research Question |
| TPS | Toyota Production System |
| VSM | Value Stream Mapping |
| WIP | Work-In-Process |

# 1 INTRODUCTION

## 1.1 Background of the thesis

Through the years Lean tools and methods have been successfully implemented to a large number of manufacturing applications. Companies have put a lot of effort to make their production processes as Lean as possible but when it comes to office processes they have somewhat accepted that inefficiency is part of the office environment. However, it's important to acknowledge that Lean is not applicable only for the factory shop-floor but can be used more widely in the company's office functions. Still most of the manufacturing companies struggle to utilize Lean principles in the office and that's why it remains to be a fairly unknown concept for the white-collar workers.

Product management is a critical part of the company's success because it's the function that takes care of the strategic planning and tactical execution of the company's new and existing products. If the product fails to generate value to the customers, it simply won't sell in the competitive market. Product managers have a big responsibility to manage the product through its whole lifespan while listening and taking into consideration the customer requirements. This is not an easy task to manage because the product management function is very multidimensional and requires different inputs in different stages of the product life-cycle. Product managers also work closely with nearly all functional teams of the company which makes the job even more complex.

The Case Company is a big multinational B2B company that wants to develop its product management function into a world-class operation. In order to achieve a more agile and efficient product management, all the "waste" that is taking a lot of time away from the product managers but don't generate any value to the customer should be identified and eliminated. The Case Company is currently using Lean methods in its production and R&D functions. This thesis explores the possibility to utilize lean tools and methods also in the product management process which happens in an office environment.

## 1.2 Research objectives

Little research has been conducted on the utilization of Lean Thinking in the product management function. Therefore, the main goal of this master's thesis is to shed light on how companies could successfully bring the Lean tools and methods from their production shop-floor into their product management function that takes place in an office environment. Since product management function plays an important role in the company's success story, it's important to have it functioning as effectively as possible. In order to reach that goal, it's vital to gain a deeper understanding on the problem areas of product management and find the most suitable Lean tools and methods that can solve these issues.

The main research question is:

- **How can Lean tools and methods be applied to product management function?**

The main research question can be divided further into two sub-questions:

- **Which Lean tools and methods fit the best to the needs of product management? (RQ 1.)**
- **How to measure the results of Lean implementation in the product management function? (RQ 2.)**

This master's thesis provides the Case Company valuable information about the current state of their product management function. It looks into the biggest challenges which the product managers regularly encounter, that undermine the product managers' efficiency and ability to create value to their customers. This research also suggests practices that would "push" the product management function towards becoming more Lean. As a result of this master's thesis, the Case Company will have guidelines which to follow in its Lean transformation.

### 1.3 Research methodology and limitations

The research was conducted as a qualitative action research which includes a comprehensive literature review and a single case study. Theoretical information about Lean Thinking and product management was gathered from various sources including literature, research articles and Internet. The product management processes vary between service and manufacturing companies and due to that the theory part on product management is solely limited to manufacturing companies since the Case Company also works in this sector. Some recent studies focusing on the challenges of product managed function were found and they are also utilized in this study to form a deeper understanding on the issues that should be solved in order to achieve more efficient product management unit. Due to the limited extent of this study, not all Lean practices could be inspected. The lean tools and methods that are more specifically introduced in the chapter 4 have been selected based on the fact that they are proven to be suitable for the office environment and that's why possibly suitable also to be utilized in the product management function.

The empirical part of the study focuses on the Case Company's product management function. Lareau's 20 Keys-approach is utilized to find out what is the level of performance in terms of Lean in the product management function currently. Several product managers were also interviewed to discover the biggest challenges in the Case Company's product management department. The interview questions were formed based on previous studies that have been carried out on the subject of product management challenges. The idea of the survey was to gain a deeper understanding on the problems that product managers encounter in the Case Company. After the biggest product management challenges were recognized, a framework was formed in order to evaluate the Lean methods and tools according to each challenge. The framework was used to assist the selection process for the implementation phase. Every tool and method was reviewed sufficiently in the Case Company in order to clarify the possibility for implementation.

One unit from the Case Company's product management department was chosen to be used as a pilot unit during the implementation phase. However, time can be seen as one of the biggest limitations to this master's thesis because it takes time to

implement all the necessary Lean tools and methods. This is the reason why a follow-up plan is also introduced to the Case Company to provide guiding on how to continue the Lean transformation process in the organization.

### 1.4 Structure of the thesis

This master's thesis comprises total of eight chapters. The theory part is divided over three chapters in order to form a solid understanding on product management and Lean Thinking. The empirical part respectively comprehends two chapters that focus on the evaluation and implementation of Lean tools and methods. The figure below (Figure 1) summarizes the chapters and the goal of each chapter.

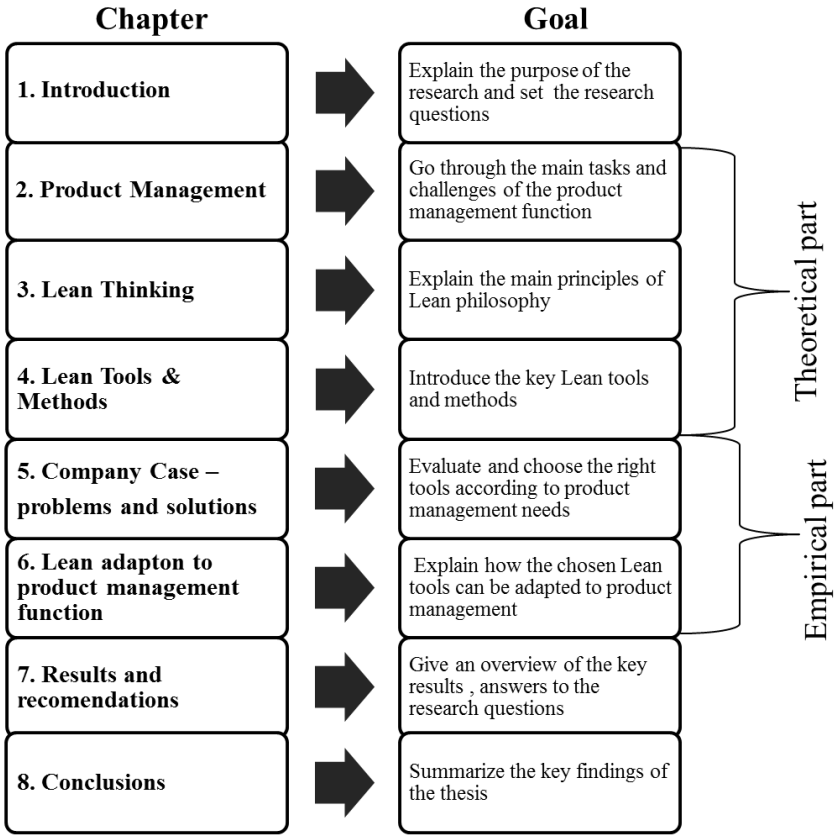



**Figure 1** Chapters and their goals

**Chapter 1** introduces the reader to the subject by going through the background of the thesis. In this chapter also the objectives, limitations and research methodology are introduced. **Chapter 2** starts the actual theory part which continues also in the following chapters 3 and 4. This chapter gives an important insight to the product

management function of a manufacturing company. This chapter explains the importance of product management's role in the organization and what kinds of tasks the product managers perform according to each product life-cycle phase. The most common challenges are also introduced in the second chapter to form a deeper understanding of the product management's problematics.

**Chapter 3** introduces the main Lean principles so that the reader can fully understand the logic behind Lean philosophy. This chapter also discloses the eight deadly office wastes and the key steps in order to eliminate them. The problematics and key success factors of practising Lean in the office environment are discussed in the last subchapter. **Chapter 4** shortly introduces the most essential Lean tools and methods that could potentially be used in the product management processes. The goal later on is to find the most suitable ones among these ten.

**Chapter 5** starts the empirical part of this thesis. The main purpose of the fifth chapter is to critically evaluate the Lean tools and methods while taking into consideration the main problems of product management. The Case Company and especially its product management department are also introduced in this chapter to give an important insight on the department's current conditions and performance. **Chapter 6** discusses how the chosen Lean tools and methods can practically be implemented to the Case Company's product management unit. The follow-up plan is also presented in the last subchapter to provide guiding on how to continue the Lean transformation process in the organization.

**Chapter 7** introduces the key results of this master's thesis and gives answers to the research questions. It also proposes recommendations to the Case Company on how to succeed in the Lean transformation process. **Chapter 8** brings to an end of this master's thesis by summing up the key findings.

# 2 PRODUCT MANAGEMENT

## 2.1 Strategic role of product management

Product management is a function that has been utilized by a large number of companies in a variety of industries and during the years it has found its place in the organizations. The invention of product management concept leads back to the year 1931 when Procter & Gamble assigned one product manager to each of the company's two competing soap products. Since then the basic idea of product management has become well-known all over the world. (Kittlaus, Clough, 2009, p.1)

Product manager's roles and responsibilities vary significantly by industry and company size. There's also a greater variability in the scope of responsibilities when working as a product manager than in other functional areas in the company. Generally speaking, product management is the function that takes care of the strategic planning and tactical execution of the company's new and existing products. This responsibility includes supervising and coordinating all the activities that a certain product or an entire product family has. It's very important that the product manager understands how all the pieces of the business fit together. That's why the product manager also needs to acquire deep knowledge about the customers and the companies that the organization competes against. (Geracie, 2010, p.20-21)

According to Zahid (2013, p. 20-23) product manager can be pictured as the mini-CEO of the product whose job is to make decisions about the product on daily and weekly basis throughout the product's lifespan. Whereas, the product manager's job is to manage a single product, a product line manager is usually responsible for the whole product family or multiple products families. The product line manager's responsibility is to lead the product line or portfolio forward as a complete solution against the competitors' offerings and make sure that the company's own products don't cannibalize each other. Successful product lines are the results of a clear product positioning among different products and a clear go-to-market strategy.

Since product marketing is closely connected to product management, it's sometimes under the responsibility of the product manager. In bigger companies product marketing activities have been separated and assigned to a product marketing manager. (Zahid, 2013, p. 23-24) Typically product manager's role is to listen to the market and communicate the market problems in the form of product requirements. Product marketing manager's role on the contrary is to talk to the market through promoting a product or product family. Product marketing manager's job description includes: managing product launches, building up product messaging, originating product collateral and planning and taking part in promotion events. Both product manager and product marketing manager are anyhow equally committed to write business cases and research market needs. (Pragmatic Marketing, 2008)

In order to deliver a successful product to the market, the product manager needs to work closely with inbound and outbound sides of the company (Figure 2). The product manager has to be committed to understand the needs of the customers and form a bridge between the inbound and outbound sides by converting the customer needs in the form of requirements. (Zahid, 2013, p. 20-21) On the outbound side the product manager interacts with customers, analysts and business partners. These interactions can consist of focus groups, advisory boards, surveys and customer visits. (Geracie, 2010, p.29-30)

On the inbound side the product manager deals with nearly every functional team of the company since the product manager needs to plan, organize and control products from their concept until the termination phase. These inbound teams include R&D, manufacturing, finance, documentation etc. (Zahid, 2013, p. 20-21) The inbound teams expect the product manager to be the subject matter expert and be able to answer questions about the market, competitors, clients and prospects. When the product moves on from the development phase, the executives expect that the product manager will also provide relevant training and support to sales and service teams that interact with the customers. (Geracie, 2010, p.23)

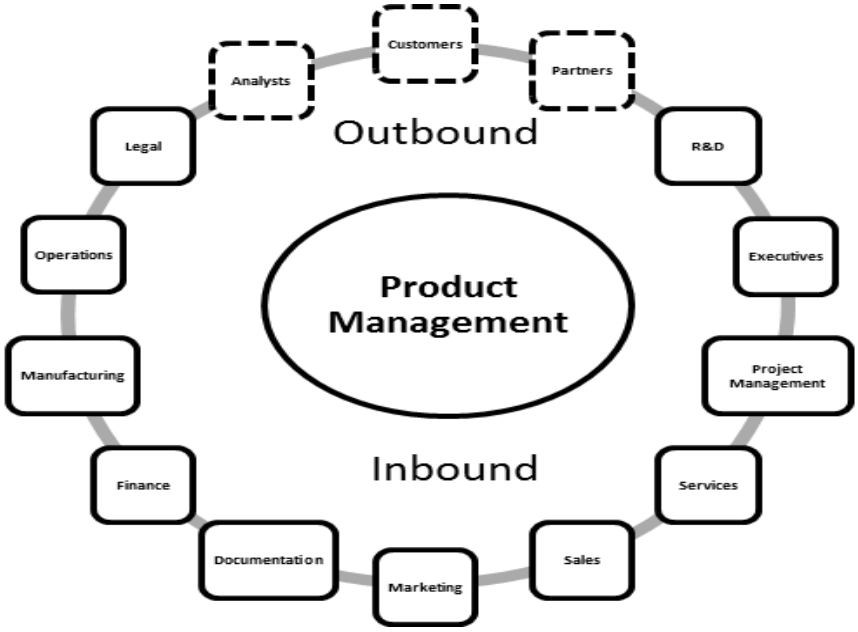



**Figure 2** Inbound and outbound sides of the company

There are many reasons why a product manager acts like the "middleman" between the customer and the engineering teams. Technically those teams could directly interact with the customers but it's not advisable. First of all, there are very sensitive issues and protocols for interacting with the customers, for example the company must be careful about what to expose and not to expose to their customers. The company has to also pay attention to a good relationship management that inbound teams are not trained or focused on. (Zahid, 2013, p. 22-23)

The inbound teams play an important role in the value chain and any communication or interaction with the customers could be more like a distraction that would take time and energy from their own core responsibilities. Evaluating the product requirements in a business context could also be challenging for the engineering team members. Inbound teams might also end up debating on which customer's requirements are more important. That's why a product manager is needed to filter, combine and prioritize the requirements from various sources for the inbound teams. Besides the requirement controlling, product managers are involved with several other tasks such as performing market analyzes, forecasting, product positioning and pricing. These activities simply cannot be carried out by engineering, operations or other functional teams. (Zahid, 2013, p. 22-23)

## 2.2 Product management tasks during the product life-cycle

A product can be either tangible or intangible and its main purpose is to function in a certain way in order to answer to the needs of the customer. The success or failure of the product greatly depends on how well the customer requirements have been translated into realization. If the product doesn't create value to the customer, it simply won't sell in the competitive market. That's why a product should never be the result of a random idea but carefully thought through so it can serve a specific purpose and need. (Zahid, 2013, p. 19)

The product life-cycle model (Figure 3) is a very important concept in the product management function as it dictates the product management tasks in each phase. Overall the product life-cycle consists of five phases: product planning, execution, launch, sustaining, and termination. For the product management, this means defining, creating, and growing products according to the customer requirements in order to generate revenue. The curve that is usually missing from the traditional product life-cycle frame shows the activities that happen before the product is ever introduced to the market. This includes product concept creation, development and testing that have a tremendous impact on the product's future success or failure. (Zahid, 2013, p. 19)

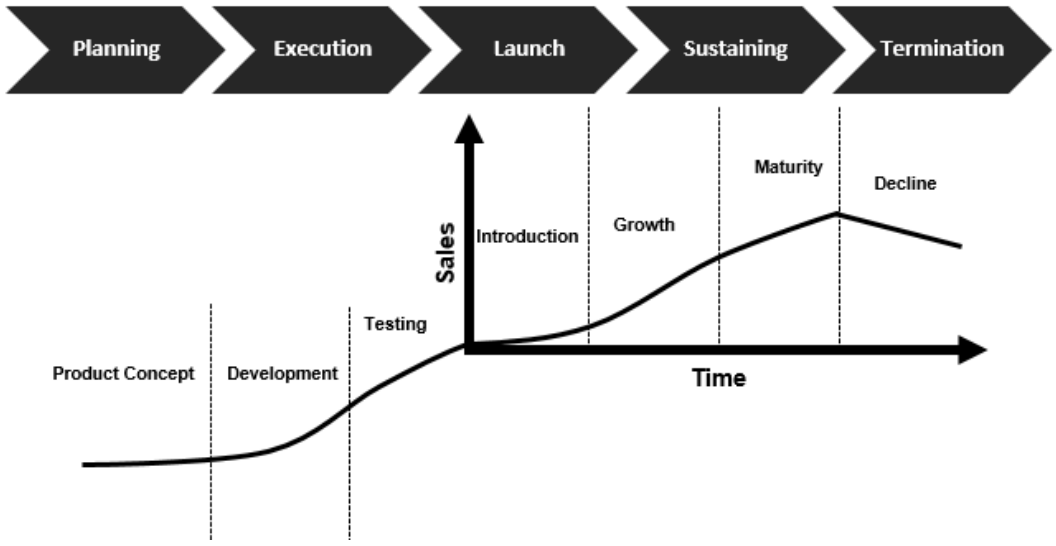



**Figure 3** Extended product life-cycle model

The product management is involved with the full lifespan of the product. This lifespan usually starts from an idea, evolves into a concept, gets built according to the customer requirements and is launched to the market to generate revenue. Product management's responsibility towards the product doesn't end after the product has been successfully pushed to the market – the product usually needs further improvements in order to maintain its competitive position in the market. When the product finally reaches the end of its lifespan, it also needs to be terminated with careful preparation and messaging. The product management activities in different phases of product life-cycle are described more detailed below. (Zahid, 2013, p. 18)

**1. Product Planning**

The product planning phase is the first and one of the most essential phases of PLC. The product ideas often derive from a deep knowledge and understanding of the customer needs, markets, technologies and the problem areas that the current products or solutions have. The very first task for a product manager is to think through an idea and evaluate it with colleagues, executives or even potential customers. In fact, through a formal usability study the product manager can obtain valuable information from the potential customers of how the new idea could benefit them or what kinds of improvements might be needed in order to make it more useful for them. (Zahid, 2013, p. 40)

Once the product idea has been validated with potential customers or investors, the product manager translates the idea into a formal concept proposal which expands the idea into more refined and detailed form. This form can be better reviewed and presented to executives. The concept proposal needs to describe the problem that customers or end users encounter because of lack of feature functionality in current products and suggest a suitable solution for it. The concept proposal also gives insight into market opportunities and product positioning. Creating the correct product positioning is one of the key tasks that the product manager must do as accurately as possible. The product not only needs to be positioned with reference to the competitors' products but also with reference to the company's own product portfolio. (Zahid, 2013, p. 41-51)

If the product concept proposal gets approved, the next logical step for the product manager is to define and write down the detailed product requirements, while the engineering team initiates preliminary feasibility analysis of the approved idea. In this phase the product manager can be seen as the voice of the target customers and the requirements appoint what the future product is supposed to deliver in terms of performance, features and functionality. Because the product requirements are communicated straight by the product manager to engineering and other functional teams, it's extremely important that the requirements are as clear as possible. (Zahid, 2013, p. 59-60)

**2. Product Execution**

In the product execution phase the product really starts taking shape according to how it was planned in the previous phase. If this phase is successfully executed, the product is delivered to the market on time. On the other hand, if managing the execution phase fails and the product launch gets delayed, it can affect the product's success negatively. This phase is very busy for all the functional teams that take part in designing, building and testing the product while the product manager is supervising all these activities closely. (Zahid, 2013, p. 25 & 114)

A project specific functional team (core team) is gathered only for the duration of the project and it's the core team's goal to deliver a finished product according to the requirements that the product manager has set. The product manager's job in this phase is not to dictate in-depth technical details but function more as a consultant and a reviewer in order to validate what the core team suggests. In the beginning of the project, a core program manager is appointed to lead and coordinate the core team's activities on daily and weekly basis. To ensure that the development phase runs smoothly, the core program manager (sometimes referred as the project manager) should work very closely with the product manager. (Zahid, 2013, p. 88-94)

A prototype can be built in the development stage to test the product's functionality and design. This raw version of the future product gives the product manager and the whole core team a great opportunity to discover any hardware or design issue.

The beta pilot units can be released to a wider distribution for both internal teams and external customers after the product design and functionality have been validated. To find suitable beta candidates, the product manager makes a call-for-beta announcement to the company's sales team and partners in order to find potential customers that would be willing to try the new product. The beta trial helps to gather early quality feedback in terms of customer experience and it also lets the potential customers become familiar with the product which can lead to possible sales and word-of-mouth marketing. (Zahid, 2013, p. 96-102)

### 3. Product Launch

The product launch phase is a very exciting period of time for the product manager because the idea finally shapes into a real and functional product and is ready to get under the spotlight. The goal is to spread the news about the product and actively start to market it in order to raise awareness. It doesn't matter how great the product is, it still needs be advertised so that the potential customers can find information about its availability and can eventually purchase the product. (Zahid, 2013, p. 25 & 116)

Before the actual launching takes place, it's important to terminate all the beta activities and form a report on the lessons learned from the beta pilot trial. The product manager needs to also complete the product pricing process. It's important that the product is priced correctly, taking into consideration the competitors, diverse geographies and buying behaviors. After determining the price that shouldn't be exceeded, the product manager releases an open-quote announcement to the sales team and partners to inform them that the product is available for quoting. This allows the sales team to start constructing a sales pipeline which consists of the potential sales opportunities that should start growing and turning into real orders. Since the product manager usually has the access to the sales data, he/she may follow the sales pipeline closely to make sure that the product is doing well in the market. (Zahid, 2013, p. 117-129)

The product launch starts with a public announcement through a press release which is usually lined up with a big industry event such as a trade show or public conference in order to maximize the customer and media attention. The press release is often followed by media and analysts briefings that give an excellent opportunity for the product or marketing manager to tell the product's story and highlight the clear differentiation against competition. A marketing manager is usually responsible for promoting and advertising the products but sometimes the product manager performs the dual role of being both a product manager and a marketing manager. The last step that the product manager has to perform in the launching stage is opening the accounting books for the product revenue recognition. At this point the product's final pricing should be uploaded into the ordering system which then should be ready to accept real orders. (Zahid, 2013, p. 134-145)

**4. Product Sustaining**

Once the product has been launched, it still needs to be sustained because the new product is typically expected to live for several years. The product is rarely perfect at the time it is launched and many unexpected issues may arise when the product is put in operation in diverse environments. These issues need to be fixed so that the customers, that have purchased the product, can get the maximum performance and productivity out of it. (Zahid, 2013, p. 148-149)

A long-term development strategy of the product is planned by the product manager already in the product's concept phase. The product roadmap is then formed according to the long-term strategy and it explains which features, components and capabilities will be added later on to the product. Often the sales people and partners start requesting different kinds of options and accessories after the product has been launched. The product manager can also start collecting the new feature requests through a process of feature request submission. Ultimately, it's the product manager's responsibility to filter out those requirements and prioritize them. After the product has been in the market for some time, the product manager can see more clearly which markets and applications have the best potential and he/she can further strengthen the product in those applications. (Zahid, 2013, p. 149-152)

During the sustaining phase, the product manager should also monitor the sales pipeline since it's an important part of the sales forecasting process. The forecast is expected to grow every year if not every quarter which indicates the success of the product and healthy business environment. The product manager usually also presents the forecast to the executives every month or quarter to keep them updated. It's important not to forget to promote the product in the sustaining stage as the competitive landscape keeps changing and the competitors launch similar or even better products. With the help of the marketing team, the product manager should design and launch new marketing campaigns that can incite the customers and partners to continue buying the product. (Zahid, 2013, p. 160)

### 5. Product termination

Eventually, every product comes to the end of its life-cycle where it's removed from the market and replaced by a better one. The product termination is not a single step but more like a process of several steps that follow each other. It's important that the product manager gives a lot of thought on how to do the planning and messaging in this phase in order to discontinue the older product gracefully. The termination preparations usually start relatively early, sometimes months or even years before the concrete end-of-life process starts. When the product hits the maturity phase, the product manager should already start visualizing the replacing product and how it would be better than the soon-to-be terminated product. (Zahid, 2013, p. 175-176)

The product's end-of-life process usually gets started when the product manager issues an end-of-life proposal which explains why the product or products should be terminated. The proposal also includes an analysis of the financial impacts resulting from the termination of the product and it suggests a replacement product and migration strategy from older to newer product. After the proposal gets approved, the product manager can make an end-of-life announcement to the customers and partners. It's important to notify the customers and partners in an early stage to get them prepared for the migration so that their business operations would not get affected. (Zahid, 2013, p. 175 & 184-186)

After the end-of-life announcement has been issued, the product manager can start building the end-of-life readiness. In this stage the product manager will monitor the sales pipeline closely and instruct the whole sales team to quote the new product instead of the one being terminated. This will slowly shift the revenue over to the newer products and protect the existing customers' installed product base. The product manager will also need to make a request to close the accounting books, take the product off from the price list and stop shipping the product. (Zahid, 2013, p. 180-183)

### 2.3 Challenges

The product management function is multidimensional and requires different inputs in different phases of the product life-cycle. The product managers also deal with nearly all functional teams of the company which makes the job even more complex. Since not much research has been conducted about the difficulties in the product management function, not much is known about how to develop it further. In 2012 both a private consulting company and a university research team conducted separate surveys in different countries about the main challenges in the product management function. The results are joined together in this subchapter to deepen the knowledge about the issues that should be solved in order to achieve a more agile and lean product management.

