SAVONIA

THESIS - **BACHELOR'S DEGREE PROGRAMME**
TECHNOLOGY, COMMUNICATION AND TRANSPORT

APPROACH TO PRODUCTIZATION PROCESSES

A case by Junttan Oy

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SAVONIA UNIVERSITY OF APPLIED SCIENCES

THESIS
Abstract

Field of Study Technology, Communication and TransportTechnology, Communication and Transport			
Degree Programme Degree Programme in Mechanical EngineeringDegree Programme in Mechanical Engineering			
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Title of Thesis Approaches to PRODUCTIZATION PROCESSES: A CASE by Junttan Oy			
Date	2 March 2020	Pages/Appendices	26
Supervisor(s) Mr A Suhonen, Senior Lecturer and Mr A Brotherus, Head of professional services at Junttan Oy			
Client Organisation /Partners Junttan Oy			

Abstract

The main purpose of this thesis was to develop a rapid production process for minimum viable products for the client organization and map out the customer needs for a specific product. This study will help the organization's product development department to comprehend the Rapid product development and its productization from a prototype into a full, ready-for-the-market product with all the features needed from the targeted audience.

This thesis started with a theoretical background to explain the role of product management and its responsibilities, then went further to explain what whole product is and how to make a product from the customers' point of view. The thesis theory background is based on the Stage Gate® Process and PDCA Process which was adapted later-on in the practical part to fit best the wormhole project. In the practical part, the study adapted both PDCA and Stage gate process to productize the new wormhole product.

As a result, this study revealed the challenges of product management in Junttan organization and proposed new solutions to tackle them by introducing a stage gate productization process which revolves around PDCA process.

Keywords
Piles analysis, Productization processes, Wormhole, PDCA, The Stage Gate® process, MVP

ACKNOWLEDGEMENTS

This thesis was a great opportunity to understand productization processes for MVP. I would like to thank my supervisor at work, mr. Anders Brotherus, who has dedicated a special weekly time slot for thesis reviewing. Besides this, a weekly meeting was held to discuss the progress of the worm-hole project, which greatly helped for material input.

I would like to take this opportunity also to thank my thesis supervisor, Mr. Anssi Suhonen, for his guidance and theory material referencing.

This thesis would not have been finished without the constant support of my wife, I want to say thank you and that I love you.

ABBREVIATIONS:

WI-FI	Wireless Fidelity
PDA	Pile Driving Analyzer
PDCA	Plan Do Check Act
MVP	Minimum Viable Product

LIST OF FIGURES AND TABLES

CONTENTS

1 INTRODUCTION

> Product management while relatively new is an important company driver. It has the most impact on whether a product, service or the entire company fail or succeed, both in the long and short term. What makes this role unique is that it revolves around all the business aspects including strategy, trends, business model, customers, and more. (Lawley & Schure 2017, 11.)

Product management strives to condense the overall of the teachings, tools and methodologies into a simple language for the company management, stakeholders and engineers to understand. (Pranam, 2017,14).

A product manager role is one of the most fascinating, rewarding, challenging and important jobs in the business industry. While becoming a product leader for everyone under the product team throughout a company without having direct authority on them, learning how to influence and lead is a necessity for a product manager. Creating a product that would delight customers with talented engineering teams, make a big difference in customers ways of doing things, and help achieve profits that make the company reach its objectives. Taking responsibility on the overall success or failure of the product, Product management is a great training ground to become a product director, General manager or CEO. (Lawley & Schure 2017, 16.)

Products are 50% faster when empowered by product managers, it meets the customer needs better, increases revenue and profitability, captivate customers who generate positive feedback and owning the market with long term solid market strategy, which is why the corporate world has recently understood the importance of product management (Lawley & Schure 2017, 16-17.).

1.1 About product management

Product management can be thought of as bringing a product to the market as successful as possible short term tactically and long term strategically. One way to think about product management is that it is at the Centre of all company departments as introduced in Figure 1. While each department understands its role on how to make the company successful Product management is the only department that has a clue on how all the pieces fit together (Lawley & Schure 2017, 17-18.).

Figure 1 The buck stops here (Lawley & Schure, 2017)

Customer success can only be covered from all aspects of by-product management, by making sure that short and long term goals are met for a solid well-planned product. (Lawley & Schure 2017, 16.).

1.1.1 Whole product

A physical product or service is never enough on its own. Customers almost always have a mental list of pros and cons when thinking about a product or service which has nothing to do about the product and its benefits. For example, these questions revolve around meeting the company standards, mutual trust, quick customer support and convenience. These additional aspects are called augmented product. Figure 2 Explains how an augmented product and product relate to each other. (Lawley & Schure 2017, 16,17).

