Product portfolio management: An analysis of a large medical device company

Aidan O'Connor[1] and Kathryn Cormican[2]

Abstract This paper focuses on product portfolio management in a large multinational medical device organisation. The contribution of this research is to provide insights into the nature, composition and decision making processes of product portfolios in a real world setting. The research is important because portfolio management decisions have a significant impact and influence the performance at each stage in the product life cycle. Results of the study indicate that portfolio management is a complex process in general but particularly challenging when dealing with technology development projects or innovative new products as unchartered waters are difficult to assess. We found that there are challenges with transparency and that stakeholders need fact based and information driven decisions. There is a need for better up front planning and systems to guide the process. Consistent criteria should be used to select and prioritise projects to facilitate better comparative ranking and allow for balanced portfolios, as well better resource distribution. However we also found that these criteria may change depending on the stage in the lifecycle.

1. Introduction

The mechanisms for introducing new medical device products are now more complex than ever due to long development cycles, expensive technology development, and lengthy regulatory pathways. Systematic structures and processes are required to select, prioritise and manage new projects in order to ensure that the right projects

[1] Senior project manager, Medical Device organisation

[2] College of Engineering & Informatics, National University of Ireland, Galway, Ireland, Kathryn.Cormican@nuigalway.ie

are chosen and that scarce resources are effectively distributed throughout the development lifecycle (Heising 2012). Portfolio management can be defined as a formalised method to select, support and manage a collection of projects that share and compete for the same resources and are carried out under the sponsorship or management of an organisation (Jonas 2010, Martinsuo and Lehtonen 2007). Product portfolio management is complex and fraught with challenges in practice. For example, research suggests that formalised systems are often not in place (Barczak et al. 2009). Indeed where systems are in place they often lack rigor and in many cases the system does not clearly align with the organisation's strategy; the criteria for assessment are poorly defined and decision making is sporadic and inconsistent (Augusto and Miguel 2008, Killeen et al. 2008).

The goal of this study is to analyse product portfolio management in a large medical device company. A detailed case study was undertaken in order to understand the nature and composition of new technology and new product portfolios. To do this we analysed the type of projects; the value of projects and the amount of minor projects in the portfolio. We also wanted to better understand the decision making processes. Therefore we investigated whether structured processes are in place; how they have evolved in recent years; the nature of the gating system (i.e. the number of gates and scoring criteria throughout the lifecycle (start, middle and end); when and why projects are terminated and how resources are allocated.

2. Product portfolio management

According to Cooper et al (1999) portfolio management *"is a dynamic decision making process"*, where an organisations' list of technology development and new product development projects is continuously reviewed, revised and renewed. In this process, new projects are "*evaluated, selected, and prioritised; existing projects may be accelerated, killed, or de-prioritised; and resources are allocated and reallocated to the active projects*" (Cooper et al. 2001). The portfolio decision making process is characterised by uncertain and changing information, dynamic opportunities, multiple goals and strategic considerations, interdependence among projects, and multiple decision-makers and locations. According to Martinsuo and

Lehtonen (2007) "*The objective of project portfolio management [is] to maximize the value of the portfolio in terms of company objectives, to achieve a balance of projects in terms of strategically important parameters, or to ensure strategic direction of projects*". Portfolio management also allows for an effective allocation of resources among on-going projects and helps to minimise competing for a small pool of resources (Heising 2012). A synthesis of the literature in the area reveals that effective portfolio management should include the following performance goals (Heising 2012, Petit 2012, Meskendahl 2010, van Oorschot et al. 2010, Grönlund et al. 2010, Killen et al. 2008, Augusto and Miguel 2008, Cooper et al. 2001).

- To have the right number of projects in the portfolio for the resources available.
- To avoid pipeline gridlock in the portfolio undertaking projects on time and in a time-efficient manner.
- To have a portfolio of profitable, high return projects with solid commercial prospects.
- To have a balanced portfolio i.e. long term versus short term, high risk versus low risk, and across markets and technologies.
- To have a portfolio of projects that is aligned with the business's strategy.
- To have a portfolio where spending breakdown mirrors the business's strategy and strategic priorities.

