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Reacting to change with product management tools

A case study

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ABSTRACT :

This thesis studies the case company's product management and its processes. Product management is one of the central functions in the company and it serves almost every branch both internally and externally. Significant changes have taken place in the company's operating environment, both in customer behavior and geopolitically. These drastic changes in the operating environment are the reason why the case company founded needs to study its own product management functions. Case company sees the need to develop product management functions to adapt more efficiently and quickly to changes in the operating environment, both small and large, unexpected changes. Creating an efficient process within the company is one of the key tasks of product management. Additionally, creating and implementing product strategies that align with the company's overall strategy and are profitable within the company's operating environment. The research consists of a theoretical background, qualitative interviews and created proposals on how product management can be developed.

The theoretical background consists of product management, risk management and the role of the product manager. In the qualitative interviews, we learn about the current state of product management, the challenges of product management and the development targets of product management. The interview answers are analyzed with a thematic analysis, through which meaningful themes from the interview answers are outlined. Artificial intelligence has been used in the thematic analysis, which proved to be positive both in terms of time and results. In the research, a proposal is created around the current situation of product management. The proposal is based on the themes that emerged from the interview answers, development proposals, and the researcher's own perspective.

The thesis studies the current state of the case company's product management. The research aims to create procedures for product management to implement more efficient product management in a constantly changing operating environment. The research is timely, as drastic changes in the operating environment have affected companies in various industries nationwide. The research showed that the case company in its current state has the necessary tools for the efficient operation of product management. It's more about using the tools more efficiently and using them to implement a transparent process throughout the organization. Through that, it is possible to create a mechanism that can adapt to a constantly changing environment based on transparency, cooperation, communication, and documentation.

Through the conclusions of the research, it can be stated that the study of the implementation of the proposal requires further research. Further research is needed to obtain concrete information about the effectiveness of the proposals in product management processes. Through this, it would be possible to determine more precisely the effect of the proposals in practice.

KEYWORDS: Product Management, Risk Management, Operating Environment, Product Management Process, Product Manager

VAASAN YLIOPISTO**Teknologian ja innovaatiojohtamisen yksikkö**

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TIIVISTELMÄ :

Tämä tutkimus käsittelee case yrityksen tuotehallintaa ja sen prosesseja. Tuotehallinta on yksi keskeisimmistä funktioista yrityksessä ja operoi lähes jokaisessa organisaation haarassa niin sisäisesti kuin ulkoisesti. Yrityksen toimintaympäristössä on tapahtunut merkittäviä muutoksia niin asiakkaiden käyttäytymisessä kuin geopolittisesti. Toimintaympäristön rajut muutokset ovat syy minkä takia case yrityksellä on tarve tutkia oman tuotehallintansa toimintoja. Case yritys näkee tarpeen kehittää tuotehallintansa toimintoja, jotta se pystyy sopeutumaan tehokkaammin ja nopeammin toimintaympäristön muutoksiin niin pieniin kuin suuriin, odottamattomiin muutoksiin. Tuotehallinnan yksi keskeisimmistä tehtävistä on luoda tehokas prosessi yrityksen sisällä. Tämän lisäksi, toteuttaa tuotestrategioita, jotka perustuvat yrityksen omaan strategiaan ja ovat kannattavia yrityksen toimintaympäristössä. Tutkimus koostuu teoreettisesta vii- tekehuksesta, laadullisista haastattelusta ja luoduista ehdotuksista, miten tuotehallintaa on mahdollisuus kehittää.

Teoreettinen viitekehys koostuu tuotehallinnasta, riskienhallinnasta ja tuotepäällikön roolista. Haastatteluissa perehdytään tuotehallinnan nykytilan hahmottamiseen, tuotehallinnan haasteisiin ja tuotehallinnan kehityskohteisiin. Haastattelun vastaukset analysoidaan temaattisella analyysillä, jonka kautta hahmotetaan merkittävät teemat haastatteluvastauksista. Temaattisessa analyysissä on hyödynnetty tekoälyä, joka osoittautui positiiviseksi niin ajallisesti kuin tuloksel- lisesti. Tutkimuksessa luodaan ehdotus tuotehallinnan nykytilanteen ympärille. Ehdotus perus- tuu haastatteluvastauksista nousseisiin teemoihin, kehitysehdotuksiin ja tutkijan omaan näke- mykseen.

Tutkimuksessa tutkitaan case yrityksen tuotehallinnan nykytilaa. Tutkimus pyrkii luomaan tuo- tehallinnalle askelmerkit tehokkaamman tuotehallinnan toteuttamiseksi jatkuvasti muut- tu- vassa toimintaympäristössä. Tutkimus on ajankohtainen, sillä toimintaympäristön rajut muutok- set ovat vaikuttaneet maailmanlaajuisesti yrityksiin eri toimialoilla. Tutkimuksessa nousi esiin, että case yrityksellä on nykytilassaan hallussa tarvittavat työkalut tuotehallinnan tehokkaaseen toimintaan. Kyse on enemmänkin työkalujen hyödyntämisestä tehokkaammin ja niiden kautta läpinäkyvän prosessin toimeenpanemisesta läpi organisaation. Tämän kautta pystytään luo- maan koneisto, joka pystyy sopeutumaan jatkuvasti muuttuvaan ympäristöön perustuen lä- pinäkyvyyteen, yhteistyöhön, kommunikaatioon ja dokumentaatioon.

Tutkimuksen johtopäätösten kautta voidaan todeta, että ehdotusten toimeenpanemisen tutki- minen vaatii lisätutkimusta. Lisätutkimuksen avulla voidaan hankkia konkreettista tietoa ehdo- tusten tehokkuudesta tuotehallinnan prosesseissa. Tämän kautta pystyttäisiin tarkemmin toteaa- maan ehdotusten vaikutus käytännössä.

AVAINSANAT: Tuotehallinta, Riskienhallinta, Toimintaympäristö, Tuotehallintaprosessi, Tuo- tepäällikkö

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1 Introduction

Chunawalla (2008) wrote regarding to products, that product is basis of any organization. If we look at that more closely, we can find that the statement is true. Products are main focus areas for organizations but there are many more functions around the product in order to organization to be successful. For example, sales department and product planning and development are in key role for successful product as sales are realized through sales department and overall success is reliant to planning and developing the product (Chunawalla, 2008).

Adapting to the ever-changing environment requires careful planning. Rapidly evolving technology, product life cycles, globalization, industry, and economical changes are challenging to every company (Chunawalla, 2008). Strategies and plans are needed to keep up with constantly changing operational environment. It is very unlikely that companies would outpace environmental changes. Company strategies and plans give direction for company to move forward towards adaptation of changing environment (Chunawalla, 2008). In changing environment, it is critical for company to respond and adapt for change in the environment before competition, underscoring the importance of responsiveness (Chunawalla, 2008). In this rapidly changing environment and changing structures, product management does evolve alongside. It could be possible that what we think or know regarding to product management could be outdated in the near future or even today. Product management studies are based on often studying effectiveness of the product management system (Murphy & Gorchels, 1996). In the rapidly changing environment, product managers are given less attention, but they are positioned themselves in the middle of this complex entity (Murphy & Gorchels, 1996).

Communication is in critical role inside the product management and especially product managers need to emphasize that. Tyagi & Sawhney (2010) emphasize interface management inside the organization will have positive effect on performance of product management and its processes. Strategical focus and coordination between different business units and functions are seen as important (Tyagi & Sawhney, 2010). Product

managers are in the center of the product management (Haines & Wear, 2009). Focusing on strategy and communication are in key role in their everyday work description (Tyagi & Sawhney, 2010). For example, in technology companies, product managers are also involved a lot in product development, where also communication is seen important. In today's rapidly changing environment, product managers need to focus also to external environment in addition to the internal environment (Tyagi & Sawhney, 2010).

This thesis studies product management and its processes inside the case company. The case company is a globally operating industrial company. Case company is technology leader in their respective industry and constantly strives to develop new technology for the industry. Constantly developing is seen as massive competitive advantage. However, the process itself from product management perspective is not seen as systematic as it should be. The case company has encountered drastic changes in recent years and there is indeed a need to examine its product management function and product management processes. The changes are shaken up industry in a way that nobody could not forecasted. Changes, which had significant impact for product management inside the case company were case Covid and ongoing case Russia. These cases brought up questions such as how to react to these kinds of changes to be more efficient. Issue is important because these above-mentioned cases affected many more companies everywhere in the world and it is important study to react more effectively to changes in the rapidly changing environment.

The objective is to study case company's current state of product management practices and propose improved procedures for their effectiveness. Instead of creating new processes and operations from scratch, the goal is to modify the existing framework for systematic functionality. Through new proposed procedures, the aim is to develop the product management process to be more efficient, which enables reacting to changes in the operating environment. With the new proposed procedures, it can be able to guarantee the functionality and profitability of individual products and the entire company as the model will be supporting decision making process in product management.

This research aims to answer to two main questions and one sub question. The main and sub questions are shown below:

1. What kind of product management process needs to be implemented to react to changes in the operating environment?
 - a. What changes in the operating environment require proactive responses in product management, and what information and tools are necessary to support effective decision-making in this process?
2. How product management process at case company should be developed based on the findings?

Interviews were conducted from persons inside the case company who are connected to product management and its processes. The desired outcome from interviews is to form answer to research questions and propose procedures for product management to react environmental changes. Interviews are effective way to understand the situation more clearly where the process is now and observing possible development targets. The development targets are seen as important for research. The targets will be one of the focusing areas on proposed procedures to form best possible process for case company.

Thesis will consist of three main parts: Theoretical background, Interview result analyzing, and proposal for case company. First, theoretical background is covering main topics discussed in this research. The topics revolve around product management and its sub-topics. These subtopics are consisting of role of product manager, objectives of product management, and risk management. In the end of the theoretical background, product management inside the case company is presented and defined more detailed way. The present moment of product management and its processes are base of the proposal for the case company and are defined based on author's own observations. After the theoretical background, interviews and analyzing the results from the interviews are covered. Interview questions are based on research questions and the aim is to get understanding

regarding to development targets and issues which are lacking. Interviews answer analysis was done by using artificial intelligence which provided simple thematic analysis from interview answers. Together with present picture of case company's product management, which is developed by the author, and interview answer analysis, procedures for product management will be created based on those issues mentioned above. Research is creating and developing the process around the current framework, so that the procedures could be implemented effectively, if it is seen to bring efficiency to the product management processes.