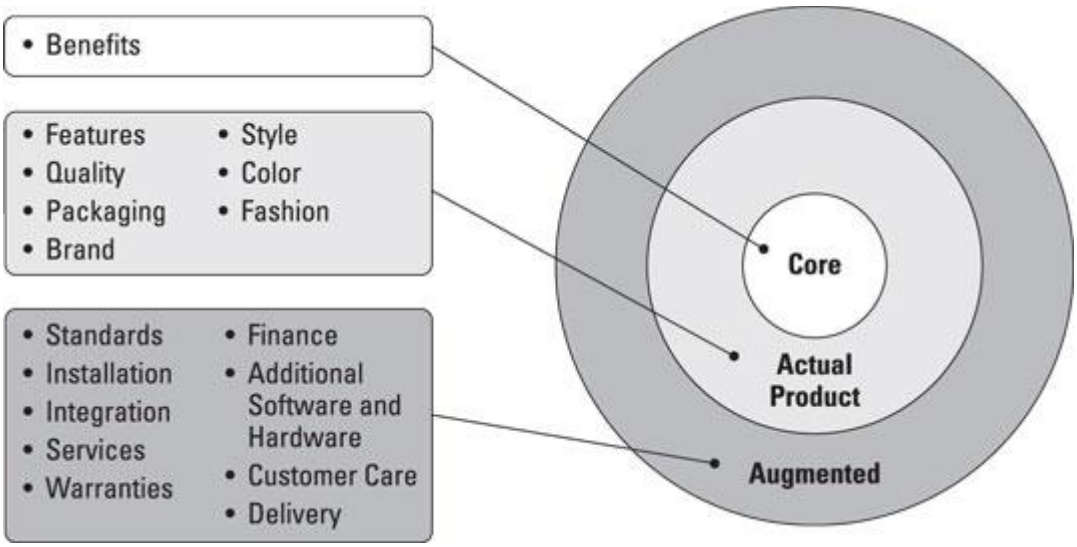

Figure 2 Whole product (Lawley & Schure, 2017)

If a customer experience issues with the augmented side of a product, then he experienced a broken product promise. A great car, for example, cannot be sold somewhere where there are not service or repair parts for it and a product manager can hold the availability of the car in that area until there is a service available for it. Therefore, awareness of product promises and keeping the product needs to be delivered as expected. A product manager's main responsibility is to try to do whatever he can to influence different parts of a company to solve any issue between customer experience and promise (Lawley & Schure 2017, 18.).

1.2 About Junttan

Junttan Oy is a Finnish company where its headquarters is in Kuopio, with subsidiaries in the United States of America, Holland, and Australia. Junttan designs, manufactures and markets earth deep foundation equipment. Junttan Oy has a product range of impact hydraulic hammers, impact hydraulic hammers mounted on hydraulic crawler cranes, hydraulic soil mixers, and multipurpose crawler cranes used for, pile drilling, pile driving and soil mixing. With over 40 years of experience, Junttan started at the 1970s where it was first founded in 1976 and the first piling rig was built in 1979, then a series of new hydraulic hammers and crawler cranes which are called "rigs" came into existence in the following years. The Brotherus family acquired the majority of shares of junttan Oy in 2010 then the company became fully owned by them afterwards.

Junttan has a wide range of professional services to offer all over the world adding to the equipment sales throughout what's called Junttan Life. The junttan life supports original Junttan parts, technical support, equipment audit, Junttan equipment training services, equipment modernization, digital services, preventive maintenance solution, spare part and workshop containers, J-pad pile cushion, and deep foundation analysis.

1.3 Productization challenges at Junttan

As most companies suffer, Junttan's biggest challenge when it comes to product development is late internal communication, lack of clear product development path, and over-engineering as a result of lack communication. This results from either too complicated product for the customer and too expensive as it has other functionalities than the addressed solution for the problem.

1.4 Purpose, scope and presumptions

Product development management is a very wide topic; therefore, it cannot be all covered in this thesis. This project revolves around the productization part of product management.

In this thesis, the focus is on a project called Junttan Wormhole, which takes part in the Deep foundation analysis services. The supervisor at work reached out to the author as an available resource and candidate to productize an existing prototype of the service product.

1.5 Applied methodology

Several books have been read under the title of Product development for dummies by Robin Karol and Inspired by Marty Cagan. The books were chosen due to the fact of their easiness to read and containing valuable information about product definition and productization processes. It was clear that the selected book will help tremendously in defining what path this thesis will take and laid a clear road on how to pursue it.

Product management for dummies provides a practical guideline on how a product should be made in common sense way of explaining. It is a well-written comprehensive book with examples from industry leading companies. The book starts by going through a product manager job description then provides the product life cycle methodology.

Inspired by Marty Cagan book was not used for referencing unlike Product management for dummies but was used to understand more the role of a product manager and how opportunities are evaluated to solve problems, how prototypes are made once and opportunity is identified, how to work with the engineering team to build a product. Basically, this book gave a better understanding about product management and how to find the correct path when starting with a product which as the book is titled "inspired" in setting up the practical part of the thesis.

The literature above led to look for a process called the Stage Gate® process by Bob Cooper, several web articles and understood that this process is worth studying for then implemented for the thesis project. The process made sense as it was in line with the product that is being productized by the thesis author.

The supervising teacher advised about implementing the PDCA in the productization process of the wormhole project. After theoretical material has been went through, it became clear that both the Stage Gate® and PDCA can be emerged together in the thesis productization case.

2 THEORETICAL BACKGROUND

As established in the previous chapter, the theoretical material has led to go through two well-known productization processes; The Stage Gate® process or known as the waterfall process and PDCA process. In this section both processes and their benefits will be explained.

2.1 De

While many companies face increased pressure to have a more efficient product life cycle and improve product success rates, companies have looked for new productization methodologies or Stage-Gate systems to better manage and direct their innovations at accelerated rates (see Figure 3) (Cooper, 2008.)