3. Research Methodology

A detailed case study was employed in a leading medical device manufacturer in Ireland utilising a mixed method research approach. In keeping with the organisation's requests for anonymity, the identity of the organisation and the participants is not disclosed. All participants were directly involved in the new product or new technology development process which feeds the project portfolio and are directly involved in the process for accepting or rejecting projects. Informants included project managers; programme managers; senior researchers; managers and directors or senior leaders. The subjects

selected were proportional and representative of their sub-population. The research comprised of initial open-ended interviews to identify key themes from the outset. This was followed by a detailed structured survey. Validation interviews then took place to verify initial findings and provide more in-depth analysis. Quantitative data was analysed using excel, SPSS, and Minitab software. The output was presented as frequency analysis, histograms plots, box-plots, ANOVA, and ANOM plots. The qualitative analysis was broken down in two stages. First, the initial coding broke up the data into components relating to actions and meanings. The data was analysed using three methods: open coding, axial coding, and selective coding. Open coding is the process by which data is broken down analytically (Corbin and Strauss 1998). The common attributes were linked together to form categories. In axial coding, categories were related to their subcategories through conditions, strategy, context, and consequence. Selective coding unifies all categories around a core category.

4. Findings

4.1 Project portfolio structure

Findings from our analysis reveal that product portfolios are well balanced as they contain a mix of small, medium, and large projects at the time of capture and the median lies between seven and nine projects. Data was collected about the value of the products in the portfolio. We found that a good mix of both high and low value projects existed in the portfolios. Interestingly, the majority of the portfolios contained at least one high value "*blockbuster*" or "*superstar*" project. The number of minor projects (i.e. limited scope, capital, and financial return) within the portfolio is an important metric. We found that the median percentage of minor projects lies somewhere between 20% and 40%.

4.2 Level of innovation in the portfolio

We attempted to establish the type and level of innovation with the portfolios. The lowest occurrence project type (13%) was "*Revolutionary or Breakthrough*". The next was "*Evolutionary or Derivative*" (40%). The remaining 47% was "*Platform-Next Generation*"

projects. In order to better understand the link between technology development projects and new product development projects and the impact of this in the portfolio, we probed whether there was a specific technology which had led to new product development within the portfolio. The vast majority of participants agreed that technology development leads to new product development in the project portfolio. One informant noted that *"the company runs a formal technology development program in order to develop novel technology platforms that can be commercialised across a broad range of products through the formal new product development process"*.

4.3 Portfolio management process

The results reveal that the majority of product portfolios had a structured management process in place. However, our study found that a notable change occurred in the decision-making processes within the last five years. Processes were changed in order to ensure better consistency and to avoid conflicting messages and prioritisation of projects across divisions and business units: "*Project ratings and justifications were not consistent among business units or project leaders making it hard to compare projects*." Better streamlining and strategic alignment was also a motivating factor to alter the decision-making processes. The overall aim was to limit the number of projects and prioritise high value ones for the project portfolio: "*There has been a reduction in the number of projects to allow more focus on the high priority ones. Streamlining of project/investment selection based on company strategy and alignment with current economic climate and future state factors."* Many project managers felt the need for more defined structures for both technology development and product development projects that has formulised gating systems to facilitate better control on the projects.

4.4 Gating process

There are a high number of gates active in the new product development process. These projects had about 11 gates but a standard deviation of 3.5, which may highlight some inconsistency in the response. There are, on average, 10 gates for new technology development projects, but the standard deviation is 8.0. These results are significant, showing a wide distribution of gate numbers within the

technology development process. The level of complexity in the innovation and the associated risk stimulates the business to create additional user-defined.