One of India's leading product business consulting firms Confianzys Consulting conducted a survey with 100 practicing product managers from different-sized companies to chart the major challenges of product management function. (Confianzys, 2012) This survey gave an important insight to the internal and external challenges which hinder the product managers' ability to create value to their customers. The main internal challenges that were recognized are illustrated in the pie chart below (Figure 4).

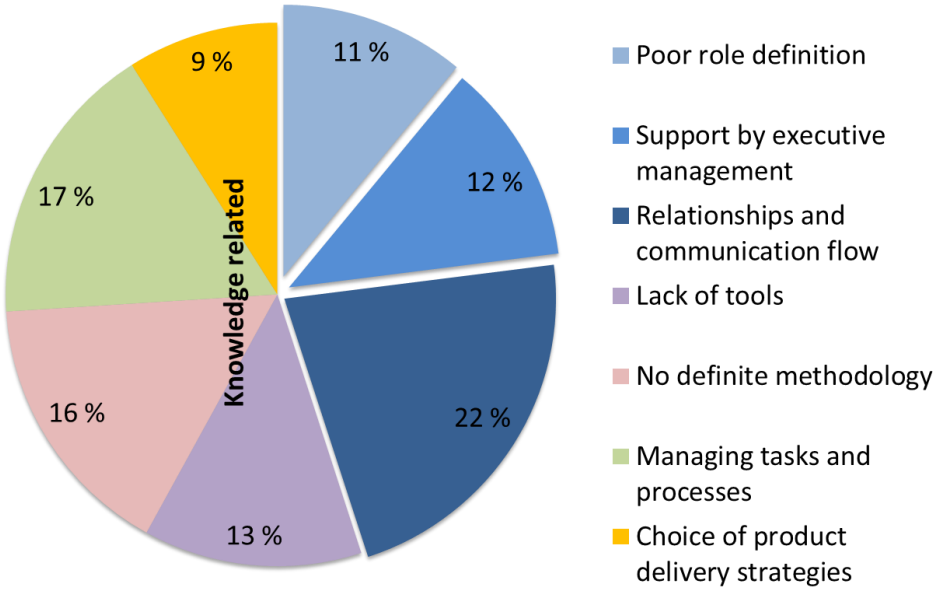



**Figure 4** Internal challenges of product management function (modified from http://www.confianzys.com/blog/the-state-of-product-management-in-india-2012/)

The internal challenges can be roughly divided into two main groups: knowledge and role definition related challenges. The survey shows that 55 % of the internal challenges were knowledge related which means that the product managers felt that they didn't have definite methodologies or enough tools and they also had difficulties in managing tasks and processes. (Confianzys, 2012) More or less 40% of the new products are unsuccessful in the market. More defined methodologies or processes don't guarantee success but they can definitely help to reduce the failure rate through check points and by repeating what has worked before. That's why organizations should give serious thought to process maturity. (Spice Catalyst, 2015)

Altogether 45% of the product managers have faced role definition and role implementation related challenges during their careers as product managers. Overall 22 % of the responders noted that internal interactions and communication flow had problems. The product managers need information in order to make profound decisions and the more they have to search for the information, the more arduous the decision-making gets. It's highly important that the communication

between the product management and the other internal teams would be as effective as possible. (Confianzys, 2012)

The product managers also felt that their roles and responsibilities in the organization have been poorly defined and also poorly supported by the executives. (Confianzys, 2012) In addition to product managers, companies can have workers with titles like "Associate Product Manager", "Product Marketing Manager", "Program Manager" and "Solution Manager" in their product management department. When the roles and responsibilities are blurry, it's very challenging to get the activities and deliverables done effectively. One of the main problems is that most executive management teams don't know how to structure a well-defined product management organization due to the fact that the role is so cross-functional. (On Product Management, 2014)

Maglyas, Nikula, Smolander (2012) observed 13 Finnish software organizations in order to understand product management challenges. The research resulted in identifying common problems that software product managers face. The same problems can be assumed to be present also in non-software organizations. The findings give a new perspective to the previous study because it analyzes the product management challenges more precisely.

The first challenge that arose was the long release cycle and that product managers had difficulties in describing the PLC from the concept until the launching phase. The most common bottleneck was the unpredictable R&D process. During the development process many features are cut off, changed or skipped and that's why it prevents the other departments from proceeding. For example, the product marketing team cannot start their work until it's confirmed which features are implemented in the next product version. (Maglyas et al., 2012)

Although product managers are responsible for the whole product, they rarely have any proper performance metrics for evaluating their own work. Some of the interviewed product managers used related practice and management by objectives but still the process of identifying these objectives was very open for speculation. The companies expect the product managers to get the product released on time but

even though he/she fails in this goal, no consequences seem to follow. (Maglyas et al., 2012)

The problem in some of the researched PM organizations was also that they weren't very customer-oriented and the new product development decisions were made internally without any collaboration with the customers. The product managers were mainly guessing the customers' needs and they didn't even test the product with customers, conduct surveys or speak with focus groups. The lack of collaboration between the company and its customers can result in delayed product release which means that the company might lose the opportunity to hit the market earlier than its competitors. (Maglyas et al., 2012)

PM organizations also seemed to often fall in short-term thinking and frequently changed their vision and strategy in order to match it with external conditions. These external conditions, e.g. new features implemented by competitors, create reactions but by always following the competitors' lead, the company can never achieve its own excellence in any area. Rather than reacting to the competitors, it's better if the product management acts independently in line with its own internal goals and visions. A steady long-term strategy lets a company simultaneously deliver unique value to the customers, reduce costs and increase efficiency. (Maglyas et al., 2012)

# 3 LEAN THINKING

## 3.1 Main principles

Lean thinking is a management philosophy that strives to generate value to the customers with less possible resources. Lean can be seen as a set of tools that help to identify and remove waste, improve the quality, speed up the lead-time and reduce costs. Because of Toyota most of the terms in lean thinking are in Japanese. (Wilson, 2009, p. 9-10) The term ”Lean” or ”Lean-manufacturing” became known due to two bestsellers: *The Machine That Changed the World* (Womack, Jones, Roos, 1991) and *Lean Thinking* (Womack, Jones, 1996). Both books describe how the automobile manufacturing company Toyota has learnt to shorten its processes' lead-time by eliminating waste in every phase of the process which ultimately results in better quality and lower costs while improving the safety and employee morale. (Liker, 2004, p. 15) Toyota's production system is based on five key steps that are depicted in the figure below (Figure 5).

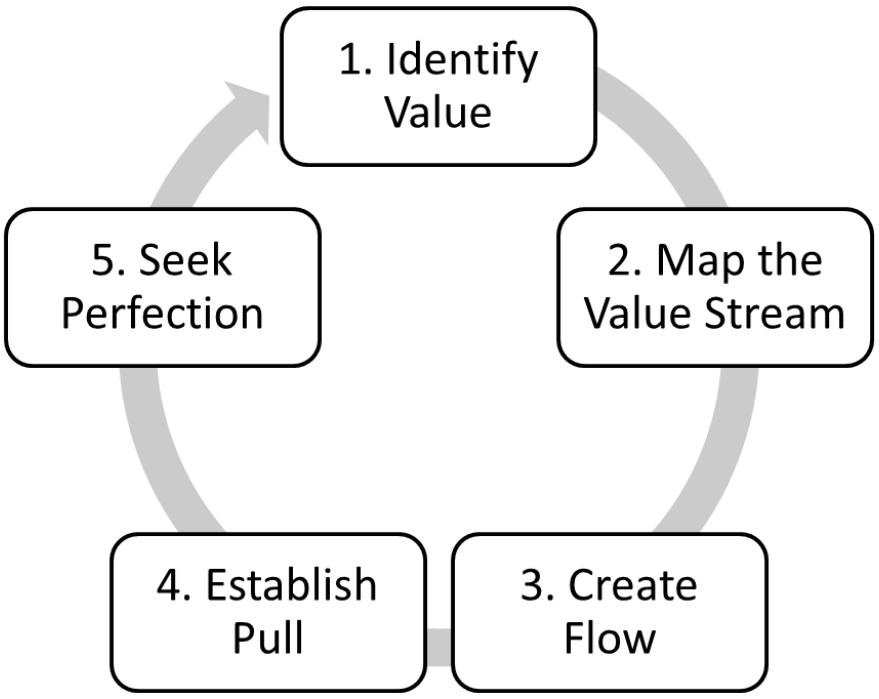



**Figure 5** Five key steps of TPS
(modified from: http://www.cardiff.ac.uk/lean/about/index.html)

At first it's important to study the process from the customer's perspective to find out what the customer really wants from that particular process and identify what's value from the customers' viewpoint. (Liker, 2004, p. 27) Only a fraction of the time that is spend in the manufacturing process or in any process of the company generates value to the end customer. Everything else can be considered waste that should be actively eliminated from the processes. By defining the value stream, all the functions that together create a product or service can be identified. This helps to clarify in which parts of the process there's the biggest potential to reduce waste. By eliminating waste, it can be ensured that the product or service "flows" smoothly towards the customer without interruptions, detours or other unnecessary waiting. (Lean University, 2015)

By implementing pull control, the customer that can either be the next stage of the manufacturing process or the real end customer, is given exactly what it wants, when it wants and as much it wants. (Liker, 2004, p. 105) The most important thing when using pull control, is to understand the customer demand and how to create a process that can effectively respond to that demand. When the value has been identified, the value stream identified, the waste phases eliminated and the flow and pull control implemented, the process cycle starts from the beginning. This cycle continues until a state of perfection is reached. (Lean University, 2015)

### 3.2 Identifying eight types of waste

The goal of Lean thinking is to identify, analyse and eliminate waste that is all the activities that don't generate value from the customer's point of view or the usage of additional resources. All the members of the organization should take part in the identification and elimination process which is the foundation for continuous improvement. The waste is traditionally divided into seven main categories but recently 8th waste, which focuses on personnel skills, has been added to the list. (Liker, 2004, p. 28-29) It's important to pay attention to the office waste as well since in most of the companies only about 5 % of the administrative work is value added and the rest comprises of nonvalue-added activities. In world-class organizations the level of value-added activities has been raised up to 50 % in the office environment. (Fabrizio and Tapping, 2006, p. 5)

All the organization's NVA activities should be identified and eliminated in order to reach better level of efficiency. Lean Thinking recognizes eight forms of waste which have been described below (Liker, 2004, p. 28-29). As addition to the classical "manufacturing waste" perspective, examples on how to identify waste also from the administrative activities have been provided by Kremer (2005 p.19-21) and Fabrizio & Tapping (2006, p. 5-8).

**1. Overproduction** – Manufacturing unordered products leads to excessive inventory which increases the warehousing and transportation costs and results in hiring unnecessary personnel. In an office environment this type of waste could for example be to prepare an offer for a customer that hasn't requested it and in the end never does. In order to eliminate this type of waste, it's important to maintain a good communication level with the customers to understand how they are using the provided information. By knowing what is needed and used by the customers, it's easier to eliminate all the rest.

**2. Waiting –** All kind of waiting can be considered as waste; waiting for a person, material, machine or information. In factory shop-floor the waste is formed when the production worker has to wait for the next production phase, reserved tool, component or delivery. In an office environment this type of waste is usually created when the workers have to wait because the computers or the printers are not working in the way they should. Waste is also formed when functional team A waits in vain for functional team B to finish a certain task even though team A could factually already in that point continue with its own work. A lack of communication leads to misunderstanding of the situation and team B thinks that they yet don't have the right input to offer to team A.

**3. Unnecessary transport –** Transportation of goods is an essential part of the production, but when the goods are transported further than necessary or unfinished products are temporarily transferred from one place to another, this causes unnecessary waste of time. In an office environment transportation of memos and documents either physically from one desk to another or electronically between information systems can be considered waste.

**4. Over processing or incorrect processing –** Over processing and manufacturing better quality products doesn't create any extra value to the customer. Therefore, processing the product more than the customer requires is considered waste. Ineffective or improper product handling will also cause waste which can be seen as unnecessary movement and defects in the product. In an office environment it's important to notice, what the basic function in the process is and not to put too much work into something that the customer doesn't require or is willing to pay for. For instance providing a 100-page report to the customer when he/she will only need the summary page, is a waste of paper and time.

**5. Unnecessary inventory –** When components, unfinished products or finished goods are stored more than necessary, it results in longer lead times, delays and higher transportation and storage costs. Furthermore, overstocking hides many production problems such as delayed deliveries from the suppliers or long setup times. In an administrative level a big percentage of this type of waste is files. Occasionally companies even rent extra space to store the files that they don't actually need in their daily functions. Since roughly 95 % of the files that are stored are plain waste, also 95 % of the space, folders, cabinets and time spent for storage management is waste.

**6. Waste of motion –** All the extra movements that the employees are required to perform during their work day can be considered as waste of time. This type of waste can be identified if the employee for example has to walk long distances to get from one place to another or the employee has to spend time searching parts and tools. This type of waste is often result of an ineffective production layout. The same applies to an office environment where unproductive work processes and bad office designs cause more walking, reaching and bending. In an office any movement of people, papers, e-mails that doesn't add value can be considered waste.

**7. Defects –** Producing or repairing faulty products cause unnecessary work which requires additional time and effort. In an administrative level this type of waste refers to all the time spent redoing, correcting or inspecting the work. Usually the inspection process is result of being afraid of mistakes made during the work

process. The inspection process itself doesn't add any value to the customer and so it can be considered waste. This type of waste can be avoided by doing the job carefully and correctly from the beginning.

**8. Non-utilized talent –** Apart from the seven traditional types of waste, sometimes an eighth waste can be identified in organizations. The employees' talents, ideas, time and learning opportunities can be wasted when not listening or engaging the employees properly. This type of waste applies to both factory and office environments.

### 3.3 Lean office and Lareau's 20 Keys-approach

Lean Thinking has been successfully implemented to manufacturing applications but when it comes to administrative work, manufacturing companies stumble in executing Lean concepts. Often these manufacturing companies strictly focus on Lean tools and due to this fail to change how work is done and how it flows. In the worst case scenario Lean philosophy gets abandoned and the personnel experience the effort as just another program. (Locher, 2011, p. xii)

Alignment is extremely critical factor to consider when implementing Lean to the office environment. If Lean office efforts are not aligned with the company's strategy and key business objectives, the expected results will not be reached and the management will get discouraged. Lean office efforts ought to focus on the main business processes that have a direct effect on the company's ability to create value to its customers. As a result, the business will experience almost immediate benefits and also the customers will be able to notice the results in short order. (Locher, 2011, p. xii)

Some organizations believe that Lean office is all about organizing the workplace better through 5S techniques. Therefore, these organizations fail to carry out the most crucial Lean methods of standard work, flow and level pull. Organizations often point out that the type of work done in the office environment is more variable, multi-tasking and creative compared to the work done in the manufacturing shop-floor. Surprisingly, in most of the cases the organizations themselves are partly

responsible for the variability of the work done. Consequently, unstandardized work creates problems and often leads to inconsistent information quality which requires extra time to address and correct. (Locher, 2011, p. xiii)

There are four basic steps to the application of Lean in an office environment: 1) stabilize, 2) standardize, 3) visualize and 4) improve. Each step is the basis for the next one and the process ultimately leads to the creation of customer value in the form of shorter lead times, lower costs and better quality. The starting point of the process depend on how far the organization stands in the scale. If the organization's process is already quite stable, then it's all right to jump to the standardization step. (Locher, 2011, p. xiii)

The goal of the stabilization step is to produce expectable and repeatable outputs. To achieve this goal, consensus on what is the best way to do each activity or process must be found. If the processes are poorly defined, the staff members are left on their own to figure out how do perform the process. This creates instability since the outputs can significantly vary depending on who performs the process. The next step *Standardization* helps to ensure that all the staff members understand and follow the same process consistently. Standardized practices make it easier to identify nonstandard conditions and to measure the efficiency of the process. (Locher, 2011, p. xiv-xv)

Visualization's objective is to make the workplace "speak" to the workers since visual communication is the most efficient form of communication. Visual workplace is also easier to manage. When work instructions, prioritization rules and performance are displayed visibly, managers spend less time in directing basic activities and identifying problems with performance. Visual workplace makes it also less challenging to strive for continuous improvement that is the fourth and last step of the process. (Locher, 2011, p. xvi)

In order to progress and strive forward in the Lean scale, it's important for the organization to know where it stands at the moment compared to the world-class standard. In his book "Office Kaizen", Lareau (2002, p. 102-105) introduces the 20 Keys-approach that is especially designed for the office environment. The

purpose of this method is to provide top-notch benchmarks for performance and a clear roadmap to follow in order to reach the world-class state. Each key includes five performance levels, from one (lowest) to five (highest). The total points divide teams into three categories:

- 25-35 points – the team is doing a decent job (traditionally managed company)
- 35-45 points – the team is very well-run
- 45-100 points – the team is doing exceptionally good job

The 20 Keys-approach has various positive effects on the team. It communicates the team's current performance state truthfully, tracks the team's objectives and gives the management proper tools to set high standards. Through the 20 Keys-approach, the team can take control of its own destiny and climb the stairs of high performance one step at a time. (Lareau, 2002, p. 112)

# 4 LEAN TOOLS AND METHODS

## 4.1 Value stream mapping

Taiichi Ohno, the founder of TPS once stated: ”All we are doing is looking at the timeline, from the moment the customer gives us an order to the point when we collect the cash. And we are reducing the timeline by reducing the non-value adding wastes.” (1988, p.6) The timeline to which Ohno referred, can be depicted as a value stream map which includes both the product and the value adding services that are needed to create the product or service. (Poppendieck & Poppendieck, 2006, p. 83)

According to Keyte and Locher (2004, p. 5-6) mapping the organization’s value stream is a very important task since it helps the management team to clearly see how the organization is currently functioning and what actions should be taken in the future to lower costs and improve service and quality. Value stream mapping can be utilized in the office environment in the same way as it has been used to visualize the production processes, though there are some differences when mapping the value in the office than in production. In the office the material flow is actually the flow of information that is needed to complete a certain task.

The value stream mapping process consists of four steps (Figure 6). In the first step *Preparation*, the company must decide which process to map. For example, the product management department could map how long it takes to go from a product concept to the launching phase. The starting and stopping point of the value stream must also be decided. The timeline could for example start when a customer need is recognized and stop when the product is being launched. (Poppendieck & Poppendieck, 2006, p. 83-84)


**Figure 6** Value stream mapping process in an office environment (Locher, 2008, p. 2)

When the current state map (Figure 7) is drawn, it's easy to spot the places where there is churn and delays. Churn results from timing problems, for example requirements churn is created when the product requirements are too detailed too soon. Delays on the other hand are caused by too long queues which happens when the team is over-flooded with work or the work is given to a team that is simply not ready for it. Many other sources of waste can also be exposed when mapping the value stream. (Poppendieck & Poppendieck, 2006, p. 91)

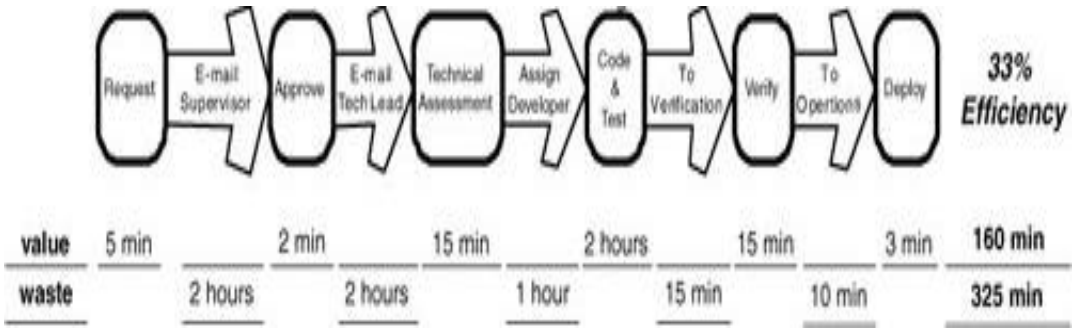



**Figure 7** An example of a current state value stream map (Poppendieck & Poppendieck, 2006, p. 86)

However, there's no point of drawing current state value stream maps, unless they are used for identifying and eliminating waste. That's why the third step of the value stream mapping process is to draw a future value stream map which is a great tool for crafting a plan for eliminating the biggest wastes. Finally, after drawing the future state map there's the last step for planning and implementing the changes. (Poppendieck & Poppendieck, 2006, p. 92)

Keyte and Locher (2004, p. 5-6) state that organizations should start their Lean transformation journey in the office by identifying and redesigning first one or two value streams and then slowly continue by adding more. Identifying and mapping the value streams of the administrative processes is typically more challenging compared to the manufacturing processes because information flows in office systems are loosely structured and use informal scheduling. Moreover, administrative units usually support numerous value streams which makes it even more challenging to track the workflow of each value stream.

### 4.2 5S

5S-programs are widely used in Japan in order to eliminate waste that is causing errors, defects and accidents in the workplaces. Without 5S-methods several wastes would just pile up over time and cover numerous problems. They would also be incorrectly accepted in the organization as ordinary practises. The term 5S originates from the Japanese words: Seiri, Seiton, Seiso, Seiketsu and Shitsuke. The figure below (Figure 8) depicts the sequence in which these activities should be carried out and describes what the main purpose of each of them is. (Liker, 2004, p. 150)

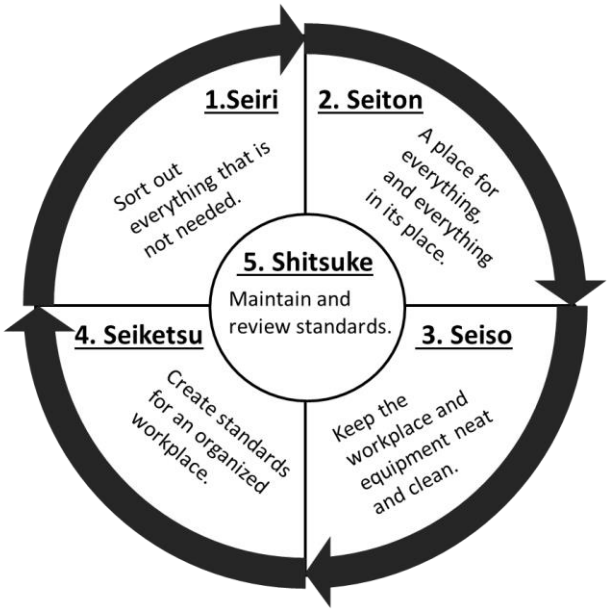



**Figure 8** 5S-program including Seiri, Seiton, Seiso, Seiketsu and Shitsuke

Seiri is the first step of the 5S-cycle. Dennis (Lean Production Simplified, 2007, p.32) states that the workplace can easily get packed with stuff (parts, documents, tools, equipment) that accumulate and impede the work flow. This consequently results in unnecessary hassle and longer lead-times. According to Liker (Toyota Way, 2004, p. 150) at first it's very important to go through all the things that can be found in the production or office shop floor in order to distinguish what is needed daily to perform value-adding procedures and what is used rarely or never. In the office environment sorting will also include cleaning and organizing databases.

