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Product Portfolio Management – Current challenges and preconditions

Arto Tolonen¹ Hanna Kropsu-Vehkaperä² Harri Haapasalo³

Abstract

The main objective of this study is to clarify the current challenges relating to Product Portfolio Management (PPM). Also, any preconditions for active PPM in terms of processes, tools, performance measurement and governance models are presented. Current state analysis is based on both a thorough literature review and case companies (10) representing business areas such as HW, SW, Services and Solutions. This study approaches PPM from a more comprehensive viewpoint than the traditional new product development (NPD) or sales & marketing focused PPM that is mainly covered by the existing literature. The implications of this study include the potential preconditions of clarifying the dynamic role of PPM. The findings can aid business managers in understanding the PPM as an entity that has a role in managing the existing product portfolio and its renewal based on strategic performance measures over product lifecycles. The portfolio renewal happens via NPD, by joint ventures and by removing old products. The primary role of PPM should be active management of current product portfolio over product life cycle instead of merely focusing on new product development. This article sets questions for further research whether PPM ought to be considered equally as a business process.

Key words: Product Portfolio Management; Performance Measurement.

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1. Introduction

New products are seen vital for securing a company's competitive position in the market (e.g. Balachandra et al., 1997; Poolton and Barclay, 1998; Lynn et al., 1999), while the development of new products is strongly driven by various customer requirements. However, there are also several other drivers that initiate product development (e.g. Majava et al., 2013). Aside new product development, also existing products are upgraded frequently to achieve cost reductions and improve product performance (Hänninen et al., 2012). The new and existing products require different types of target setting, key performance indicators and even separated organizations (O'Reilly III and Tushman, 2004). Today, also company mergers and acquisitions are meaningful ways to enter new markets and widen a company's product portfolio without conducting new product development. This kind of environment leads easily to widening product portfolios as has occurred in several industries during the recent decades. (e.g. den Hartog, 2012). Increasing number of joint product development projects are executed by alliances even that adds the complexity and risk of cannibalization of firms (Gerwin and Ferris, 2004)

The common belief is that a diverse product portfolio will have a positive effect on a company's sales volumes. A wide product offering is seen to allow reaching many customer segments and a larger market share. A high product variety is thought to stimulate sales by segmenting customers and attracting variety-seeking shoppers. (Wan et al., 2012). This coin also has its other side that is often ignored in the discussion. In fact, internal product variety and complexity usually reduce sales per product variant. (Cooper and Griffiths, 1994; Randall and Ulrich, 2001; Thonemann and Bradley, 2002; Pil and Holweg, 2004; Wan et al., 2012). Product variety is often justified by fulfilling customers' requirements. However, too wide product range can lead to mass confusion by the customers, thus weakening sales (e.g. Jiao et al., 2007, Wan et al., 2012). One example of the positive effects of reducing this type of mass confusion is Procter and Gamble increasing its sales by 10 % by reducing the number of versions of its Head and Shoulders shampoo from 26 to 15 (Wan et al., 2012). The other example can be taken from housing and real estate markets. The housing prices are determined more by other factors than the supply volume of housing (Bojnec and Romih, 2011)

Product variety has emerged as a source of competitive differentiation responding to the requests for increasingly customized products and services, when the variety is even desired (Hayes et al., 2005). One aspect that is often ignored in the literature is managing the product plans, products under development, and products in the market over the product life cycles, from an end-to-end viewpoint. Today, companies are often too focused on managing single products instead of managing the entire product range. Consequently, companies could benefit from considering several product families rather than separately optimizing each product. (Salvador et al., 2002). Productivity can be achieved by working smarter according to company strategic objectives rather than just increasing the amount of work (Pekuri et al., 2011).

This research paper aims to analyze the current main challenges of product portfolio management (PPM) faced by ten case companies. The literature review about the theory of PPM and process management methodology is used as a base frame for the used interview questionnaire. Challenges identified based on the interviews are classified to clarify the most common and significant ones. PPM, as any other processes, requires the availability of certain building blocks as preconditions. This paper also aims to clarify these preconditions to further improve PPM practices over the product life cycle.

The above discussion can be condensed into the following research questions:

RQ1. What are the challenges related to product portfolio management?

RQ2. What are the preconditions for product portfolio management?