2 Theoretical background

This chapter introduces theory around the research. The topics are product management and risk management. Last, case company is introduced, and their product management operations are presented.

2.1 Product Management

Product management is a comprehensive function that manages products and product portfolios (Haines, 2013). The product management begins from the very beginning of the ideation of, for example, new product or updating existing product and ending when the product is withdrawn from markets completely and ending supporting operations of the product. (Haines, 2013) Product management have had many different definitions over the years. It is difficult to define specifically, and the definitions differ based on the perspectives and researchers. (Maglyas et. al., 2012) According to Haines (2013), product management is business management of products, and it refers also to that it is a function inside of a company which leads and integrates the work of people in other functions. Roach (2011) defines product management as horizontal function which is involved in different other departments inside the company. It can be seen from research and books that product management, as a definition, is described differently based on an author but in main picture, all the authors are meaning the same thing. This research will use example framework from (Chunawalla, 2008), which shows the scope of product management and where does product management as a function operates inside company's own operations.



Figure 1. Scope of product management (Chunawalla, 2008, p. 4)

As can be seen from Figure 1, product management is linked to many different functions inside the company. The scope of product management can be divided into four different branches: product planning & development, corporate & marketing planning, product life cycle, and brand management. Product management function covers all the operations regarding to product planning and management.

2.1.1 Corporate and Marketing planning

Before the actual product is developed, comprehensive and broad planning and analysis is conducted. It contains corporate and marketing planning, competition, customer, and industry analysis, as Figure 1 illustrates. Corporate and marketing planning considers giving direction for product management, in other words product managers, to express their strategies for product to fulfil marketing objectives. Product management objectives and strategies are derived from corporate and marketing objectives and strategies. Chunawalla (2008) illustrates that product objectives and strategies is derived mainly through marketing strategies as marketing objectives and strategies are derived from corporate objectives and strategies. To get more clearer picture, management can be

divided into two different types. Steiner (2010) divides management into strategic management and operational management. Strategic management can be referred to corporate objectives and strategies and operational management is everything else (Steiner, 2010). Thus, corporate planning is considered as foundation for other planning and analysis, in this case marketing planning and whole product management function. Corporate strategies are considered as long-term base for company to move towards (Orok, 2013). The strategy selection is based on environment, resources, and long-term objectives (Orok, 2013). Orok (2013) also describes corporate marketing planning that it is divided into two parts: Corporate strategy and product mix strategy. Corporate strategy meaning as mentioned above and product mix strategy as connection between corporate strategy and product objectives and marketing strategies (Orok, 2013). Product mix strategy also addresses development of reaching marketing strategies which are giving direction for product objectives in product mix (Orok, 2013).

Chunawalla (2008) writes that product planning starts from marketing plan, meaning that first it is critical to document four following issues: situational analysis, marketing objectives, marketing strategy, and action plan. As mentioned earlier, corporate strategy sets up direction for company and its business units to form plans to reach those objectives. Thus, marketing plan starts the concrete movement. Situational analysis reviews past and present data which illustrates trends, markets, customers, competition, and current status as a company and as a brand (Chunawalla, 2008). Marketing objectives gives direction in short and long term for products or brands. Chunawalla (2008) suggests that marketing objectives can be seen as also product objectives (Chunawalla, 2008). Marketing strategy means realizing the objectives set (Chunawalla, 2008). Action plan sets up the budget and expected results are set for product objectives (Chunawalla, 2008).

2.1.2 Product Planning and Development

Product planning and development is in a significant role in product management as it can be seen as part of beginning of new product or modifying existing product. Product

planning and development is impacted from corporation and marketing planning. Corporate and marketing plans are closely linked to product plan providing direction for the product management. Product planning and development means that it addresses all the activities from idea creation to commissioning. Kahn (2011) divides product planning into two categories: product development and product management. In this research, product planning and development are considered as a part of product management which oversees the areas what Figure 1 is illustrating. Product planning and development is considered as up-front process (Kahn, 2011). Planning and development itself consider different situations such as new products and existing products. Product planning and development should have a constant cooperation with marketing department. Chunawalla (2008) writes that marketing support is critical as while developing value-based products, it needs to be in harmony with marketing objectives and planning. There could be seen some overlapping between marketing and product planning. In product development, marketing management should be involved although the actual development does happen elsewhere, for example Research & Development function. Cooper (2019) claims that marketing department is least involved in product development process although marketing strategy is applied to the product development and is critical part of the product management.

Chunawalla (2008) divides new product development into six different categories: technological breakthroughs, significant improvements, modified products, products new to the company, repositioning, and cost-reductions. These above-mentioned categories can be whole new products or considering existing products. Product development process has been illustrated different ways. For example, Cooper & Sommer (2018) introduced agile stage-gate model for agile product development. Chunawalla (2008) illustrates product development framework in his book. All the models have same base which can be divided as follows: ideation, concept, business case, development, testing, and launch.

2.1.3 Product life cycle

Product management addresses the product life cycle from creation, from product planning, to end of the life cycle, which can be for example deletion of the product. Product life cycle is in important role inside of the product management operations, as product management needs to find a strategy in different phases of the product life cycle (Chunawalla, 2008). It could also be seen that the product life cycle encompasses all operations what the product management does. As in literature, product life cycle describes products lifetime in the markets from its launch to its withdrawal from the markets. In theories, one specific illustration is used regarding to the describing product life cycle (Chunawalla, 2008). It contains four different stages: introduction, growth, maturity, and decline.

Product life cycle management maintains products or product lines life cycle and with it at the same time building a brand around product or product line. Product life cycle management has become over the years more crucial to companies as competition is more demanding and environments change rapidly (Saaksvuori & Immonen, 2008). Also, companies have products in different phases of life cycle which need different strategies from product management to ensure perform better to have a solution for competition and from financial perspective. Saaksvuori & Immonen (2008) refers product life cycle to product data management which is based on a thought that the data and information is a key component for decision making in product life cycle management. The data gathered from product needs to be clear for information-based decisions in different phases of lifecycle (Saaksvuori & Immonen, 2008)

2.1.4 Product Branding and Marketing

Figure 1 illustrates product branding as one of key components in product management. Brand could be many of different things. It could be, for example, name, symbol, and design which has a visual representation of something what identifies the seller or maker

of that brand (Chunawalla, 2008). Brand is a complex entity. Brand provides to the customer what is expected. It could be, for example, quality and value (Chunawalla, 2008).

Product management literature is quite often addressing how to create successful products from product development perspective (Baker & Hart, 2007). Marketing department has been seen as distinct function in some extent in a company, but marketing strategy implementation is critical for company to embed its operations, even it could be hard to measure. Building marketing assets through marketing investments is in crucial role in brand building (Swan, Zou & Swan, 2012). Figure 1 shows that product management is linked heavily together with marketing functions inside the organization. Product management has a strong role inside of marketing function from the perspective of brand management and marketing plan creation (Tyagi & Sawhney, 2010) Chunawalla (2008) presents objectives which many of them are also marketing department objectives. It is critical for product management operations to be aligned with marketing strategy and company strategy. Constantly changing environment is forcing product management department, more precisely, product managers to consider brand management and marketing more (Herstein & Zvilling, 2011). It is important to acknowledge the importance of marketing related investments inside the organization, as those bring great competitive advantage in way of brand equity which bring value to both customer and organization (Swan, Zou & Swan, 2012). As written earlier, marketing is critical from many different perspectives, for example creating strategy and involving in product planning and development. When product management assesses their strategies for product in different lifecycles, product branding and marketing should be considered to create long-term sustainable growth.

2.2 Product management objectives

Concept of the product management provides solution for problem when there is not enough managerial focus on a product or a brand (Murphy & Gorchels, 1996). The concept is advantageous for organization or company as it provides clear managerial focus on products as profit-generating systems (Murphy & Gorchels, 1996). The scope of the

product management can be defined through the many objectives of the product management which gives more detailed information what are key responsibilities of the product management.

In product management, Chunawalla (2008, p. 4) presents seven objectives which are in significant role. The objectives are:

- 1) Define a strategy around the product and consider the perspectives of customer, industry, and competition.
- 2) Identify market opportunities.
- 3) Pursue growth.
- 4) Define strategies for product life cycle stages.
- 5) Have a platform for generating new ideas.
- 6) Strengthen product portfolios.
- 7) Build a brand.

These seven objectives form a broad understanding what does the product management means. Although, there is not direct mention of profitability and one of the definitions of product management considers product management as a profit generating system (Murphy & Gorchels, 1996). That doesn't mean it is not considered as the objectives, if reached, are supporting heavily to profitability and efficiency of organization. There are also different definitions of product management objectives and often is based on topic of research and perspective. For example, (Roach, 2011) is defining, through founded literature, product management objectives based around on growth of the company. These above-mentioned objectives have common part of not mention profitability. The profitability comes from the perspective that one has product and objectives around which will create a product that has an efficient strategy and sales department can sell to customers. Chunawalla (2008) defines product as foundation of company and with the help of product management and its objectives, the profit for company is created. Product management objectives can vary between different companies because their own visions and strategies. These different visions and strategies from company level have direct impact to product management as the product management objectives are set to be aligned with company and marketing objectives (Chunawalla, 2008). Baker & Hart (2007) view that product strategies are closely linked to company's core, meaning

that the product strategies are thought from corporate level when overall strategies are made. A conclusion can be drawn from this that product management strategies are very influential inside companies as there is viewpoint it being critical for companies' survival in rapidly changing environment.

From Figure 1, some conclusions and frameworks can be made based on the scope of the product management and above-mentioned literature. Product management starts from planning, in other words marketing, corporate, and product planning. Corporate and marketing planning also considers competition, customer, and industry analyses which are important drivers in business environment from product management perspective. Product management is in many ways maintaining information flow between different shareholders inside and outside of company. From that, the information can be seen also essential component inside of product management.

Product management and key responsibilities can be linked heavily together with roles of the product manager. In product management literature, the definition of product management is sometimes presented through the role of product manager. For example, in Tyagi & Sawhney (2010) article is assessing high performance product management through product manager as an individual. Roach (2011) founded on literature that product management is defined either through product manager characteristics or organization characteristics. As in this thesis, it is important go through the product management also from the perspective of product manager key responsibilities. This perspective suits the thesis objective itself as the main result is to create supporting model for product management and especially for product managers to react changes in business environment.

2.3 Product Manager

Every great product produced, there is someone behind it and often the title of the someone is product manager (Cagan, 2017). In a simplest way, the product managers main responsibility is to decide what is built and delivered to customer (Cagan, 2017).