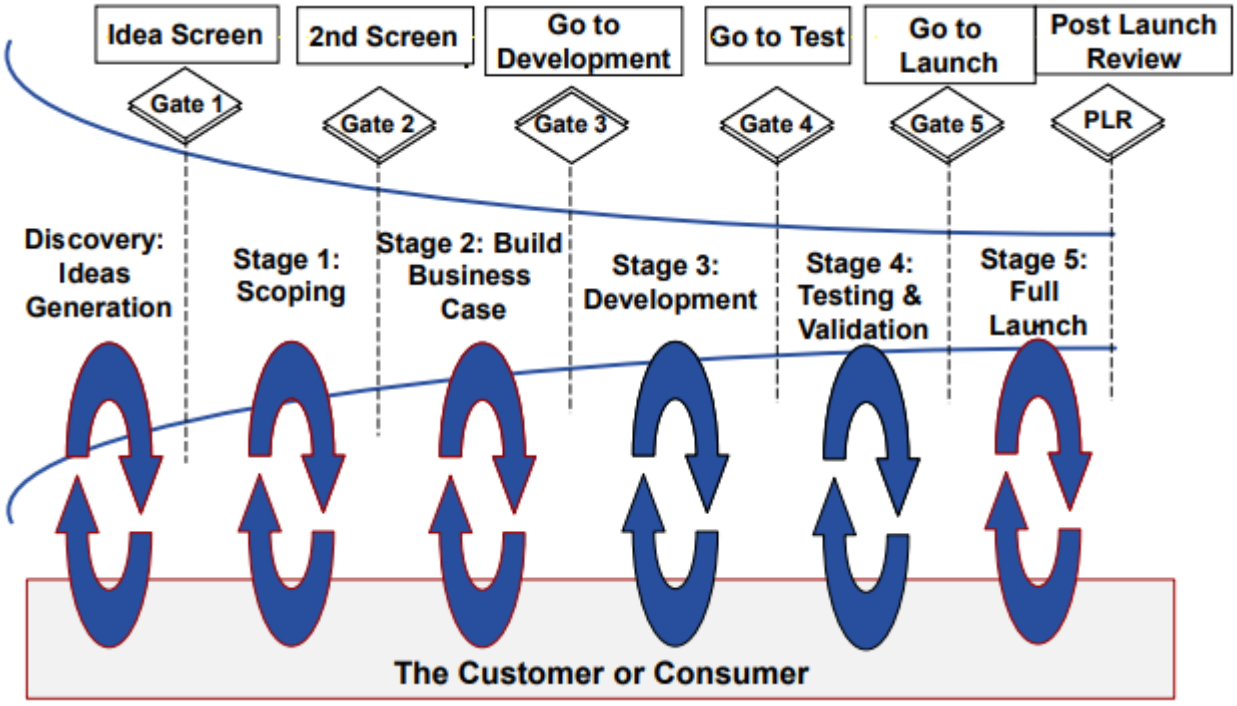

Figure 3. A general overview of a Typical Stage gate® system for major new product development processes (Cooper, 2008)

The Stage Gate® system is well known and used in the development of new products, also called the waterfall process. Where product development is divided into several different stages or so-called "gates" each gate is a decision point on where to proceed to the next gate or not. One of these decisions can be made (Mudler 2017.)

Go

The overall product development is good enough and can move on to the next stage. (MULDER 2017.)

Kill

The product development does not meet the expectations and is not good enough to be developed furthermore which results in it being shut down. (MULDER 2017.)

Hold

The product development must be put on hold at the moment. This could be made when an essential element of the product development is missing, or if the product is not ready to be introduced in the market yet. Here the project is put on hold until it can be resumed later. (MULDER 2017.)

Recycle

The overall product development is good. Changes to be made are highlighted. (MULDER 2017.)

2.1.1 Stages:

Stage gate process includes stages the need to be made and is connected to gates, the next gate opens when the stage is considered done.

Stage 0: Discover

This is the first stage, to begin with when developing a new product. Ideas can be gathered by observing the market needs or tending to solve a customer problem. The idea is gathered then proposed to different customers, suppliers or partners, then after valuable feedback about the idea, the product manager will know if going to the next stage by gate one is valuable or not worth the effort. (Elmansy 2017.)

Stage 1: Scoping

A different part of the company stake internal holders evaluate the idea. In this stage, at this stage, an overall evaluation is made to determine whether this product results in a market opportunity. Different tools can be used to have an estimation like the SWOT analysis—which helps the product development team to evaluate the idea based on strengths, weaknesses, opportunities, and threats. (Elmansy 2017.)

Stage 2: Build a Business Case

The product development team works on building product definition and analysis, a business case, a project plan, and a feasibility review after a clear vision are formed from the idea that the product is based on. (Elmansy 2017.)

Stage 3: Development

From the application of the previous stages above, The team from different sections of the company put the plans into action to develop a prototype product. 5 achievements for the product are very important for this stage which is: measurable, actionable, realistic, and time-round. Production status as a base for the timeline. (Elmansy,2017.)

Stage 4: Testing and Validation

The prototype is tested at this stage, the test aims to collect feedback to improve the prototype. After that, the product is put under field and marketing test from consumers for the prototype product to understand the market feasibility. (Elmansy,2017.)

Stage 5: Launch

The last stage. After the product passes all the above stages, it transits directly to the launch phase. The product is introduced to the market on market strategy basis. Marketing team plays an extremely important role in creating a market need and to better expose the product on the market. (Elmansy,2017.)

2.1.2 The value of The Stage Gate® process:

Adaptive and flexible

The spiral interaction between the customer and the product development process provides a continues adapted product that fits consumers best (Elmansy 2017.).