This study addresses the research questions by using a qualitative and inductive approach, through case company interviews and a literature review.

2. Earlier research

2.1 Product Portfolio Management

The portfolio management approach can be applied in various areas to manage a set of activities conducted by the same pool of resources (Vähäniitty, 2006). The main objectives of portfolio management can be

defined as 1) maximizing the value of the portfolio, 2) balancing the portfolio, and 3) linking the portfolio to business strategy (Cooper et al., 1997a). The long term growth and profitability of the company are impacted by the right product portfolio selections (Mikkola, 2000). In addition, portfolio management can be seen as a higher management level decision making process for managing uncertainty, dynamic opportunities, strategic goals, and interdependencies between portfolio items to obtain clear decisions based on agreed criteria (Cooper et al., 1999). The cross functional and executive level steering for product portfolio management is the crucial element for the success of right product decisions (Cooper et al., 2001). The structure of executive team has a direct impact on the value of a company (Meeamol et al., 2011). Products can be evaluated based on their strategic importance and ability to become top class products. Also, resources should be allocated to products according to their business value. (Ward and Peppard, 2002; Kinnunen et al. 2011).

2.2 Product Portfolio Management challenges

Many product portfolio related challenges have been presented in Hewlett-Packard's portfolio management and operations research (Ward et al., 2010). According to Ward et al. (2010) the following challenges have been identified for offering multiple similar products: 1) increase in overall demand volatility, 2) reduced forecasting accuracy, 3) impact to revenue and the cost of the product over life cycle, 3) increase in inventory-driven costs and order cycle time, 4) increased liabilities to channel partners, 5) increased cost for operations, R&D, marketing and administration, and 6) the complexity of product lines that confuses customers, sales representatives, channel partners and even driving business to competitors. Optimization of the product development portfolio is more difficult more there are interdependencies between projects (Dickinson et al., 2001). Ward et al. (2010) also present solutions to overcome these challenges. These solutions are grouped into managing product portfolio by a "complexity ROI calculator" within product creation life cycle, and managing product variations by a "revenue coverage optimization tool" after product launch.

The interests towards PPM have increased due to many negative side effects of the portfolio management not being done properly. Cooper et al. (2001) have listed the following negative aspect such as a) missing strategic criteria in project selection resulting in unimportant and low value projects and too many of them and b) deficient go/kill decisions for low value projects

resulting in too many extensions, modifications, enhancements, short term projects and lack of focus. However Cooper et al. (2001) concentrate only PPM practices within the new product development phase not over the entire product portfolio over product life cycle.

One of the challenges of PPM is the lack of consistent interest and understanding by different areas of senior management. Senior management focused in technology has the most important role in PPM, followed by senior management in general, and corporate executives. Marketing and Sales managers are seen to have the least important role as they are seen to operate at the customer front end, with a clear role in project selection and portfolio management. (Cooper et al., 2001). The organizational design and management practices have direct impact on company's performance for simultaneous break through initiatives and traditional enhancements (O'Reilly III and Tushman, 2004). The misalignment of the product and organizational structures increases the challenges in complex product development (Sosa et al., 2004). Specialization of the skill limits the capabilities to use the same development resources over many sub portfolios (Beaujon et al., 2001).

One of the most significant weaknesses of existing commercial IT-solutions for PLM is the poor support of product life cycle activities outside the actual product development process. Second significant gap is the integration of mechanic, electronic, software, and services components, and elements such as the full view over products. (Saaksvuori, 2011). The overall knowledge about product architecture might be available only by separate organizations (Sosa et al., 2004). According to case study in welfare service business, the key improvement actions to be focused to costing system and product definitions (Hänninen et al, 2013).

2.3 Process management approach for active PPM

In this research the ideas for active product portfolio management are looked from current theories in PPM, strategic planning, process management and performance measurement points of view.

The linkage of strategy and operational measures can be strengthened by using the GQM (Goal Question Metric) type of hierarchy. The goal as the highest level objective can divided into sub targets and related measured by answering derived questions. (Basili et al., 1994). The strategy

implementation and linkage to operative level measures can be also illustrated by "performance pyramid". In this method, the objectives are derived from the top to down and measures from the bottom to up. (Lynch and Cross, 1992).