Product manager is responsible of it and main feedback comes to the product managers, especially when things don't move what was engineered (Cagan, 2017). When product managers have responsibility for what is built and delivered, they also have responsibility for success of the product (Murphy & Gorchels, 1996). There are also other responsibilities what is needed from product manager. To be clear, same as in defining product management, definitions of product managers key responsibilities can vary based on a perspective and researcher. Cagan (2017) defines four key responsibilities what should product manager have if he or she wants to be efficient. The four responsibilities are: deep knowledge of customer, data, business, and market and industry.

It is said above, that behind every successful product there is product manager behind. That is in some sense true, but around product manager there is cross-functional teams including people from engineering, sales, and marketing for example. Collaboration between different functions inside the organization can be the most challenging for product managers. There are different interfaces within the organization for product manager. For example, supply chain, finance, executive management, and research and development are in direct contact with product manager (Tyagi & Sawhney, 2010). According to Murphy & Gorchels (1996), that typically product managers workload is based on working with different departments and cross-functional teams inside the organization and maximizing value of a product or product line by guiding operations through product strategies. According to Tyagi & Sawhney (2010), they found that interpersonal skills are one of the most important skills for product manager to have an impact in product management. According to Calantone et. al. (1995) there is often conflict between for example marketing and research and development departments regarding to product management. The conflict often consists of that marketing department accuses research and development for not considering marketing initiatives and they are only technical oriented. In turn, research and development department accuses marketing to not understand the technical trade-offs (Calantone et. al., 1995). This example perfectly defines the role what product managers have through different departments as they operate

between departments and are needed to have good interpersonal skills. Product managers have not direct control on producing and selling products as can be seen from the definitions of product managers responsibilities. Through product managers responsibilities, product manager defines strategies for changing market needs and advocating processes in bringing product for markets (Murphy & Gorchels, 1996). In addition, according to Calantone et. al. (1995), it was found that compatible interactions between needed departments, such as marketing, research and development, and manufacturing, will result more effective product development and management.

The complexity and scope of product management brings with it the requirement that qualified and knowledgeable people are needed in product management. According to Tyagi & Sawhney (2010) product managers are, in a way, the chief executives of the products. Murphy & Gorchels (1996) says that product managers operate business inside the organization with their responsible products.

2.4 Risk management

Risk management is a form of term that has no direct definition in the literature. According to Wolke (2017), commonly used definition of risk is that it is based on possible damage of assets and there are no gains to compensate it. Pinto & Magpili (2015) define risk as a future event which has undesirable consequences without specific intent. Pinto & Magpili (2015) have also different definitions which are related to chances of event happening and occurring with something undesirable happening. Especially in businesses, risk is based on probability regarding to unknown events (Alberts & Dorofee, 2010). Although, risk is defined as a potential loss, risks are taken because of the opportunity which is in some extent counterpart of risk (Alberts & Dorofee, 2010). Meaning of opportunity is that there is potential change to gain something (Alberts & Dorofee, 2010). Chasing opportunities often creates situations where risks appear, or risks are taken into consideration (Alberts & Dorofee, 2010).

Risk management is defined by Wolke (2017) as organisational measurement and control of all risks inside the organisation. Pinto & Magpili (2015) define risk management through guiding questions which are directly linked to management of risks, for example what should go right and what can go wrong. Alberts & Dorofee (2010) defines risk management as systematic approach where is three core activities. The three activities are assessing risk, plan for risk mitigation and mitigating risk. Risk management and assessment are done all the time for different reasons. Wolke (2017) identifies those reasons to three categories: legal, economical, and technological reasons. All of the reasons can be linked to product management directly or indirectly as could be seen from Figure 1. Product management is a very broad concept and operates in many parts of the organisation, including risk management in some extent. Thus, risk management can be linked to product management directly as lot of planning and analysing goes through in product management. Risk management is critical when planning inside the product management in order to have clear understanding of probability of possible events which does bring risk. Jifeng et. al. (2009) found that right risk management strategies applied to the product development will improve the success of the product development. According to Park (2010), including risk management to the product development process is important for minimizing impact on overall performance of the product. Park (2010) also found out that product managers have a significant role in risk management inside product management operations, especially in product development. Communication through organisation was seen as critical for minimizing risk and improving performance (Park, 2010).

2.5 Product management in case company

This section introduces the product management inside the case company. This also refers to what is the scope of this research. As the main objective is to propose supporting procedures for product management and product managers, it is important to define clearly what is the scope of product management inside the case company and how it is

linked with different functions. Figure 2 below illustrates the scope of the product management inside the case company. The information is based on researcher's viewpoint as a product management employee for one and a half years.

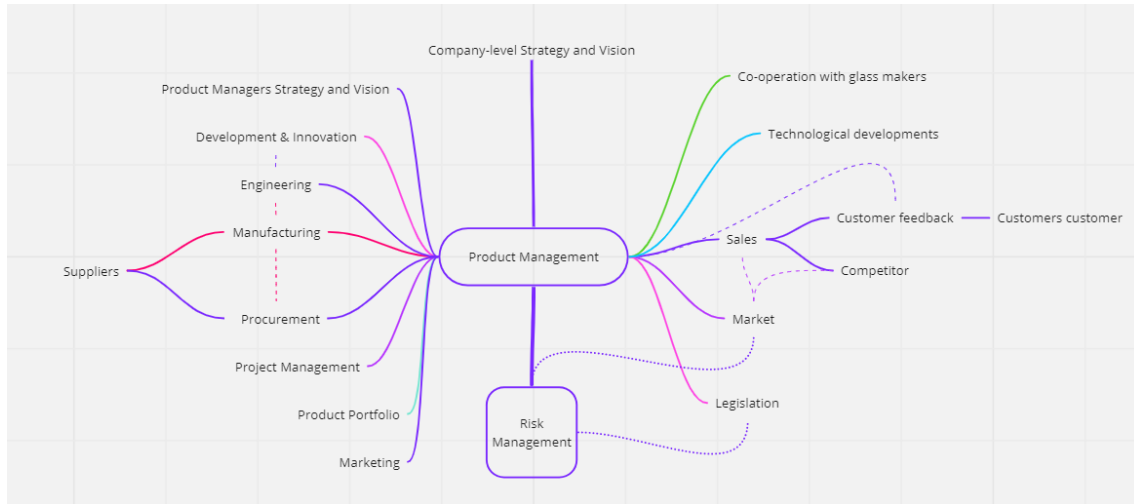


Figure 2. Scope of Product Management inside of the case company (author's own observation)

The figure is illustrating the scope of product management inside the case company. It shows what different functions are associated with product management function. The lines between functions are referring to information flow. Dotted lines are also referring to information flow and making clearer how does information move from other functions to another function. The dotted lines are referring only information which are important from product management function perspective and critical to decision making. As we can see, product management is clearly between many functions inside the case company's operations. Product management function, which closely aligns with the responsibilities of product managers, involves collaboration with various departments including marketing, sales, manufacturing, and engineering. Product manager is seen as a chief executive of product where responsibility and decision-making are directly in product managers hands. Case company is not a large company and product managers role and responsibility is broader than it could be in larger or different companies. Thus, product managers role can be referred to product management function as product manager

oversees all the product management functions. Also, product management is sometimes defined through product managers responsibilities, which was found from literature written earlier in this chapter. From a company perspective, product management is in a critical position and is one of the most important functions what comes to company's performance and profitability.

Risk management is seen in Figure 2. Although, risk management as a function is not clear department inside the case company. In this research, risk management is placed in an own function to be clearer of its importance. It would also be inside a product management function as risk management acts as constant factor what comes to decision making.

Right side of the Figure 2 is referring in some extent to external information sources. Sales function is placed on to external information source although it can be seen as internal source. External information mainly goes through salespersons before it reaches product management people. Usual information consists of market changes, competitor information and customer feedback. Information goes through salespersons but sometimes information goes straight to product managers. Market changes means case company's market where it operates. In markets, there are competitors which are moving markets to more competitive and healthier environment. Customer feedback has significant role in case company's operations as they use machines case company produces and give firsthand information about the performance and efficiency. Usually, case company's customer has own customers which are using processed glasses for example construction sites. This information now mainly goes through case company's customers to case company's notice. Legislation changes has in some extent role in how case company operates. Legislation could also be under market category. There are for example construction legislation changes which can affect case company operations. Cooperation with glass makers is important for glass processing industry to process the different glasses. There are different glass types which has different processes. Technological developments externally must be considered if there is something case company can use

in its own machines. Cooperations with glass makers and technological developments are not usual and constant information sources if compared to markets which include competition and customers.

On the left side of the Figure 2, there can be seen internal information sources. Internal sources are crucial for product management to operate efficiently. Product managers are in close contact with different functions such as engineering, marketing, development and innovation, procurement, and manufacturing. These functions are working closely together inside the case company to ensure efficiency and profitability of product managers product portfolios. Maintaining product portfolio needs constant cooperation with different functions. Project management are one of the important information sources for product management as they are very closely working on projects where product managers products are delivered. Delivery projects are common information sources for product managers as many important functions from product management perspective are working on these projects.

Strategies for case company are updated at least once in three to four years in company level. Also, product managers create own strategies for their designated products. The strategies include visions where company and product managers want to be and strategies how to get to objectives asserted.

3 Methodology

This chapter is consisting of research methodology what is used in this thesis. First, used research method, approach and purpose is discussed. After that, data gathering procedure and data analysis is described. Then reliability and validity are discussed. Last, this chapter consists of limitations.

3.1 Research Method

The method decided for this thesis is qualitative research methodology, particularly employing a case study approach. Qualitative research method is suitable for the research as research questions requires textual data in order to answer the research questions (Williams, 2007). In this thesis, interviews are conducted to gather information regarding to subject in thesis. Interviews are one of the common ways to gather information in qualitative research (Tuomi & Sarajärvi, 2018). In this research, the interviews are focused on the company's employees who are involved in product management activities. Interviews are conducted as semi-structured interviews. Semi-structured interviews are way to search views on a focused topic which is product management and its processes (Hammarberg et. al., 2016). Through qualitative research, subject can be studied as comprehensively as possible (Hirsjärvi et al., 2009). Studying case company's product management through interviews, it is possible to get comprehend results and understand the processes behind the product management. In qualitative research, the premises are build based on inductive reasoning (Williams, 2007). In the thesis, inductive reasoning is used as research approach.