4.4 Scoring criteria

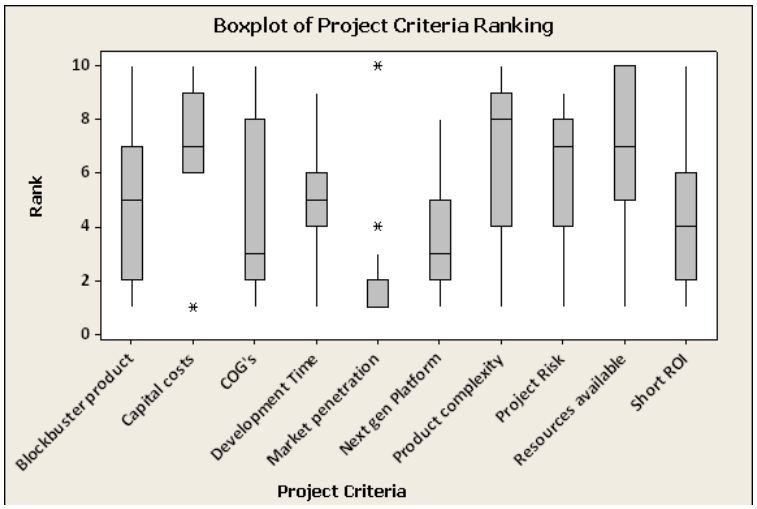
In order to evaluate the best criteria that can be used to evaluate a projects successful inclusion in the portfolio we asked participants to rank a series of criterion chosen from the literature. These include: development timeline; strategic market penetration; cost of goods sold (COG); product complexity; next generation platform; adequate resources available; blockbuster product; return on investment; capital costs and level of project risk. Each criterion was ranked in order of perceived importance from 1–10, where 1 represents the highest priority and 10 the lowest (see Figure 1). The results show a spread of data within each criterion. However market penetration was deemed the most important factor. The other criterion show varying rank levels, which makes determination of the next level of priority difficult to assess.

In order to assess the next priority level, mean variation and ranks are analysed relative to each other. The P-values for both Bartlett's and Levene's (F-Test) in the test for equal variance on all the factors shows P-values in excess of 0.05 (0.730 and 0.454 respectively) which supports the hypothesis that there is no statistical difference in variation across all factors. An analysis of means (ANOM) highlights a shift between differing factors. This suggests that "*Market Penetration*" was the highest priority. The median level of priorities were "*Blockbuster product*", "*COG's*", "*Development Time*", "*Next Generation Platform*", "*Project risk*", and "*Short ROI*". The lowest priority criterions were "*Capital Costs*", "*Product Complexity*" and "*Resource Availability*".

We then attempted to identify the best criteria to measure the health of the project within the formal review process over the project lifecycle i.e. once approval was granted to initiate the project and officially make it part of the portfolio. We found that "*Alignment to the Portfolio Strategy*", "*Return on Investment*", and the "*Technical Feasibility or Challenge*" were important criteria. Other key criteria that were identified include: alignment with the business strategy;

product advantage; technical feasibility; target market penetration; likelihood of success and risk versus return.

Fig. 1. Project selection criteria

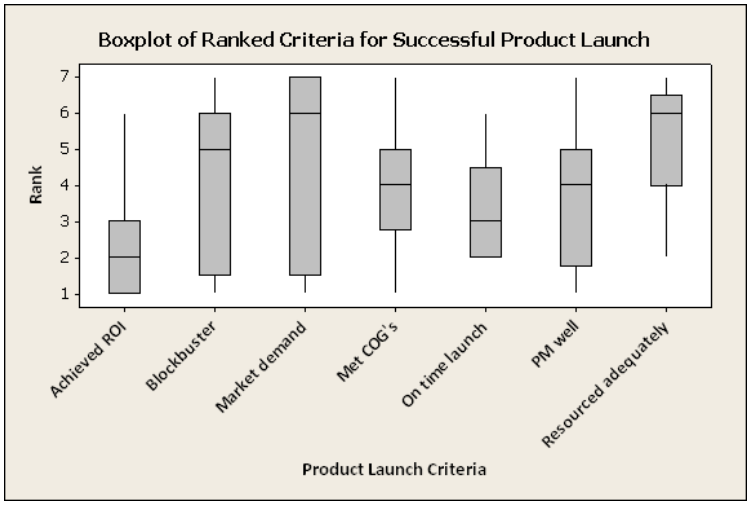


In order to ascertain what criteria should be used to evaluate the successful launch of any new product participants were asked to rank a series of criterion chosen from the literature. These include: on time launch; market demand; requirements met for cost of goods sold (COG); return on investment (ROI) achieved; project resourced adequately; project managed well (from plan to assess phases) and blockbuster product. The ranking ranged from 1–10. The results showed a spread of data within each of the criterions. Based on visual factors, it can be deduced that achieving ROI is the most significant factor for product launch (see Figure 2). The other criteria showed varying rank levels, and so further analysis was required.

An analysis of the means variation and means rank relative to each other were conducted. A test for equal variance on all the factors was calculated. The P-values for both Bartlett's and Levene's (F-Test) shows P-values in excess of 0.05 (0.247 and 0.402 respectively). This supports the hypothesis that there is no statistical difference in variation across all factors. An analysis of means found that "*Achieved ROI"* is the highest priority. The next level of priorities

are identified as "*Blockbuster Product"*, "*Market demand"*, "*product met COG's"*, "*On Time Launch"* and '*Project Managed Effectively*" as occupying the median of the ranking. The lowest priority criterion was "*Resourced Adequately*".