Agile

Elements of Agile development system is found on the Stage Gate® process. Which is adapted to be used in the software industry (Elmansy 2017.).

Accelerated

For maximum speed to market, with a properly staffed cross-functional team is probably the most important part of product development. This requires a Stage-Gate with portfolio and resources management ensuring that the resources available are enough to run the project in the pipeline (Elmansy 2017.).

2.2 The NextGen Stage-Gate® process

Figure 4 shows that it is possible to observe that the stages can be adapted to become more suitable to the project which can shorten the product development time. (Elmansy 2017.) While the full process of the stage-gate process has been described above, a more abbreviated process of stage gates Processes can be ne noticed in Figure 4.

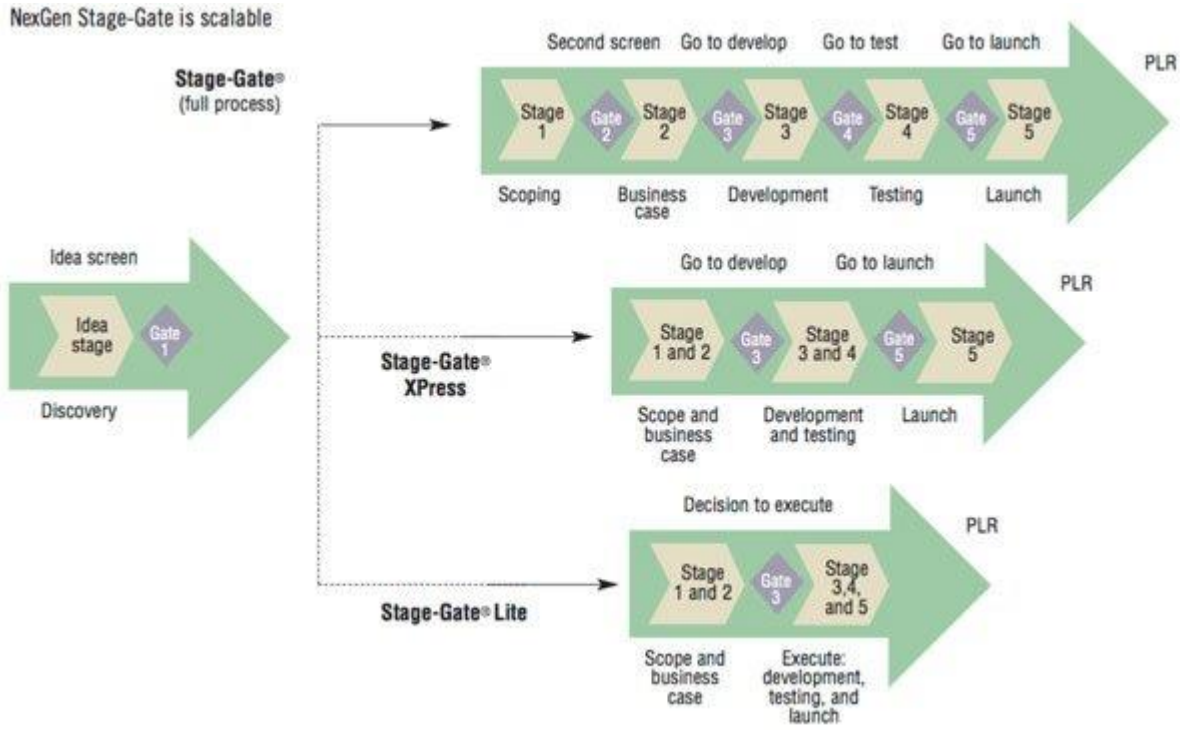

Figure 4, Next Generation scalable Stage gate® system (Cooper 2008).

2.2.1 Stage-Gate Xpress:

To cope with smaller, low-risk projects, some companies have created an abbreviated version of the five-stage model in Figure 2.3. The idea behind this is that not all production processes fit the 5 Stage-gate processes and that smaller projects with lower risks do not require the same level of work, unlike bigger and higher-risk projects. Which confirms that the Stage-Gate process is not a strict set of rules, on the contrary, each project is unique and can be defined through the system according to its specific level of risk. Therefore, stages can be skipped, and gates can be combined (Cooper, 2008).

A shortened version of a Stage gate model is resulted, corresponding to the 3 stages found in figure 2.4 under stage-gate express. However, the Stage-Gate Xpress model should be reserved for the projects with lower risk only (Cooper, 2008).

2.2.2 Stage gate lite:

The stage-gate lite is an even reduced Stage gate process into a two stages process. This process is extremely fast but very risky to implement in product development. It is often used in some firms for very minor developments (Cooper, 2008).

2.3 The PDCA

The PDCA method was originally conceived by Walter Shewhart and W. Edwards, which later was adopted by the Japanese in the 1950s. The PDCA cycle, which also called Deming wheel or the

Shewhart cycle, is a great continuous improvement tool. It is best described as a continuous and systematic problem-solving approach. This too is well known in the industry, nowadays; it is highly recommended by the ISO/TS 16949 which is a quality assurance standard.

The PDCA cycle includes four steps: Plan, Do, Check and Act as shown in Figure 5 The PDCA is designed to be a continuous cycle for improvement and the end of each cycle means a start of a new one.

