

A Study on product portfolio management in small and medium-sized foundries

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ABSTRACT

KEYWORDS

Case Study,
Foundry,
PPM,
Governance Model,
Product Structure,
Life Cycle Stages.

This case study examines the practical implementation of Product Portfolio Management (PPM) in small and medium-scale foundries located in the Belagavi region. The main goal is to develop an effective governance model for PPM, optimizing product structure, life cycle management, and strategic decision-making in these foundries. Small and Medium-scale foundries often encounter challenges in efficiently managing their product portfolio, leading to suboptimal resource allocation and strategic decisions. To address these issues, the study focuses on the practical implementation of PPM and proposes a governance model to enhance overall product management. A qualitative, multiple case study approach was employed, involving interviews with key personnel such as CEOs and product managers to understand their perspectives on product ownership, management, and strategic alignment. The research outcomes reveal the development of a tailored PPM governance model for the studied foundries. Distinct differences between smaller and medium-sized foundries were found in terms of product ownership, with smaller foundries showing a deeper understanding of ownership, often embraced by their CEOs, while medium-sized foundries commonly appoint product managers as owners, focusing primarily on commercial elements. The study's practical insights offer valuable guidance for successful PPM implementation in small and medium-scale foundries, addressing product management challenges and enhancing strategic decision-making. It serves as a valuable reference for foundry managers aiming to optimize their product management processes and overall business performance. Governance model framework which is developed has supported foundries effectively to strategize product portfolio ownership and improved productivity by 4.7% on an average considering all the case foundries.

1. Introduction

Product Life Cycle Management (PLM) looks after the market strategies and decision makings while the Product Portfolio Management (PPM) emphasizes investments in various sectors of business development. PPM is a driving potential for the new product designs, it is a roadmap for the domain on which the industry has to focus. It emphasizes areas upon which major investment spent like research activities, sales and market strategies, refinement of an existing product as per customer requirements, studies on the scenario of an open market, penetrating into the open market and increasing market share and

introducing completely new product designs as per (David & Rowe, 2016). PPM gives awareness on investing in new product design; it enables the companies to get aware and attentive towards risk management with an appropriate product development strategy. With the long vision of PPM strategies, sustainable and consistent growth can be attained for generations together. PPM allows the best product concepts with a higher degree of innovation and balance between risks and rewards. It can be achieved through an optimized allocation of resources. Along with the sustainable growth, an effective PPM system helps the business in several areas where the management has to focus; few of the pivotal areas of business where PPM pays special attention are depict in Fig. 1. At broad, PPM may seem to be financial control over business attributes; it not only emphasizes on investments but also focuses on

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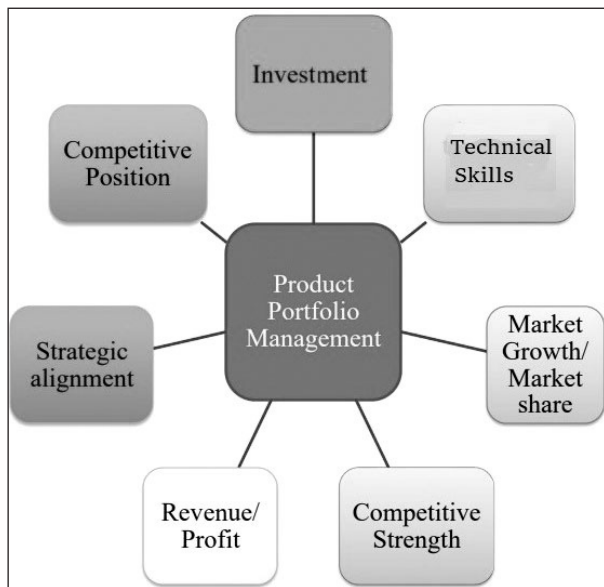


Fig. 1. PPM emphasizing areas.

other key areas to succeed the business. Business investment always depends upon market demand of product, customary requirements, market share, and competitive strength of the product and revenue generation from the product in terms of returns/profit as per (Pasley & MacCarthy, 2013).

If the company is ready to invest in a risk based approach the company might allocate its investments to core products, adjacent products and transformational products. Core products are the new products to market share, it contributes major market share. It creates leverage between product technologies and product performance. Adjacent products are identical to core product with substantial modifications in product design while transformational products are mere relative products to the market with dramatic improvement in either performance or functionality. Time, money and efforts spent on core, adjacent and transformation products depend upon the time of the company and the attitude of the business people. The PLM product portfolio software is able to integrate the methodologies of product and project perspectives to minimize the risk factor according to (Kirilova & Vakiieva-Bancheva, 2017). However, the concept of PPM is to reduce the payback period and increase the returns on investments. Investment in product development may not give success all the time, so the primary objective of the PPM is to minimize the investments in lagging products and raise the investments in top-line products to establish value addition to financial resources.