Seiton is the next step to take after everything has been sorted out and it's time to set everything in order. Every item should have a permanent place so if needed it can immediately be found. For example, places for equipment can be marked on the floor with colorful tapes and shadow boards can be created for tools. (Liker, 2004, p.150-151) The places should be so clearly marked that anyone can found anything at any time. The out-of-standard situations should also be obvious for everyone. (Dennis, 2007, p. 32)

Seiso stands for shining and inspecting the workplace. When Americans first visited Japanese factories in the 70's and 80's, they were astonished about how clean the facilities were kept. The cleaning process functions also as a form of inspection that can reveal abnormalities that can severely harm the quality and cause machine failures. Sweeping floors, dusting and all the other activities that promote tidiness, ensure that the working areas remain clean. (Liker, 2004, p. 150-151)

Seiketsu that signifies standardization is the fourth step that is supporting the three first principles. The standards should be as clear, simple and visual as possible and they should make the out-of-standard conditions noticeable. The standards for the sorting out step should tell what is needed and what is not and the disposal procedures. Set-in-order standards could inform where people can walk and what different colors mean. Shine and inspect standards could inform what to clean and inspect and who is responsible for making sure that the area is tidy. (Dennis, 2007, p. 37-38)

The last step Shitsuke is one of the most important ones to remember because sustaining a balanced workplace is part of the continuous improvement process. This step focuses on getting the first 4S's deeply rooted into the organization's culture. Overall Shitsuke is a team-driven technique which is taken forward by the management that is using standards as an audit form and who often rewards the best teams with symbolic prizes. (Liker, 2004, p. 150-151)

### 4.3 Gemba

Masaaki Imai (2012, p. 205) has stated the following: “The worst thing a leader can do is live in a world isolated from the gemba, making all decisions from a comfortable office.” This quote summarizes well what gemba is all about. According to Locher (2011, p. 138) the term gemba can be translated into “actual place” which is the place where the actual value-creating work is done. The reality is that a large number of today’s managers tend to spend a lot of time in meetings or behind their desks instead of spending time in gemba.

Managers should view gemba as the site of all improvements and the source of all information. That’s why it’s highly critical that the managers would be in close contact with the realities of the gemba so that they would be able to solve any problem that occurs there. (Imai, 2012, p. 14) A manager could for example in case of discussion, take the team for a so-called “gemba walk” so that the team could directly observe the problem in the actual place where the problem occurs. In many cases, the solution to the problem will also be found at the gemba. The emphasis of the “gemba walks” can vary, from observing the flow of information, to pinpointing NVA activities in the process. (Locher, 2011, p. 138)

### 4.4 Standard work

Standardized work, or often referred as standard work, is one of the best-known tools to effectively perform a certain process or activity. Standard work describes in which order the steps of the activity should be performed, how much time each step can consume and other elements that are needed to make sure that the activity is performed in a consistent way. When the process or activity is performed consistently, also the quality of the output is consistent regardless of who performs the task. Standard work charts should be made very simple and visual, and they should be utilized as a reference for workers who already are skilled enough to perform the task. The standard work chart (Figure 9) demonstrates the steps that a customer service worker might perform, how frequently he/she performs them and how many minutes each step ought to take. (Locher, 2011, p. 10)

| Standard Work Daily Management | | | | |
|---|---|---|---|---|
| Role: Customer Service | | | | |
| | | Frequency | | |
| **Task (with key points)** | **Time** | **Daily** | **Weekly** | **Monthly** |
| 1. Enter Orders within day of receipt to ensure that published lead times can be met | 5-10 mins per order | Throughout day | | |
| 2. Generate weekly order input reports to monitor current demand | 5 mins | | Fridays by 3:00 PM | |
| 3. Generate monthly reports for management to monitor sales performance | 10 mins | | | Last Friday of month |

**Figure 9** Standard work chart for customer service personnel (Locher, 2011, p. 15)

Standard work provides the basis for the implementation of numerous other Lean practices and is also the starting point for continuous improvement. Surprisingly many professionals are already familiarized with standard work charts. Pilots are obliged to go through a checklist before each flight and surgeons are recommended to follow surgical-safety checklist to avoid unnecessary accidents. (Sayer, 2012, p. 237-238)

### 4.5 A3-reports

According to Dennis (2007, p. 133) A3s are possibly the most effective communication tools ever used in Toyota. The term "A3" origins, just like the name suggests, from the paper size used for the report. Sobek & Smalley (2008, p. 11) state that A3 report follows Edward Deming's Plan-Do-Check-Act – cycle which depicts the never ending process of continuous improvement (Figure 10). The usage of A3s helps the authors to gain a deeper understanding of the problem or opportunity and it also results in better cohesion and alignment within the organization.

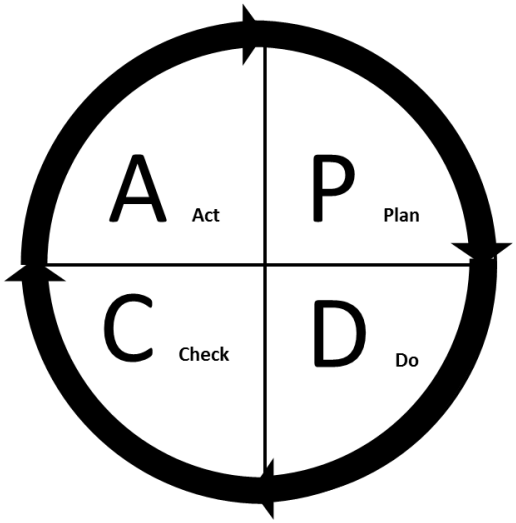



**Figure 10** Plan-Do-Check-Act – cycle

The three most common types of A3-reports are proposal, problem-solving and current status A3s. A proposal A3 report is a great tool when facing situations where the investment is financially significant, the implementation is quite involved and/or the proposal reaches far across the whole organization. These kinds of situations require careful thinking, planning and consensus on the recommendation from the organization before making any decisions or taking approving actions. The aim of the proposal A3 is to demonstrate a logically structured plan in order to ease the decision-making process. (Sobek et al., 2008, p. 60-62)

Problem-solving A3 reports are usually written after the proposal A3s, but they can also be written between the Plan and Do steps. The report's purpose is to find the problem's root causes, confirm that the problem has been solved and illustrate the efforts that were needed to solve the problem. The problem-solving A3 is not applicable for every single problem or situation but the organization should strive to use it as frequently as possible since solving the problems through A3 report leads to valuable learning opportunities. (Sobek et al., 2008, p. 59)

A current status A3 report could for example be an interim report or it could be done at the end of a project. It's important to note that writing a status A3 is not topical until some effort has been seen in solving a problem or carrying out an approved proposal. Its main purpose is to describe the current condition, underline

what has or hasn't been improved and spark the important discussion of why things went the way they did. A current status A3 sums up the changes and outcomes achieved in the implementation phase by focusing in the last two steps (Check and Act) of the PDCA cycle. (Sobek et al., 2008, p. 87-88)

### 4.6 Kanban

The term Kanban derives from a Japanese word for "signal" or "sign board" and in Lean production it is well-known as a visual production control system that signals refilling. The signal itself can vary from Kanban cards to Post-it boards – the essential thing is that it's always generated by actual consumption. Kanban's purpose is to function as a link between the value stream processes by visualizing the pull of the downstream customer/process to the upstream supplying resource. (Vatalaro, Taylor, 2005, p. 12)

Kanban can easily be utilized beyond the production shop-floor since it's a great tool for managing tasks and processes in an effective way. It allows the individuals, teams and organizations to visualize their workflows which decreases bottlenecks and eliminates waste. Kanban's effectiveness lies on three principles which are: 1) visualization of the workflow, 2) limiting the work in progress and 3) managing the workflow. By making the tasks visual, every team member can easily follow what is happening in every stage of the process, who is responsible for a certain task and who would be the most suitable person for a certain type of job. When the work in progress is limited, the team members will be more focused and committed because they are able to concentrate on one thing at a time without multi-tasking that usually decreases productivity. When the workflow is managed properly, all the issues can be tracked and solved before they escalate. (Majowska, 2014, p. 3-5)

The following figure (Figure 11) is an example of a Kanban board used to visualize the workflow of a team. In this board the work items are written on Post-it notes and process flows from left to right through 8 different stages. If the feature doesn't pass the "Manager Review"-column, it's thrown backwards in the process to the "Bumped by Managers"- column. "Manager's Review"- column has also been limited to have maximum 10 items at a time.

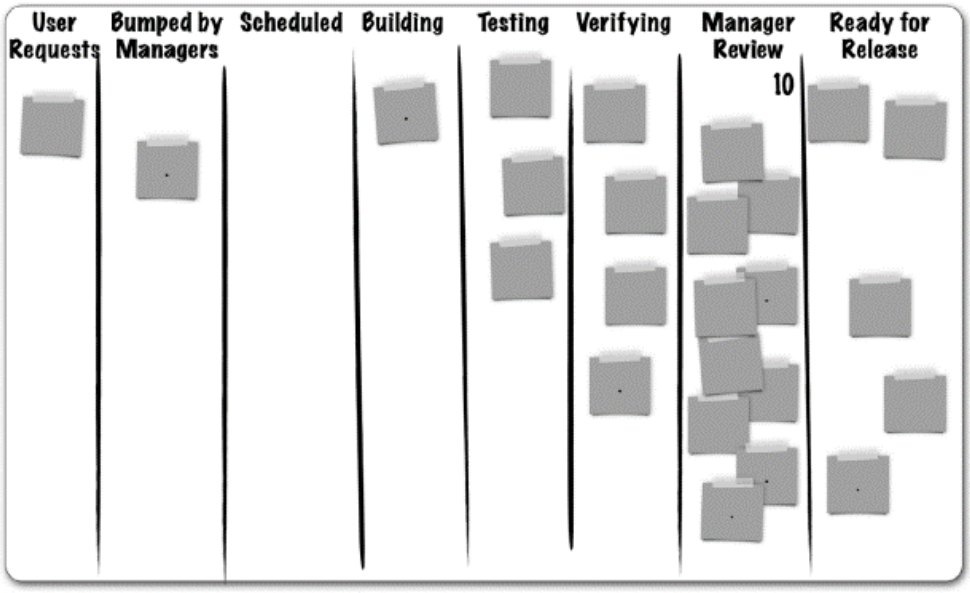



**Figure 11** An example of a Kanban board (Stellman, Greene, 2014, p. 330)

According to Stellman and Greene (2014, p.327-328) there are three major differences between a Task board and a Kanban board. Firstly Kanban boards don't show tasks like Task boards but instead they have stories. Another difference is that Kanban board's columns are not fixed but vary depending on the tasks of each team. Thirdly, like presented in the example, Kanban boards can put limits on the quantity of work in each column. In order to keep the board always up to date, it's important to regularly set up a meeting called "walking the board", in which the Kanban team members can discuss the state of each work item on the board.

### 4.7 Key Performance Indicator

In an office environment the performance is usually measured against a budget. Since usually the biggest single expense in the administrative department is the white-collar workers, the budget is typically controlled by controlling the number of employees. Lean Thinking encourages the companies to focus on improving productivity through performance measures than solely controlling the head count. (Katko, 2013, p. 37-39)

Lean KPIs have three purposes: 1) expose the issues that lead to poor performance in the company's value streams, 2) identify the root causes behind the issues and 3)

encourage the teams to take corrective actions in order to solve the issues. Corrective actions can be short-term countermeasures, long-term continuous improvement events or large-scale changes. Lean performance measures should be as simple as possible because they are reported quite frequently (hourly, daily or weekly) and due to this they shouldn't take a long time calculate. Simple performance measures also motivate the team members more to identify root causes of poor performance. (Katko, 2013, p. 47-50)

According to Dudbridge (2011, p. 68-69) it's important to also pay attention to the number and type of KPIs. The company can easily drown in paperwork if too many KPIs are monitored, but on the other hand too few KPIs can signal that the performance measurement system is not to be taken seriously. Selecting the KPIs is a critical phase, because if not done well many problems and improvement opportunities can be missed. Correctly selected KPIs can easily be utilized also in benchmarking between different departments or factories. Maskell, Baggaley and Grasso (2011, p. 163-164) emphasize the importance of presenting the KPIs visually. Since most of the metrics are manually created, they should be presented on the team's performance measurement board which strives for continuous improvement. The information doesn't have to look good since it's not for reporting purposes but it should be clear, frequently updated and readily available.

### 4.8 Heijunka

According to Luyster and Tapping (2006, p. 105) in Japanese language the term Heijunka signifies load leveling and balancing. Its main purpose in the factory shop-floor is to set the pace of flow in production and product withdrawal. In fact, pull production systems should always begin and end with Heijunka. Before starting to use Heijunka, the organization is required to have the first two steps of Lean Thinking *Stability* and *Standardization* successfully implemented. Pereira (2008, p.30) states that Heijunka boards (Figure 12) or boxes can be utilized in the office environment in the same way and for the same reasons as they are being used in manufacturing. The only difference is that the items produced in the administrative processes are things like invoices, quotes and drawings. Leveling or smoothing the

work load in the office is equally, and sometimes even more important than in the factory shop floor.

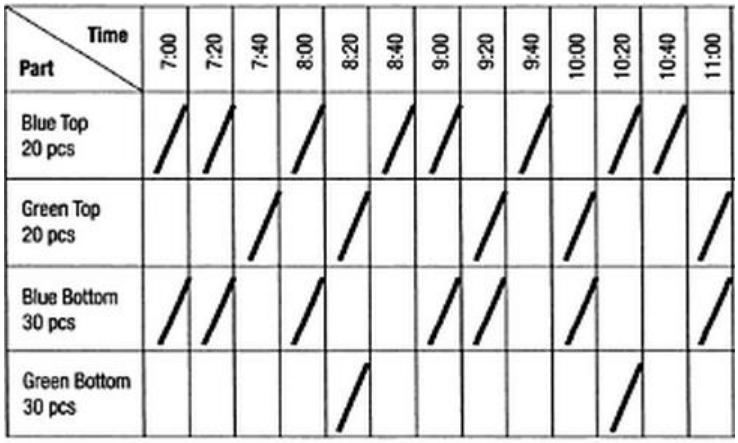



**Figure 12** An example of a Heijunka board (Luyster, Tapping, 2006, p. 109)

The first step, when implementing Heijunka, is to calculate the takt time (available daily work time / total daily volume require). Then it's time to decide pitch for each value stream. The pitch can be calculated by multiplying the takt time by the number of work units that are supposed to flow through the value stream. The third step is to create a work sequence table that depicts when each value stream work is planned to be done and what is the correct quantity. The last step is to create a Heijunka board or box that is utilized to balance the work volumes by value streams. (Tapping, 2005, p. 32-35)

### 4.9 Lean visual management

The old saying: "A picture tells more than thousand words" is accurate based on the fact that people are very visual beings and are able to absorb large amounts of information only by using the eyesight. Normally people encounter different kinds of visual controls (warning signs, traffic lights) that guide their actions on a daily basis. Visual controls play an important role also in the Lean philosophy and they are commonly used for detecting problems.

According to Liker (2004, p. 152-158) the goal of visual management is to tell at a glance, how the process is currently running and does it differ from the standard.

When implemented correctly, visual management is supposed to increase the productivity, lower the costs, enhance the safety and improve the quality. The workers will also be more motivated because they feel that they have more control over the working environment than before. Shimbun (1995, p. 11) states that visual controls allow people, who know very little about the activities of the production plant, to understand a certain amount of important information about it by just walking through the plant and observing the surroundings. With the help of visual controls the executives are also able to identify problems and make suggestions in order to fix them more easily.

Visual controls are a simpler form of systems that, when implemented successfully, don't require any communication between employees in order to indicate what actions should be taken. This means that there's no need for e-mails, information management system interactions or phone calls that are all no-value-adding activities. Nowadays visual controls are becoming increasingly widespread in many organizations. In the production shop floor Andon lights are used to signal employees when a certain action needs to be done, Kanban cards control material movements and exception tags indicate special conditions or abnormalities. Performance measurement displays show visually performance vs. target and personnel boards show current availability and assignments. (Voehl, Harrington, Mignosa, Charron, 2013, p. 130-131)

### 4.10 Kaizen

The term Kaizen derives from two Japanese words: kai (change) and zen (good). Kaizen or continuous improvement is the fourth step of Lean application and its main purpose is to empower and free the creativity of people. The ideal situation is achieved when every person in the organization starts to think Lean and apply Kaizen every minute of the work day. (Martin, Osterling, 2007, p. 21)

According to Alukal and Manos (2006, p. 28) a Kaizen event is a short focused project that usually takes three to five days to perform. For specific applications companies can even perform mini Kaizens that last only one day. Martin et al. (2007, p. 21-23) define Kaizen events as structured activities that organizations can

utilize in order to achieve quick and dramatic enhancements. Kaizen events strongly rely on the innovative power of a cross-functional team that is learning how to identify waste and implement new ways to perform work in order to eliminate it. Practicing Kaizen results in enhanced productivity, better quality and reduced costs. It also improves the working relationships between individuals and teaches the teams how to resolve problems through PDCA-process.

Alukal et al. (2006, p. 28) recommend to use a cycle that takes eight weeks to perform. The cross-functional team should have its first meeting three weeks before the Kaizen event to prepare for the project. During the Kaizen event the team's goal is to define the current state, innovate ideas on how to improve the process and finally implement the best ideas. The follow-up activities are performed during the next three weeks in order to make sure that the project has a clear ending, the benefits will be sustained and the results are made public.

# 5 COMPANY CASE – PROBLEMS AND SOLUTIONS

## 5.1 Case Company introduction

The Case Company is a big global company specialized in power and automation technologies. The company's business functions are divided into five divisions which are subdivided into business units. These business units focus on specific industries and product groups.

The Case Company's product management organization has two aspects - regional and global. The product lines (Figure 13) are regionally led by the local product group manager whose responsibility is to ensure business growth through the local representation of the global product group. Every product line has also its own product line manager, who is leading a varying number of product managers. The product line manager has the profit and loss responsibility for the product line's offerings. The Case Company's regional product management organizations are not always congruent as the roles and responsibilities vary depending on the product group.

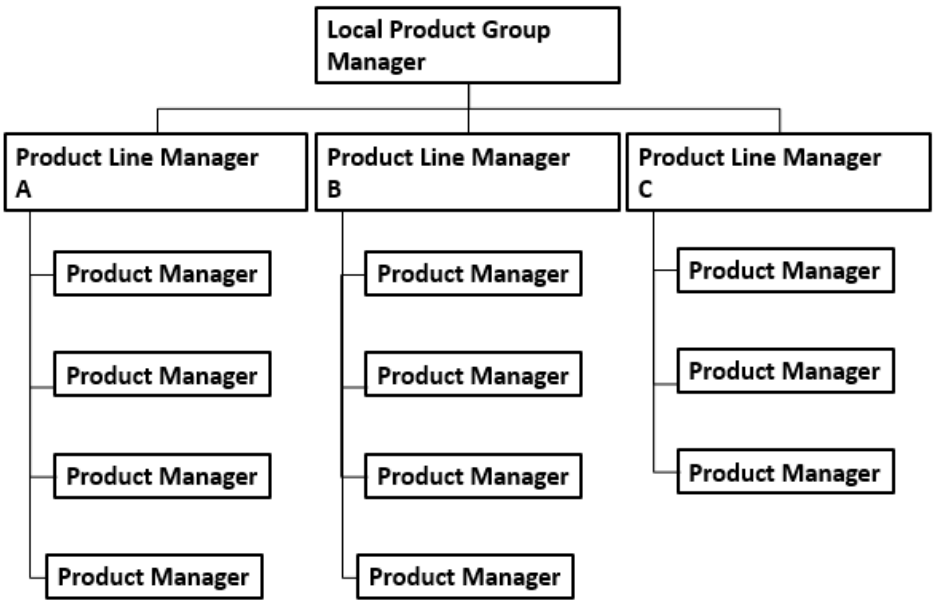



**Figure 13** Regional product management organization

The product lines are also led globally (Figure 14) by the global product line manager whose responsibility is to strive for profitable growth and optimize business success on a global level in alignment with the business and division strategy. For example the regional product line manager B, who regionally belongs to the EMEA area, interacts also with the regional product line managers from Americas and Asia since they all belong to the same global product line.

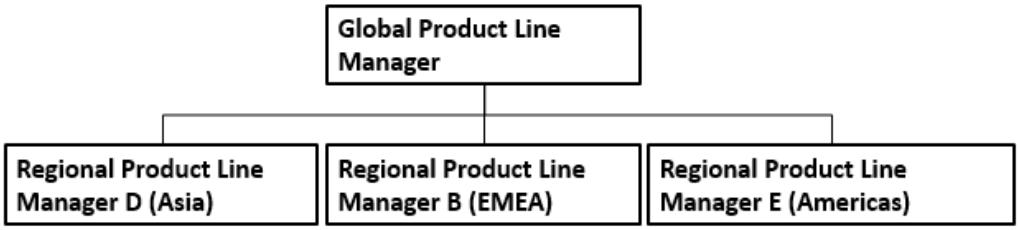



**Figure 14** Global product line management organization

The Case Company is using a so-called *Gate Model* (Figure 15) for product and technology development projects. The goal of this model is to increase the number of successful projects, resulting in better products and shortening the time from idea to profit. The Gate Model consists of seven steps which each include certain documents and a checklist. In order to "open" the gate and move on to the next phase, the checklist must be reviewed by the product manager.

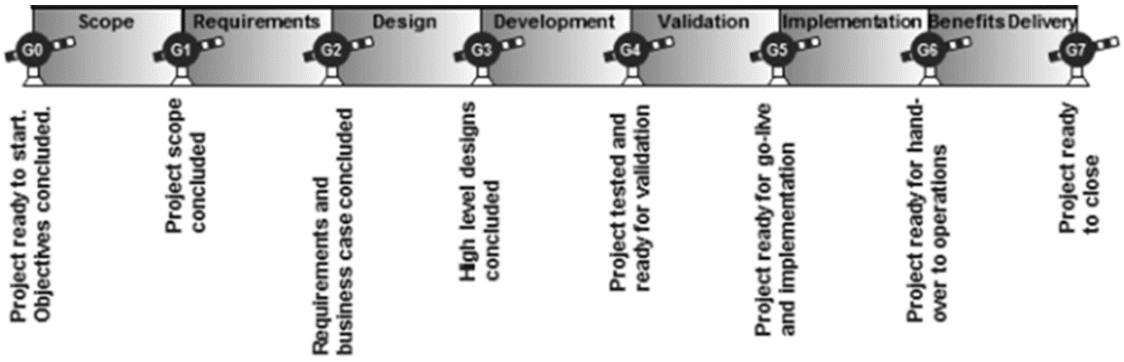



**Figure 15** Gate Model

Because the journey from G0 to G7 can take several years, it's common that the product managers and project managers change on the way. However, the product manager shouldn't change during a certain gate but only after the gate has been reached. Since the product managers' backgrounds vary from technical to business, some product managers can be more skillful handling certain gates than others and vice versa.

### 5.1.1 Organization's Lean maturity

The Case Company has been practicing Lean in its production shop-floor for several years now. Kanban cards take care that the production flows smoothly and 5S system has been implemented to keep the workplace tidy and organized. Value stream mapping was also recently conducted to expose the waste in the production area. In the year 2014 the Case Company also launched a new product development model that is based on Lean Thinking. This model includes "Gemba walks" in the customers' premises so that the R&D personnel could better understand the customer needs. The new model also includes A3-reports that are used for problem-solving and information sharing. Project and R&D teams are also encouraged to use visual management (bulletin boards, flipcharts) to depict the project's progressing.

Lareau's 20 Keys-approach that is especially designed for office environment is a suitable tool for assessing Lean maturity in the product management function. Since the Lean tools and methods will be first tested on one PM unit, it's essential to understand the unit's current state and performance. The pilot unit's product line manager answered the 20 keys (Appendix 1) and the results of this survey are depicted in a radar chart (Figure 16) which visualizes the current state of the product management unit in a graphic form. This chart illustrates from scale 1-5 how Lean the product management unit is at the moment; the lower the maturity level, the closer the scores are toward the center of the chart. In a world-class organization the chart has a shape of a perfect circle on the outer ring due to the highest ratings.