(Lodgaard & Aasland, 2010)

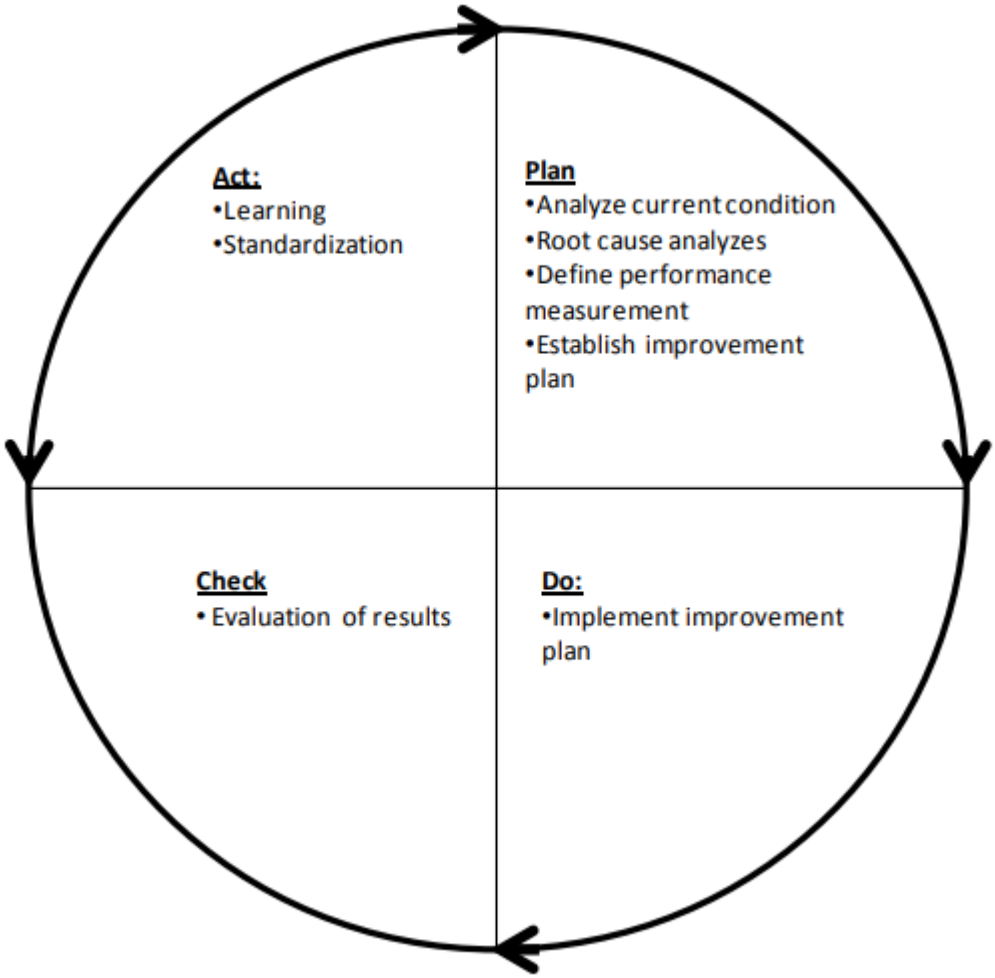

Figure 5 The four phases of the PDCA cycle (Lodgaard & Aasland, 2010)

The PDCA has wide use of applicability. It is often used in the team for process development. Toyota who is well known for using the Lean manufacturing system found the PDCA applicable in their manufacturing and it reflected on its product development system. PDCA has become a culture in some Japanese companies to solve problems and as a way of thinking. (Lodgaard & Aasland, 2010)

- Plan phase

The planning phase is about identifying and analyzing the problem then set-up performance targets and methods to reach the needed result, and not just planning what to do. In normal circumstances, a team with the necessary competence is set up to reach to solve a specific problem and achieve the desired improvement. After recourses identification and assigning responsibility to each member of the team before carrying out the improvement plan. Firstly, each one must understand what caused the problem to occur and how the system arose it. Teams typically the majority of the teams spend much of their time in this phase. When analyzing the current condition, the performance measurement must be defined to determine the improvement targets. Performance targets are used to assess the results of the problem-solving attempts which is essential to secure that improvement is reached. (Lodgaard & Aasland, 2010)

Behind every problem, there is a cause which can be clarified by following the root causes of it as classified under

- Symptoms: can be described as signs of an existing problem
- First-level causes: which directly points at the problem
- High-level causes: Causes that point out to the first-level causes from chain-link of causes which ultimately creates a problem.

(Lodgaard & Aasland, 2010)

This illustrates that a problem can be resulted from multiple causes and different levels and that some causes affect another cause. Causes identification can be performed by what's called a Root Cause Analysis. Correctly identifying the root cause is a major challenge, because of the chance of the exitance of multiple root causes at the same time. Even the identification of the correct root causes is not enough to bring the desired result without an action to be implemented. With that being said, eliminating the root causes is imperative for the problem to not show again in the future, the action plan is to think of better alternatives and effective improvement plan to avoid future problems. (Lodgaard & Aasland, 2010)

- Do Phase:

The Plan phase is executed according to schedule in the Do phase. The "do" as it may sound is an implementation of the Plan phase where all the issues were addressed and planned according to the improvement plan. There might be several causes which direct to the actual problem, and the do phase is not successful, but in the end, the "do" phase is a very important phase of the PDCA cycle as it will contribute to other phases and then the cycle continues for the problem improvement. If the problem was partially unsuccessful in the "do" phase. The planning phase can be revisited to improve the implementation plan. (Lodgaard & Aasland, 2010)