According to Kaplan and Norton (2001), the following five principles are the foundation for strategy driven objective setting and performance management: 1. Describe the strategy into operational objectives, 2. Align and integrate functional organizations into the strategy, 3. Embed strategy for personal objectives and rewards, 4. Run strategy a continual process and 5. Implement change by mobilizing executive leadership teams. The very similar approach is proposed by Rummler and Brache (1990) by concept of the "three levels" of performance: organization, process and job/performer levels can be seen as an ecosystem dimensions to business performance. According to Rummler and Brache (1990), organizations produce their outputs through cross functional work processes, organizations being only as good as their processes. Processes are performed by individuals holding various jobs. Rummler and Brache (1990) also present three "performance needs" of goals, design (the structure of organization, processes and individuals,) and management based on clear performance measures. According to Rummler and Brache (1990), active cross functional processes are critical to the quality, productivity, cycle time, and cost of any company.

According to Paliszkiewicz (2011) the trust between employer and employees is the essential enabler for the success of organization. The organization strategy and goals of processes to be linked together. People to perform the tasks according to processes and related performance measures to be capable of making things on the more predictive way rather than proactive. The foundation is organizational strategy and process architecture. (Haapasalo et al. 2006; Jeston and Nelis, 2008).

Improvements can be done in two different ways in principle such as by breakthrough type of approach or by continuous improvement. Business Process Re-engineering (BRP) has been utilized for more radical changes. The BRB methodology includes several phases: the reaffirmation of the vision, core process identification, process analysis, process re-design, blueprinting and implementation planning. (Slack et al. 2012).

According to Jeston and Nelis (2008) the foundation for Business process management consists of the following building blocks: 1) process

leadership, 2) process governance, 3) process performance, 4) strategic alignment, 5) people capability, 6) project execution, and 7) technology.

3. Research process

The research process is shown in Figure 1. This research utilizes qualitative and inductive research methods. The existing theory in relation to product portfolio management and its performance measurement was first studied by using the existing literature as a key source. The empirical study consists of industrial interviews.



Figure 1. Research process.

Process management theory and approach were utilized to create a comprehensive questionnaire for the empirical part of the study and to analyze whether the current practices apply process management methodologies. The viewpoints are PPM processes, tools, target setting, performance measures, governance models and data availability.

Ten selected companies (Table 1) were interviewed to clarify the current practices and challenges related to PPM. The interviews were recorded, extracted and transcribed to enable thorough analyses. The selected ten companies represent both large/global and small/growing businesses such as Solutions, HW, SW, and Services products, or all of them simultaneously. The number of interviewees are dependent on the size of the case company. In bigger companies, the interview has been conducted as several workshops of cross functional group of managers while in smaller companies only CEO, R&D or Product Management type of managers have been interviewed.

Table 1. Company characteristics

CASE	Portfolio characteristics	Operational maturity	Interviewees' responsibility areas/roles	# of interviewees
A	The small portfolio of HW products and related emerging service business. Retailers and business customers.	New national rival in mature business	CEO	1
B	The large portfolio of solutions, HW, SW and Services products under strategic renewal. Global business customers.	The experienced global innovator in both mature and new business with strong R&D investments.	PPM Development Manager, Product Data Manager, F&C Manager, Product Manager (2), Process dev manager (2)	7
C	The small innovative portfolio of SW products. Consumer customers via business partners	Growing international presence in new growth business	CEO, R&D manager	2
D	The global portfolio of HW, SW and Services products. Business customers.	The global supplier with long history in the business. Both organic growth and by business acquisitions	Head of IT PLM, PLM Architect, Global sales support/product management, Master thesis worker PDM, Global Production Engineering, Supply Chain Management development engineer, Supply Chain Management development leader, Production platforms, Product development engineering, Sales configurator development program, Mechanics multi brand components, Spare parts, Services Business, Product and Engineering process owner	12
E	The new service oriented product portfolio is being established recently. Regional consumer customers.	New innovator in in growth market	Head of business unit, controller and project manager	3
F	The small portfolio of HW and SW products. Global business customers.	The experienced growing company in mature global business	R&D manager	1
G	The medium size HW product portfolio under strategic renewal. Global, regional and local business customers.	The experienced global leader in declining business, new growth and business potential via portfolio renewal	Product Management Manager	1
H	Attractive traditional HW product portfolio for consumers with new additional services and HW accessory type of products.	Both mature and new innovative HW products with wears and accessories.	Manager of Product Management team, Designer riding wears and accessories, Sales coordinator, Manager wears and accessories, Product Manager, Sales & Marketing Manager, R&D Manager	7