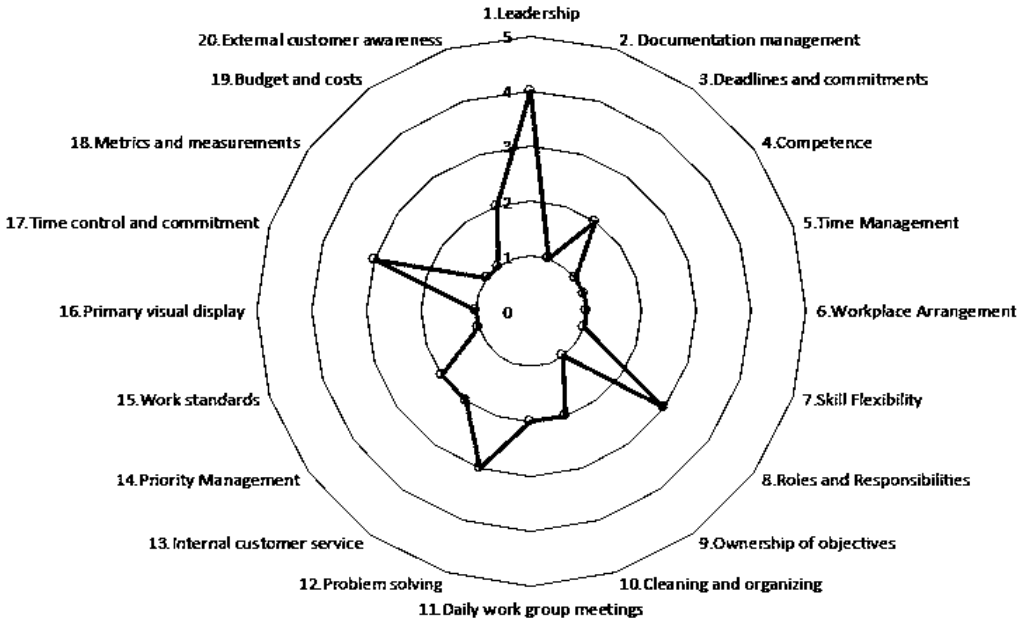



**Figure 16** Case Company's product management unit according to Lareau's 20 Keys-approach

The Case Company's PM unit scored total of 35 points which according to Lareau's scale means that they are doing a decent job in a traditionally-run organization. 10 keys were scored with the lowest grade (1) and 6 keys with the second lowest grade (2). The four keys that brought the highest points were: Leadership, Roles & Responsibilities, Problem Solving and Time Control & Commitment.

According to the assessment, decisions are made in consensus and everyone in the PM unit understands the plan on how to accomplish objectives. The product line manager develops the roles and responsibilities together with each product manager but yet the roles and responsibilities are not defined in detail. All team members have a basic understanding of problem-solving tools and they are applied when major problems occur. The team members also usually arrive on time and the absenteeism rate is less than 3 %. Despite the positive scores in these areas, the PM unit still has a long way to go in order to reach the world-class state. However, they have a fairly good starting point as half of the keys were already scored above the lowest grade. In order to monitor the pilot unit's improvement, the product line manager should regularly perform the Lean assessment.

### 5.1.2 Product management challenges

A number of product managers were interviewed (18-20.8.2015) to unravel the challenges in the case company's product management department. The interview questions were formed based on the two surveys introduced in the theory section (2.3). The choice of product delivery strategies was intentionally left out from the survey questions as it depends on the PLC phase. The idea of the survey was to gain a deeper knowledge on the issues that product managers encounter and compare the results to the findings of the researches conducted by Confianzys Consulting and Maglyas et al. The interview form can be found from Appendix 2.

The objective was to interview product managers who are currently working on a different PLC phase and have different amount of experience as product managers. The years of experience ranged from 0, 5 - 16 years. The product managers were also chosen from three different product lines to represent the whole product management department in the Case Company. The diversity of interviewees is to ensure a variety of point of views since junior product managers can experience different challenges than the senior product managers. Altogether five product managers took part in the survey and expressed their opinions on the topics.

The product managers were asked a total of 11 questions and the findings of the survey are depicted in the Figure 17, where the green bars indicate agreement with the statement and the yellow bars disagreement. The dark colors demonstrate strong agreement or disagreement with the statement. In some cases the interviewees were almost unanimous but some statements truly divided opinions.

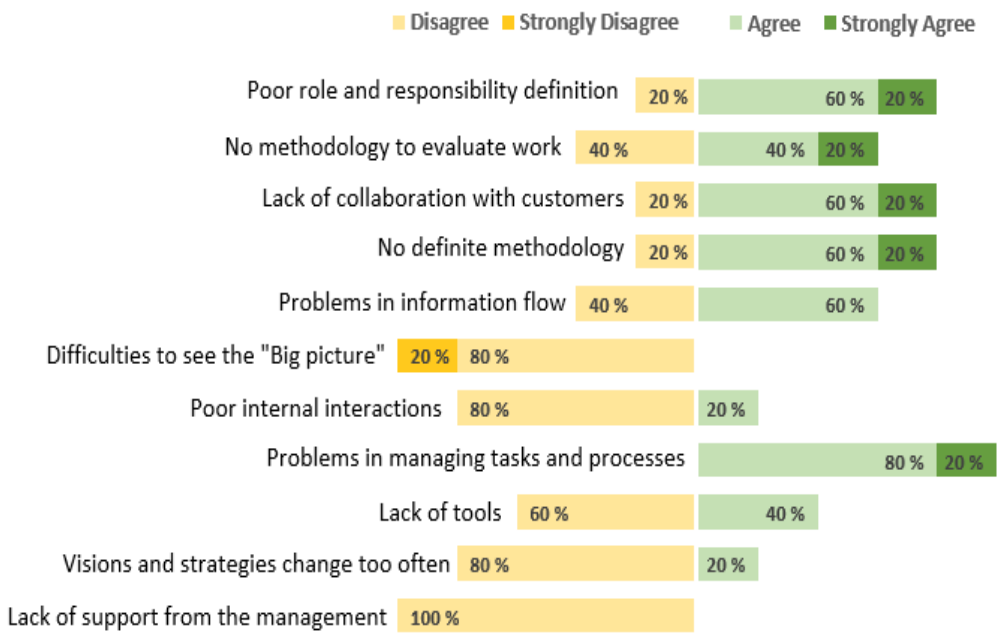



**Figure 17** Product management challenges in the Case Company

Most of the product managers felt that the roles and responsibilities in the Case Company's product management department were blurry and poorly defined. A freshman product manager stated that at first it was challenging to comprehend when to express own opinions in meetings because it was not clear which subjects belong to the product manager. Another interviewed product manager expressed that the product managers often get tasks that are not exactly under anyone's responsibility but need to be done in order for the business to go forward.

More than half of the product managers agreed with the statement that at the moment they are not able to measure or evaluate work. The product managers who disagreed with the statement commented that their evaluation is mainly based on the customer satisfaction and the ability to keep up with the schedules and tasks. However, these product managers also acknowledged that they don't have any formal measures to help them to evaluate work. The product managers also stated that they get verbal feedback from the other functional groups but the negative feedback is not often given directly but heard from somewhere else.

80 % of the product managers admitted that they don't collaborate enough with the customers in order to truly know their needs. A number of product managers expressed that the reason for the few customer visits is the long chain between the customer and the product manager. Before getting to the customer, the product manager needs to first get in contact with the local sales unit and partners. Sometimes the local sales units are even a little skeptical about the value the product manager's customer visit would bring and do not actively go along with the idea. When considering the product management's ultimate role as the "voice of the customer", it's not good that there's not more direct contact with the customers and as one product manager summed up: "The more I could visit the customers' premises, the better job as a product manager I could do".

Most of the product managers stated that PM methods and processes are not defined clearly enough. The process descriptions are inadequate and for example a definite methodology how to search for information about potential markets and customers doesn't exist. On the contrary, one senior product manager felt that the PM processes are rather well-defined and that maybe not all process descriptions are even needed. The difference of opinion could be explained by the factor that senior product managers have during the years got so used to performing the tasks on their own way that they feel no need for precise process descriptions.

60 % of the product managers acknowledged that there are some problems in the information flow. Especially the communication beyond organizational interfaces came up as challenging. One product manager noted that poor communication can in the worst-case scenario even lead to duplication of work. That is pure waste in terms of Lean. Surprisingly, all of the interviewees stated that they don't have any difficulties describing the product's PLC from the concept till the launching phase which differs from the findings of the earlier studies. Many product managers commented that they have experience working in several PLC phases which has resulted in seeing the "Big picture" more clearly.

80 % of the product managers considered that the internal interactions with the other functional teams are rather good in the Case Company. One product manager commented that for a new product manager it might be a little challenging at first

to create good interactions because he/she hasn't been involved in projects previously and due to that doesn't know the people from the other teams so well. Many product managers also noted that good interactions depend also on the chemistries between the people. It's natural that some individuals get along better than others.

All of the product managers admitted that they have problems in managing tasks and processes in terms of time. The reasons that were mentioned are the lack of resources and control. Sometimes the product manager just has to wait until some other team or person finishes their job in order to move on with the task. One product manager noted that sometimes the more you "scream" the faster you get things done. On the other hand, when there's too much work the product managers tend to delegate and prioritize tasks in order to stabilize the workload.

The topic about lack of tools divided opinions between interviewees. More than half of the product managers disagreed with the statement of having too few tools. One product manager who agreed with the statement noted that the current tools don't have all the functionalities that he would need in order to support the decision-making. For example the product manager can't get information on how many products with different variations have been sold in a certain market area without linking different databases together.

It was also mentioned that the information loop from the customer to the product manager is very informal and it's challenging to get information about how for example a software change has affected the customer satisfaction. A number of product managers also mentioned that searching for the information in general takes a long time because data has been sprinkled among many databases that contain also outdated data. One product manager noted that if the time spent on information searching would be measured in the Case Company, the results could be shocking. Most of the product managers stated that the visions and strategies don't change too often in the Case Company so that they can truly focus in the long-term plan. All of the product managers also felt that they get enough support from the management.

### 5.2 Challenges vs. Lean methods and tools

A framework (Table 1) was formed in order to evaluate the Lean methods and tools according to each product management challenge. The product management challenges are listed in the column shown on the left side of the table. Poor documentation management was added to the original listing since it was mentioned as a problem during the interviews. Lareau's 20 Keys-approach is also presented in the table since some of the keys are more or less connected to the PM challenges. The most essential Lean tools and methods that were introduced in the theory section are listed on the uppermost row of the table. The circle indicates that the specific Lean tool is applicable in order to overcome the challenge. Some of the tools can be utilized in several cases.

**Table 1** Framework: Challenges vs. Lean tools & methods

| PM Challenges | Keys | VSM | 5S | Gemba | Standard work | A3-reports | Kanban | KPIs | Heijunka | Visual Manage-ment | Kaizen |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Poor role and responsibility definition | 8, 9 | ● | | | | | | | | | |
| No methodology to evaluate work | 16,18 | | | | | | | ● | | ● | |
| Lack of collaboration with customers | 20 | | | ● | | | | ● | | | |
| No definite methodology | 15 | | | | ● | ● | | | | | |
| Problems in information flow | 6 | ● | | | | ● | ● | | | | |
| Difficulties to see the "Big picture" | | ● | | | | | ● | | | | |
| Poor internal interactions | 13 | | | ● | | | | ● | | | ● |
| Problems in managing tasks and processes | 3, 5, 14 | | | | | | ● | | ● | | |
| Lack of tools | | | | | | | | | | | ● |
| Poor documentation management | 2, 10 | | ● | | ● | | | | | | |
| Visions & strategies change too often | | | | | | | | | | | |
| Lack of support from the management | 1, 11 | | | | | | | | | | |

When defining value to the customer, it's crucial to clarify the roles and responsibilities of each member of the value stream. Value stream mapping exposes any duplication of work and leads to a better role definition which supports the value creation process by assigning the tasks and responsibilities correctly. When the roles and responsibilities are specified, every member of product management knows what to do and what is expected from them.

By defining and implementing suitable KPIs, the product managers would have the opportunity to learn and improve. Through the KPIs, the product line manager could also easily follow how his/her team is doing and have there been major changes in the performance. Visual Management should also be applied when creating metrics because visual KPIs are easy and quick to interpret and they also provide transparency within the team members.

Product management's lack of collaboration with its customers can be solved by practicing Gemba. The more the product managers spend time in the customers' premises, the more they will learn about the customers' processes and needs. KPIs can also come useful when motivating the team to more actively arrange visits or video meetings with the customers. The team could for example set a goal for customer visits quarterly/yearly and then monitor the actual number of customer visits through a KPI. The product line manager should also pay attention to this indicator and continually seek root-causes if the results are lagging the expectations.

By clearly defining and standardizing each PM method and process, the product managers wouldn't have to waste time in planning how to do the task but could directly focus on the task itself. Information quality would also become more consistent if every product manager performed the task in the same way. A3-reports could be used as templates for example when presenting a new concept proposal or proposing a new product feature.

Problems related to information flow can be solved with several methods. By mapping value streams, the biggest blockages can be identified and eliminated. This will ultimately result in enhanced information flow that is highly important in PM processes. Value stream mapping can also help the product managers in seeing more clearly the "Big picture", because when all the tasks of a certain process are mapped it's easier to describe for example the path from Gate1 to Gate4. Kanban system can be used for managing the flow of information in a process and by making the tasks visual, the product manager can constantly see what's going on and have a better control on the workflow. A3-reports can also help to achieve a more efficient information flow in the organization by providing a clear and brief way to share information.

Interaction and relationship problems between product management and other functional teams can be decreased by implementing Gemba, KPIs and Kaizen events. Product managers shouldn't isolate themselves away from where the customer value is created but frequently visit functional teams to ask questions and gather feedback. Visiting in person instead of emailing will improve internal interactions and create stronger bonds between product management and functional teams. Product management KPIs should also reflect internal customer satisfaction so that the interaction and relationship issues wouldn't go unnoticed but could be identified and eliminated early on. Short Kaizen events could be organized to solve common problems and implement better ways to perform work cross-functionally. Practising Kaizen would also improve the working relationships between product manager and individuals from the other functional teams.

Kanban and Heijunka boards may come in handy when there are difficulties to manage tasks and processes. Kanban system would provide an easy way for the Product Manager to see all the pending tasks and make future plans about how to divide the time for each task effectively. Through the Kanban system, the product line manager would also be able to monitor how each product manager is doing and give suggestions if needed. Heijunka boards are designed to level the work load in the office which could also help to reach the deadlines better and improve time management.

If there is a lack of tools or the current tools don't have all the functionalities that product managers would need in order to support the decision-making process, the tools could be reviewed and developed through Kaizen events. Since the events strongly rely on the innovative power of a cross-functional team, it could be profitable to mix product management, IT and sales personnel to work together. 5S-method contributes to the improvement of documentation management by sorting and organizing the objects in databases. By regularly following standardized 5S-procedures, the product managers would get rid of the information that is no longer needed to perform value-adding actions. This means reviewing inboxes, folders and files to remove the waste.

The evaluation points out that most of the reviewed product management challenges could be overcome by practicing Lean. The issues that are left to be solved internally in another ways are the lack of support from the management and frequently changing visions and strategies. Usability rate for each Lean practice can be determined by reviewing how useful they are when it comes to solving product management issues. According to the evaluation Value stream mapping, Kanban and KPIs have the best usability rate since they can each address three different product management challenges.

### 5.3 Lean tools and methods selection

A meeting with the pilot unit's product line manager was arranged to determine which tools and methods should be implemented to the Case Company's product management function at first. The survey results were reviewed carefully in order to sort out which issues are the most critical and should be solved instantly. After that Table 1 was used to assist the selection process. Every tool and method was reviewed sufficiently in order to clarify the possibility for implementation. Since the extent of this study is limited, not all potential methods and tools could be tested even though they would be appropriate for implementation. The figure below (Figure 18) depicts the seven practises that were selected to be further investigated for the possible adaptation to product management function.

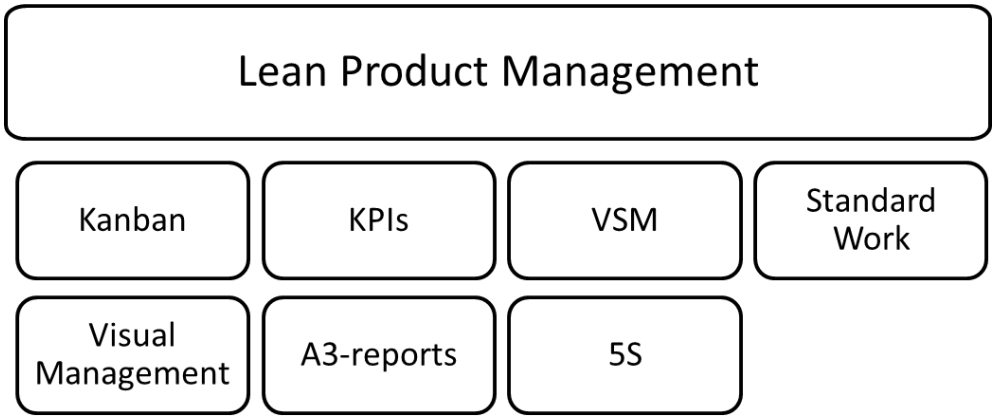



**Figure 18** Selected Lean tools and methods

The Case Company's product managers don't currently have any formal tools to evaluate the work they have done. As it's highly important to gain information about the teams' performance, KPIs were chosen to be implemented in this master's thesis. Since the lack of collaboration with customers is acknowledged to be a challenge, it was decided to have one indicator dedicated to this particular matter. The aim is to see do the customer visits increase due to a more formal indicator. Visual Management was also decided to be applied to make the performance of the PM unit transparent and visible to everyone.

Because the product managers have big difficulties to handle their tasks and processes, Kanban board was decided to be tested in the pilot unit. The goal is that every product manager would have a personal Kanban board through which they could do the task management more efficiently. Heijunka board was also considered for the work load leveling purposes in the pilot unit. Because the Case Company's product management processes are not stabilized and standardized enough, Heijunka shouldn't yet be implemented.

Value stream mapping was decided to be used for visualizing the information flow from the customer to the product manager. Since the product manager has to get exact information about the customers' needs, it's essential to explore does all that information ever reach the product manager's ears or is it lost somewhere on the way. The usage of A3-reports in order to facilitate information flow, was also decided to be looked into. The survey points out that due to poor documentation management the correct information is often hard to find. For that reason, the Case Company's databases will be inspected and a plan for 5S-cycle will be introduced.

The Case Company hasn't really standardized its product management methods and processes which most product managers acknowledge to be problematic. New product managers mostly depend on the information shared by word of mouth and are left on their own to figure out how to perform a certain task. This master's thesis will therefore also propose more standardized methods on how to perform certain tasks. These methods can then be further developed by the Case Company to really meet the needs of product management.

# 6 LEAN ADAPTION TO PRODUCT MANAGEMENT FUNCTION

## 6.1 Measurement-driven product management function

The product managers unquestionably need relevant KPIs but is there a way how to measure if the product managers are doing a good job? The metrics should really reflect the success of product managers and also motivate them to aim higher in order to reach their goals. It's also important to choose metrics that are easy to update and don't require excessive amount of time. Choosing the right KPIs should be done carefully so that problems and development opportunities will not be missed. When considering all the aspects of success, the PM metrics can roughly be divided into three categories (Figure 19).

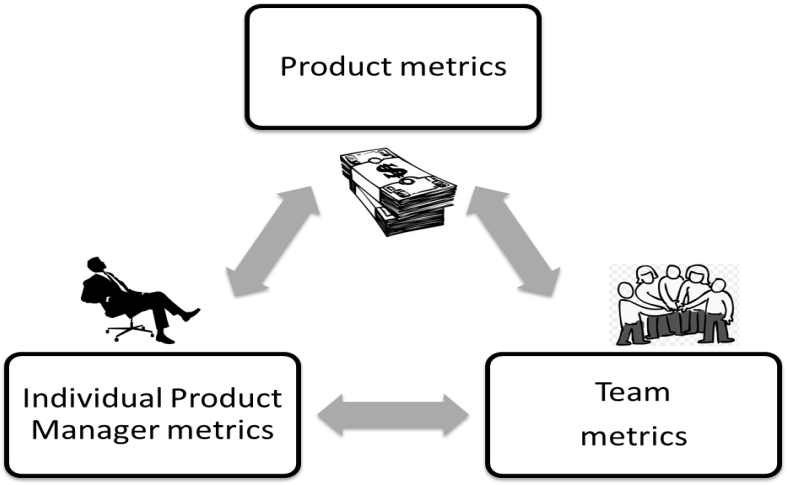



**Figure 19** Three types of product management metrics

Product metrics can indicate product revenue growth, product gross margin and customer satisfaction. Since these figures typically depend on numerous factors, the product manager has only indirect control over the outcomes. Another factor that needs to be taken into consideration when evaluating product manager's performance through product metrics is time. It takes a relatively long period of time so that the product manager's input would really be reflected into these metrics – especially in the case of a new product manager.

As product-level metrics are somewhat insufficient, the product managers should also be evaluated individually or through team metrics. The team can comprehend the whole product management department or be a single PM unit. These KPIs should measure the activities that are needed for the product management to be efficient and market-driven. The literature doesn't present any predefined metrics for product management, however generally acknowledged performance measurement frameworks can be used as a basis for the metrics planning process.

### 6.1.1 Choosing the right KPIs

Balanced Scorecard (Kaplan & Norton, 1992) is one of the most used performance measurement frameworks. It includes both financial and non-financial metrics and it's centered on four performance perspectives: financial, customer, internal process, and learning and growth. These perspectives can also be utilized when planning KPIs for the product management function. Meetings with two product line managers were arranged to discuss which KPIs should be considered in the Case Company. As a result the following metrics were chosen to be implemented as product management KPIs (Figure 20).

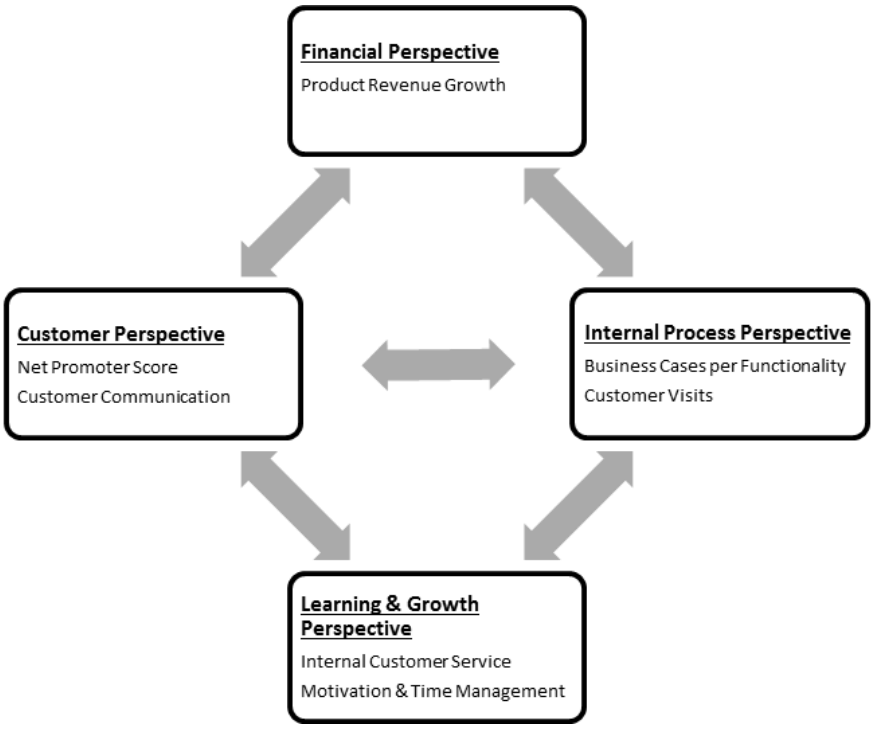



**Figure 20** Product management KPIs grouped according to BSC framework

### 1. Product Revenue Growth

Product revenue growth is a clear financial measure. Like previously stated it doesn't directly depend on the actions of product manager but is rather the outcome of many factors. These factors include, for example sales performance, global economic situation and competition on the market place. However, if the product manager is not satisfied with the functionality of his/her product and gathers a dedicated core team to improve the product, the results of that input should show as an increase in the product revenue growth rate. In that matter the product manager should also be held accountable for the results. In the Case Company the product line managers have a profit and loss responsibility which means that the product revenue growth rate also indicates how good job they have done in order to guide the product portfolio to the right direction. This KPI was decided to be updated monthly.