The primary objectives of PPM are:

- Line up the products (running and pipelined) with the organization vision and mission
- Access and analyze the market status and its potential
- Assign the available resources on innovative and novel products
- Minimize the investments on lower profit ratio products
- Create a transparent work environment
- Emphasize improving the product service.

2. Literature Review

Since the mid-1980s, more efforts in foundries have been oriented on satisfying short-term client needs through incremental new product development. As a result, fewer pure new items and completely new product developments have been introduced. According to Kavadias and Chao (2007) a diverse product variety is regarded a technique to enhance sales and suit client wants, with more products being introduced than deleted as a major trend. For example, two new products are introduced for every product eliminated from the portfolio. The aforementioned reasons are to blame for many PPM concerns in the foundry business. According to Kahn et al. (2012) an extremely extensive product variety may confuse customers, resulting in lower overall sales and sales per product. Furthermore, an overly broad product offering increases product complexity, lowering productivity, product development time, and demand-supply chain costs. The company's product portfolio may swiftly expand or even explode as a result of concurrent corporate mergers and acquisitions. A fundamental challenge in PPM is the lack of enthusiasm and knowledge of the PPM concept by diverse senior management teams. As per Patidar and Ladhe (2017) et al market analysis, product development strategy, and product life cycle management are all aspects of PPM for both existing and new products. This is when PPM is viewed as the enterprise-level overseeing element of product management and requirements creation.

According to Hines et al. (2006) PPM is essentially about making strategic decisions about markets, products, and technologies. Customers, technological generations, product families, documentation goods, and so on can all be used to categorize products in a portfolio. As per LeDuigou et al. (2011) for simultaneous breakthrough

projects and traditional upgrades, organizational architecture and management methods have a direct impact on a foundry performance. Bordi et al. (2011) found out that different organizational structures, management styles, procedures, and cultures are required, to manage existing firms while simultaneously developing new enterprises and products. Regardless of line organizational frameworks, there is always the possibility of misalignment between organizational structure and product architectures, which affects the productivity and capacity of product development teams to develop product platforms and related applications. According to Cicconi and Raffaelli (2011), no direct relationships were established between organizational and governance systems and commercial success. According to Cooper (1999), PPM can assure that crucial product development decisions are based on top management recommendations. According to Eschenbacher et al. (2011), in the industry, technology managers and senior management value PPM the most, but marketing and sales managers who work directly with customers do not. Instead, marketing managers favor incremental advancements due to the quicker time-to-market, whereas technology experts seek more radical long-term developments. Depending on the management culture and decision-making procedures of the company, PPM decisions may be either objective or intuitive, according to (Jugend & Leon, 2015). However, there is evidence that suggests that using portfolio management methodologies and tools to make portfolio decisions is associated with better company outcomes. This study aims to investigate and develop a new PPM governance model framework to address the PPM challenges that case foundries face. The dialogue that has just taken place can be used to answer the following research questions: What kinds of product portfolio management governance frameworks are acknowledged in the existing literature on this topic? What is the current structure of ownership of products and product portfolios in small and medium-sized foundries? What kind of governance architecture is necessary to enhance commercial and technical product portfolio owners over their whole lifecycle?

3. Methodology

The study was carried out as a qualitative, multiple case study, with the research method depicted in Fig. 2.

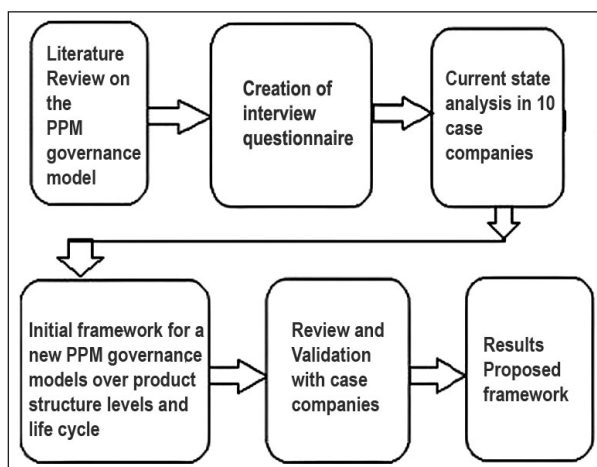


Fig. 2. Research steps and process.

Table 1

Categorization of foundry units in Belagavi.