CASE	Portfolio characteristics	Operational maturity	Interviewees' responsibility areas/roles	# of interviewees
I	The global portfolio of HW, SW, Services and Solutions. Global, regional and local business customers.	The global supplier in mature business	Product Process Owner, Head of PDM, EVP Product Development, Product Manager, Product Process Development Engineer, Product Management Category Director, Product Management Manager, Product Development Manager, Portfolio Management Manager	9
J	The global portfolio of HW and Services products. Global, regional and local business customers.	Both mature and new innovative HW and Services products in mature global business.	Director Product Development, Design Manager, Engineering Manager, Product Line Manager	4

Based on the interview material, high-level PPM challenges and requirements were identified by using inductive logic. The findings were grouped based on the process management approach.

4. Results and analysis

4.1 Product portfolio management challenges

All interviewed companies see potential for improvement in their PPM. PPM challenges generic to all interviewed companies are classified for the five following groups:

- 1) Generic challenges in PPM
- 2) PPM challenges related to processes and tools
- 3) PPM challenges related to ownership and governance models
- 4) PPM challenges related target setting and key performance measures
- 5) PPM challenges related to data availability.

4.1.1 PPM challenges in general

Product portfolio management is seen as a generic challenge in case companies regardless of the size, maturity and history of the company. PPM is viewed nearly non-existent, not only from the processes and tools perspective, but from the strategic target setting and performance management, the ownership and governance model points of view. The idea and the role of PPM as higher level analysis and decision making process for the entire product portfolio including new and existing products is not

thoroughly understood.

The entire product portfolio and sub portfolios have been not clearly defined and agreed while different groups of products, units, modules and technologies have been called portfolios. Overall, the visibility over the product portfolio as a whole is not seen to be consistent.

The size and proliferation of the product portfolio are seen as the most common challenges in case companies. In some cases, even when the company is relatively new, they are too many products to being maintained and updated in comparison with capabilities. In this type of cases, the total revenue share per product decreases. Products and their technical relations to each other are seen even more complicated to maintain. Several versions of the same products are simultaneously sold and produced over many years resulting in cannibalization within product families, and even outside them. Product cannibalization is not planned and managed consistently, resulting in negative product business cases and/or obsolete materials. Usually the management focus has been more on new products ramp ups while the removal of old products has not been given adequate attention. In an ideal situation, product ramp down activities are done in a synchronized manner with ramp ups (phase in / phase out management).

Lack of product portfolio level business case thinking is seen to exist. The focus has been more on single components, modules, units and products rather than on an entire product portfolio. The durations of product life cycles are seen not to be planned in original business plans for new products. Companies have simply followed their customers' behavior and their requirements.

Product portfolio management is tightly connected to concepts and methods applied in product life cycle management and product data management. The reporting capabilities on the portfolio, sub portfolio and product levels are seen dependent on product data management concepts and data structures. In some cases, the required data would even be available but existing design, PDM, configurator and ERP –tools are not utilized consistently in reporting.

The clean-up and renewal of the product portfolio are seen as a company level challenge that requires the strong leadership of top management. Lack of clear ownership for PPM and product management decreases the

capabilities to manage and communicate the change efficiently in co-operation with the main stakeholders such as R&D, Sales, Operations and Services.

4.1.2 Processes and tools related challenges in PPM

The challenge is not seen to be the lack of process management theory and overall practices. The business processes such as R&D (also referred to as product process), Sales, Deliver and Services processes are described at a higher level, and even structured in more detail as sub processes in most of the case companies. Process management concepts and descriptions have been not been implemented for the entire PPM due to lack of overall understanding PPM. Product decisions and activities have been done more in an ad-hoc and intuitive manner, and in bigger companies at the lower levels of business units. Due to lack of processes, product decisions are made too quickly and without the real analysis of the market demand and understanding the potential for profitable business.