- Check phase

This is an important step in the PDCA cycle. The effect of the implementation plan is evaluated and studied by the data gathered in the "do" phase. A review of actual expected results is made and performance targets are summarized. This phase further highlights how successful the action plan to address the real causes of the problem and filters more if the root causes are further eliminated. If the problem is partially eliminated it is important to go back to the previous phase (Lodgaard & Aasland, 2010)

- Act phase

In this phase, the success of the previous phases is confirmed and implemented. This phase is also responsible for standardizing the work for further studies and development. (Lodgaard & Aasland, 2010)

3 CASE STUDY ON PRODUCTIZATION AT JUNTTAN

The productization case of a product and service has been named: The wormhole, even though the name of the service will be changing in the future, the product and service of this case study will be referred to as "the wormhole". The case study is to capture an 80 million € market of the deep foundation pile analysis under what's called "dynamic piles testing", Where piles integrity and bearing capacities are tested to confirm that the calculated foundation can withhold the planned structure under the defined safety factor.

3.1 Dynamic pile testing

The dynamic pile analysis is a well-known procedure in today's deep foundation practices. A pile strain and acceleration are measured by sensors near the pile head when a hammer with a specific mass impacts the pile head. The measurement is done according to a method called the Case Method, information is gathered in real-time about the pile driving stress, structural integrity, pile capacity after each hammer impact. Further analysis can be done using the CAPWAP method which determines soil resistance distribution for the pile shaft.

3.1.1 The challenges with today's Pile dynamic testing

The pile dynamic testing requires expertise on-site, to conduct pile analysis for the driven piles, certified pile measurement specialist is quite a few around the world with the current number of 175 people worldwide. This means for each pile driving project that a a specialist needs to travel depending on his availability which costs precious time for the pile driving companies.

Adding to the lack of experienced/certified pile driving analyzers, pile driving equipment is expensive. which makes it challenging for any company to scale up a business for it due to the high risk of return of investment.

Dynamic testing is not used worldwide due to the existence of other competing methods like pile load testing, these other methods of testing are more expensive and time consuming (in average, one hour per pile for PDA comparing to 8h per pile for load testing).

Some foundations are not tested which leads to higher risk of failed supported construction structures. Contractors level up the risk by adding more piles then needed to harden the soil which makes the work more expensive.

Current ways of producing do not scale, which leads to the market being led by small regional Suppliers, the customers are also not aware about the high prices imposed by these regional suppliers, therefore they end up paying higher price for received value.

From the above, all results in an expensive and time-consuming pile driving process, resulting in a high cost for the pile driving contractors.

Junttan Oy addressed the challenge and observed opportunity, to make a product that would render the PDA testing wirelessly. The product itself will make the business scalable, solve the piling analyzers availability and reduce the costs for the piling contractors.

3.2 Wormhole product and service concept introduction:

The wormhole is a wireless bridge that connects two Wi-Fi networks over an internet cloud. The wormhole acts as a client, logging in to the primary PDA wireless sensors and getting the data, which it passes on over the cloud to the pile driving analyzer devices connected to its wireless transmitter at Junttan headquarters, A junttan remote analyzer is connected with the wormhole operator from the PDA wireless sensors side to assists in the setup process, then gives instructions on the PDA testing to start receiving the pile information in Junttan headquarters to be analyzed in real-time, processed and communicated, after the analysis process, The Junttan measurement engineer proceeds with making the PDA report then send it over to the client to certify the driven piles' capacities.

3.3 The followed process

Prototype solution review

Before the wormhole productization process was handed, a prototype already existed and developed by a company called digitalist Oy in Tampere, Finland. The prototype was two Raspberry pies connected with 4G internet stick for connectivity and 2 power banks for power management both prototypes could turn ON/OFF by plugging and unplugging the battery power bank and led indicators both in the USB hotspot and Raspberry pie casing would indicate the operation and internet connectivity to the cloud. The prototype itself operation was a success with the Finnish piling contractor Niskasen Maansiirto Oy. The product received promising feedback in time/cost saving and became an easier way of conducting PDA around Finland.

At this point it was discussed how to enhance the wormhole product into a better version of itself and make it easier and more friendly to use.

Power management design:

The wormhole prototype had power bank to power ON/OFF both the Raspberry modules of the prototype. The Author, with the help of a Junttan software engineer, discussed on what Shields to include to make all the components of the wormhole into one piece under casing with a wormhole with integrated battery and 4G shield. A power management Design was needed and power consumption needed to be defined.

A power button was selected to be included in the wormhole, Pind-4ge shield to capture the internet connection and to be connected with 12000mAh battery. The estimated usage time according to each component consumption was 11 hours and a half. Pictures of the components can be found in Figure 3.1, 3.2, 3.3 and 3.4

Figure 6 find-4ge

Figure3.2 PiJuice LiPo 12000mAh battery

Figure 7 16mm Anti-vandal Sealed Led Pushbutton Switch

Figure 8 Raspberry Pi 3 B+

Hardware availability:

This step was to ensure the availability of the hardware at any given time of the production process, First, it was decided to start with selecting the available suppliers, Then, portfolio analysis to be done on these suppliers to be classified. Also a review of the existing electronics Junttan suppliers for better cooperations. The primary selected suppliers are Mouser Oy and elfadistrelec Oy.