### 2. Net Promoter Score

Net promoter score represents customer satisfaction. The Case Company uses this tool to measure whether customers would promote them or not. The customers need to rate on a scale of 0-10 how likely they would recommend the Case Company to others. According to the survey, the customers fall into 3 categories based on their score: promoters, passively satisfied and detractors. The survey includes a section where the customers can drag a red or green card onto the area where the Case Company's performance needs to be improved or where they perform well. Many of the 22 areas are one way or another linked to product management, such as product quality, product features, and industry & application knowledge.

Once the customer places the red card in one of the areas, writes a comment about it and ticks the product group name, the Case Company gets direct information on the issue. The idea of this KPI is to follow the amount of red and green cards. The PM unit, to which the card is assigned to, would collect all the red cards on their dashboard and mark them as improvement areas. Likewise, the green cards would be visually shown to indicate the strengths.

### 3. Customer Communication

Both product line managers agreed that sometimes the information flow back to the customer is poor. This means that when the product has been transformed, for example product functionalities have been added or the power range has been expanded, the customers haven't been notified about the changes. That's why it's important that the product managers would make sure that the information loop will be closed so that the customers don't have outdated information about the products and they'll know that actions took place because of their remarks. This KPI will be executed on the dashboard by having two separate areas: "Product Changes" and "Communicated to Customers". The idea of this KPI is to motivate the product managers to be more responsible towards the customers and also bring transparency within the organization by monitoring the number of information loop closures monthly.

### 4. Business Cases per Functionality

An important part of the product manager's job is to justify whether the product should have a certain functionality or not. It's important that the product manager understand the cost-benefit aspect of every new product enhancement. The waste of overproduction is formed when new features and products are designed without real business demand. Due to that, resources are tied to developing a solution with low business criticality which negatively affects also other projects. Therefore, product managers should always be able to defend his/her opinion based on real facts without using expressions like "I think" or "In my opinion". This KPI demonstrates how many business cases per new product functionality the product manager constructed. The goal is that every product enhancement would be based on a valid business case. This KPI is especially topical during the R&D processes.

### 5. Customer Visits

The number of customer visits indicates how well the product managers really know the market needs. This KPI pushes the product managers to get out from behind their desks and engage more with customers. The lack of collaboration with

customers was acknowledged to be an issue in the Case Company and that's why both product line managers agreed that product managers should more actively look for customer visits. The market information plays as important role in the product sustaining phase as when planning the next generation products. When there's a big backlog of potential features and limited amount of resources, it's vital to have first-hand market information in order to prioritize and make market-wise decisions. The amount of customer visits or online video meetings will be recorded once a month and the goal is to little by little increase the number in the following months.

**6. Internal Customer Service**

It's essential that other functional teams, such as Sales Area Management and Local Sales units, would evaluate Product Management's performance and express openly have they been served well by the PM unit. The idea of this KPI is to formally monitor and display internal customer satisfaction. One of the Case Company's product management units used to perform internal customer service surveys for a period of time but since the results were too person-related, the try-out was terminated. This is one of the reasons why the new KPI will be more team-specific and doesn't emphasize the performance of an individual product manager. The internal customer service survey will be conducted once a quarter and it will be very quick and simple to fill in order to keep the response rate high enough.

**7. Motivation & Time Management**

The main idea of this KPI is to demonstrate employee productivity and welfare. At the end of every week the product managers need to estimate through an online survey how their energy, motivation and stress levels currently are. It's important to learn how to measure and diagnose motivation in employees as it has been seen to have a great impact on productivity. Too heavy workload and constant stress on the other hand can result in burnout which can in the worst case scenario lead to severe consequences. The product managers will also need to estimate how they have divided their weekly working time between different task categories. This is a great way to gain valuable information about product managers' time usage and see more clearly do some activities consume too little or too much time.

### 6.1.2 Team Dashboard

The figure below (Figure 21) depicts the possible layout for a team dashboard which should be positioned in a visible place near the operating PM unit. The product management KPIs can be found on the left side of the board. The board also includes the Lareau's 20 Keys chart which visualizes the current state of the PM unit and motivates the team to strive for better performance. The problem solving and continuous improvement aspect can be found on the right side of the board. This includes an A3 problem-solving report (Appendix 3) and a task list through which the team should be able to identify and eliminate problems that are negatively affecting the team KPIs.

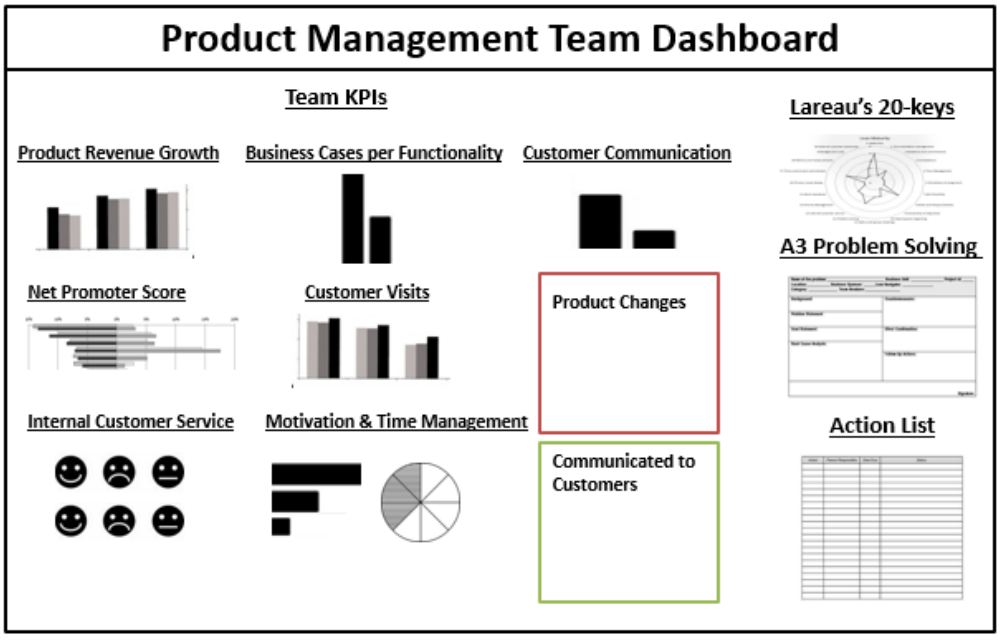



**Figure 21** Team dashboard layout

The product line manager should on a regular basis gather his/her team in front of the board to discuss the performance of the team and the factors affecting it. The goal is to deeply root the measuring culture into the team's own working culture. It's also important to remember to regularly evaluate and develop the metrics further so that they would be up-to-date and aligned with the company's strategy.

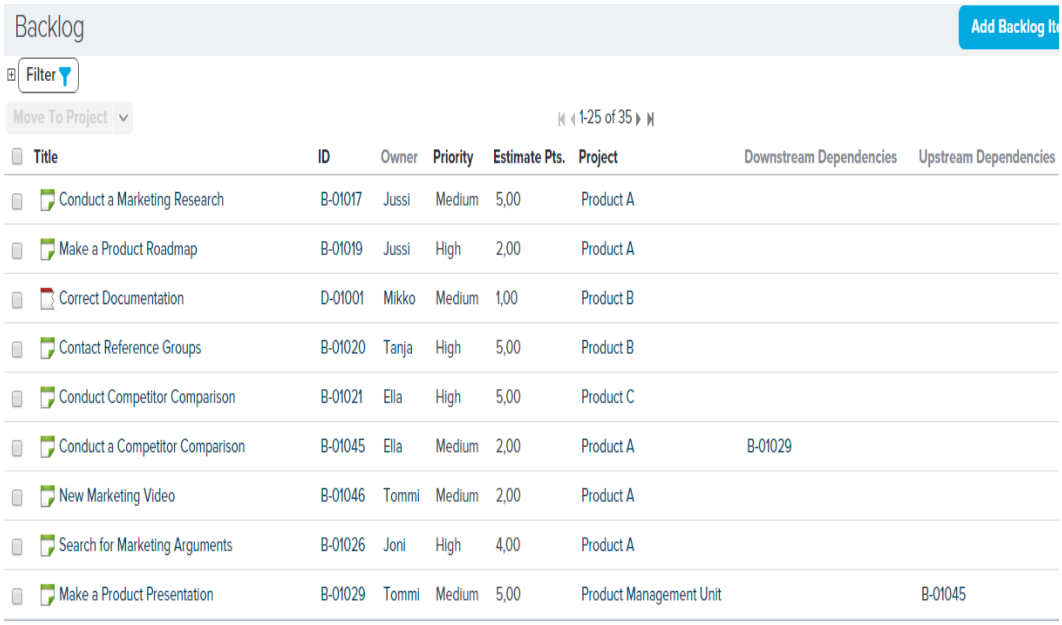
### 6.2 Electronic Kanban board

Kanban board was decided to be first tested in the pilot unit before implementing the tool more broadly in the product management function. Due to limited amount of wall space, Kanban board was decided to be implemented in an electronic form. An electronic Kanban board offers exactly the same benefits as a physical Kanban board and it enables even more flexible way of working because the board is not tied to a certain location. A physical board can contain only a limited amount of information, whereas an electronic board can contain task specific details, comments and team data analysis. With the electronic Kanban board the team doesn't neither have to ever worry about losing the work items as they are not written on physical Post-it notes.

There's many companies that offer online programs that include Kanban boards. During the search for a suitable program, the Case Company's software development team suggested a program called VersionOne which has been utilized in the Case Company's other global business units and it has been the subject of a pilot run in the Case Company as well. A meeting with VersionOne's representatives was arranged to discuss the needs of product management and set goals for the trial period. It was agreed that the program will be tested in the pilot PM unit for two months, after which the benefits for product management will be evaluated.

#### 6.2.1 Backlog

The Kanban board implementation begins with first building a backlog of work items (Figure 22). VersionOne has divided the work items into three categories: stories, defects and test sets. Stories can be for example product requirements, features and units. While defects can be programming bugs or broken product functionalities that cause the system to work unexpectedly. The third category "test sets" is used to represent testing activities that can be performed throughout the product release. (VersionOne, 2015)




| Title | ID | Owner | Priority | Estimate Pts. | Project | Downstream Dependencies | Upstream Dependencies |
|---|---|---|---|---|---|---|---|
| Conduct a Marketing Research | B-01017 | Jussi | Medium | 5,00 | Product A | | |
| Make a Product Roadmap | B-01019 | Jussi | High | 2,00 | Product A | | |
| Correct Documentation | D-01001 | Mikko | Medium | 1,00 | Product B | | |
| Contact Reference Groups | B-01020 | Tanja | High | 5,00 | Product B | | |
| Conduct Competitor Comparison | B-01021 | Ella | High | 5,00 | Product C | | |
| Conduct a Competitor Comparison | B-01045 | Ella | Medium | 2,00 | Product A | B-01029 | |
| New Marketing Video | B-01046 | Tommi | Medium | 2,00 | Product A | | |
| Search for Marketing Arguments | B-01026 | Joni | High | 4,00 | Product A | | |
| Make a Product Presentation | B-01029 | Tommi | Medium | 5,00 | Product Management Unit | | B-01045 |

**Figure 22** Backlog work items (VersionOne)

Every work item has to have an owner and an individual ID number through which it can be tracked. The work items can also be prioritized by three different priority levels: low, medium and high. Prioritization helps the product owners to decide which work items should be done before others. The size of the work item should also be estimated by story points. According to VersionOne (2015) for example a small product feature can be estimated to be worth of a single story point and the rest of the work items should be estimated in relation to that feature. By estimating how big each piece of work is, the team can better schedule its tasks during a given period of time.

The work items can also have dependency relationships with each other. By defining the dependencies, the team can specify when a certain work item is required to be completed in order to deliver another. This also helps the team members to recognize the critical defects that are holding up new features or when regression tests have to wait till the relevant stories have been accomplished. After creating the backlog items, they can be further segmented into backlog groups that function as filters during the planning and tracking process. (VersionOne, 2015)

### 6.2.2 Team Room

VersionOne includes a team-based environment called a Team Room which is designed to help the team members to plan and track day-to-day activities in one central location. The Team Room can also easily be customized according to the needs of each team so that the room will display only the information panels that are the most important ones. The backlog list can be opened in the Team Room to show all the upcoming work items and to drag them into the Kanban board. All the work items that have already been closed can also be displayed in one of the information panels.

According to VersionOne (2015) teams that are practicing Kanban should use the Storyboard panel (Figure 23) as their main tracking view. The Storyboard displays all the team's work items as story cards. These cards can be picked from the backlog list and moved around the board by dragging and dropping. The visual Storyboard enables the team members to see at a glance the work in progress and understand the bigger picture better. The Storyboard can also be filtered to display the stories of each team member which facilitates personal task management.

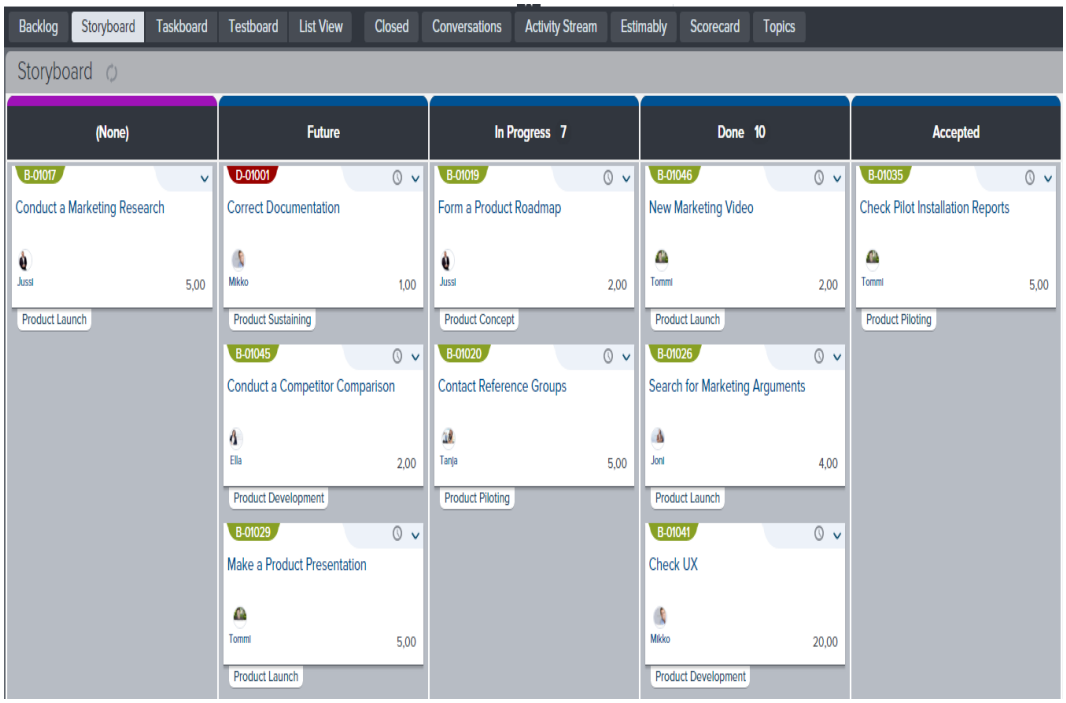



**Figure 23** Kanban Storyboard (VersionOne)

The team can customize what kind of information the story cards display. By default the cards include the work item name and ID. The story cards of the example Storyboard contain also the name of the item owner, backlog group and estimated story points. By clicking the story card, a new window that includes more specific details on the work item pops up. These details include e.g. dependencies, work item tasks and tests. Just like in the physical Kanban board the team can set limits on the quantity of work items in each column. A visual color signal appears if the WIP limits have been exceeded to notify the team to focus on the right work in order to ensure a continuous flow.

In addition to the Storyboard view, the Team Room also includes Taskboard and Testboard tracking views. The Taskboard view (Figure 24) illustrates the backlog items that have been further split into minor tasks. These tasks can have different sizes, however according to VersionOne (2015) it's recommended that the sizes would vary between 2 hours to 2 days of effort. The tasks can also have several different owners and they can be assigned to individuals or a group of members. The Testboard works with the same principle as the Taskboard, except its columns have been named: in progress, passed and failed.

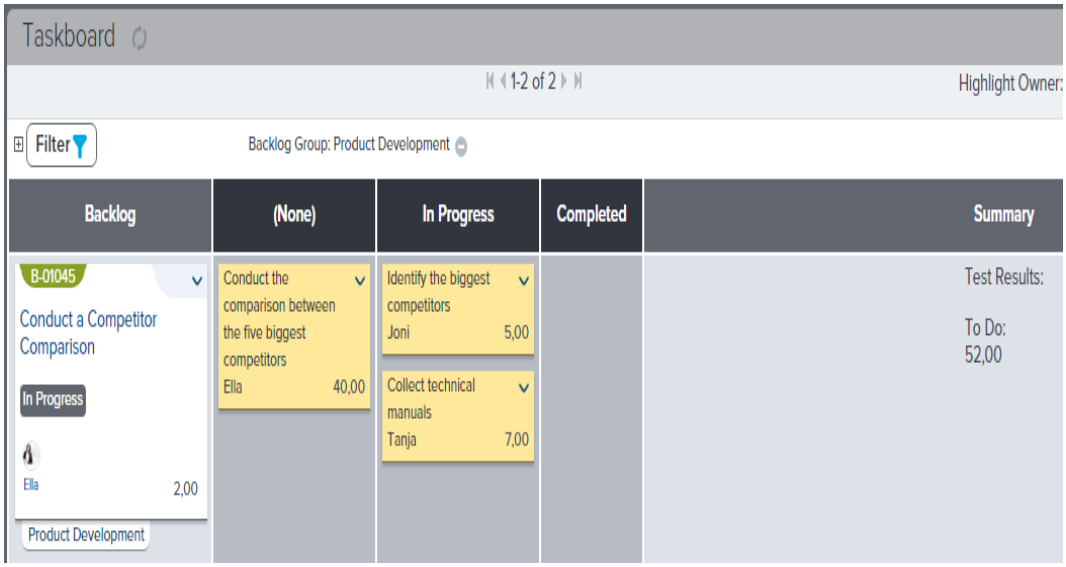



**Figure 24** Taskboard view (VersionOne)

The team data analysis can be found in the Scorecard view which includes metrics about how well the team has been doing in terms of efficiency. Through this view the product line manager will be able to compare planned vs. actual amount of work items. The product line manager can also gain a better understanding about the amount of remaining work and how the team has performed historically on delivering work items. The analysis can be further fragmented to show how the team members have individually been able to deliver work which allows the product managers to evaluate their own performance. (VersionOne, 2015)

After implementing the electric Kanban board, the product managers should be more capable of managing their tasks and processes better. They will be able to visually see which work items are to be done and in which point of the development process the items are currently situated in. By setting limits to the work in progress, the product managers would also avoid multi-tasking which has a negative effect on the productivity. The product managers should also be able to see the big picture more clearly as the electronic Kanban helps to visualize the whole PLC from ideas to actual stories and tasks. Moreover, information flow and communication between product managers and other functional teams should be enhanced.

### 6.3 Standard work

Standardizing the product management processes was started in the Case Company by first standardizing the templates product managers use to perform certain tasks. The long-term goal in the Case Company is that every product manager would use the same templates so that the information quality would be consistent and that duplication of work could be avoided. The templates ought to describe specifically what kind of information is needed and where. The time perspective of standard work will not be taken into consideration at first but it can later be added into the templates.

After establishing standardized templates for different processes, it’s important to strongly advise product managers to use them. The templates should be stored in a shared database where they can easily be found by the product managers. They should also be frequently reviewed and developed so that they would correspond to

the changes in the business environment. The following subchapters (6.3.1 & 6.3.2) present two standardized templates that the product management function could collectively start using.

### 6.3.1 Lean business model canvas

Lean Canvas is Ash Maurya's adaptation of Alex Osterwalder's business model canvas which is presented in Appendix 4. Both canvases represent an easy and quick way to write a business plan. The one-page canvas format forces the author to choose their words wisely in order to capture the essence of the product. The short format also enables more effective way to communicate the business model with other people.

Just like the original business model canvas, Lean Canvas (Figure 25) comprises of nine boxes. Out of the nine boxes, four have been changed compared to the original version in order to achieve more problem-focused approach. The boxes that were added to the original canvas are: Problem, Solution, Key Metrics and Unfair Advantage. Concurrently, the boxes that were removed from the Lean Canvas are: Customer Relationships, Key Activities, Key Resources and Key Partners.

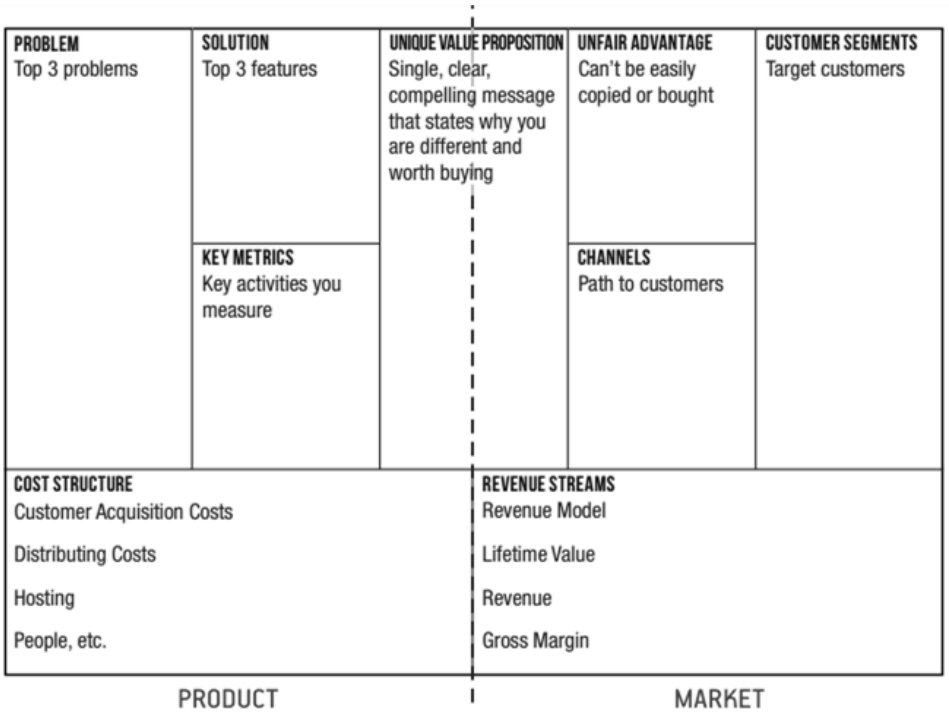



**Figure 25** Lean business model canvas (Maurya, 2012, p.5)

The Lean Canvas is divided into two main segments – product and market. The canvas is well-balanced as both segments include equal amount of boxes. The idea of the Problem box is to shortly describe the three top problems which the new product would solve. According to Ash Maurya (2012) companies fail because they waste valuable time, money and effort building the wrong product due to the lack of problem understanding from the beginning.

After describing the problem, it should be rather easy to define the top product features that form the core of the solution. These features are needed to fulfil the value promise made to the customer. Moreover, defining the key metrics will make the product manager to think over how he/she can measure the success of the new solution. It's essential that the product manager will also open the cost structure of the product to give a more precise idea of variable and fixed costs. Unique Value Proposition is situated in the middle ground as it combines both product and market aspects. The purpose of this box is to explain why the product is so different compared to the existing products and how does it bring value to the customers.