Only a couple of strategic and tactical PPM tools have been utilized by the case companies. For the entire product portfolio evaluation, the most typical and used tool is a product road map, in all case companies. For the evaluation of individual product development projects, the state gate process – approach has been used by only some of the case companies.

The above mentioned challenges are common in the case companies. There are not many specific challenges related to processes and tools due lack of PPM process as such.

Many strategic and tactical tools are available for the evaluation and the management of product portfolio in theory. Not many of them have been even identified and only a couple of them has been utilized in studied case companies.

4.1.3 Portfolio ownership and governance models related challenges in PPM

The definition of product ownership is seen to require more clarity as responsibilities and expected activities are not clearly defined in studied case companies. According to interviewees, the product portfolio ownership can mean both business and technical responsibilities but many other views

as well.

The clarity of product portfolio ownership is seen to be dependent on the consistent definitions of product portfolios, product families, applications and platforms. In many case companies there are no written and formal product portfolio definitions, due to which neither have ownership statements been done. The wider the offered solutions and systems are, more they are seen to cross the borders of possible sub product portfolios, resulting in more challenges on final ownership, both from sales recognition and technical viewpoints. Offered solutions and systems can consist of many HW, SW and Service products, and can be combinations of all of them.

The ownership and governance of PPM differs based on the size of the company. In the biggest company there is a separate PPM team organized in addition to product managers in separate business units and business lines. In the smallest company, the product portfolio ownerships have been taken by CEO. In medium sized companies the ownership is seen as very collegial and taken by the executive board, or cross functional management team.

Only in one case company there is separate PPM function organized. Even though the team was named a year ago, they still have challenges applying their role and to get visibility over the entire product portfolio. The similar group of people is currently being created by another interviewed company. This type of group can be created by grouping existing product managers together as a centralized team. In all of the other interviewed companies, the ownership is taken by CEO or R&D manager. At the highest level, the group of executives form the cross functional and collegial final ownership of the product portfolio but even at that level the responsibilities are seen to have room for clarifications. The overall challenge is to have dedication, time and resources for PPM on the needed level of organization.

Due to lack PPM, or related ambiguities, some key product decisions are made only at business line / product manager level, or even within customer account teams, without the strategic analysis of product suitability for company's product portfolio.

4.1.4 Target setting and key performance measures related challenges in PPM

The usability of PPM as a concept and a tool for strategy

implementation has not been consistently understood and utilized by the case companies. The main reason for this is seen the lack of PPM understanding as a concept.

Most commonly, the PPM targets have been set for the value maximization, such as revenue, sales, cost, investments and profitability targets in the case companies. The financial targets have been set at the company level, and only a few cases at the level of sub product portfolios. In addition, the case companies are targeting to reduce their product portfolios and to clean-up data. Both of these targets can be connected to the strategic fit of the portfolio. Also, the “state gate” –process related milestone criteria can be seen as strategic targets and performance measures on individual products and project levels. The targets for the balance of the portfolio are not recognized by the interviewees.

On the side of key performance indicators, the financial measures are the most common. Total sales revenue, the cost and profitability at a company level are the most common ones. The profitability has been measured only at a company level. According to interviewees, this is not even technically possible due to implemented data and the reporting structures of the products in most of the case companies. Measuring profitability at a company level might be one of the most critical challenges in case companies. The size of the product portfolios has been mainly measured such as the number of sales items and certain other specific types of items. The strategic fit and the balance of the portfolio have been not measured at all.

4.1.5 PPM challenges related to data availability

The data targets for PPM have not been specified thoroughly by the case companies due to overall lack of PPM as a concept. The PPM as dynamic executive level analysis and decision making process is seen to require data availability and reporting from many angles.

The data challenges identified by the case companies are very generic related to the availability of product master data such as bill of material, item codes in different data structures, product compatibility and configuration rules, list of sales items, products and header level systems and solutions.

The data availability, directly from design tools, product data management tools, ERP tools and sales configurators have been not utilized

by managers directly. The reporting capabilities of the tools are seen not to be the most flexible and their usage is seen to require special abilities. Instead of using the data from operative tools, the portfolio management related data has been created manually and presented by universal office applications by management. The smaller the company is the better competence the management has to use operative data systems. Overall the data availability for the use of portfolio management is seen to require better specifications on data requirements.