Software availability:

The software was already available for the author to use from the previous prototype, However, modifications were needed to be made to make the raspberry pie compatible with the chosen components which go along with the newer wormhole product model. At this point, the author is looking forward to work with Junttan's software engineers.

Casing design, producing prototypes:
After both hardware and software gets secured, The author and supervisors have agreed about producing 3 of the new products prototypes inhouse then design a casing prototype with the help of junttans 3D designer and 3D printer. The casing prototype aims to observe how well the hardware components sit inside the casing, heat produced by the hardware inside the casing, and to determine the final size of the wormhole transmitters. After the prototype is produced, a better version of the prototype is sought where more impact resistance material is determined and chosen for the future wormhole products.

Testing technical reliability:
At this stage, technical testing is planned to be conducted where the wormhole is tested for, real-time power consumption, cellular and wifi connectivity between the two products to tackle any early facing challenges.

Shipping design:
At this stage, Components will be chosen for which go inside each shipping box before shipping and how they are organized.

Testing connectivity, globally:
Another round of internal usability is conducted during this stage where the produced prototypes of the transmitter wormholes are shipped to three continents where Junttan subsidiaries are located, The Netherlands, United States of America and Australia. A pure connectivity test is conducted in these areas where we assume that if connectivity is successful then usability is since usability is already tested in Finland in the previous stage.

Map sales process:
A sales process is produced to map out" what needs to be done and when" for the sales team. The process is produced as a workflow chart which can be seen in Figure 9 under.

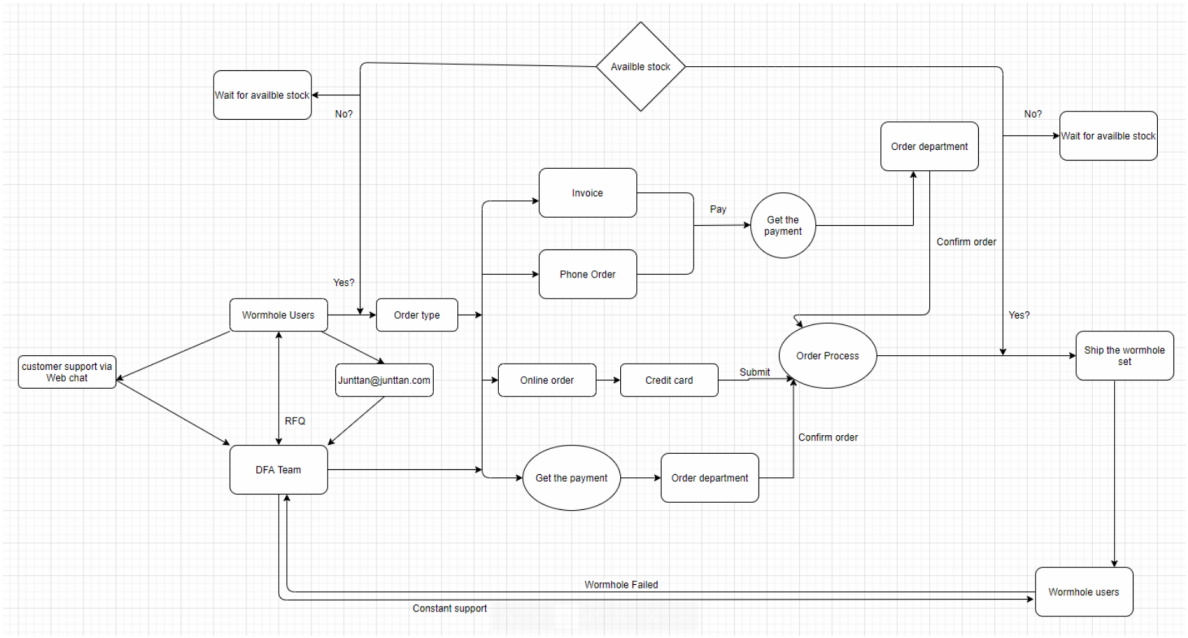

Figure 9 sales process (Bourahli 2020)

As observed in Figure 10 Sales support is an important role of product management, where the sales process is established by the product manager for executing sales of the wormhole.

Map Jobsite process:

A Jobsite is produced to simplify the user manual into a workflow chart for the future Junttan measurement engineers to be followed when conducting a wireless testing PDA Jobsite process can be found under in figure 3.6.