Category	Production capacity (tonne/month)	Employees (Nos.)	Turn over (Rs.mn/year)
Small & Micro	50	25-30	15
Medium	100	75-85	45
Large	500	200-225	200

The PPM literature was read first to give a solid foundation for the empirical case analysis. Product portfolio management and line organizational governance approaches for managing the complete product portfolio both horizontally across all product life cycle stages and vertically across all product structure levels were the subject of the literature review. As a result of the literature analysis, a 23-question interview questionnaire was created as a second step in the research. Table 1 depicts Categorization of Foundry units in Belagavi. Table 2 depicts list of interview questionnaire. Questions were asked on product ownership and the PPM governance architecture.

These questions addressed topics such as who owns what at each product structure level and life cycle phase, how the organization is organized as major functions and decision-making bodies focusing on product management and PPM functions, and probable cross-functional steering bodies. The empirical research included industrial interviews with ten case firms to define existing practices and difficulties connected to PPM governance models at each stage of the product life cycle and at each level of the product structure.

Table 2

List of questions of PPM used in interview.

Sl.No	Questions
1	Do New product development managers exist in your foundry?
2	Do PPM team exist in your foundry?
3	How the organization is organized as major functions and decision-making bodies focusing on product management and PPM functions?
4	Who owns what at each product structure level and life cycle phase in your foundry?
5	What product portfolio ownership primarily entails in your foundry?
6	What are the challenges for product portfolio management?
7	Whether your foundry implements PPM, a business strategy during decision making processes regarding the development of new products?
8	Whether market research and testing are conducted at every stage of the development of product?
9	How will your business model for acquiring new customers impact your plan?
10	How will your new product fit into your product portfolio plan?
11	The success rates of your new products in markets remain low or high?
12	Do you think market share can be increased by investing?
13	Is the number of customers increasing with time in your foundry?
14	Which phase you think is the best stage to build a product's position in the market?
15	Do you think quality management system of foundry impacts NPD success rate?
16	According to changing market conditions whether your foundry is into revising/changing strategies?
17	Are the markets and market segments your foundry serves conducive to continued profitable growth for your business?
18	Are your competitors reacting to your approach to the market?
19	Whether foundry prioritizes the key initiatives?
20	Whether tactical work is linked with strategic initiatives?
21	Whether risk identification is carried out on regular basis?
22	Whether the Portfolio is in compliance with strategic objectives in foundry

Table 3 depict the characteristics of case foundries. To enable extensive analyses, the face-to-face interviews were recorded, extracted and transcribed. During the interviews, notes were made for further statements and adjustments. From a market perspective, typical lifespan phases include planning, introduction, growth, maturity, and decline. The life cycle phases were simplified to four due to existing and practical wording by most of the case companies: new product

development (NPD), active castings sales and delivery (maintain), castings features (quality), and finally the last life cycle phase in which only casting (product) data is stored without any business activities.

Following the literature study and empirical analysis, an early framework for a potential new PPM governance model was developed to improve collaboration between commercial

and technical product portfolio owners across the product life cycle. During a joint face-to-face interview, the constructed first framework was subsequently presented in ten case foundries of Belagavi cluster present in Udyambagh, Belagavi, Karnataka. The case foundries served as a focus group for evaluating and improving the newly developed governance model. The framework was improved and provided as a feasible solution to manage product portfolios across the life cycle and product structure levels based on feedback and recommendations. The ten case foundries of Belagavi Foundry Cluster cover both major and global organizations as well as small and rising companies that offer a variety of items such as aerospace, automobile and other castings. In order to examine potential disparities in governance arrangements, a variety of case companies were chosen. The interviews were performed as a series of workshops involving cross-functional groups of managers in larger organizations, while only CEOs, R&D, and Product Management managers were interviewed in smaller companies. According to the study, there are many different perspectives on product and product portfolio ownership. According to the respondents, product portfolio ownership primarily entails business and technical obligations and is contingent on product portfolio definitions that are consistent. Ownership is thought to necessitate more clarity in terms of roles and expected tasks. In a typical

scenario, the case companies just followed their customers' expectations and responded accordingly through new product development, oblivious to the expanding size of the product portfolio at many products structure levels and throughout the product life cycle stages. Lack of clear portfolio understanding and ownership reduces the ability to effectively manage and communicate product portfolio changes, as well as weakening collaboration with key stakeholders such as R&D, Sales and Marketing, Operations and Services, and customers, suppliers, and other important stakeholders. The smaller the company, the simpler the product range is, and the lighter the governance model is, according to the interviewees.