4.2 Summary of product portfolio management challenges

PPM challenges are very generic starting on inadequate understanding of product portfolio management as a concept. In smaller companies, the overall understanding about product portfolio management are seen to be more consistent while in bigger companies, there are several viewpoints even to product portfolio definitions. Summary of PPM challenges are presented on Table 2 below.

Table 2. Summary of product portfolio management challenges

Generic challenges in PPM

- The explosion of the product portfolio as a size.
- The idea and the role of PPM as higher level analysis and decision making process for the entire product portfolio including new and existing products is not thoroughly understood.
- The entire product portfolio and sub portfolios have been not clearly defined and agreed.
- Inadequate product portfolio clean-up activities.
- Too slow product portfolio renewal.
- The cannibalization within product families, and even outside them. Un-synchronized product ramp up and ramp down activities (phase in / phase out management).
- Lack of the product portfolio level business case thinking.
- The durations of product life cycles are seen not to be planned in original business plans for new products.
- Inadequate reporting capabilities on the product portfolio, sub portfolio and other product structure levels.
- Lack of clear ownership for PPM and product management decreases the capabilities to manage and

communicate the change efficiently in co-operation with the main stakeholders such as R&D, Sales, Operations and Services

Processes and tools related challenges in PPM.

- Process management concepts and descriptions have been not been implemented for the entire PPM.
- Product decisions are done based on too mutual a basis without understanding the potential for profitable business.
- Only a couple of strategic and tactical PPM tools have been utilized if any.

Ownership and governance models related challenges in PPM

- The definition of ownership is seen to require more clarity as responsibilities and expected activities.
- The wider the offered solutions and systems are, more they are seen to cross the borders of possible sub product portfolios, resulting in more challenges on final ownership, both from sales recognition and technical viewpoints.

Target setting and performance measures related challenges in PPM

- The usability of PPM as a concept and a tool for strategy implementation has not been consistently understood and utilized.
- Targets and performance measures are not set consistently due to the lack of PPM understanding as such.
- On the side of financial performance measures the profitability has been measured only at a company level or business unit level (only one case company being able to report product profitability).
- Targets and performance measures for the strategic fit and balance of the product portfolio are not available.

Data availability related challenges in PPM.

- The data targets for PPM have not been specified thoroughly.
 - Instead of using the data from operative tools, the portfolio management related data has been created manually and presented by universal office applications.
 - Overall the data availability for the use of portfolio management is seen to require better specifications on data requirements.
-

4.3 Preconditions for product portfolio management

PPM is seen as a common challenge in case companies. The viewpoints to PPM challenges include: 1) generic challenges, 2) processes and tools, 3) ownership and governance model, 4) target setting and key performance indicators and 5) data availability.

Due to the current level of understanding and the existence of PPM practices in the case companies the improvement activities may need to be started from the very basics. Preconditions for PPM improvement, derived based on both theory and interviews, can be summarized as follows:

1. Creation of basic understanding about the idea and concept of PPM.

The very basic training could be given starting from executive board level to get justification and approval for further improvement needs on the topic. The training can be started to unravel the negative impacts and inefficiencies caused by lack of PPM. Tackling the basic questions such as what, how, when and by whom, are seen important for improving product management practices, especially the question why.

2. Creation of PPM strategic targets and performance measures based on company strategy. Strategic targets could be classified as a) strategic fit, b) maximized value, c) portfolio balance and d) portfolio size. Strategic targets can be aligned with the overall capabilities of the company. Each area of strategic targets could be divided into measurable sub targets and key performance indicators. The fundamental issues in target setting and related performance measures are the coverage of all product life cycle phases not only the NPD phase which is the most typical focus of current portfolio management literature and practices.

3. Creation of the strategic product sub portfolios, product families, applications and platforms based on agreed criteria for prioritization. The synergy between product families to be utilized, not only in marketing and sales, but also in technology development and for the benefit of deliver and service processes. The product portfolio renewal and clean-up can be managed based on modular product

platforms and data models to gain efficiency in the creation and implementation of them.