3.2 Data Collection procedure

The most common data collection methods in qualitative research are interviews, questionnaires, observations, and information from different documents (Tuomi & Sarajärvi, 2018). The data collection procedure consists of interviews with company's employees

who are working closely with product management. A purposive sampling technique was utilized to select participants based on their expertise, experience, and relevance to the research topic, ensuring a rich and diverse dataset. Interviews advantage is that interviewer and interviewee have a flexible conversation where is possible to for example repeat and clarify questions (Tuomi & Sarajärvi, 2018). The interviews are conducted within two rounds, each of them has same themes but the questions are worded and adjusted differently. This also allow interviewer to be more flexible in the interviews. The most important thing in interviews is to gather as much information as possible regarding to subject of the research (Tuomi & Sarajärvi, 2018). In order to get much information as possible, it is preferred to send questions before the actual interview. It is ethically justifiable to inform interviewees what issues are concerned in interviews (Tuomi & Sarajärvi, 2018). In this research, the themes were informed to get interviewees more prepared. The interview for research is conducted with a theme interview, i.e. a semi-structured interview. Theme interviews are proceeded according to themes selected in advance and questions are defined before based on the themes (Tuomi & Sarajärvi, 2018). In this research, the themes are product management, product management process, operational environment, and risk management which are core issues in the research. As written earlier, the flexibility suits this research because the opportunity to clarify and specify questions in interviews. The questions are set in a way that research questions are answered indirectly. In theme interviews, interviewee strives to find meaningful answers according to the purpose of the research and the research problem (Tuomi & Sarajärvi, 2018).

3.3 Data Analysis method

In this research, thematic analysis method is used to analyze results from semi-structured interviews. Thematic analysis identifies and describes patterns from the data, in this research interview answers, and form themes regarding to the data provided. (Guest et. al., 2012) Thematic analysis is a flexible method, which is suitable for different research as researcher need to make decisions regarding to data and analysis (Terry et. al., 2017). According to Clarke & Braun (2017), thematic analysis is flexible in many ways,

not only theoretically, and it can be used to recognize patterns. Thematic analysis suits research as the aim is to understand what present status of the case company is and what are the areas of improvement. Forming themes from interview data is useful to recognize themes which are seen important. This study approaches data inductively as the base for this research is data from interviews. As researcher is part of the case company, the inductive approach is suitable and common because the coding for the data requires familiarization of the data and research subjectivity is seen as part of the analysis process (Terry et. al., 2017). Codes can be described as building blocks for themes and thematic analysis. (Clarke & Braun, 2017) Researcher acts as a code creator; thus, thematic analysis is good method for this research in order to find correct themes from the data.

This research will be following guidelines of conducting thematic analysis from Braun & Clarke (2006, p. 87). The guidelines are as follows:

1. Familiarizing yourself with your data
2. Generating initial codes
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing of report

3.4 Procedure of data analysis

In this research, thematic analysis is partly conducted by using AI. The AI used in this research is ChatGPT. The assigned role for AI is to create codes and themes based on data from interviews. The AI is guided by researcher to ensure that correct direction and the themes are in line with research objectives. The procedure will follow guidelines from Braun & Clarke (2006), but AI will be used on the steps 2 and 3 where the code is created, and themes defined in the first time. Guiding of the AI will be conducted with the help of research method objectives which are mentioned in chapter 4. The step-by-step procedure in this research is as follows:

1. Familiarizing yourself with your data
 - a. Transcribe interviews answers from audio-based interviews. The audio is transcribed to text form.
2. Generating initial codes
 - a. Start building codes regarding to research objectives. First step where AI is used to generate codes for interview answers.
3. Searching for themes
 - a. Gather data based on coding to search themes. Based on the guided code by AI, the themes are searched.
4. Reviewing themes
 - a. Checking that themes are in line with coding.
5. Defining and naming themes
 - a. Checking that the naming is correct regarding of purpose of the research. If needed, modifying the themes to match research objectives.
6. Producing of report
 - a. Report for selected themes and why those are found important. Importance is based on research objectives.

Usage of AI was conducted as follows. Researcher created text-based document from the interview questions and answers from audio recordings. The text-based document, including interview answers, was submitted to AI and AI was given command “Can you make thematic analysis based on the interview answers from the document?”. AI provides thematic analysis which is reviewed by the researcher. Based on researchers’ knowledge and competence, themes are created. Themes created by the AI and afterwards reviewed by researcher; the main themes are formed to support objectives of this thesis. Usage of AI was intended to use AI as a research helper to increase the speed and performance of creating thematic analysis from interview answers. As researcher is familiar with topic and working with the company, usage of AI is seen useful to handle large amount of data more effectively than typically conducting thematic analysis.

3.4.1 Use of ChatGPT in data analysis

According to Nguyen-Trang (2023), researchers have used different technologies in assisting research studies. This study uses AI, ChatGPT, as a tool for analysing interview answers to form thematic analysis. ChatGPT has been used in data analysis by some researchers. Nguyen-Trung (2023) used ChatGPT for thematic analysis on four different

stages: data familiarization, preliminary coding, template forming and theme development. Morgan (2023) used ChatGPT as an assistant of the research, where AI analysed the data and examined what was in the data. Zhang et. al. (2023) used and studied ChatGPT as a tool for thematic analysis. They found that ChatGPT can be used to conduct thematic analysis and that the AI can be used as a tool or assistant researcher. The usage is not clear and there is significant impact from researcher to recognize how to use and guide AI to ensure quality of the research. Perkins & Roe (2023) studied usage of AI in thematic analysis by comparing theme creation manually versus AI. They tried to form final analysis based on the themes created by AI and manually resulting usage of themes created either way. Goyanes et. al. (2023) studied ChatGPT usage for thematic analysis and found that AI can facilitate data analysis. They conducted thematic analysis from semi-structured interviews by using ChatGPT.

There is found different applications where AI could be used. Nguyen-Trung (2023) founded that ChatGPT is helpful for qualitative data analysis and also argues that despite the development of AI, it is critical for researcher to be in control of analysis. Morgan (2023) suggest that AI is used as a tool for qualitative analysis as long as the AI is controlled and guided by researcher to not lose quality of the research. (Goyanes et. al. (2023) writes that ChatGPT could be suitable to use in exploration of interview data for thematic analysis and include use of AI into traditional research methodology. Then data exploration and analysis can be refined, tested, and modified by researcher to produce reliable, systematic, and flexible research. Nguyen-Trung (2023) founded that ChatGPT can understand concepts from texts and form summaries from them.

ChatGPT could be seen as advantage in qualitative research. According to Nguyen-Trung (2023), ChatGPT positively impacted on speed and efficiency of code and theme creation, and its learning capabilities when assessing ChatGPT as assistant researcher in thematic analysis. Morgan (2023) found that there was positive impact on time saving and simplicity of usage of the ChatGPT when using AI in research.

As said above, AI called ChatGPT is used to assist this research. The AI usage is conducted as follows:

1. Thematic analysis is done by AI from interview answers.
 - a. Audio-based interview is converted to text-based document by researcher.
 - b. Text-based document is submitted to AI.
 - i. The AI will be guided by researcher and AI is given simple instruction as mentioned in procedure of analysis section.
2. Searching and reviewing the themes provided.
 - a. Themes are reviewed and modified to match research objectives.
 - i. Reviewing and redefining of themes are partly based on researchers own perspective.

Assist of AI is only used in above mentioned way. If we look more closely to the guideline procedures from Braun & Clarke (2006), researcher is still in control in making of the analysis. The AI is used as an assistant researcher, which is doing the data analysis but controlled by researcher. According to Morgan (2023), AI is seen as an assistant for coding process.

3.5 Reliability and validity

The basic principles of good scientific practices can be classified as reliability, honesty, appreciation, and responsibility (Tutkimuseettinen neuvottelukunta, 2023). This research follows good scientific practices when conducting qualitative research. In this research, planning, implementation, and documenting is based on good scientific practices and all the needed approvals and consents are acquired. Approval and consents mean that the company employees, who are interviewed, are informed regarding to recording, storing, and handling information, and anonymity. In this research, interviewees gave their consent to present their titles inside the company. On the other way, case company and researcher have agreement on what information should or should not be visible to the public. In the qualitative research, the researcher should constantly reflect on the decisions made while considering on the comprehensiveness of the analysis and the reliability of the research (Eskola & Suoranta, 2000).

3.5.1 Reliability of ChatGPT in data analysis

If we are comparing end results from researcher and AI, the results for thematic analysis could be different but it does not mean directly that AI is wrong (Goyanes et. al., 2023). The end result of thematic analysis done by researcher is based on point of view of the researcher. Morgan (2023) suggest that ChatGPT is used to produce data for researcher to make decisions regarding to the research. Researcher should familiarize the data when conducting thematic analysis by using AI (Goyanes et. al., 2023). This will help for researcher to assess the reliability of the results.

4 Results

The interview results are addressed in this chapter. Total number of six interviews were conducted. Interviews were conducted in a 2-round basis, meaning that in the first round, product managers were interviewed and in the second round, directors were interviewed. Between interview rounds, questions vary because of the job description of the interviewees. The base of the interview questions is the same and the themes were product management, risk management, and business environment changes affecting product management and risk management. Interviews were conducted in Finnish, but answers of the interviewees are analysed in English as this research is written in English. The objective of these interviews was to understand what kind of information is needed to practice product management, how the information is used and communicated, what kind of risk management procedures there is inside the case company, and how different situations in business environment affected product management. Based on the interviewee's answers, supporting procedures for product management is formed to support decision making in dynamic environment.

4.1 First round interview results

In this round of interviews, three product managers were interviewed. Text-based interview answers can be found from Appendix 1. Answers from interviews are revealed in a way where question is on the left side of the table and combination of all interview answers are condensed together to right side of the table. Themes were formed with AI to analyse great amount of data and find suitable categories where all answers are considered in some extent. Themes provided by AI was then reviewed and redefined by researcher manually to highlight the detailed points in this research. This suits researcher and research objectives as the aim is to find critical points and improvement areas for constructing procedures for case company to practice effective product management in rapidly changing environment.

Thematic analysis was conducted first by using AI. The themes from thematic analysis done by AI are as follows:

1. Market Orientation
2. Competitor Analysis
3. Internal Collaboration
4. Customer-Centric Approach
5. Risk Management
6. Adaptation to External Factors
7. Process Improvement
8. Continuous Improvement

After the thematic analysis is conducted with AI, themes are reviewed and compared to the interview answers. Then, themes are modified. Modified themes are based on AI-provided analysis and research objectives. Modified themes are shown below.