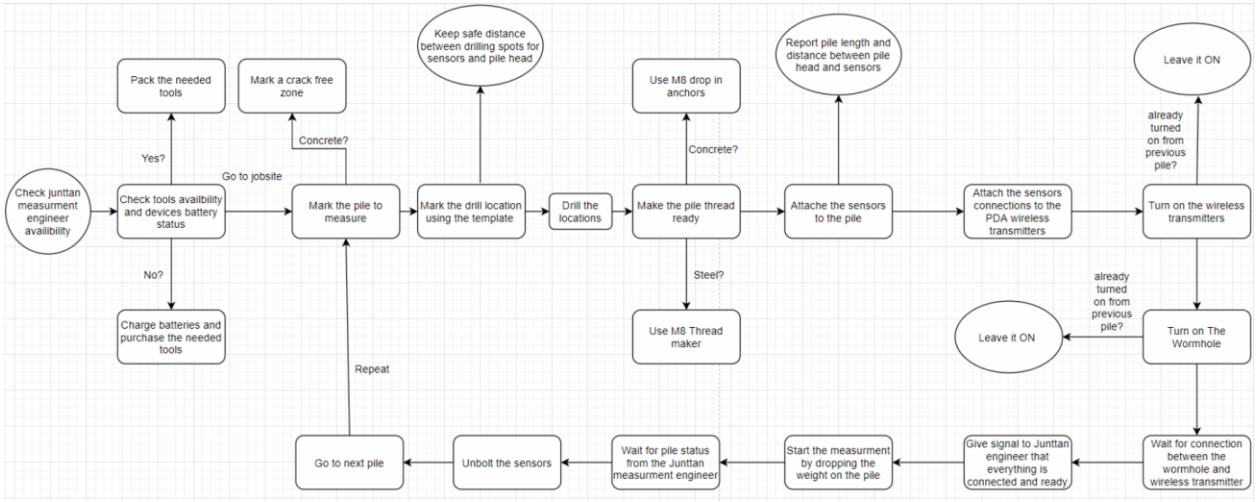

Figure 10 Jobsite process (Bourahli 2020)

Testing usability, external:
At this stage, the author and supervisor planned to choose 3 external customers for Beta testing of the product. Three companies will be chosen to test the prototype and review it along with the service quality. The feedback that will be produced is crucial for further development of the product.

Design and launch webpage:
At this stage, a junttan internal webpage is produced to commercialize the Wormhole product and service. Junttans graphic designer will be responsible of producing the final layout of the junttan wormhole web page.

Secure Wormhole-readiness for next-gen control system:
Junttan future rigs are designed to be smarter, with a new control system. At early stages, the author made sure that the wormhole will be compatible with the new Linux control system of the junttan Rigs. A new plan is secure at this stage to make the wormhole service available with the new junttan rigs control system

Internal launch:
The last stage will be to train the sales team about the new product/service.

3.4 Summary

The Junttan Wormhole productization process is conducted by a mix of Stage-gate process and Plan, Do, Check, Act process, which makes the process more flexible and more precise than traditional productization methods due to each stage of the wormhole productization process being revised by a PDCA cycle. The decisions after each gate are taken on each week if to proceed, pause a step or cancel a step. The end goal is to produce a product that would fit the remote PDA measurement service best. The theoretical part and the constant supervisor support gave great support to write the thesis and conduct each stage.

The key benefits of this thesis is to enable Junttan to have a clear vision and a path of how productization of a process should be, improving a product from customers point of view and defining a clear path of a product success overall.

3.5 Findings:

The purpose of conducting this study is to answer the research following questions:

- What are the processes that should be considered during productization of MVP?
- How can these processes be used to improve the overall success of MVP productization?

In order to answer the above research questions, this study focused on detailing the chosen models in section 2.1 and 2.3 to establish a theoretical framework, two key Findings were gathered during the productization of the wormhole

TABLE 1. Key finding factors in productization process and their improvements

Key findings	**Improvements**
PDCA	- Continuous improvement of the product. - Prevents recurring mistakes in the productization process
Stage Gate Process	- Controls the flow of work - Steer the project work - Improve project quality - Better productization vison

Using Table 1, the research questions can be answered:

- What are the processes that should be considered during productization of MVP? (Refer to key findings column in Table 1)
- How can these processes be used to improve the overall success of MVP productization? (Refer to Improvements column in Table 1)

In addition to identifying the key success factors of productization process and their improvements for Junttan Oy and wormhole case, a drawback was noticed when using the two processes at the same time, which is time consumption. Even though it's highly effective to use both process at the simultaneously, revising each stage with PDCA requires a noticeable amount of time.

3.6 Future recommendations:

Junttan Oy should ensure that the following duties are implemented in the existing product development manager's responsibilities:

- The Product manager should focus on the target market and specify the market requirement for future wormhole development.
- Product lifecycle should be managed along with following market requirements for future wormhole development
- Wormhole requirements, wormhole lifecycles, and release definitions should be followed and defined by the product development manager
- A product manager to be appointed to each product development project in order to avoid product development pauses.

4 CONCLUSION

This thesis took around three months to finish, the wormhole is planned to be ready by the month of July, 2020 while this thesis is planned to be presented in May, 2020 , therefore some of the stages are predicted, planned and documented in this thesis as steps to be done in the future. great articles have been found for the theory part and used them to plan and execute some of the stages in the practice part. Not to mention the countless support given by the work supervisor in-order to help with the thesis writing.

This thesis was documented while the Wormhole project is ongoing and gave the author plenty of ideas to use for the wormhole project, and a chance to document the wormhole project thesis as a diary of work.

This research aims to provide recommendations that could be implemented in organizations to productize an MVP which needs agility in the product development process. This specific research demands more practical implementations than theoretical framework. This thesis is a mixture of theoretical analysis with practical implication. It is worth to be mentioned that this work was made for a single company, which is Junttan Oy, the concept and implementations are also relatable in similar kind of activities.

The theory framework was a generalized framework for product management and included products in general, This brings notable impracticalities when it comes to the wormhole project, several steps was found useless in the stage gate process when it comes to this specific productization process and the author saw a good mixture of the PDCA and Stage gate process which are going on in this productization process.

Productization models are company specific, each model is adapted to each organization. Therefore, the stage-gate model and PDCA model was specified to Junttan Oy' wormhole product.

The used process is a mixture of The Stage Gate® process and The PDCA process while the author and supervisor used PDCA for some critical stages to move forward. This process made the smooth path towards productization productivity so far for the project development and both the author and supervisor are planning to continue using this process for further development of the wormhole product.

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