Abbreviations

- B2B: Business to Business
- B2C: Business to Customer
- PPMT: Product Portfolio Management Team
- PPMB: Product Portfolio Management Board

The CEO of a new expanding company is usually in charge of product portfolio management. "There is no clear agreement about the product," according to the CEO of one of the smaller enterprises. The vastly distinct duties of product managers were an interesting discovery. "Product

Table 3
Characteristics of case foundries.

Foundry	Portfolio Size	Product Type	Business life cycle stage	Business Type	Markets
I	Small	Ferrous	Growth	B2B	Domestic
II	Large	Ferrous & Non-Ferrous	Mature	B2B	Global
III	Small	Non-Ferrous	Growth	B2B & B2C	Domestic
IV	Large	Ferrous & Non-Ferrous	Mature	B2B	Global
V	Small	Ferrous	Growth	B2C	Domestic
VI	Small	Ferrous & Non-Ferrous	Mature	B2B	Global
VII	Medium	Ferrous & Non-Ferrous	Growth	B2B	Global
VIII	Medium	Ferrous & Non-Ferrous	Mature	B2C	Global
IX	Medium	Ferrous & Non-Ferrous	Mature	B2B	Global
X	Large	Ferrous	Mature	B2B	Global

Technical Paper

Managers own sales items, but ownership of other sellable levels in a commercial product portfolio is not clearly specified, according to a head of New Product Management Team. They were also organized in different ways. Depending on their responsibilities, Product Managers were assigned to R&D and business Lines. In some circumstances, the utter lack of these responsibilities is even more surprising. There are no Product Managers named in the foundry, what they should do?" said the owner of one of the foundries. As a result, it appears that one crucial product management duty, product profitability knowledge and management, has been largely overlooked. As a result, fundamental problems about governance models arise. In addition to product managers in business units and business lines, only the larger companies have a specialized PPM team. Despite this, the new PPM team faced difficulties in implementing their job and gaining visibility throughout the full product range. The decision-making environment, according to a member of the PPM Team, is as follows: "The highest product investments and product family decisions are prepared by the Portfolio Decision Team for the decision-making by the Executive Board." The Program Management Team can decide on lower investments at the product program level. Business lines make product selections within product families." In most circumstances, product ownership can be perceived as extremely collegial, with the executive board or a cross-functional management team taking on the role of product owner without any formal role nominated.

However, there are difficulties around the ownership and control of products and product portfolios, independent of the size of the company or its product portfolio. The overarching difficulty is to schedule PPM in a fair amount of time and with adequate resources. Table 4 summarizes the current product portfolio management practices of the case foundries. Based on the facts, regardless of how the case foundries organize their decision-making, a better and more consistent understanding of the PPM idea may be required. Without a strategic and financial review of products from the perspective of the complete product portfolio, certain major product decisions are decided exclusively at the business line/product manager level or even within client account teams. "The Product Board concentrates on client project specific topics only," says the Director of Product Platforms, "cross project coordination does not exist at all." The Vice President for Product Management cited the key focus areas of the meetings as an illustration of the more evolved PPM approach: "The agenda themes in cross functional meetings are technology and product road maps, as well as sales opportunities." The link between a company's financial success and product portfolio management governance frameworks may be hazy.

A Product and Engineering Process Owner emphasized this: "Research, innovation, and development challenges, road maps, specific themes, patents, important R&D program milestones, and some individual R&D projects

Table 4
PPM governance practices in case foundries.

Foundry	Product portfolio decision and governance bodies	Product and portfolio owners	PPM team exists	Product managers exists
I	CEO	CEO	NO	NO
II	Executive board and Portfolio decision team	Product managers	YES	YES
III	A cross functional board	R&D Manager	NO	NO
IV	A cross functional board	Product managers	NO	YES
V	Board of directors	R&D Manager	NO	NO
VI	A cross functional board	Product managers	NO	NO
VII	A cross functional board	Product managers	NO	YES
VIII	Executive board and Portfolio decision team	Product managers	NO	YES
IX	Product development and technology team	Product managers	NO	YES
X	Product board	Product managers	NO	YES

are on the agenda. The topics of sales, costs, and profitability are not mentioned here.” This is odd because, on the one hand, the firm’s executive board is accountable for the company’s competitiveness and financial success, but on the other hand, they may lack clarity on which goods are competitive, match the corporate plan and are profitable. The fundamental borderline between the commercial product portfolio and the technical product portfolio can be recognized in the vertical direction, the governance over product structure levels as shown in Fig.3. product families, product configuration items, sales items, version items, common modules, common platforms, subassemblies, and the lowest level of components become more ambiguous as the product architecture becomes more complex and deeper. The more comprehensive the solutions and systems on offer are, the more they are regarded to breach the boundaries of feasible sub-product portfolios, leading in additional issues in final ownerships, both from a sales and technical standpoint. Technical product portfolio and structures are held by Main Designers, the R&D Manager explained, but purchasing can sort and alter a component, which poses functionality challenges. Furthermore, due to organizational structures across business units, business lines,