1. Market feedback
2. Strategy, Planning, and Analysis
3. Collaboration and Cooperation
4. Product Management tools
5. Risk Management
6. External factors
7. Areas of Improvement

4.2 Second round interview results

In the second round of interviews, three directors were interviewed. Most of the questions are the same but because of their role in the company, question layout is different, and some questions has been added and removed. The desired output of this round will be the same as in first round of interviews.

Thematic analysis was conducted first by using AI. The themes from thematic analysis done by AI are as follows:

1. Impact of Case Covid
2. Impact of Case Russia
3. Other Factors Influencing
4. Information Needs
5. Importance of Cooperation and Collaboration
6. Risk Management Practices
7. Development Areas

After the thematic analysis is conducted with AI, themes are reviewed and compared to the interview answers. Then, themes are modified. Modified themes are based on AI-provided analysis and research objectives. Modified themes are shown below.

1. External Factors & Market Changes
2. Importance of Information
3. Cooperation and Collaboration
4. Risk Management
5. Areas of Improvement

4.3 Summary of results

In this section, we are analysing interview answers and themes, and make a summary. The summary will be directing and supporting the proposal which is created based on the interview answers. The interview questions considered product management, risk management, and changes in the environment.

The interviews were conducted in two rounds, interviewing product managers and directors of the company. Questions are similar with some corrections and edits to be

more towards interviewees job description. It noticed that product managers could answer questions more comprehensively than directors. This is due to the fact that, despite the modifications, the question layout leaned more to reflect the image of the product managers' work. Answers to questions are not divided directly who answered what because there is no need to clarify who of the interviewees answered what. The summary of the answers is sufficient enough for creating proposal.

4.3.1 First Round Interviews: Rationalizing Theme Selection

First in the summary, themes founded are described more directly regarding to why themes are chosen. There are some specific modified questions regarding to interviewee groups. The questions layout was different but the outcome desired was the same in both interview rounds. Both interview rounds are assessed, and then overall findings are discussed.

First round interview themes were formed as follows:

1. Market feedback
2. Strategy, Planning, and Analysis
3. Collaboration and Cooperation
4. Product Management tools
5. Risk Management
6. External factors
7. Areas of Improvement

Market feedback was first chosen theme. In the interviews, there was clear perspective where market feedback was seen important. Market feedback can be divided into different categories. According to interview answers market feedback comes through sales-people. The feedback consists of customer needs and feedback, market trends and changes, competitors, and in general view from glass industry.

Strategy, planning, and analysis was chosen as second theme from the interviews. Planning and analysis are the foundation of conducting business and decision-making. There was noticed in the interviews that there has been done planning and analysis in some degree. Based on market feedback, internal and external factors, planning, and analysis is conducted. Markets provide data for product management which includes customer demand, needs and feedback. External factors also were seen as important factor for product management planning and analysis. It is included competition, future trends, and other long-term factors. Internal operations have also effect on planning and analysis. It included strategy and vision creation. Company strategy is provided from higher levels which are directing product level strategies.

Collaboration and cooperation were one of the themes that was noticed from interviews. It was seen critical when asked by interviewees. This theme also includes communication which can be seen as important issue in collaboration and cooperation, probably most important issue. Collaboration and cooperation are the most important things that needs to be focused on, especially in product management. Interviewees were asked about collaboration and cooperation. It was seen as job description of product manager. Information flow between different shareholders is also seen important. There can be noticed also the importance of communication and information.

Many different applications and tools are used by product managers. There can be seen that there is tool for all core areas of product management. These areas are product development, marketing, sales, engineering, and project management. Maybe only product management tools should not be as a theme but the most critical issue in product management is information what goes through product management tools.

Interviewees talked about strategies, competitor mapping, information, and market feedback. All of those, in their own ways, are linked to risk management. Interviewees were asked about risk management present status and there was some risk management being done. Customer promises, customizing, and testing rose up in the interviews

when asked about risk management. Risk management was linked to communication and cooperation by interviewees. It was noticed that company tries to focus on those in risk management to ensure product success. These are the reasons why risk management was chosen as a theme and also in addition, it is important theme in whole research.

One of the main reasons for this research is external factors affecting to businesses. From that perspective, and regarding to interview answers, external factors are seen as one the themes in this analysis. External factors were discussed a lot by interviewees. External factors include changes in operating environment, this case good examples are Covid and Russia, which had drastic impact on business operations.

Regarding to objectives of this research, improvement areas are chosen as one theme. This theme will support the overall objectives for case company also to recognize the current status and what is wanted to be improved. Interviewees were asked about improvement areas and there were lots of discussions regarding to this subject. Improvement areas will be discussed further in the proposal chapter.

4.3.2 Second Round Interviews: Rationalizing Theme Selection

Second round interviews were directed to directors of the case company who are or were closely related to product management in organisation. The final themes founded by thematic analysis is shown below:

1. External Factors & Market Changes
2. Importance of Information
3. Cooperation and Collaboration
4. Risk Management
5. Areas of Improvement

Market Changes and external factors was chosen as first theme from second round interviews. These could have been different themes but regarding to discussions in interviews these points were discussed at the same time. Interviewees were talking a lot about case Russia and case Covid impacts on product management and how those events have changed the markets overall. The impact was seen from customer behaviour all over to supply chain problems. Interviewees also talked about other changes in the operating environment which have had an impact on product management strategies. There could be seen some events in the past that have had some actions from product management regarding to operational environment changes.

Information was one of the main topics in the second-round interviews. Information was seen crucial in product management. Information sources were listed by interviewees. Sources were for example, customers, internal operations, and competitors. Information was seen important from the perspective of decision-making. There was also discussion around missing information which had affected product management operations. There was seen clear need for more information from for example information from markets, customers, and competition.

Cooperation and collaboration were chosen as third theme from the second-round interviews. Product management is seen as centre of business. Thus, cooperation and collaboration as seen the most important thing in product management. Interviewees also pointed out the importance of cooperation and collaboration from product life cycle perspective. This means that product management should plan and communicate with different stakeholders internally through whole product life cycle.

Interviewees saw that risk management is being all the time in some way. This means that all people do some kind of risk management, at least in their minds. Risk management is seen that it is integrated to the operations in product management directly or indirectly. Risk management is being done for example in bigger projects and engineering and customisation projects. Risk management is being done too little according to

interviewees and there is clear need for improving the risk management inside product management. Thus, risk management was seen as one theme in this research.

Interviewees were asked about areas of improvement and according to answers, there was lot of areas of improvement. Thus, areas of improvement were chosen as one of themes. From interviews, there was noticed that there are different areas of improvement regarding to product management. For example, areas of improvement were communication and cooperation internally and externally, understanding customer and contacting more customers. Improving interviewees proposal company should be able to be practising more effective product management.

4.4 Proposal for change and improvements

Interview from the company gave important information regarding to what is the current status and what are the problems and development targets. This proposal will be based on company's development needs as one of the main focus areas in this thesis is to develop company's product management process.

From the comprehensive interviews and thematic analysis, we could gather a list what are the development targets. The targets are as follows:

- Product management database
- More defined process around product management
- More comprehensive service reports and gathering information from the field
- More emphasis on communication, cooperation, and transparency
- Better and more documentation
- More customer contacts
- Education about our product around the company
- Involve risk management more around operations
- Better documentation regarding to risk management and pace to the risk management operations

- More focus on analysing possible market changes
- More emphasis on product marketing and communication

Also, it is important to include issues what is seen important in the product management from interviewees perspectives. What the interviewees saw as important are as follows:

- Customer demand and meet the demand.
- Importance of communication, cost efficiency, and gaining competitive advantage.
- Customer based product development and moving towards product business.
- Ensuring profitability
- Product marketing and communication
- Get organisation involved
- Contacting and conversations with customer

What we can see from development targets and what is seen important inside the case company, there is similarities. Documentation and communication clearly emerge the most of anything. What we learned about interviews, interviewees have noticed that there is still room for development, even when these mentioned issues are taken into account. It is clear that development targets are not considered or implemented in any way at the moment as case company is doing fine in product management when considering on going events globally. Interviews indicated that there is a need to be more systematic, especially when changes happen in operating environment.

If we look development targets and what is seen important in case company, there is no clear need to add anymore applications or systems in order to enhance product management effectiveness. Case company is using already tools such as Salesforce, Aha!, Jira, Confluence, and others. Through interviews, there can be identified that the overall communication and cooperation through these applications needs to be improved. In addi-

tion to improving communication and cooperation, documentation needs to be improved and answer might be found through product management applications which company is using at the moment. Improving communication and documentation through tools that are already available and used, there can be formed the desired product management database for example.

Communication and documentation also reach to improving marketing, risk management, market analysis, organisational involvement, and understanding of customer. Involving marketing more would increase effectiveness of product marketing. Marketing can be used through various different channels to get more company's product under customers eyes. Communication between marketing and clear documentation of, for example, product arguments would increase the ease of use of creating marketing materials. Involving other functions inside the organisation would have positive impact, especially in technological business. It is important communicate through strategy and vision and also facilitate education for organisation what is being done and why in product management. It is important organisation to know about company's product in such a technological organisation, especially if people are involved in making, producing, or marketing the product. This was seen important by interviewees.

Emphasizing communication towards customers and to all important stakeholders by product management was identified as one of the improvement areas. There is a link from emphasizing communication with external, including salespeople and service people who are working in field, shareholders to creating more effective analyses of the markets for example, better understanding regarding to customers and their behaviours, and more effective risk management by adding clear documentation with communication.

In addition to above, it is important to acknowledge the starting point. As mentioned before, company's product management is presented in Figure 2. The aim is not to build

new product management process and operations from scratch, but to modify the current process to be systematic. Also, to form most comprehensive procedures and process around product management, this research also uses researchers' perspective and experience with the company operations as a resource.

As the starting point, we are using current status of product management in case company. First, it is important to take a look how does it look if we add scope of product management which was defined in Figure 1. Scope of product management is built around following issues: Product life cycle, product planning and development, brand management, and corporate and marketing planning, competition, customer, and industry analysis. Based on information from present status of scope of product management in case company's product management and information from interviews, there can be seen clearly that scope is reaching everything related to scope of product management what is presented in Figure 1. There can be seen from interviews that even that case company product management operations reach whole scope of product management, that doesn't mean automatically that those parts are implemented efficiently in action.