Unfair Advantage box describes why the product can't be easily copied or bought. This type of competitive advantage can be for example exclusive access to customers or ability to innovate faster than the competitors. The purpose of the Customer Segments box is to describe who the target customers or main users of the new product would be. Whereas, the Channels box illustrates how those target customers can be reached. Revenue Streams box demonstrates how the company can generate revenue with the product and of what kinds of components the revenue consists of.

The Case Company's product managers could really take advantage of Lean Canvas when proposing next generation products and product features. Since the Case Company is not using any formal concept proposals, the Lean Canvas could be beneficial as it emphasizes the aspect of solving customer problems and delivering value. It's critical for the product managers to also get feedback on their new ideas and that's why the one-page canvas format would be ideal for easy documenting and sharing. The Lean Canvas is submitted to the Case Company in a PowerPoint-format which is easy to update and print in an A3 paper size.

### 6.3.2 Competitor product comparison

In order for the product manager to come up with a competitive product, he/she needs to understand who the competitors are and how the product should be positioned against the competition. By comparing the competitors' products to the company's own product, the product manager should be able to form a picture of how the product should be in order to be competitive in the market. The Case Company has built an online comparison portal which is designed to help the sales engineers and product managers in the product comparison process and provide them more detailed information about competitors' products. However, the portal is not so popular among the product managers since it's considered too burdensome to use and since it contains highly-detailed technical data. The good thing about the comparison portal is that the information it encompasses is organized consistently.

Recently the pilot product management unit has been working on a common competitor comparison template that is presented in a PowerPoint format. The comparison template comprises different aspects from energy efficiency to application suitability. The figure below (Figure 26) illustrates an example slide from the new competitor comparison PowerPoint template.

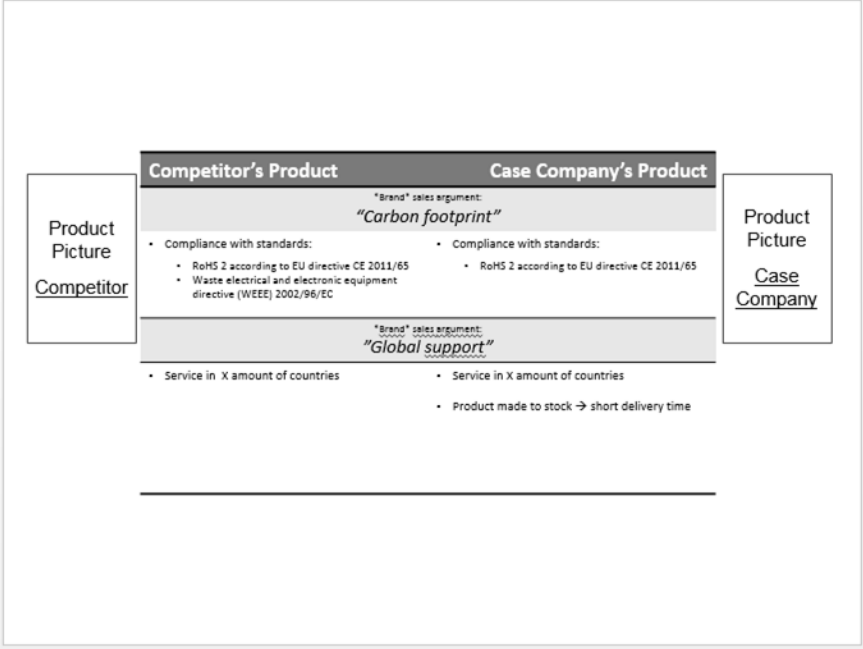



**Figure 26** Competitor comparison template

The newly developed competitor comparison includes a total of 26 slides that ought to give a comprehensive insight on how the competitor's product differs from the Case Company's product. The first slides give basic information on both products, such as release year and main sales arguments. After that the products are compared through 20 different areas. The other half of the comparison designates the biggest strengths the Case Company's product has over the competitor's product. The last slides of the comparison summarizes the top selling points and the product frame size differences. The Case Company's other PM units could also utilize the same template since the template is consistent and it clearly points out what kind of information is needed and where.

### 6.4 Information flow

Product managers are constantly collecting, analyzing and distributing information. Therefore, the availability of high quality, up-to-date and reliable information is especially emphasized in the product management function. Product managers do not only create and use information but they also have a significant role in distributing the right information to the people who need it. In order for the other teams to work effectively and make wise decisions, product managers need to have a proper understanding on what kind of information people need, when do they need it, and in what form they need it.

The following subchapters (6.4.1 & 6.4.2) focus in enhancing the information flow in the Case Company through value stream mapping and 5S procedures. The effectiveness of information systems and the current state of information flow between product managers and customers will be evaluated in these subchapters in order to have a better understanding of what should be changed in the future. Undoubtedly, a good information flow gives the company a clear competitive advantage and that's why the Case Company should also strive for being better than its competitors at gaining maximum value from information and optimizing the information flow.

### 6.4.1 Value stream mapping

Value stream mapping was decided to be used for visualizing the information flow all the way from the customer to the product manager since it was mentioned during the interviews that this information loop is quite informal and complex. The current state drawing was sketched together with the product line manager in order to capture all the links of the information chain. Additional information about the support queries was obtained by interviewing the global support personnel.

The current state value stream map (Figure 27) depicts the information flow from the customer to the Case Company's global product management unit. The information flow is also supposed to run backwards through the same links till it reaches the customer. Value stream mapping icons and design have been adapted from the literature (Keyte et al., 2004) and they are explained in more detail in Appendix 5. Additional grey comment boxes have also been added to clarify the nature of information.

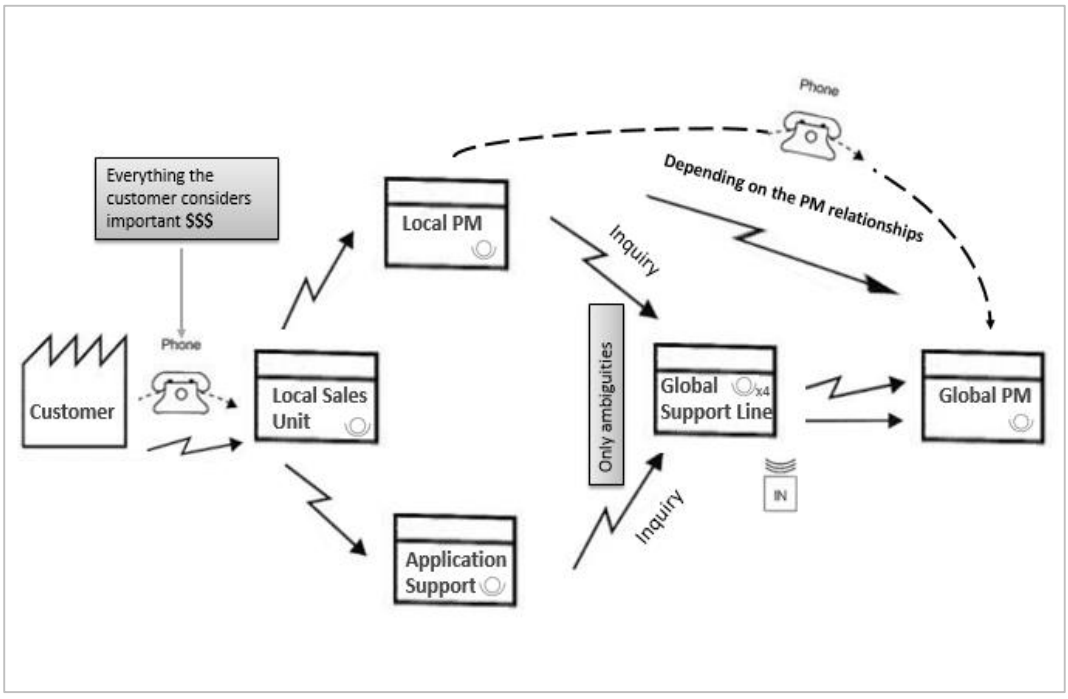



**Figure 27** Current state value stream map

The local sales unit is first contacted when the Case Company's customer has a question or request. The sales engineers and the customers have usually built up good relationships and everything that the customers consider important is shared with the trusted sales engineer. If the sales engineer doesn't have enough knowledge to satisfy the customer's need for information, he/she will turn to the local product manager or application support engineer. These two units are usually more familiar with the particular product and can answer the questions more broadly. In case the local product managers or application support engineers are unable to answer the question or they need verification, global support line is consulted. Some local product managers have very good relationships with the global product managers and depending on the customer case, they might sometimes directly contact the global product managers. All the inquiries are otherwise fed to the global support line's database. In this point the information is often narrowed down to ambiguities.

The global support line receives an average of 20 internal support inquiries daily. The questions are divided into two categories: presales and aftersales questions. These questions are further divided into subcategories for example software, hardware and documentation questions. The global support line promises to solve the case within 24 hours which means that the customer will get a response from the local sales engineer in 30 hours since the question was asked. Approximately 30 % of the inquiries go till the product manager through the global support line.

Since the product managers receive only a fraction of the initial information the customer considers important, many good business opportunities are lost on the way. Let's imagine a situation where the customer, for example an OEM is developing a new product and choosing between the Case Company and its competitor to provide the necessary component. The component has a special requirement, for example it has to tolerate high temperatures. The customer will first consult the sales engineer whether the Case Company's products can be used in such environments. The sales engineer will most likely check the technical specifications and in case there's a limit for the temperature, tell the customer that this limit needs to be considered.

However, the product manager might know that in some cases this temperature limit is flexible and the customer could in fact use the product despite the technical specifications. In case of a big business opportunity, it's profitable for the company to even add the required functionality to the present product in order to satisfy the customer need. Because of the long information chain, business opportunities can unfortunately get filtered and due to that potential cash flow lost. If the local product manager is persistent enough and has a good nose for business opportunities, he/she can directly suggest the potential business case to the global product manager. This however highly depends on the communication level and relationship between these two parties.

Figure 28 depicts the information flow (red) that should be strengthened in order to maximise the possibility for new business cases. This future state value stream map emphasises the importance of knowledge sharing between the customer, sales and product management. The goal is that the product managers could gain the maximum value from the information that the customers provide and which they consider important.

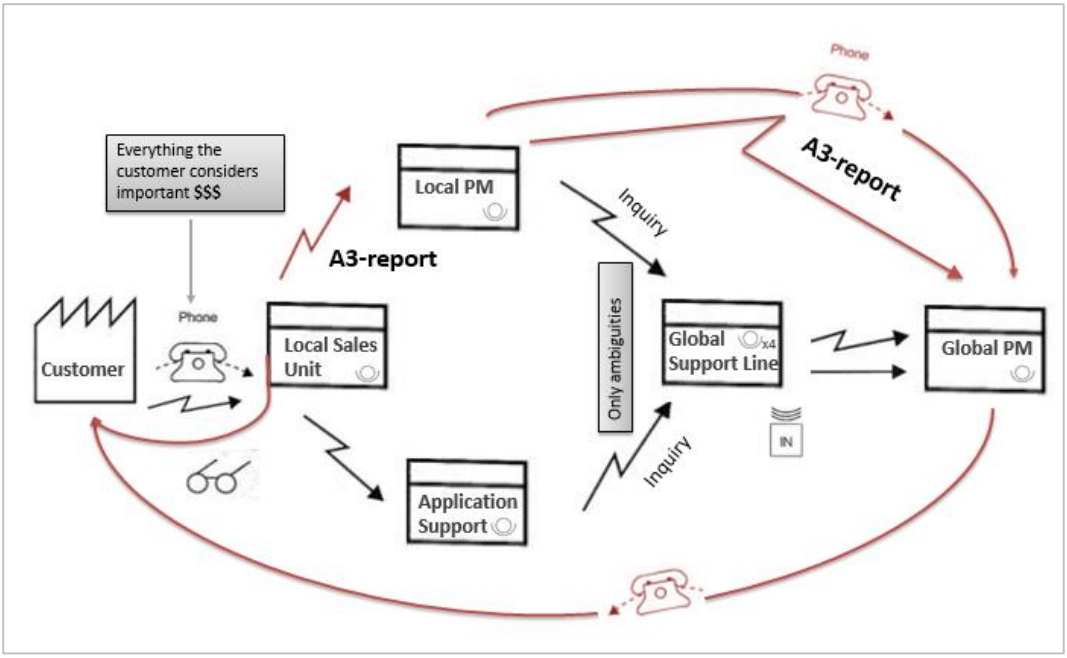



**Figure 28** Potential future state value stream map

The local sales engineers have the key role in the future VSM because they are the ones that interact with the customers the most. The new sales engineers are regularly trained in the Case Company's training center where the global product managers introduce their own products and answer questions related to them. The usage of a proposal A3 report could also be demonstrated in the training events in order to encourage the new sales engineers to actively hunt for new business opportunities. A3 report, an example presented in Appendix 6, can be used to evaluate the financially significant business opportunities. A3 report also compiles a lot of information into a small space which eases the flow of information in general.

After filling the A3 report, the sales engineer would send it to the local product manager who would take a closer look into the case. It's good that the local product manager functions as a filter between the sales engineer and the global product manager so that the product managers wouldn't drown in new proposals but would receive only the most potential ones. After reviewing the A3 proposal, the global product manager could conduct more precise analyses and have a video meeting with the customer or possibly even visit the customer's premises with the local sales engineer to get more firsthand information on the business case.

### 6.4.2 Lean document management and 5S

The Case Company has several databases that the product managers use to obtain information. A number of product managers were interviewed in order to list all the databases and find out what type of information do they contain. The figure below (Figure 29) illustrates the databases and what kind of information product managers can find from these databases.

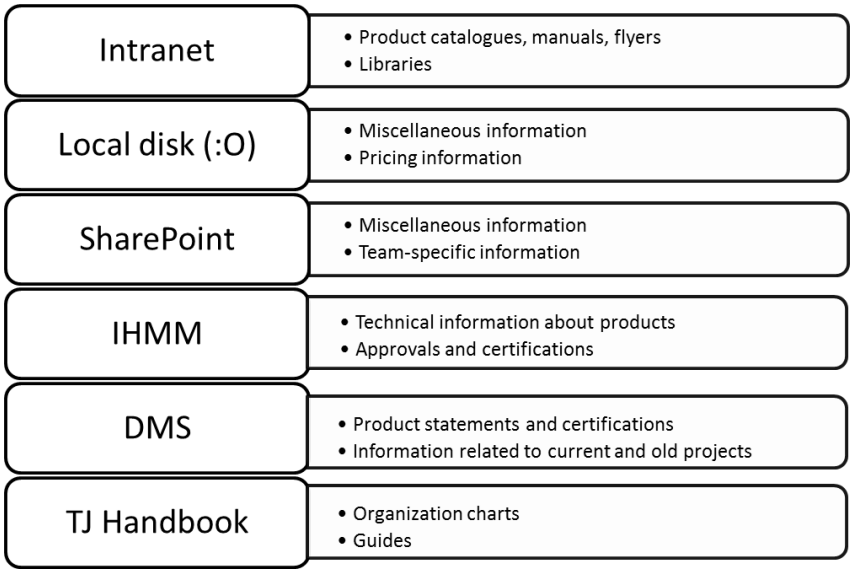


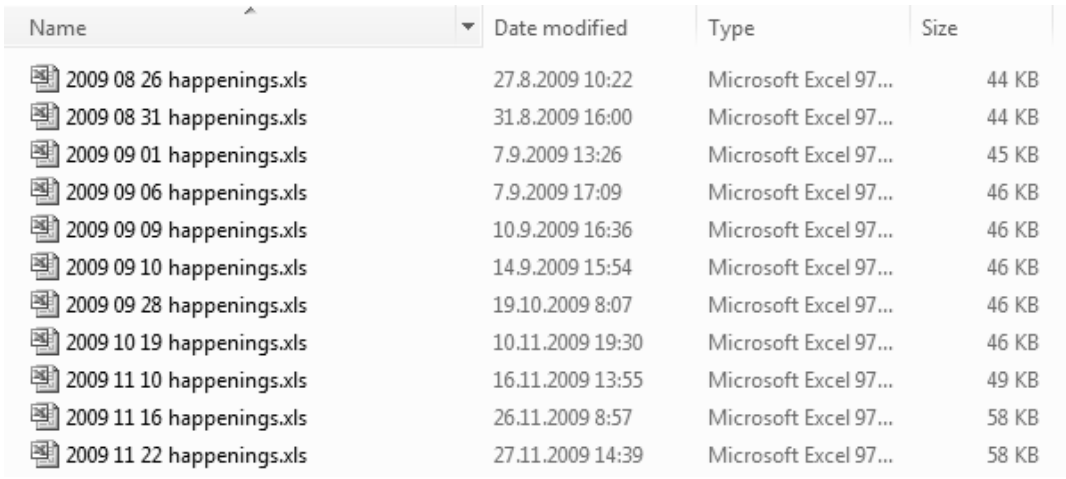

**Figure 29** Case Company's databases

The Case Company's intranet provides lots of useful data from employee contact information to different kinds of libraries. These libraries contain over 70 000 marketing and technical documents which the product managers can utilize. Through the intranet the product managers can also access different portals e.g. business intelligent and image bank portals. Whereas, the local disk has a folder for each functional team of the Case Company. The product management folder includes personal folders for each product manager, product files and miscellaneous product management files. The interviewed product managers noted that from the local disk they look for pricing and marketing event information that are situated under sales and marketing teams' folders.

Product managers use SharePoint, which is a web application platform, for information storing and sharing purposes. The product management function has its own global site that contains for example product roadmaps, competitor comparisons and sales reports. The interviewed product managers commented that they search for team-specific information from SharePoint since team reports and action lists are also gathered there. In-house maintenance manual (IHMM) includes technical information about the Case Company's products. Product manuals, approvals and certifications are stored in this database which is meant for internal usage only.

Product managers use DMS (SAP Document Management System) to preserve data related to current and old product development projects. Several versions of the same file can exist in DMS in order to depict file modifications. The interviewed product managers stated that they use this database also to acquire product-related certifications and statements. Whereas, from TJ Handbook the product managers can find updated organization charts and several guides. These guides are for example helpful in situations where the product manager needs to buy accessories from production or send goods through the Case Company's dispatch department.

The idea of Lean document management is to provide the exact amount of information that is needed, at the right time and to the right people. This does not only save space from the company's databases but also makes it easier for the product managers to find what they are looking for. A closer look into the Case Company's databases reveal that many documents would need revising since they unlikely serve their purpose in the value creating process no longer. These documents include, for example old conference reports and department event memos (Figure 30). There's also several folders in the local disk that are completely empty or include only 1-3 files. Moreover, people who haven't been working as product managers in the Case Company for years still have their own personal folders in the local disk.



| Name | Date modified | Type | Size |
|---|---|---|---|
| 2009 08 26 happenings.xls | 27.8.2009 10:22 | Microsoft Excel 97... | 44 KB |
| 2009 08 31 happenings.xls | 31.8.2009 16:00 | Microsoft Excel 97... | 44 KB |
| 2009 09 01 happenings.xls | 7.9.2009 13:26 | Microsoft Excel 97... | 45 KB |
| 2009 09 06 happenings.xls | 7.9.2009 17:09 | Microsoft Excel 97... | 46 KB |
| 2009 09 09 happenings.xls | 10.9.2009 16:36 | Microsoft Excel 97... | 46 KB |
| 2009 09 10 happenings.xls | 14.9.2009 15:54 | Microsoft Excel 97... | 46 KB |
| 2009 09 28 happenings.xls | 19.10.2009 8:07 | Microsoft Excel 97... | 46 KB |
| 2009 10 19 happenings.xls | 10.11.2009 19:30 | Microsoft Excel 97... | 46 KB |
| 2009 11 10 happenings.xls | 16.11.2009 13:55 | Microsoft Excel 97... | 49 KB |
| 2009 11 16 happenings.xls | 26.11.2009 8:57 | Microsoft Excel 97... | 58 KB |
| 2009 11 22 happenings.xls | 27.11.2009 14:39 | Microsoft Excel 97... | 58 KB |

**Figure 30** Product management's NVA documents

As an attempt to separate data and restrict user access, companies can easily end up with multiple databases. However, companies seldom have enough time and resources to manage them which can result in outpouring of NVA documents and information. The same phenomenon has also occurred in the Case Company which is now operating several databases that are not up to date. 5S-method helps to improve document management by sorting and organizing files and folders in the databases. The Case Company should perform the following 5S steps in order to achieve more efficient information searching process:

**1. Seiri** – Inspect all the files and folders since clutter complicates information searching. The rule is to only store the files that are important and needed in the value creation process – everything else should be deleted. This comprises as well all the unnecessary icons, files and folders in the product managers' own desktops and libraries. It's essential to also critically evaluate are all the current databases necessary or could some of them be possible united.

**2. Seiton** – Organize all the files and folders. There should be a certain location which everyone knows, for a piece of information. Folder/file names should also be descriptive enough so that the viewer will be able to comprehend at a glance what the contents are about. General titles such as "Others" and "Marketing" should be avoided. Moreover, the amount of subfolders should be limited to ensure easy access to the information.

**3. Seiso** – Clean up all the unnecessary data on regular basis. The product managers could browse through the folders and subfolders every other week and delete all the unnecessary files and folders. They should also maintain their e-mail inboxes properly. If the received e-mail doesn't require any action or re-reading, it should be deleted immediately as there is no purpose to save e-mails that are going to be deleted later anyway.

**4. Seiketsu** – Standardize methods on how to follow the first 3Ss. This includes creating a document retention guide that has instructions on how to name, structure and organize files and folders in the databases. The guide should also include a schedule for cleaning up the unnecessary documents and give recommendations for keeping and deleting e-mails.

**5. Shitsuke** – Maintain and review standards. The purpose of this step is to ensure that everyone is following the procedures as agreed. Monthly/quarterly audits should be conducted by the management to make sure that the information searching process stays effective.

The document management project in the Case Company will be challenging as there's several databases which each include hundreds of files. It can take quite a while to sort and organize all the folders and files, but once completed the time product managers spend in information searching should be shortened. The goal is that documents would always be up-to-date, accurate and never in several locations at once. In order to achieve this goal every member of product management function has to participate and daily apply Lean Thinking.

### 6.5 Follow-up plan for the Lean transformation process

Because it takes time to execute all the necessary steps in order to transform into a Lean product management function, a follow-up plan (Table 2) is introduced to the Case Company. This plan comprises all the practises which have been discussed in this master's thesis. By executing this follow-up plan, the product management function will be able to systematically climb the stairs of high performance one step at a time. The follow-up plan introduces the initial steps to improve efficiency but it's ultimately the Case Company's responsibility to continue the cycle of improvement until a state of perfection is reached in the product management department.

**Table 2** Follow-up plan for the Case Company

| Stage | Step | Description | Time Frame | Goal |
|---|---|---|---|---|
| 1 | Pilot unit's product management KPIs | Set up a team dashboard for the pilot unit. The product line manager should on a regular basis gather his/her team in front of the board to discuss the performance of the team and the factors affecting it. Develop the chosen KPIs further. | 6-9 months | Key #16 Level 2<br>Key #18 Level 2-3<br>Key # 20 Level 3<br>Key # 13 Level 3 |
| 1 | Kanban Board testing | Test the VersionOne Kanban board in the pilot PM unit. Collect feedback from the product managers on the program. | 2-3 months | Find the suitable Kanban application |
| 1 | Lean business model canvas | Introduce the Lean business model canvas to the product managers and collectively start using it. | 6-9 months | Key # 15 Level 2 |
| 1 | Competitor comparison template | Introduce the template to the product managers and collectively start using it. | 6-9 months | Key # 15 Level 2 |
| 1 | 5S-program | Start 5S-cycle to clean the databases one by one. Involve product management, IT and other necessary teams. Create a document retention guide and perform monthly/quarterly audits. | 9-12 months | Key #2 Level 4 |
| 1 | A3-reports | Use A3-reports to achieve a more efficient information flow in the organization. Focus on the knowledge sharing between the customers, sales units and product management. | 9-12 months | Maximise the amount of potential business cases |
| 1 | Roles and responsibilities | Define product managers' roles and responsibilities in detail by group brainstorming and with the help of value stream mapping, which leads to a better role definition. | 3-6 months | Key #8 Level 4<br>Key #9 Level 2 |
| 2 | Common product management KPIs | Set up team dashboards for the rest of the PM teams. Refine the KPIs in common Kaizen events. | 9 months | Key #16 Level 2<br>Key #18 Level 3<br>Key # 20 Level 3<br>Key # 13 Level 3 |
| 2 | Kanban Board | Start using the chosen Kanban application also in other PM teams and R&D function. | 9 months | Key #3 Level 3 |
| 2 | Value stream maps | Identify and redesign first one or two value streams and then slowly continue by adding more. | 6 months | Clarify PM processes and enhance information flow |

The Lean transformation steps have been divided in the follow-up plan into two stages. The first stage includes practises that have been agreed to be tested first in the pilot PM unit, such as Kanban board and KPIs. These practises will be implemented more broadly to the whole product management department during the second stage. The follow-up plan also suggests a time frame for each step after which the results of the implementation should be evaluated. Moreover, the goals have been defined for each step in the follow-up plan’s last column.