product design competency areas, development projects, and steering bodies, product portfolio ownerships can be fragmented. This complicates the overall visibility and control of the vertical product portfolio. Individual products should be controlled horizontally according to their life cycle phases. In the case foundries, the number of life cycle phases ranges from 3 to 9. They only cover development, active sales, distribution, and removal in the smallest organizations and in the most simplified circumstances. The life cycle phases are specified in greater detail in larger firms and include phases such as build, implement, and ramp up, maintain, ramp down, care, and obsolete. Throughout the life cycle phases, the ownership of a single product can remain the same or change. However, for all product-structure levels, the product portfolio life cycle stages were not clearly specified, resulting in extra ambiguity in ownerships. The example foundries appear to place a greater emphasis on new product ramp ups than older product ramp downs, resulting in unplanned portfolio growth and product cannibalization.

This is true even though the ideal condition, in terms of portfolio management, is a more synchronized approach. Individual items, single

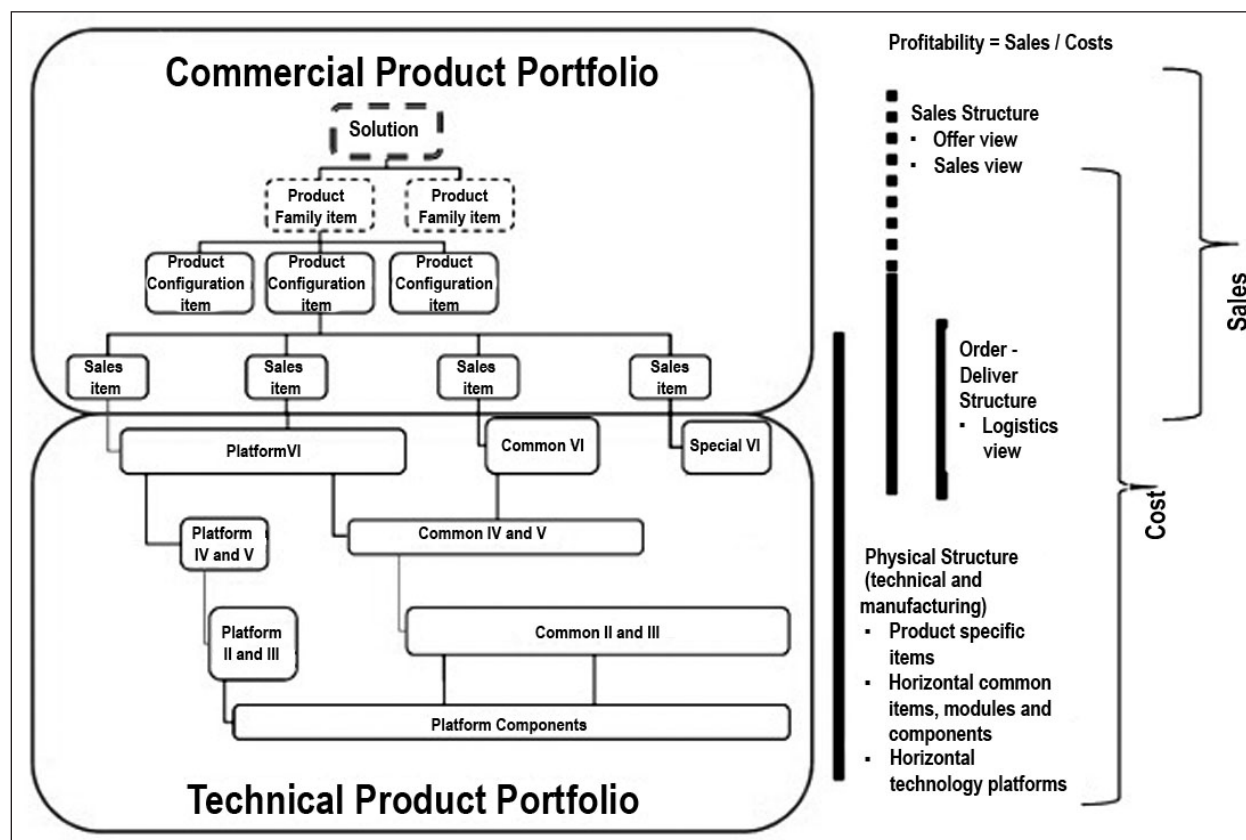


Fig. 3. Product configuration and portfolios.

components, modules, and units are managed separately, with just a slender link between sub-portfolios and other products inside them. Product life cycles are only planned in a few circumstances, the majority of which involve consumer products.