Based on current status of case company's product management and interview answers procedures for more efficient product management in case company should contain following:

Based on increased communication, documentation, and cooperation					
Involve marketing function more effectively	Use of current product management tools more effectively	Focus on product life cycle	Emphasis in product management to be more in contact with customer	Involve more efficient and systematic risk management	Focus on getting organisation involved more regarding to products

Table 1. Focusing points for product management

These seven focusing points would possibly improve product management process inside the case company. Involving marketing department more means that there should

be more product marketing organized through various channels. The marketing channels should be decided from the perspective of how to reach our customers the most efficiently, for example direct messages, increased marketing on our own channels, sales, or LinkedIn. There should be also input from product management in order to get the most precise argumentation for products. Increasing marketing of our product could improve brand as well. Case company's brand is in good state, but it is definitely not used as advantage as much it could be used, especially when case company is considered as one of the technological leaders in its industry.

In addition to the marketing department, other departments in the organization, at least those that deal with the product, should be better trained around the products. It is important that the employees of the case company, e.g. design and product development, know how the company's machines work, so that they can understand better when, for example, there are cases when products need to be customized or what a certain product does and why the machines work this way. Training should increase efficiency in the project-based operating environment where the organization operates.

Case company has a comprehensive service organization. The service areas cover almost the entire world and upgrade products are available in a very comprehensive manner. It is possible to get spare parts for every product sold with a really fast delivery time. From the interviews, it was noticed that cooperation is not done as well as it should be. Bringing product life cycle thinking into a larger focus area could increase long-term profitability and also increase the sale of new machines if the case company took comprehensive service department more of a into account in its argumentation.

The case company operates with a very high focus on a project basis. Because of this, the customer is at the centre of the business, and everyone is important. Based on the interviews, it could be noticed that product management is not in contact with the customer almost at all. Information about the customers' activities comes from sales, service or, in the worst case, as negative feedback. Communication mainly consists of sales

situations, during a project, or maintenance situations. It would be very important for customers to be contacted in situations other than those mentioned above, outside of sales situations. This also makes customers react differently and the level of communication and cooperation is much better, because the intention is not to directly sell products to customers, but to develop long-term cooperation, which would have a positive effect in the long term.

By increasing and focusing on communication, collaboration and documentation, the current functionality of product management tools can be improved. It can be concluded from the interviews that there is at least no desire to add more applications for product management. It can also be stated that the use of current product management applications and tools is sufficient to produce systematic product management. The lack of systematicity is due to the fact that the information is fragmented and has not been processed well enough. By improving cooperation between departments, by increasing communication and improving documentation, it is possible to significantly influence the use of product management tools and thus the systematization. Applications that the case company currently uses, e.g. Confluence, Salesforce, and Aha! are integrable and able to meet all the required goals in a rapidly changing operating environment. Also, by improving the functions mentioned above, the case company can significantly, without major changes, improve their own risk management skills. The systematicity of risk management is largely based on cooperation, communication, and documentation. Risk management can be implemented by creating risk management sections within existing applications, which must be considered when products are developed or sold.

Based on the above suggestions for improvement, the case company will be able to engage in more systematic product management, which will be able to respond to the dynamic market. In the research, it was noticed that there is not so much a need to bring any new application or tools. With the current tools, the case company's product management is able to implement systematic product management. Systematization is based first on gathering information from stakeholders, who are critical sources around

the product. After this, the case company must invest in communication, cooperation and, after that, transparent documentation. The tools for documentation exist in the company, and implementing systematic product management is partly about free time and the desire to create the desired product management environment that can react to changes in the market. The market in this case means the customers' end and, for example, the subcontractor's end, both of which are really important for a company that implements a very customer-oriented project business.

In this case, the information can be interpreted as many different sources as possible. The importance of information for product management is so critical that its absence slows down or even in the worst case prevents the operation of product management. The interviews revealed that information and increasing its availability is a critical part of product management. This reflects well how important the development of cooperation and communication is seen within the company. Increasing the collection of information will be the first steps towards more effective product management. This includes gathering information from within the organization, such as from planning, marketing, business analysts, procurement, and assembly. In this case, sales and service are counted as external to the organization, in addition to customers and customers' customers. It is also important to note that information and obtaining it may be beyond the reach of product management, such as strategies and visions set by senior management. These strategies are very often refined from future megatrends, which have been carefully examined with analyses and studies. The strategy set by senior management is seen as an excellent source of information, even though product management does not always have actual information about what the strategies are made of. Based on these strategies, product management tries to create a strategy around the products that supports the product and the company's strategy.

Based on the interviews, more information is wanted about sales situations and customers, which in this case are seen as external sources. By adding these, it is possible to analyse the competitive situation, which reflects why the company has won or lost the

deal. Developing the Win/Loss analysis and adding information regarding it is seen as really important in relation to how the company can better argue or develop its own operations in the future. Information from customers can come from other than sales situations, e.g. from a service visit. To obtain this information, increasing communication and cooperation with both the service department and the customer is critical. Obtaining the information in question helps product management to better support product life cycle management and in the future to create long-term entities for customers through which long-term relationships with customers can be created.

A table 2 is outlined below that contains the scope of product management from Figure 1 and added operations that the case company should consider and improve in order to operate more efficiently in a dynamic environment. First row represents scope of product management based on Chunawalla (2008) definition, which was found matching also to the scope of product management in the case company. Second to fourth row are procedures for all of the parts of the product management scope which needs to take into account. Last row defines procedures more specifically for each part of product management section.

Product Planning and Development	Brand Management	Manage-	Product Life Cycle	Corporate and Marketing Planning, Competition, Customer, and Industry Analysis
Increase information gathering from all sources which are important from product management perspective. This includes earlier mentioned sources from inside and outside of the organisation.				
Using product management tools to create on database for important information regarding to product management operations. Tools are available already for case company. Confluence is for example suitable solution for information database. It is also integrable with other tools which are used by case company, for example Salesforce, Aha!, and Jira.				
Increase and facilitate transparency in organisation operations by enhancing communication, cooperation, and documentation.				
Create transparent information flow	Involve marketing department more	Unify new machines, upgrades, maintenance, and	Involve product management to	

between development and other functions in product management through product planning which comes through corporate and marketing planning.	efficiently to increase reach and to be more in the eyes of the customers, for example with new products.	spare part departments together for increasing more product life cycle thinking for profitable continuity.	corporate strategies more. Use analyses more in product management decision making.
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Table 2. Procedures for product management

5 Conclusions

The study examined the case company's product management and how they can improve their operations in a rapidly changing operating environment. The starting point of this research was how to respond better to the changes in the operating environment caused by case Covid and case Russia.

The research was carried out using the researcher's knowledge of the case company, through which it was possible to form a current picture of the scope of the company's product management. In addition to this, interviews were organized, with the help of which it was possible to map the needs and development targets more precisely. Based on the interviews, it was possible to create a framework and procedures for product management, which enables it to function effectively in a changing operating environment. In addition to improving the current state of product management and operations, this study aimed to propose a refined procedures for the product management.

1. What kind of product management process needs to be implemented to react to changes in the operating environment?
 - a. What changes in the operating environment require proactive responses in product management, and what information and tools are necessary to support effective decision-making in this process?
2. How product management process at case company should be developed based on the findings?

The research questions were addressed through analysis of the interview responses and the conclusions drawn from them. We were able to answer the research questions directly and indirectly through the proposal, which has been presented earlier. The proposal presents product management with a reference framework and instructions on how product management could work efficiently and systematically.

When examining the matter to be investigated, it could be noticed that even though the topic of the study was born based on case Covid and case Russia, all changes should be reacted to, because changes in the operational environment usually always affect product management in some way, especially through the proposed reference framework. The importance of information was emphasized a lot in the interviews and its acquisition and processing is seen as vital in order to create a good basis for communication, cooperation, and documentation in product management. The interviewees brought up development targets and important issues related to product management, which have been taken into account when the new reference framework has been proposed. From the interviews, it could be seen that in the big picture, the company has at its disposal the necessary tools to implement effective product management in a changing environment. A solution was found to make better use of the tools through more efficient information acquisition, communication, cooperation, documentation, and transparency.

The study used artificial intelligence to analyse interview responses. Artificial intelligence assistance used in a very simple style was seen as positive and surprisingly good. The most significant benefit was found on the temporal side. In terms of time, artificial intelligence was able to produce a simple thematic analysis quickly and efficiently compared to if the researcher had performed it manually. A researcher can recommend the use of artificial intelligence for simple analyses, but in the future, the use of artificial intelligence in more complex analysis should be treated with caution and the functions of artificial intelligence should be studied more, because the reliability and truthfulness of artificial intelligence must be taken into account, especially when large amounts of complex data are processed. The data used in this study was simplified for artificial intelligence, which helped to make a simple analysis.

5.1 Limitations

Regarding to the research topic, product management and its processes, it is broad term and conducting this research will describe only the perspectives of researcher and interviewees. Being a broad concept, input from other than product management function is

not considered heavily in this research. Mentioned earlier, product management operates extensively inside the organization and if further investigated, there should be more functions inside the organization taken into consideration to get more comprehensive results.

There has been found limitations regarding to the usage of ChatGPT. Nguyen-Trung (2023) found that ChatGPT had limitations on handling large and detailed analysis and AI does not have always consistent results which does mean that AI is not learned enough of qualitative research. Morgan (2023) found that AI was performing quite well finding descriptive themes but had difficulties to find interpretive themes. According to Morgan (2023) ChatGPT lacks post-hoc nature and there is possibility of bias in the analysis. This is depending on how the AI is educated. Also, Morgan (2023) found that ChatGPT could give answers that are nonsensical which means that there is a need for researcher to analyze the answers in order get the data correct. Perkins & Roe (2023) found that AI can be helpful and beneficial but there still needs to be human intuition and judgement in order to produce reliable and quality results. Goyanes et. al. (2023) found that at current state of AI, it cannot substitute human dependence. There is still a significant need of human interpretation for producing quality analysis. Morgan (2023) found that privacy is one limitation as there is not clear understanding how the data analyzed are used in the future. Anonymity is useful in this case but there are not marks that AIs are in threat, but it is possibility.

Product management and its scope is a wide-ranging entity. Although the purpose is to study product management, it is possible that the topics focus on certain points based on the author, the research method, and the target. This resulted limitations for this study as well, such as for example not all product management interfaces could be processed based on the reasons stated earlier. In addition to this, the author's time, and resource challenges to produce completely comprehensive research on a broad subject area such as product management are also a challenge. The results of the study can also be used for studies of other case companies, but it is important to consider the diversity

of companies and the differences between companies in their ways of operating. The qualitative research method was suitable for this research, but it would have been possible to carry out the research with a quantitative research method, when the angle of approach to the topic would have been different from that in this study.