# 7 RESULTS AND RECOMMENDATIONS

This chapter gives answers to the research questions that were set in the beginning of this thesis and proposes recommendations to the Case Company on how to succeed in the Lean transformation process. The main research question of this thesis was:

*How can Lean tools and methods be applied to product management function?*

In order to answer this questions, a closer look into the product management's problematics was required to determine the challenges that Lean principles can address. The purpose was also to provide valuable information about the current state of the product management function to the Case Company during the process. Information about product management's biggest challenges was gathered from two separate studies that were conducted in 2012. The Case Company's product managers were then interviewed to discover do the same challenges arise also in the Case Company's product management department. The following table (Table 3) concludes the recognized product management challenges that should be aspired to overcome using Lean tools and methods.

**Table 3** Recognized product management challenges

| General Product Management Challenges | Recognized Challenges in the Case Company |
|---|---|
| Poor role and responsibility definition | x |
| No methodology to evaluate work | x |
| Lack of collaboration with customers | x |
| No definite methodology | x |
| Problems in information flow | x |
| Difficulties to see the "Big picture" | |
| Poor internal interactions | |
| Problems in managing tasks and processes | x |
| Lack of tools | |
| Visions & strategies change too often | |
| Lack of support from the management | |
| ***Poor documentation management** | x |

According to the survey results, the Case Company's product managers battled with slightly more than half of the same challenges that have been previously acknowledged. Poor documentation management was also added to the original listing since it was pointed out as problematic during the interviews. It's important to notice that the survey sample size in the Case Company wasn't as big as in the two previous researches which can to some extent distort the results. Therefore, it could be useful to conduct a more comprehensive study in the Case Company in order to review the differences more accurately.

Additionally, Lareau's 20 Keys-approach was used to assess Lean maturity in the Case Company's product management. According to the assessment, the product management function is doing a decent job in a traditionally-run organization. The total of 35/100 points demonstrates that the Case Company still has a long way to go in order to reach the world-class state with its product management teams. However, they have a good starting point taking into consideration that half of the keys were already scored above the lowest grade.

After gaining a profound understanding of product management's needs, several Lean practices were studied and evaluated. These Lean tools and methods were selected to be reviewed in this master's thesis based on the fact that they have been generally recognized to also improve office processes. The following table (Table 4) presents the answer to the first research question.

**Table 4** Answer to RQ 1: Which Lean tools and methods fit the best to the needs of product management?

| Lean tools and methods | Usability rate | Implementation |
|---|---|---|
| Value Stream Mapping | 3 | x |
| Kanban | 3 | x |
| KPIs | 3 | x |
| Standard work | 2 | x |
| A3-reports | 2 | x |
| Gemba | 2 | |
| Kaizen events | 2 | |
| Heijunka | 1 | |
| Visual Management | 1 | x |
| 5S | 1 | x |

Each Lean practice has been given a usability rate based on the number of product management challenges it can address. The most suitable Lean practises for product management function are Value stream mapping, Kanban and KPIs which were also decided to be implemented in this master's thesis. The research indicates that most of the reviewed PM challenges could be overcome with Lean practises, excluding the lack of support from the management and frequently changing visions and strategies. Nevertheless, these two issues are also very important to consider and solve in order to achieve both innovative and motivating working environment.

The information flow in the Case Company was decided to be improved through value stream mapping and 5S procedures. Value stream mapping was used for visualizing the information flow from the customer to the product manager because it was noted during the interviews that this information loop is quite informal and complex. The suggested future state value stream map emphasises the importance of knowledge sharing between the customer, sales and product management. The usage of a proposal A3 report was also suggested to the Case Company to facilitate the flow of information since it can compile a lot of information into a small space in a structured way. Due to poor documentation management, the Case Company's databases were inspected and a plan for 5S-cycle was introduced.

The seven KPIs that were chosen to be implemented in the Case Company represent four performance perspectives: financial, customer, internal process and learning and growth. Since the lack of collaboration with customers was acknowledged to be a challenge, it was decided to have one KPI especially dedicated to this particular topic. Visual management was decided to be applied in the form of a team dashboard which provides transparency and visibility within the organization. Besides the actual KPIs, A3 problem-solving report was also suggested to be included in the team dashboard for identifying and eliminating problems that are negatively affecting the team metrics.

In order to get rid of the task management problems, Kanban board was decided to be tested in the product management function. Due to limited amount of wall space, Kanban board had to be implemented in an electronic form. Standardizing the product management processes was also started in the Case Company by first

standardizing the templates that product managers use to perform certain tasks. These templates include Lean business model canvas and a competitor comparison template. The ideal situation is that every product manager would use the same templates so that the information quality would be consistent and that duplication of work could be avoided. The time perspective of standard work was not taken into consideration but it can later be added into the templates.

The second research question (RQ 2) was about how to measure the results of Lean implementation in the product management function. When it comes to the process of measuring the results of Lean transformation, the PDCA-cycle (Figure 31) plays an important role. Therefore, it would be important that the Case Company followed the PDCA-cycle carefully when implementing each Lean tool and method. During the third step *Check*, the Case Company should measure how effective the implemented solution has been and learn how to improve the solution further. The evaluation can be made by repeating Lareau's 20 Keys-assessment to check have the desired goals been reached. Moreover, product managers should be interviewed in order to compare the results to the initial survey. The suggested time frame between *Do* and *Check* steps can be found from the follow-up plan.

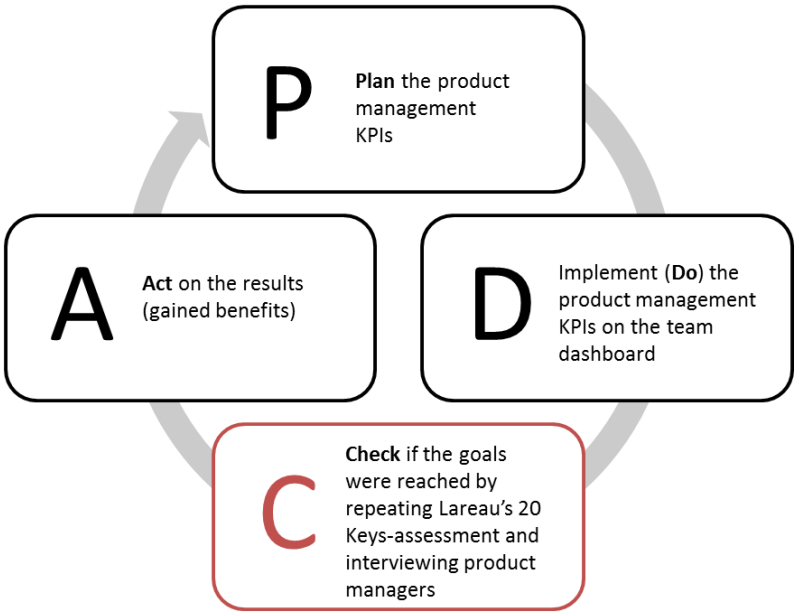



**Figure 31** Measuring the results of Lean implementation in the PDCA-cycle

People tend to be resistant to changes that affect their working routines and they might question the reasons why things should be done differently. Therefore, it's recommended that the Case Company would educate its product managers about the principles of Lean Thinking so that every member of the product management team would be committed to practise Lean in everyday work. It's essential that the product managers understand the benefits of implementing Lean tools and methods in order to feel motivated to use them. It can be generally stated that the biggest challenge of Lean implementation is to make the company culture change. For that reason, managers should try to integrate Lean thinking to be part of the company's everyday culture so that it wouldn't be considered as an extra activity which takes time from the actual work.

Since Lean is a continuous and never-ending process, companies should never claim that they have completed Lean. Even if the Case Company eventually reaches Lareau's world-class state, it should never stop moving forward. Therefore, it's recommended the Case Company would focus on building a culture of continuous improvement. By routinely arranging Kaizen events and going "waste hunting", the Case Company can reach a more efficient learning organization.

# 8 CONCLUSIONS

For several years companies have been implementing Lean practises to a large number of manufacturing applications, yet they have somewhat failed to utilize Lean principles in the office environment. Little research exists on the utilization of Lean Thinking in the product management function. The goal of this master's thesis was to explore how companies could successfully bring Lean tools and methods from their production shop-floor into their product management function.

An understanding of the most common product management challenges was formed by reviewing two recent researches on the topic. Based on the previous findings, the Case Company's product managers were interviewed. The study revealed that the Case Company's product managers were struggling with more than half of the same issues that have been identified in the previous researches. The issues that arose were: poor role & responsibility definition, no definite methodology, lack of collaboration with customers, problems in information flow, no methods to evaluate work and problems in managing tasks & processes. In addition, the interviews also revealed lack of documentation management.

Ten Lean tools and methods, that have been generally recognized to also improve office processes, were studied and evaluated. It was discovered that most of the acknowledged product management challenges could be overcome with the chosen Lean practises. Based on the usability rate, the most suitable Lean practises for product management function are: Value stream mapping, Kanban and KPIs. In addition to these three, A3-reports, 5S, Standard work and Visual management were presented for implementation to the Case Company in this master's thesis.

It's recommended that the Case Company would follow the PDCA-cycle throughout its Lean transformation. During the *Check* phase, the Case Company should measure how effective the implemented solution has been and learn how to improve the solution further. The evaluation can be made by repeating Lareau's 20 Keys-assessment and interviewing the product managers in order to discover have the desired goals been reached and survey results improved.

Even though Lean has traditionally been associated with manufacturing shop-floor, no evidence indicates that it could not be applied also to administrative processes including product management function. In fact, Lean principles seem to be so universal that they could be utilized in any business process across all industries. However, there are some differences when applying Lean in the office environment compared to manufacturing shop-floor. Information usually plays a bigger role in administrative processes and therefore, the flow of information is commonly the subject for transformation. Whereas, the flow of material is inspected in production processes. Furthermore, identifying and mapping value streams of administrative processes can also be considered more challenging.

Perhaps the biggest struggle is to convince the white-collar workers to utilize the same practices that have initially been designed for manufacturing applications. For that reason, it’s important that the management would encourage and support the office employees in the Lean transformation process as much as possible so they would learn how to adapt the unfamiliar terms and concepts to their own daily work. Lean should be fully adapted to every department in order to accelerate efficiency in the entire company.

# 9 REFERENCES

Alukal, G., Manos, A. (2006) “Lean Kaizen: A Simplified Approach to Process Improvements”. ASQ Quality Press, p. 28

Ash Maurya. Why Lean Canvas vs Business Model Canvas? 2012 [www-pages]. Updated 2015 [Accessed 20 October 2015]. From: <http://leanstack.com/why-lean-canvas/>

Confianzys. The State Of Product Management In India, 2012 [www-pages]. Updated 2012 [Accessed 12 May 2015]. From: <http://www.confianzys.com/blog/the-state-of-product-management-in-india-2012/>

Dennis, P. (2007) “Lean Production Simplified”. Productivity Press; 2nd edition, p.32-133

Dudbridge, M. (2011) “Handbook of Lean Manufacturing in the Food Industry”. Wiley-Blackwell; 1 edition, p. 68-69

Fabrizio, T., Tapping, D. (2006) “5S for the Office: Organizing the Workplace to Eliminate Waste”. Productivity Press, p.5-8

Geracie, G. (2010) “Take Charge Product Management: Take Charge of Your Product Management Development; Tips, Tactics, and Tools to Increase Your Effectiveness as a Product Manager”. Actuation Press, p.20-30

Imai, M. (2012) “Gemba Kaizen: A Commonsense Approach to a Continuous Improvement Strategy”. McGraw-Hill Education; 2 edition, p. 14 & 205

Kaplan, R., Norton, D. (1992) ”The Balanced Scorecard Measures that Drive Performance”, Harvard Business Review, p.72

Katko, N. (2013) “The Lean CFO: Architect of the Lean Management System”. Productivity Press, p. 37-50

Keyte, B., Locher, D. (2004) “The Complete Lean Enterprise: Value Stream Mapping for Administrative and Office Processes”. Productivity Press; 1 edition, pp.5-6.

Kittlaus, H., Clough, P. (2009) ”Software Product Management and Pricing”. Springer-Verlag Berlin Heidelberg, p.1

Kremer, R. (2005) “The Lean Office Pocket Handbook”. RK Publishing Co, p. 19-21

Lareau, W. (2002) “Office Kaizen: Transforming Office Operations into a Strategic Competitive Advantage2. ASQ Quality Press, p.102-112

Lean Production. Top 25 Lean Tools, 2010-2013 [www-pages]. Updated 2010-2013 [Accessed 1 May 2015]. From: <http://www.leanproduction.com/top-25-lean-tools.html>

Lean University. The Five Principles of Lean Thinking, 2015 [www-pages]. Updated 2015 [Accessed 15 May 2015]. From: <www.cardiff.ac.uk/lean/principles/index.html>

Liker, J. (2004) “The Toyota Way”. McGraw-Hill Education, p.15-158

Locher, D. (2008) “Value Stream Mapping for Lean Development: A How-To Guide for Streamlining Time to Market”. Productivity Press; 1 edition, p.2

Locher, D. (2011) ”Lean Office and Service Simplified: The Definitive How-To Guide”. Taylor & Francis Group, p.1-138

Luyster, T., Tapping, D. (2006) ”Creating Your Lean Future State: How to Move from Seeing to Doing”. Productivity Press; PAP/CDR edition, p.105

Maglyas, A., Nikula,U., Smolander, K. (2012) “Lean Solutions to Software Product Management Problems”, IEEE Software, Vol.29 No.5, p. 40-46

Majowska, A. (2014) “What is Kanban?” Shore Labs, p.3-5

Martin, K., Osterling, M. (2007) ”The Kaizen Event Planner: Achieving Rapid Improvement in Office, Service, and Technical Environments”. Productivity Press, p. 21-23

Maskell, B., Baggaley, B,. Grasso, L. (2011) “Practical Lean Accounting: A Proven System for Measuring and Managing the Lean Enterprise”. Productivity Press; 2 edition, p. 163-164

Maurya, A. (2012) “Running Lean”. O’Reilly Media; 2 edition, p. 5

Ohno, T. (1988) “Toyota Production System: Beyond Large Scale Production”. Productivity Press, p.6

On Product Management. The 3 biggest problems in Product Management today, Part 1 Roles, 2014 [www-pages]. Updated 2014 [Accessed 27 May 2015]. From: <http://onproductmanagement.net/2014/05/19/the-3-biggest-problems-in-product-management-today-part-1-roles/>

Poppendieck, M., Poppendieck, T. (2006) “Implementing Lean Software Development: From Concept to Cash”. Addison-Wesley Professional; 1 edition, p. 83-92

Pragmatic Marketing. The Strategic Role of Product Management, 2008 [PDF-file]. Updated 2008 [Accessed 26 May 2015] From: <http://mediafiles.pragmaticmarketing.com/strategic-role-of-product-management/strategic_role_product_management.pdf>

Ron Pereira. The LSS Academy Guide to Lean Manufacturing, 2008 [PDF-file]. Updated 2008 [Accessed 16 July 2015] From: <http://blog.gembaacademy.com/lssa_guide.pdf>

Sayer, N., Williams, B. (2012) “Lean for Dummies”. For Dummies; 1 edition, p. 237-238

Shimbun, N. (1995) “Visual Control Systems”. Productivity Press, p. 11

Sobek, D., Smalley, A. (2008) “Understanding A3 Thinking: A Critical Component of Toyota's PDCA Management System”. Productivity Press; 1 edition, p. 11-88

Spice Catalyst. What do You Think: Product Management and Product Marketing Challenges, 2015 [www-pages]. Updated 2015 [Accessed 28 May 2015]. From:<http://spicecatalyst.com/what-do-you-think-product-management-and-product-marketing-challenges-2/>

Stellman, A., Greene, J. (2014) “Learning Agile: Understanding Scrum, XP, Lean, and Kanban”. O'Reilly Media; 1 edition p. 327-328

Tapping, D. (2005) “The Lean Office Pocket Guide XL”. MCS Media Inc, p. 32-35

Vatalaro, J., Taylor, R (2005) “Implementing a Mixed Model Kanban System: The Lean Replenishment Technique for Pull Production”. Productivity Press. p.12

VersionOne. Help Center, 2014 [www-pages]. Updated 2014 [Accessed 20 October 2015]. From:<https://community.versionone.com/Help-Center>

Voehl, F., Harrington, H., Mignosa, C., Charron, R (2013)” The Lean Six Sigma Black Belt Handbook: Tools and Methods for Process”. Productivity Press, p. 130-131

Wilson, L. (2009) “How to Implement Lean Manufacturing”. McGraw-Hill Professional; 1 edition, p. 9-10

Zahid, I. (2013) “The Art and Science of Managing Network and Communications Industry Products”. Xlibris Corporation, p. 18-186

**APPENDIX 1: Lareau's 20-Keys approach assessment (Lareau, 2002, pp. 157-163)**

| Level | Key #1—Leadership |
|---|---|
| 1 | The work group has no defined leadership structure and there is no clear leader. No work area vision or goals exist. |
| 2 | The work group recognizes the group leader, and a work group vision is defined. There is little worker participation in decision making. |
| 3 | A plan to achieve objectives is developed. Associates have input to decisions, but the leader gives final approval. |
| 4 | Everyone in the work group understands the plan to achieve objectives. Decisions are made by group consensus facilitated by the leader whose main role is that of a coach. |
| 5 | Everyone understands the vision, the plan, and road map to get there. Associates are empowered to make decisions to achieve objectives. The leader/coach provides guidance when needed and his/her input is always appropriate and welcomed. |

| Level | Key #2—Documentation Management |
|---|---|
| 1 | There is no central location for work group documentation. Documentation is missing, redundant, and/or out-of-date. Associates maintain personal storage areas. There is no consistent process for document handling. |
| 2 | Elimination of outdated, redundant, and unnecessary documentation has begun. A storage area for shared documents has been established but is not always used. |
| 3 | No personal storage areas for work group documentation remain. Occasionally, documents are still misplaced, duplicated, and/or lost. |
| 4 | All associates in the work group use the central area for work group documents and very seldom is a document misplaced, and/or found to be out-of-date, or in two places at once. |
| 5 | Documents are always where they are supposed to be, and they are up-to-date and accurate. All documents are quickly available to any work group member on demand. |

| Level | Key #3—Deadlines and Commitments |
|---|---|
| 1 | Deadlines are not defined, documented, communicated, or measured. Commitments are regularly missed without accountability. |
| 2 | The work group begins to document and measure deadlines and commitments. Awareness of the need to meet commitments is built. Commitments and deadlines are still regularly missed. |
| 3 | The work group implements a structured system to manage deadlines. Commitments and deadlines are usually met, but sometimes deadlines and commitments, some major, are still missed. |
| 4 | The work group is skilled in using a structured system to manage deadlines. Ownership of every aspect of managing commitments is defined and internal/external customer satisfaction is met through consistent on-time delivery. |
| 5 | Firm schedules are always set and are never missed. Internal and external customers have full confidence that delivery will be on time, every time. |

| Level | Key #4—Competence |
|---|---|
| 1 | There may be general descriptions of functional and technical (F/T) competence requirements in the area, but they are not communicated. There is no process in place for competence improvement. |
| 2 | The work group defines F/T requirements for itself. Associates begin to improve current skill sets through training and education. |
| 3 | The work group begins measuring competence against best practices in their industry/field. All work group members attend at least three relevant inside/outside technical workshops each year. |
| 4 | Work group F/T competence is on par with the best in the industry/field. The area associates have the ability to teach F/T skills to other associates. |
| 5 | Some members of the work group conduct workshops in their industry/field and at least one is published as an F/T innovator in the industry/field. |

| Level | Key #5—Time Management |
|---|---|
| 1 | Time management is not viewed as an important tool in the work group. Overtime and/or long days are normal. |
| 2 | The work group realizes that time management is important. An efficient, consistent, and standard time management (ECSTM) system is beginning to be used in the work group. |
| 3 | All work group members use an ECSTM system with few problems. Work group members can access each other's schedules and plans. Overtime and long days occur no more than once a week. |
| 4 | All work group members use an ECSTM system expertly. Long days are rare and time is rarely wasted due to poor time management. |
| 5 | It is easy for all personnel at the site to quickly access appropriate portions of the work group members' schedules and plans. All work group members feel as if their time is always effectively used. |

| Level | Key #6—Workplace Arrangement |
|---|---|
| 1 | Workplace layout just "happens," with no planning or thought as to work flow, storage, traffic patterns, and person-to-person communication. |
| 2 | The work group begins to explore possible areas of improvement in the physical layout of their area. Work group members construct a diagram of the current layout and begin to think about alternatives. |
| 3 | The work area arrangement has been modified to improve work flow and communications. There are still some issues that have not been resolved but they are being explored. |
| 4 | Work group equipment is placed to support key processes and work flow. Workspace is flexible and highly mobile. The work group can reconfigure their area when necessary. |
| 5 | All floor space is fully utilized to maximum effectiveness. The work group members believe that they have a near-perfect arrangement to be productive without wasted space. |

| Level | Key #7—Skill Flexibility |
|---|---|
| 1 | Cross-training is not tracked, and/or it is done informally, and/or it is done only when a problem arises. |
| 2 | The work group begins to define tasks and begins to display skill flexibility charts in the work area. |
| 3 | Skill flexibility for all appropriate tasks in the work group is tracked and displayed visually. Goals for work group flexibility are established. At least 50% of the work group members are skilled in three critical tasks. |
| 4 | The work group has training plans for each member's skill development. Every task can be done by at least two work group members. At least 75% of the work group members can do all tasks in the work group. The work group is beginning to learn tasks of up/downstream work groups. |
| 5 | Except for recent hires, all work group members can do 90% of the work group's tasks. Members visually track tasks of immediately adjacent up/downstream groups and can do 50% of the tasks. |

| Level | Key # 8—Roles and Responsibilities |
|---|---|
| 1 | Roles and responsibilities (R&R) are left to evolve on their own or are assumed on the basis of past work practices. |
| 2 | A member of management, without any discussion, specifies R&R for each work group member. |
| 3 | The supervisor or leader of the work group meets individually with each group member to jointly develop the member's specific R&R. |
| 4 | Through group brainstorming and discussion by the entire group, each person's specific R&R are negotiated and defined in detail. |
| 5 | Level 4 above *and* all R&R are continually monitored and modified as required through discussion among the work group members. |

| Level | Key #9—Ownership and Objectives |
|---|---|
| 1 | There is no clear ownership of objectives in the work group, and/or objectives continually change and evolve on their own. |
| 2 | The work group identifies and displays short-term (daily and weekly) goals with milestones, completion dates, and accountabilities (MCDA). Medium-term goals (monthly and quarterly) are being added to the visual display. |
| 3 | Short- and medium-term goals are displayed and tracked with MCDA. The group quickly deals with occasional missed goals. Plan changes create some problems. |
| 4 | Short-, medium-, and long-term (annual to several years) goals are tracked and displayed with MCDA. The work group is totally accountable for objective attainment and adjusting to changes. Almost no problems exist. |
| 5 | The work group has full ownership for all objectives, handles changes easily, and adjusts proactively to potential problems. Objectives are always met. |