4. **Creation of PPM ownership and governance models** to manage the entire group of all sub portfolios and products over the life cycle. New product development, ramp up, maintain, ramp down, warranty and removal phases can form the continuous renewal of the product portfolio according to strategic and tactical targets. Product portfolio governance models can be organized based on functions and/or by cross functional steering bodies. The difference in PPM and product management to be clearly communicated and implemented. By the nomination of dedicated ownership and man power for PPM could improve the focus and speed up the required activities.
5. **Creation of PPM processes and tools** for the dynamic analysis and decision making. Systematic yearly, quarterly, monthly or even weekly management practices could improve the implementation of strategic and tactical targets consistently. By using agreed processes and tools the needed tasks can be done by the agreed roles of people in right order, right time and quality. As an enabler the related processes and tools need to be trained and implemented through all sub portfolios and business units under control of PPM.
6. **Creation of the data availability and reporting** capabilities according to needed information for both the strategic and tactical management of the product portfolios. This requires first the understanding about PPM as a concept, processes and tools but even more as the strategic targets and performance measures. The data specification for PPM can be connected with overall product master data specification requirements.

Table 3: Preconditions for product portfolio management

1.	Creation of basic understanding about the idea and concept of PPM
2.	Creation of PPM strategic targets and performance measures
3.	Creation of strategic product sub portfolios
4.	Creation of PPM ownership and governance models
5.	Creation of PPM processes and tools
6.	Creation of data availability and reporting capabilities

5. Conclusions

Product and business evolution from HW orientation to SW products and inclusion of services has been ongoing already for some time. Many companies sell and deliver combined solutions that are a sum of HW, SW products and related services. Offering a wide variety of products complicates a company's product portfolio, potentially resulting in some challenges. Opportunities for additional and new business and turnover may be missed if the product portfolio is not actively developed and renewed. The product portfolio renewal and clean-up can be managed based on modular product platforms and data models to gain efficiency in product creation, maintenance and removal phases. Ideally, product portfolio renewal happens in balance of new product introductions and old products' removals and by the synchronized combination of them. This study analyzes the current PPM related challenges faced by companies.

The challenges related to the PPM were identified in practice. The portfolio management is a generic challenge in case companies regardless of the size, maturity and history of the case companies. The challenges start from the disconnection between company strategy and expected PPM strategic targets and follow up. The overall idea and the role of PPM as a higher level analysis and decision making process for product portfolio renewal are not thoroughly understood. The usability of PPM as a concept and a tool for strategy implementation is not consistently implemented while only a couple of strategic and tactical PPM tools are utilized by the case companies. The profitability is measured only at a company level due to current data and reporting structures. The entire product portfolio and sub portfolios are not clearly defined. Lack of product portfolio level business case thinking can be seen as the growing size and proliferation of the product portfolio and as product cannibalization. PPM processes are not described and documented in case companies. The definition of PPM ownership is seen to require more clarity. The governance models of PPM are not structured and implemented formally over the entire product portfolio. The overall challenge is to have focus and time by dedicated resources for PPM on needed levels of organization. The data targets and data specifications for PPM have not been defined thoroughly by the case companies.

The preconditions for implementing the PPM practices need to be well connected to the fundamental main challenges. The very basic precondition is to enhance the understanding over the idea and concept of PPM, followed

by the creation of PPM strategic targets and performance measures according to company strategy. Next preconditions are more operative, the creation of the strategic product sub portfolios and related PPM governance models. Dynamic and active PPM processes and tools need to be defined and implemented. Finally the last proposed precondition is the creation of the data requirement specification according for the need of portfolio analysis and decision making.

The implications of this study include the potential preconditions of clarifying the role of PPM. The findings can aid business managers in understanding the PPM as an entity that has a role in managing products and portfolios based on strategic and financial targets over product lifecycles.

The limitations of this study include analyzing a limited number of companies. Also, the experience of the analyzed companies varies from a few years to a relatively long history. Regardless of the fact that the portfolio management is seen a generic challenge in case companies.

Several questions were raised up during the analysis which might prove worth further researcher activities, including: a)What are the definitions of the listed preconditions in more detail for implementing them in practice?, b)Can product portfolios be visualized to increase the understanding over the entire product portfolio?, c)How is PPM connected with other business processes? and d)Should PPM be raised to the level of other business processes such as R&D (Product process), Sales, Deliver and Service Processes?

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