5.2 Recommendation for future research

Through the proposal of the research, it can be stated that by implementing the proposal regarding product management functions, it is possible to better react and determine when there is a need for change, based on the fact that through new proposals, information is better presented, and the flow of information is even more transparent. However, in addition to the proposal, strong information-based decision-making is needed from product management, which could be the subject of future research. The possible subjective decision-making of product management decision-makers based on preferences and experience based on the past are influential factors in the operation and direction of product management. In addition, measuring the effectiveness of using product management tools is seen as an object of further research. Also, measuring the implementation of measures, in whole or in part, based on the proposal, if the proposal is implemented in one way or another, would possibly be the subject of research in the future.

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Appendices

Appendix 1. First round interview questions and answers

Question	Answers
<p>What information do you need in product management?</p>	<ul style="list-style-type: none"> - Information from markets. This includes market feedback (customer and market trends), sales feedback, and does our product meet customer's demands. Markets are important to know when we are developing something new for our customers. - Customer needs are important, even the feedback comes from one customer, it could be very important for us. For example, when we are selling new products. Customer feedback helps us to create better functionalities. - Information from competitors. This includes what kind of products our competitors are making, how are they competing against us from perspectives such as marketing and argumentation. We need to react to the competitors changes if needed. It is important to evaluate competitors to reach more competitive advantages. - Information from different subdivisions around glass industry. This includes standards, glass makers new products. - Feedback from product team. This includes how does the product perform, is there challenges or doubts, are there development needs, is there

change needs in assembly/structurally, cost development feedback, feedback from experts for example development of standards and requirements. When we are creating something new, there needs to be some kind of pre-planning and pre-study with product teams before we start making anything.

- Cost development is one aspect also which is important factor. When we are developing something new, we need to have clear understanding about our costs (not only when developing something new but all the time).
- Constant challenges and broader problems that affect warranties. When creating strategy, this perspective needs to be considered.
- Lifetime of the machines need to be monitored. This includes how long machines have been running, where are machines located, how machines are used, and what products machines are used for. Service department gives also important information about our products performances and challenges, especially information from service engineers is seen as crucial.
- For strategies, inputs come also from inside the organization. Management of the organisation gives input for where the company is heading which also drives our development and direction.
- Also, information from subcontractors and suppliers are considered very important. This includes

	<p>components and items we are using to manufacture our machines. The information usually from these sources comes from sourcing and procurement function.</p>
<p>What kind of product management tools do you use in your work?</p>	<ul style="list-style-type: none"> - Not really or directly a product management tools in use now where all the product management information is gathered to the same place. One upcoming application is Aha! which is partly dedicated to the product management where we are road mapping our product developments. There is no place for documentation of competitor information or if there is a documentation, the information is not at same place. - Salesforce is considered one tools of product management as that is used by our sales personnel and to communicate our product offering and pricing. - One simple tool is Excel where budgeting is made and also cost structures for our machines are in excel based. - Confluence is one tool what it is used actively. At the moment, it seems to be slightly complicated as there is some repetition. Many tools are used in some ways but no need of new ones. In theory these work well but the implementation of these tools needs more emphasis.
<p>Do you see better competitor mapping in product management as an opportunity?</p>	<ul style="list-style-type: none"> - Information from competitors is seen as very important. Although, we know about our competitors technologies, but we want to know more about our competitors for example products, portfolios, and features. This will be helpful for our

	<p>sales representatives in argumentation when we are in competitive situation.</p> <ul style="list-style-type: none"> - It is important as in some parts competitors affect in our development directions. - Our customers are also mapping our competitors when making purchase decisions, so we should also do that.
<p>How do you prioritize the features of the products (options) to be developed?</p>	<ul style="list-style-type: none"> - Customer demand is seen as high priority what comes to developing new features to the machines. Prioritization is developed mainly from the subjective perspective of the product manager. although, product manager cannot be expert in every different aspect what comes to the product as a whole. Prioritization depends on a lot about the feature itself. If the development feature is sold, it will be in highest priority and that needs to be done first. Is it narrow or broad to implement, what fits to the main strategies, how does it fit to workload, what is seen to be helpful or needed, does it give cost savings, does it give competitive advantage. There is not systematic way to make a comprehensive decision making about all the above points made. It based on product managers own point of view what to do and when. To condense, basically decision making is based on a product managers own view with a little help from different functions and experts who are linked to manufacturing the product or feature. Of course, the aim is to make decisions with product team and the prioritization is sum of co-operation.

	<ul style="list-style-type: none"> - Aha! has scorecard which in use in some cases but it needs to be more comprehensive what it is now. - Communication between internal and external seen as important as from there could come up some very good input for future development.
<p>Are the current products based on customer needs?</p>	<ul style="list-style-type: none"> - Yes, mainly based on customer needs. Glass industry is evolving, and customer needs are developing based on that. As a company, we need to react to that to match our offering to the demand. Strategy based product and marketing-based products are also brought to the markets. Strategy based product are in line with organizations internal strategies and marketing-based products are product which are brought to match the general trends which are on going at the glass markets. - We are as a company in some way pioneering in technological developments, so some products are based on our own innovation. - Competition has also some affect to our product offerings.
<p>How do you ensure that your products meet customer needs and generate value for the organization?</p>	<ul style="list-style-type: none"> - At the moment, we do not have specific tool or data is not centralized which is created challenges for systematic practising. There are two main information sources regarding to this is sales and service departments. One source is also directly from customer in a form of feedback, but it is minimal when comparing to customer communicating through sales and services. Interviewing customers more to get more detailed information about

	<p>their needs is seen one of the development points in our operations.</p> <ul style="list-style-type: none"> - Increasing communication between product management and customer could create more feedback, especially positive. Now, the feedback coming from different channels are mainly based on challenges with customers production.
<p>What strategies do you use to differentiate your product from competitors' products in the market?</p>	<ul style="list-style-type: none"> - Fairly new product manager, so product strategies are based on what was created before. - Strategies are created before case Covid and case Russia, so there have been rather radical changes after those strategies are created. Hard to follow now. - Information of competitors are seen very important how the product strategies are created. We go through competitor's argumentation and plan how can we argue back and succeed in competitive environment. - Our company has been pioneering in terms of innovation so monitoring competition has been minimal as the competitors are following what our company has done. - One good example is energy consumption now which has come from customers and from competitor's argumentation. Creation of energy efficient solutions have come up from reacting to competition in the market.

	<ul style="list-style-type: none"> - One is customization for customer. We try to solve one customer's special challenge. We have very experienced and competent people. From that, we can create competitive advantage.
<p>How do you identify changes in the market or operational environment that affect the products?</p>	<ul style="list-style-type: none"> - Information about possible changes in the market comes from salespeople. Customers ask different possible solutions and that would lead to new products or solutions. The information includes for example what the customers are doing with our machines and what new product has come up. - We react to the feedback by starting to study the issue or situation and possibly implement actions towards that. - Some ideas come up from inside the organisation as an idea. These ideas also, if seen as important, are taken into consideration.
<p>How do you collaborate with different functions (cross-functional teams), such as design, sales and marketing, to ensure the success of your products?</p>	<ul style="list-style-type: none"> - Lot of cooperation with different functions and it is critical. Basically, the whole job description is working together with different shareholders, internal and external. As a product manager, the job is to form together the information gathered from different shareholders and react and make decision based on that information. With the cooperation between different functions, we try to create solutions and make decisions. It is important to cooperate and not only make subjective decisions as a product manager. - Product managers also teach and educate other functions regarding to their responsible products.

	<p>This has been a bit minimal but seen as important for company.</p>
<p>How do you communicate product changes to customers and internal teams?</p>	<ul style="list-style-type: none"> - It has its challenges. Communicating information internally has been weak for a long time. Communicating information for example between engineering, marketing and sales should be constant to ensure the best results. Product management has been leaned more towards sales department. More transparent internal communication is needed. - Communication to external, especially to customers, is mainly based on sales situation. For example, if we have an upgraded structure or feature and customers have old version. Other than sales situation, communication on product changes mainly consists of completely new features which we want to market to know. - Some business lines this is seen in a good status. There is constant communication between key persons weekly, even more.
<p>Do you do risk management in your work? What kind?</p>	<ul style="list-style-type: none"> - Yes, risk management is being done. One good example is promises to customers. Customized products need some risk management based on the difficulty. In customizing, we go through with the experts the proposal of the feature or something else. It is critical to have full confidence in doing the customisation. In some cases, if it is seen as high risk, customer is also communicated and trying to figure out together with customer. Commu-

	<p>nication and cooperation between different functions is critical to ensure efficient risk management for our products.</p> <ul style="list-style-type: none"> - Testing is seen as important, but not always done and relying to experts' opinions and experience. - Risk management is also done from the perspective of cost structure of the project.
<p>What kind of risk management tools do you use?</p>	<ul style="list-style-type: none"> - There is not targeted tool for that. Risk management in our organization is based on information flow. It is critical to get information about customized products from different functions such as engineering if there are obstacles, challenges etc. - Some risk management is documented to the confluence, but it isn't seen as mandatory at the moment.
<p>What kind of challenges do you see in risk management at the moment?</p>	<ul style="list-style-type: none"> - Documentation is very important. It ensures more transparent information flow. If there is not documentation, challenges could rise later even there has been done some risk management. Documentation becomes important if we are customizing products. - Testing on the field is seen as challenge. - At the moment financial risks are seen as challenging because of the rising costs of the components.
<p>How did case Covid affect product management?</p>	<ul style="list-style-type: none"> - Rising material costs, rising freight costs and availability of components affected our delivery times and forced to react with our pricing. Forecasting costs for projects became very hard. Cooperation intensified with procurement function to ensure we had right component for the right projects. Had