3.1. Proposed work

The premise is that product portfolio management should attempt to renew product portfolios in a strategic and cost-effective manner by adding new items to the portfolio, enhancing and altering current products, and removing non-competitive products. The governance model should acknowledge product structure levels vertically and life cycle phases horizontally in order to address to difficulties such as unnecessary product portfolio explosion on different product structure levels and over life cycle phases in example foundries. Furthermore, regardless of how organizations are organized, the framework for product portfolio management should address difficulties and should not be dependent on the size of the company or its portfolio. Strategic product portfolio management across vertical and horizontal sub-product portfolios is required for product portfolio renewal. In an ideal world, horizontal and vertical product portfolio renewal would occur in tandem with new product launches and old product phase-outs. Customers notice the renewal of the commercial portfolio in the form of new or improved solutions, product families, product configurations, and sales items. Renewal happens on main assembly, sub assembly, and component levels within the technical portfolio, which are not necessarily apparent or immediately linked to the renewal of commercial sub-portfolio levels. Product cost-cutting efforts, for example, are only noticeable on the technical side, not the commercial side. Both technical and commercial sub-portfolios must be managed over life cycles as a partnership between business and engineering teams, under the supervision of companywide product portfolio management, in order to maximize the benefits of technical platforms and commercial applications. The suggested new product portfolio governance model framework should take into account the concept of continual portfolio renewal. From the NPD phase to the later stages of the life cycle, the framework anticipates a continuous horizontal flow of products and items at all product structure levels. Additionally, product portfolio, sub-portfolio, and item ownerships must be agreed upon and

communicated at all product structure levels and throughout the life cycle for the framework to be effective. The established framework for PPM governance, which takes into account all layers of product structure across life cycles, is based on four primary enablers: 1. Vertical sub-portfolios and their owners, organized by product structure level. 2. According to product life cycle phases, horizontal sub portfolios and their owners 3. Product Portfolio Management Team, which is chaired by the Head of Product Portfolio Management and consists of vertical and horizontal sub portfolio owners. 4. The Product Portfolio Management Board, chaired by the CEO and aided by the Head of Product Portfolio Management, is made up of executives from various business processes and roles.

It is suggested that one has to initially describe the common product structure and vertical sub-portfolios, as well as the companywide owners for them. From the highest solution layer to the lowest component layer, vertical sub portfolios can be constructed based on common product structure levels as shown in Figure 3. Four product portfolio life cycle phases can be used to form horizontal sub portfolios: New Product Development (NPD), Maintain, Quality, and Archive. NPD's portfolio concentrates on product concept creation, design, and engineering. Maintaining a portfolio covers the product life cycles ramp up, active sales and delivery, and ramp down phases. The quality portfolio is primarily focused on the castings. For defunct products, the archive portfolio manages the legally needed product data archive. The relationship and management between vertical and horizontal sub-portfolios can be better ensured by employing this type of two-dimensional governance architecture. Vertical and horizontal sub-portfolio owners must be designated simultaneously with the Product Portfolio Management Team in order for the suggested framework to function and be effective (PPMT). Vertical sub-portfolio managers are in charge of vertical sub-portfolios at all levels of the product hierarchy, from the solution sub-portfolio to the lowest component sub-portfolio. As a result, horizontal sub-portfolio managers are in charge of horizontal sub-portfolios throughout the life cycle, from the NPD sub-portfolio to the Archive sub-portfolio. The Product Portfolio Management Team (PPMT), led by the product portfolio manager, is in charge of product portfolio renewal, as well as related analysis, evaluations, and decision-making. PPM concepts, techniques, and technologies