| Level | Key #10—Cleaning and Organizing |
|---|---|
| 1 | Open space and storage is cluttered with excess and unused equipment, supplies, and papers. There is visible grime, obvious trash (old newspapers, copy machine rejects, etc.), and dust in the work area. |
| 2 | A formalized plan to improve C&O is being developed. Obvious trash is removed by the end of each day by work group members. Unused equipment and out-of-date materials, supplies, and files (MSF) have been removed. |
| 3 | C&O performance is assessed at least twice per week with checklists and visually displayed and reviewed results. MSF are labeled in both the work area and storage areas. |
| 4 | Work group members conduct C&O activities during the day. Audits show near-perfect C&O performance. Only rarely is an item out of place. Members begin to plan for optimum placement of MSF. |
| 5 | 99.99% C&O performance exists. Work area MSF are stored, labeled, and arranged for optimum ease of use. |

| Level | Key #11—Daily Work Group Meetings |
|---|---|
| 1 | No daily work group meetings (DWGM) are held or they are only held when there is special news (for example, merger, reorganization, and so on). |
| 2 | DWGM have begun but are not attended by all work group members. Some meetings are missed and some meetings seem pointless. |
| 3 | DWGM are held almost every day and are attended by most work group members. Efforts are underway to make the DWGM relevant to all group members. |
| 4 | DWGM are held every day, without exception. Attendance is 100% and most work group members participate actively. |
| 5 | Every work group member views the DWGM as an essential and critical element of the job. |

| Level | Key #12—Problem Solving |
|---|---|
| 1 | The work group has few or no "team tools" that everyone understands for manipulating data and/or identifying/solving problems. |
| 2 | A majority of the work group members understand a few tools but they are applied inconsistently. A plan is developed to identify necessary tools and teach them to the work group. |
| 3 | All work group members understand a small set of basic problem-solving tools. The proper tools are used for significant problems, but there is still much "subjective" analysis of minor problems. |
| 4 | All work group members understand and apply appropriate tools for all problem solving. Tool usage skills are tracked on cross-training displays. |
| 5 | The work group members (except new hires) are expert in all of the basic tools that might be used in the work group. Additional skill development plans are always in process. |

| Level | Key #13—Internal Customer Service |
|---|---|
| 1 | The quality of service to other areas is poor and there are no measurement system and improvement plans in place. |
| 2 | Work group asks other areas to measure their performance. Issues are identified and displayed for improvement planning. Many problems still exist. |
| 3 | Metrics are in place and displayed to formally monitor customer satisfaction. Continuous improvement plans are defined to address root causes of the most serious problems. Small problems occur regularly but are dealt with quickly. |
| 4 | All major and many minor root causes of customer dissatisfaction have been eliminated. Almost all potential problems have been proactively eliminated. |
| 5 | Customers' satisfaction is near perfect. Satisfaction metrics are consistently at the very top. |

| Level | Key #14—Priority Management |
|---|---|
| 1 | The work group functions via crisis management. Environment is purely reactionary as members are only fighting fires. |
| 2 | Work group priorities are imposed on the group. There is some discussion within the group as to how they must meet the priorities, but most decisions are made by some level of management. |
| 3 | There is a good level of work group discussion involved in deciding how to meet imposed priorities. The work group begins to set many of its own priorities and develops and displays plans to manage them. |
| 4 | The work group begins to take ownership of all of its priorities and develops and displays plans for them. Management reviews and approves the work group's plans but seldom makes any changes. |
| 5 | The work group develops all of its own priorities after being given broader organization priorities. The work group priorities are 100% in line with organization priorities and need no management approval. |

| Level | Key #15—Work Standards |
|---|---|
| 1 | There are few standardized work procedures (step-by-step instructions, flowcharts, lists of needed data/forms, approximate time required) that are known by and/or accepted by the work group. |
| 2 | All work group members are familiar with what a good work standard would look like. A few activities have work standards that all group members have reviewed. |
| 3 | 80% of the work group's primary tasks have work standards and they are used in cross-training activities. |
| 4 | All critical activities and most minor activities (95% of the group's tasks) have standards that the entire work group helped develop, understands, and uses. |
| 5 | Standards for all work group activities have been established and the work group continually strives to improve them. |

| Level | Key #16—Primary Visual Display |
|---|---|
| 1 | There is no primary visual display (PVD), which is a large display in the work area showing the work group's status, metrics, tasks, priorities, and so on, and/or the PVD is not updated regularly. |
| 2 | The work group has a PVD and it displays information that is important to the group. The information that is displayed is kept up-to-date most (80%) of the time. |
| 3 | The work group PVD is comprehensive and has been extensively improved by work group members. The information is almost always up-to-date (95% of the time). |
| 4 | The PVD contains almost every critical element that the work group must track. Work group members have most of the responsibility for keeping the PVD up-to-date. It is current better than 99% of the time. |
| 5 | The PVD display and the performances it tracks are viewed by the work group as the heart and soul of their pride and commitment. |

| Level | Key #17—Time Control & Commitment |
|---|---|
| 1 | Work group members don't always arrive promptly and there is considerable (5% to 10%) absenteeism on occasion. Turnover in the work group is high. |
| 2 | Attendance is charted and displayed. |
| 3 | Work group members generally arrive on time. People will work late when it is required unless personal commitments are pressing. Absenteeism is less than 3%. |
| 4 | Work group members always arrive on time. Absenteeism is less than 2%. Annual turnover (not counting promotions) is less than 5%. |
| 5 | Workers are prompt, enthusiastic, and willing to work late on those rare occasions when it is required. Absenteeism is less than 1% and turnover less than 3%. |

| Level | Key #18—Metrics & Measurement |
|---|---|
| 1 | There is little or no measurement of critical processes within the work group. |
| 2 | Initial efforts are underway to identify key performance indicators (KPI) for critical processes in the work group. |
| 3 | The work group tracks and displays KPI for all critical processes and has developed and displayed plans for improvements. |
| 4 | The work group tracks and displays the KPI of all major and most minor processes as well as progress against plans for improvements. |
| 5 | The KPI of all appropriate processes are monitored on a continuous basis and corrective action is seamlessly integrated into the work group's daily activities. |

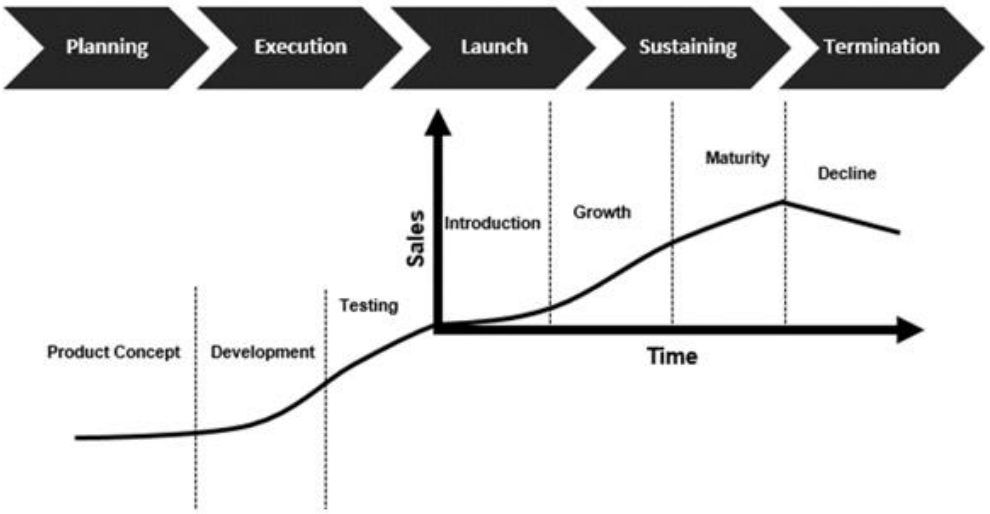
| Level | Key #19—Budgets and Costs |
|---|---|
| 1 | Budgets and cost tracking (B&CT) for the work group do not exist and/or are unknown to work group members. |
| 2 | Work group costs are displayed to the work group. Periodically (at least quarterly), work group performance against budget is reported and posted. |
| 3 | The work group budget is established at year start and posted. Performance against budget is posted monthly and the work group contributes to discussions as to how to resolve major discrepancies. |
| 4 | The work group participates in development of its annual budget. Performance is tracked and displayed and the work group is primarily responsible for budget performance with management approval/review. |
| 5 | All aspects of cost and budget development and performance are the responsibility of the work group with only minimal management coaching. |

| Level | Key #20—External Customer Service |
|---|---|
| 1 | The work group has little or no knowledge of who the external customers (EC) are and/or how the work group's efforts impact EC. |
| 2 | EC data relevant to the work group's performance are posted in the work group and reviewed and discussed. Work group begins to make plans to address the most critical issues. |
| 3 | The work group has a posted plan with milestones, completion dates, and accountabilities (MCDA) for dealing with all major EC issues. Many major issues have been resolved. |
| 4 | All major EC issues have been resolved and the work group is addressing the minor issues with posted plans that have MCDA. |
| 5 | The work group has corrected all EC issues and can resolve any new issue under its control within 24 hours. EC view the work group as a world-class unit. |

## APPENDIX 2: Product management interview questions.

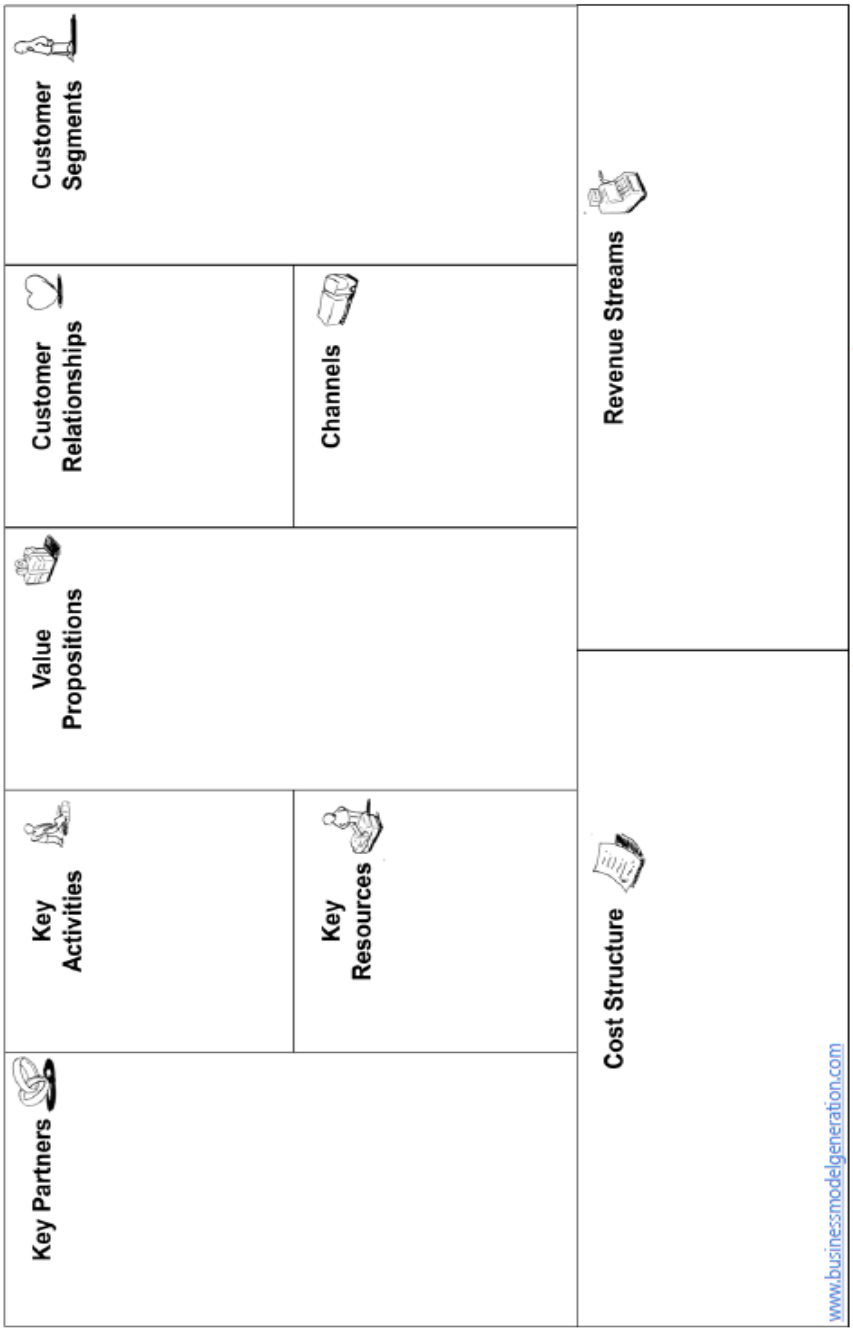
| Product Management Challenges | | | | |
|---|---|---|---|---|
| Years as Product Manager: | 1) Strongly Disagree | 2) Disagree | 3) Agree | 4) Strongly Agree |
| 1. Product manager's role and responsibilities are poorly defined | | | | |
| 2. I can't evaluate / measure my work performance | | | | |
| 3. I don't collaborate enough with the customers to really know their needs | | | | |
| 4. PM methods and processes are not clearly defined | | | | |
| 5. Information flow is one of the problem areas in PM | | | | |
| 6. I have difficulties to describe the product's PLC from the concept till the launching phase | | | | |
| 7. I think that the product managers have poor internal interactions with the other functional teams | | | | |
| 8. I have difficulties to manage the tasks and processes in terms of time | | | | |
| 9. I don't have enough tools in order to do my job | | | | |
| 10. I think that the PM's visions and strategies change too often | | | | |
| 11. I don't get enough support from the management | | | | |

In which PLC phase is my current product?

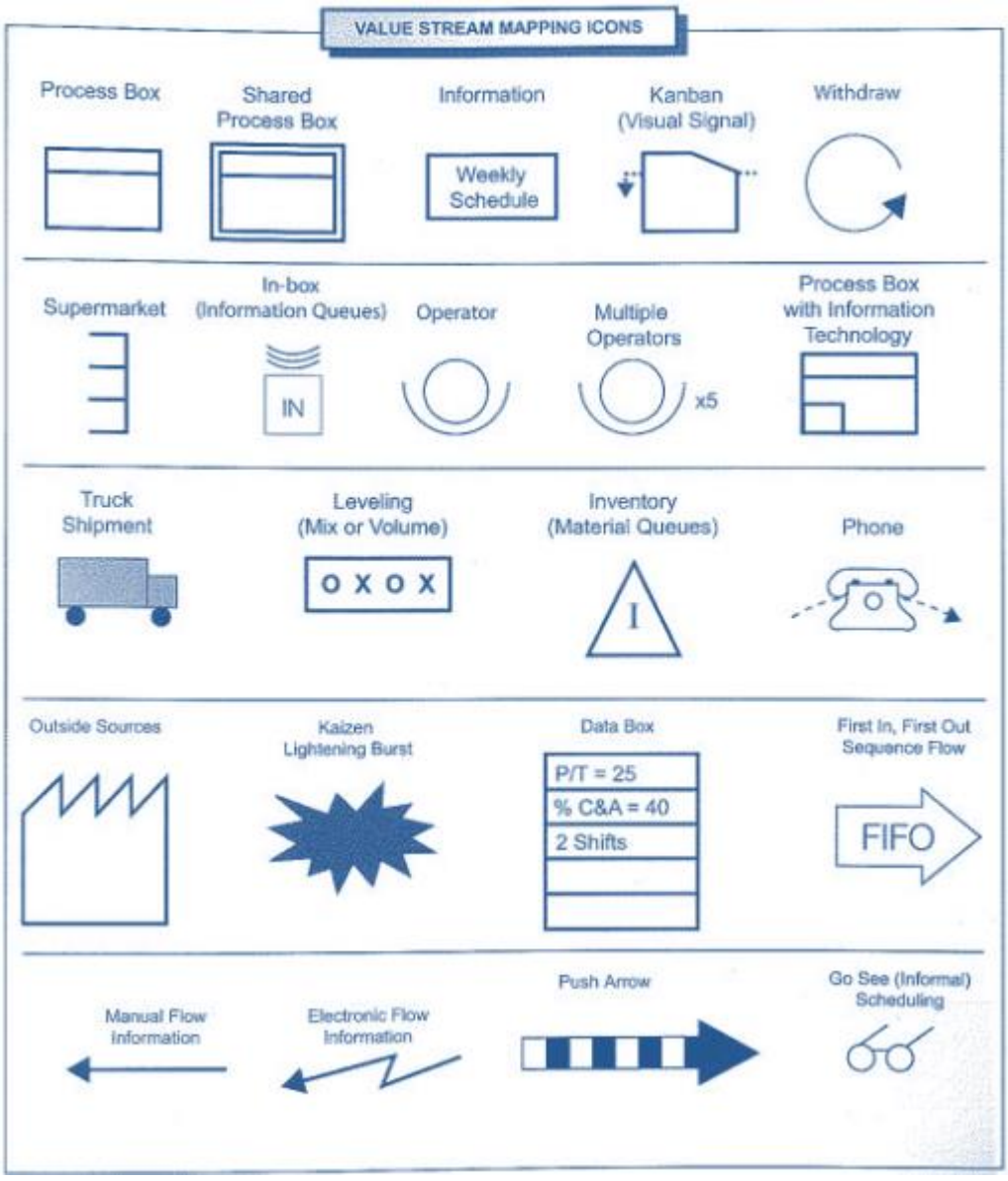


**APPENDIX 3: Problem Solving A3-report (Katherine Radeka, Lean Product Development, 2012)**

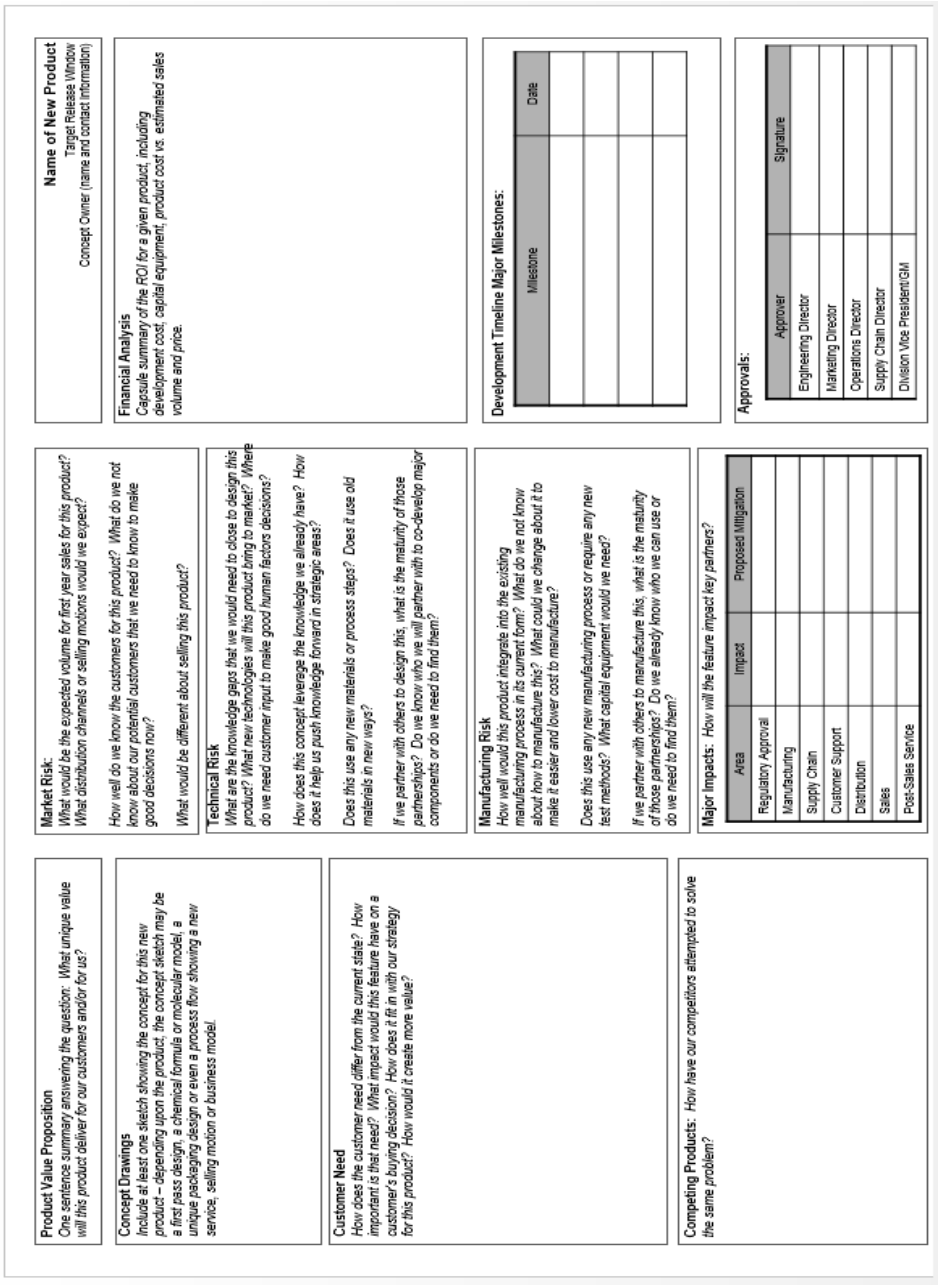
**APPENDIX 4: Business Model Canvas (www.businessmodelgeneration.com)**



**APPENDIX 5: VSM icons. (Keyte & Locher, 2004)**



**APPENDIX 6: Product/feature proposal A3-report (Katherine Radeka, Lean Product Development, 2012)**



**Name of New Product**
Target Release Window
Concept Owner (name and contact information)

**Financial Analysis**
*Capsule summary of the ROI for a given product, including development cost, capital equipment, product cost vs. estimated sales volume and price.*

**Development Timeline Major Milestones:**

| Milestone | Date |
|---|---|
| | |
| | |
| | |
| | |

**Approvals:**

| Approver | Signature |
|---|---|
| Engineering Director | |
| Marketing Director | |
| Operations Director | |
| Supply Chain Director | |
| Division Vice President/GM | |

**Market Risk:**
*What would be the expected volume for first year sales for this product?*
*What distribution channels or selling motions would we expect?*

*How well do we know the customers for this product? What do we not know about our potential customers that we need to know to make good decisions now?*

*What would be different about selling this product?*

**Technical Risk**
*What are the knowledge gaps that we would need to close to design this product? What new technologies will this product bring to market? Where do we need customer input to make good human factors decisions?*

*How does this concept leverage the knowledge we already have? How does it help us push knowledge forward in strategic areas?*

*Does this use any new materials or process steps? Does it use old materials in new ways?*

*If we partner with others to design this, what is the maturity of those partnerships? Do we know who we will partner with to co-develop major components or do we need to find them?*

**Manufacturing Risk**
*How well would this product integrate into the existing manufacturing process in its current form? What do we not know about how to manufacture this? What could we change about it to make it easier and lower cost to manufacture?*

*Does this use any new manufacturing process or require any new test methods? What capital equipment would we need?*

*If we partner with others to manufacture this, what is the maturity of those partnerships? Do we already know who we can use or do we need to find them?*

**Major Impacts:** *How will the feature impact key partners?*

| Area | Impact | Proposed Mitigation |
|---|---|---|
| Regulatory Approval | | |
| Manufacturing | | |
| Supply Chain | | |
| Customer Support | | |
| Distribution | | |
| Sales | | |
| Post-Sales Service | | |

**Product Value Proposition**
*One sentence summary answering the question: What unique value will this product deliver for our customers and/or for us?*

**Concept Drawings**
*Include at least one sketch showing the concept for this new product – depending upon the product, the concept sketch may be a first pass design, a chemical formula or molecular model, a unique packaging design or even a process flow showing a new service, selling motion or business model.*

**Customer Need**
*How does the customer need differ from the current state? How important is that need? What impact would this feature have on a customer's buying decision? How does it fit in with our strategy for this product? How would it create more value?*

**Competing Products:** *How have our competitors attempted to solve the same problem?*