	<p>problems with procuring for example semi-conductors and those caused problems, including rising costs and longer delivery times. Needed to keep some buffer stocks for different critical components and it is costly but necessary.</p>
<p>How did case Russia affect product management?</p>	<ul style="list-style-type: none"> - One geopolitical market disappeared, and it changed markets overall. It brought financial losses to the company. In Europe specifically, decision making was hard and slow for customers and the situation is very unclear. - Did affect raw material and energy costs. Some our components were produced in Ukraine which become unavailable. There was need to choose alternative sources for specific components.
<p>Based on Case Covid and Case Russia, can you think of what kind of risk management could have been done?</p>	<ul style="list-style-type: none"> - Very hard to react this kind of massive changes. Some cost reservations could be made earlier and warehousing critical components. Proactivity not mainly in product managements hands. - Some learning happened on sourcing and procurement function for sourcing alternative solutions for components, especially critical ones.
<p>If you could, how would you develop product management and product management processes in the company?</p>	<ul style="list-style-type: none"> - Some kind of product management tool or database is needed where all the information could be gathered and structured. Information, now, is very fragmented. With this, we can remove the human dependency and decrease mistakes. Also, the information needs to be synced with different tools to prevent unnecessary repetition. - About the process, it is needed to create a process where we can make decision what products to

	<p>bring to the markets and what product should be terminated. More systematic process for feedback and development proposals.</p> <ul style="list-style-type: none"> - Service reports could be more comprehensive. - Communication and transparency are seen as important and needs more emphasis between functions. - More and better documentation needed. - More customer contacts for product management to get more open communication for feedback and ideas between PM and customer directly. - More education about our products to our organization and get proper understanding about our products, especially to personnel who are in key roles.
<p>If you could, how would you develop risk management in the company?</p>	<ul style="list-style-type: none"> - More control to the customer promises and specifications. Involve more risk management to that. - More pace to the risk management, risk management takes too long as it is not done regularly and not documented.
<p>What things do you consider most important in product management at Glaston?</p>	<ul style="list-style-type: none"> - Customer demand and meet the demand. We produce as much as possible for the customer and thereby profit for the company. It has been designed and implemented in such a way that it is a durable product that maintains our company's brand and reputation. - Importance of communication, cost efficiency, and gaining competitive advantage. Customer based product development should be primary. Maintaining cost control is seen important also.

	<ul style="list-style-type: none">- Moving towards product business and not only customer customization.
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Appendix 2. Second round interview questions and answers

Question	Answers
<p>How did case Covid affect product management?</p>	<ul style="list-style-type: none"> - Covid had huge impact on the product management. Product management needed to adapt to occurring situation. Controlling component shortage and drastic price level changes were difficult for product management to handle. - Biggest impacts were on the huge drop on demand. Case Covid created uncertainties in customers mindset. In year 2020, everything basically was shut down. Some biggest players in the markets saw this as an investment opportunity which helped a lot our business. Also, people stayed home and tried to do by themselves some renovations which affected positively to our business. - Covid impacted heavily to the availability of components and general price levels which affected our project budgeting and margins/profitability. - Case Covid raised question such as how to react this kind of drastic change in the market? Should we consider adapt to decreased demand or is this just short-term negative impact? - Demand had already dropped in some business areas before covid hit. From that there is need to more take look into statistics and indexes from where we can evaluate possible demand changes. - If we look more closely, at the very beginning of the pandemic, covid didn't affected to the de-

	<p>mand. The affect to the demand decreasing happened when there was difficulties and restrictions in supply chains.</p>
<p>How did case Russia affect product management?</p>	<ul style="list-style-type: none"> - From business standpoint the impact was lot smaller than in case covid. One business area disappeared but it wasn't big market for us. - Increased the component unavailability and prices. Doubled the affect with pandemic. - Steel prices increased drastically. Affected to our margins. - Energy prices increased drastically. Affected to customers margins. - Energy prices had some impact on our development on more energy efficient solutions. - Impacted to inflation, but some reservations were made when covid happened. - Cost checking increased and monitoring it increased. - Case Russia raised same kind of questions what case Covid raised: How to react to these kinds of changes? - Possibly outsource our production to somewhere else closer to customer and more cost-efficient place. For example, to China but this creates more questions on how our customers react to that part of our machines came from China which were previously build in Finland. This mainly depends how things are evolving and not really in implementa-

	<p>tion at the moment. Some customers were indicating that they want machines closer to their operations and not for example from China.</p> <ul style="list-style-type: none"> - Both cases mentioned affected heavily on the markets from demand side in different regions because customers didn't want to make investments and were uncertain about their decision making. Covid made customers to be more cautious and case Russia made them even more cautious. This maybe showed more in rhetoric but not mainly in operation or end decision making. - Glaston, in 2022, had nevertheless good year because of the America markets. - Case Russia had direct/indirect impact to the decreasing demand. Length of the war is also creating more uncertainties and impacts on our results. Demand isn't ending completely but many projects are pushed forward. Maybe some of what same what was happening before Covid hit. - Political crisis affected to the competition environment. Maybe some east vs west set-up was in the horizon. Maybe too early to say if it is positive or negative affect for us. - We didn't reserve our stock with spare parts when these cases happened.
<p>Are there other factors in the operating environment that have caused you to make significant changes to your product management strategy in the past?</p>	<ul style="list-style-type: none"> - Legislation and standards have impact. If there is a change in that, there is immediate to demand. Following regulations and legislations is important to us. This affects for example quality requirements.

- There is also affect from what kind of glasses our customers are producing. Coatings and different glass sizes are prime example of these.
- Great example is lamination. There was rapid increase of demand in lamination machines as there was need of more laminated glass. We launched our lamination line in 2014 and partly reason for that was that there was increased demand for laminated glass. Although legislation started to lean towards more laminated glass afterwards which did increase demand of lamination.
- Anisotropy is one phenomenon. From customer feedback and markets there could be noticed that anisotropy in glass raised concerns. Based on the feedback, measurement device was created to measure anisotropy. Glaston was one of the companies who did push new measurement standards for anisotropy. We also did create measurement device with cooperation of another company.
- White haze is good example alongside anisotropy where customers have some problems with it. White haze has existed on a glass for long time and nowadays Glaston has created measurement device for it also.
- Profitability and value creation for customers is one of our main goals, so for example shortage of manpower is causing challenges for our customers. Also, there is different factors that affect our customers such as high interest rates at the moment. These things affect a lot to our business.

<p>What kind of information do you need in product management?</p>	<ul style="list-style-type: none"> - Cost and availability of components. - Regulation and standardization information. - Some market monitoring is done but could be more, especially from product management perspective. - One critical information source is customers. Customers gives us the most up to date information what is happening in the markets. It is important to listen customers and answer with correct offering. - Information about our customers' customers - Sales and service people give us information about our products. - Competitor information is seen important. - Architects and builders' ideas - Technology and product development - Product management is in the middle of the organisation, which touches little bit everywhere.
<p>What kind of information is important from a decision-making point of view?</p>	<ul style="list-style-type: none"> - Profitability and competitiveness. Profitability/sales volume. Operational quality costs. - Market information and competitor information. - Won-Loss analysis seen as important, but we don't implement it much. - Also, previous questions have answers which affect a lot about decision-making.
<p>From which source of information would you like to get more information?</p>	<ul style="list-style-type: none"> - Market information in more refined form. To get more detailed documentation and analysis. This also could help for Won-Loss analysis.

	<ul style="list-style-type: none"> - More information about customers. Increasing contact between customer and product management. - How could be learn from customer as an organisation, not only individually. - More emphasis on presenting our offering for customers. - Competition information.
<p>Can you describe a situation where a lack of information caused challenges in your product management work?</p>	<ul style="list-style-type: none"> - In general, maybe we are too flexible in some cases. - Clarifying Won-Loss analysis to get more detailed information what is important and what is not. - More clarity to determining quality costs. - Product lifecycle perspective to be more present for more informed decision-making. - Payback calculator. We could prove profitability for our customers. - Need more knowledge about customers environment inside our organization. Customers are probably using also equipment from other companies and their operations does not only consist of our machines. It is important to know customers operational environment.
<p>What kind of product management tools do you use in your work?</p>	<ul style="list-style-type: none"> - Salesforce, Aha! , cost/price lists, Confluence, energy cost calculator, budgets, Showell, SAP.
<p>What are the most important product management tools in your opinion?</p>	<ul style="list-style-type: none"> - Salesforce is up there. Salesforce can be the place where product management get most of the information of what happens in customer end. - Budgets and SAP - Also, Aha! and Jira seen important.

	<ul style="list-style-type: none"> - Biggest concern is that there is not integration between all the important applications. That would make communication more transparent and would improve our operations.
<p>How important do you consider cooperation with different functions (cross-functional teams), such as design, sales and marketing, to ensure the success of your products? Is there anything that could be improved?</p>	<ul style="list-style-type: none"> - Product management is in the centre. From that, cooperation is the most important thing. - It is important to keep communication through organisation clear and transparent, including external and internal shareholders. Transparency and communication help increasing knowledge inside the organisation. - Cooperation and communication are seen important also from the product life cycle. - We have very competent and experienced people working here but at the same time we do not probably use it as an advantage at fullest as we could.
<p>Do you do risk management in your work?</p>	<ul style="list-style-type: none"> - In some ways there is risk management being done all the time. Risk management affects directly/indirectly to all our doings. - Some risk management is being done in the big picture and within the projects.
<p>What kind of risk management do you do?</p>	<ul style="list-style-type: none"> - Engineer to order projects has some risk management. - Project overall have some economical and technical risk management. Now, we don't have formal tool for that. - Risk management is being done and documented slightly. This consists of economical, technical, and financial risks. These needs improving, especially documentation.

<p>Do you see doing risk management as something that could be developed and taken into account better?</p>	<ul style="list-style-type: none"> - Absolutely. Risk management should be more involved in documentation form for product management. With that, risk management could be more transparent. - On risk management perspective is also our competence inside our organisation. Do we have constant continuum regarding to that.
<p>What do you think are the most important things for Glasto's product management to work as it should?</p>	<ul style="list-style-type: none"> - Ensuring our profitability. Ensuring that we reach our strategic goals and move towards our vision. - Understanding customer needs and communicating it to the organization. This should be affected to our product offering directly. - Product marketing and communication. Market presence through our own marketing communication. - To get organisation involved more. More communication through strategy and vision. - Ensuring that our sales have tools for argumentation. - More contacting and conversations with customers.
<p>If you could, how would you develop product management and product management processes in the company?</p>	<ul style="list-style-type: none"> - Bring company's vision more exposed. - Pursue to be more systematic. - Product management should be more awake to react to changes in markets or elsewhere. - Product management should be more active in gathering information from sales and service. - More cooperation and communication between functions.

	<ul style="list-style-type: none">- More education for our organization about our products, customers, and their environments.- Customer information and promises should be more transparent.- Product marketing and communication should be better internally and externally.
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