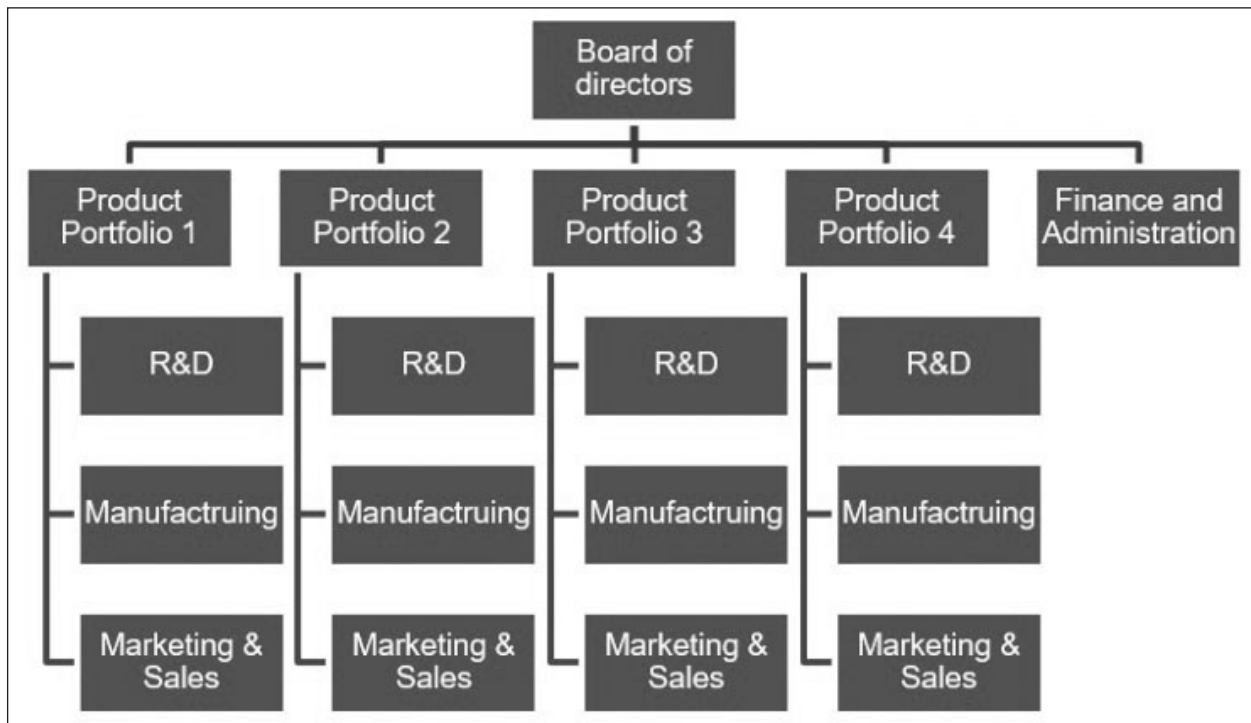


Fig. 4. Organizational hierarchy.

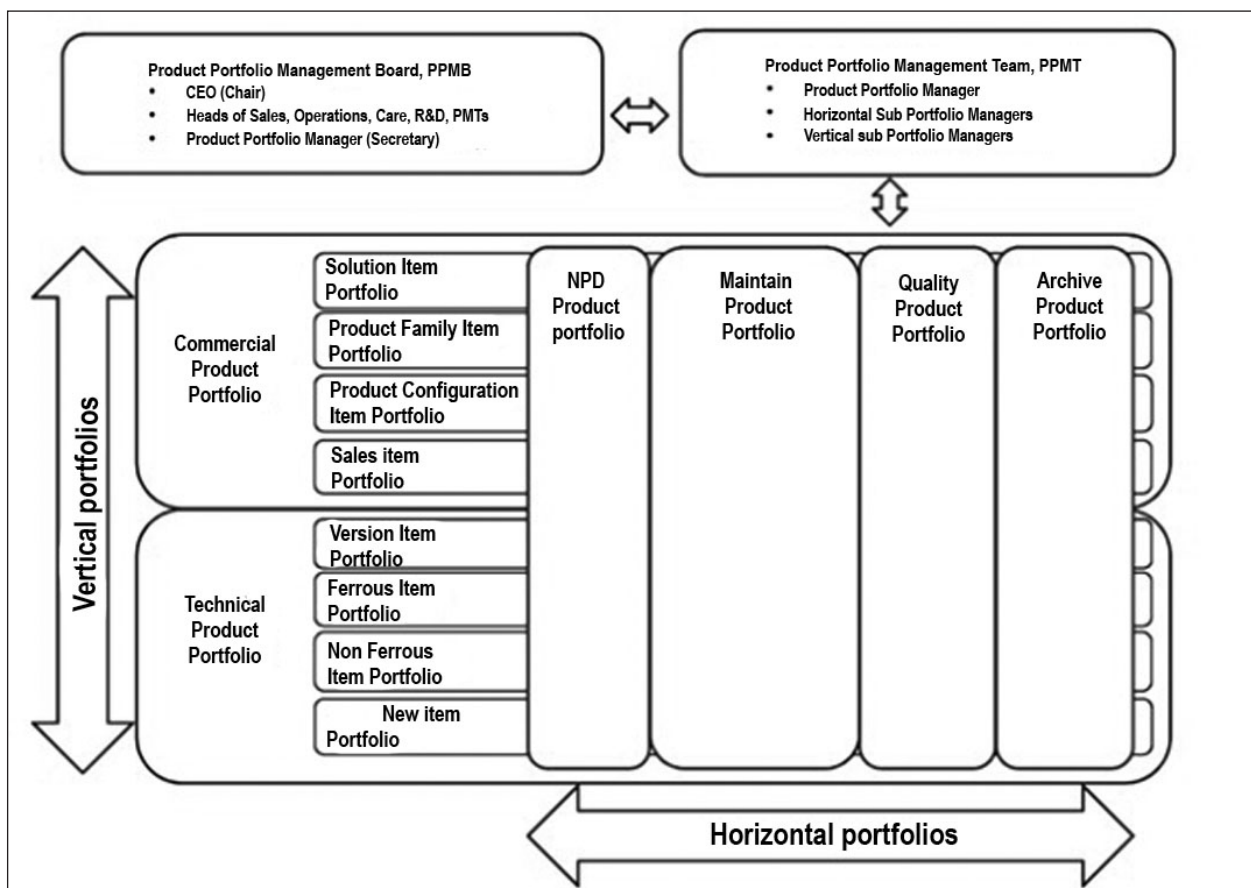


Fig. 5. Proposed work for PPM governance.

are owned and developed by PPMT. PPMT is in charge of the agreed-upon vertical and horizontal portfolios, as well as communicating the targets, key performance indicators, and portfolio development status to the organization and key stakeholders. Fig. 4 depicts Organizational hierarchy.

The Product Portfolio Management Board (PPMB), as the highest decision-making team in the system, is the fourth enabler. Due to the fact that PPM has an impact on the content of all business operations, the board members proposed are the CEO, Heads of Sales, Product Management Teams (PMTs), Operations, Care, R&D, and Product Portfolio Manager. The CEO may chair PPMB meetings, with Product Portfolio Managers assisting. PPMB is in charge of PPM targets and key performance indicators, as well as decision-making based on agreed-upon criteria, processes, and tools. The suggested new product portfolio governance model framework should address the concept of ongoing portfolio renewal as shown in Fig 5. The proposed governance model framework is reviewed and discussed with all case foundries. The proposed new framework was seen potential both for smaller and larger companies due to “fact” that the vertical and horizontal portfolios (over product structure and over product life cycle) need to be managed regardless the size of the foundry or the number of workforces. The case foundries may introduce the framework for improvement.

4. Results and Discussions

- A framework for PPM governance model implementation was developed based on four enablers found to facilitate vertical and horizontal implementation of PPM governance model across product structure and life cycle.
- Vertical sub-portfolios and their owners, horizontal sub-portfolios and their owners, Product Portfolio Management Team (PPTM) and Product Portfolio Management Board (PPMB), all companywide and across functional organizations and teams, are all enablers for the framework. This type of governance model framework helps with product portfolio ownership and management that is in both effective and strategic way.
- The potential for a new PPM performance management framework as a precondition for enhancing PPM practices in the case foundries is one of the study’s managerial implications. The findings helped business

managers view PPM as an entity that manages products and portfolios based on strategic and financial aims across all product structure levels and life cycle phases according to well-defined vertical and horizontal sub-portfolios.

5. Conclusion

- Through a survey of both small and medium-sized foundries in Belagavi, a framework is developed to facilitate the vertical and horizontal implementation of the PPM governance model across the product structure and life cycle.
- Governance model framework which is developed has supported foundries effectively to strategize product portfolio ownership and management and improved productivity by 4.7% on average considering all ten foundries. Study showed that a company manager mapped their PPM to products and portfolios based on strategic and financial goals across all product structure levels and lifecycle stages, according to well-defined vertical and horizontal sub-portfolios.
- It is concluded that foundry executive-level cross-functional team is responsible for making PPM decisions.
- Research shows that product ownership is not always clear. Therefore, it is necessary to be more explicit about responsibilities and expected actions when defining ownership.
- Smaller foundries have a better understanding of product management, and CEOs often embrace it. As a commercial element, some emerging foundries appoint product managers as product owners.

Acknowledgement

Authors are grateful to all the foundries in Udyambagh, Belagavi mainly part of Foundry cluster that provided the facilities to carry out this research work. Authors are also very much thankful to all the faculty of Industrial Production and Engineering Department of PDA College of Engineering, Kalaburagi of Karnataka for their invariable support in carrying out this study.

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