Fig. 2. Successful product launch criteria



4.5 Project termination

Changing business priorities was cited as a significant reason for projects stopping within the portfolio. Often other projects took priority and resources were reallocated. According to one informant, "*resources in either product development or operations [were] transferred to other projects."* Other contributory factors for terminating projects include the inability to realise key technology potential and a poor understanding of market requirements. High costs are cited as a reoccurring problem throughout the analysis. The cost to develop new technologies increase or unforeseen costs arise. Sometimes the product cannot compete with a product currently on the market. Also, the marketing of a new technology may take too long to recoup the costs incurred. Markets also erode which has an impact on recouping costs.

We found that the main reasons for projects stopping too late is a result of (a) a lack of systems and tools to help make these difficult decisions, (b) strong team ownership, loyalty and connectivity to the project, and (c) change in expectation: "*You usually get a sense that programmes are off track but lack the formal decision making tool to guide the teams.*" Also, "*teams feel they can overcome many obstacles so they won't back down from challenges even if they present with risks.*" Other reasons, such as poor up front expectations, are blamed for late decision-making.

4.6 Resources in the portfolio

Most of the respondents stated that a central process for the management of resources was in place. We found that lead times slip as a result of the lack of available resources required to execute the project deliverables. One participant noted: *"In general we have to wait until a project gets into trouble before full resources get assigned."* We also learned that projects often start with fewer resources than required until a defined execution plan with a resource map is in place: *"Early research project resources tend to be limited, until potential for ROI is identified; it takes careful management of what is available … Projects are predominantly started with inadequate resources."* While insufficient resources were found to impact on the success of projects so too did inappropriate appropriate resources. However we learned that high-value projects have a higher probability of being resourced.

5. Conclusion

Portfolio management is an effective method for organisations to manage their projects through their development lifecycles, provided ranking, priority, gating, and consistent approaches are taken into consideration. However, there are some challenges which can be overcome by implementation of new processes and a shift in culture. Our study found that a balanced portfolio is integral to resource availability and risk management. However to achieve this, greater uniformity in the system of scoring and ranking of projects is needed. In other words a robust review gating system is required throughout the development lifecycle. Without a unilateral process,

differences of approach can occur within the organisations sub-structures.

6. References

Augusto P, Miguel C (2008) Portfolio management and new product development implementation: A case study in a manufacturing firm. International Journal of Quality & Reliability Management 25(1):10-23.

Barczak G, Griffin A, Kahn K (2009) Trends and Drivers of Success in NPD Practices: Results of the 2003 PDMA Best Practices Study. Journal of Product Innovation Management 26(1):3-23.

Cooper R, Edgett S, Kleinschmidt E (1997) Portfolio Management in New Product Development - Lessons from the leaders II Research Technology Management 40(6):43-52.

Cooper R, Edgett S, Kleinschmidt E (2001) Portfolio management for new product development: results of an industry practices study. R&D Management 31(4): 361-380.

Corbin JM, Strauss AL (1998) Basics of qualitative research: techniques and procedures for developing grounded theory. London, UK: SAGE publications.

Grönlund J, Sjödin D, Frishammar J (2010) Open Innovation and the Stage-Gate Process: A revised model for new product development. California Management Review 52(3): 106-131.

Heising W (2012) The integration of ideation and project portfolio management - A key factor for sustainable success. International Journal of Project Management 30(5):582-595.

Jonas D (2010) Empowering project portfolio managers: How management involvement impacts project portfolio management performance. International Journal of Project Management 28(8):818-831.

Killen C, Hunt R, Kleinschmidt E (2008) Project portfolio management for product innovation. International Journal of Quality & Reliability Management 25(1): 24 - 38.

Martinsuo M, Lehtonen P (2007) Role of single-project management in achieving portfolio management efficiency. International Journal of Project Management 25(1):56-65.

Meskendahl S (2010) The influence of business strategy on project portfolio management and its success - A conceptual framework. International Journal of Project Management 28(8):807-817.

Petit Y (2012) Project portfolios in dynamic environments: Organizing for uncertainty. International Journal of Project Management 30(5):539-553.

van Oorschot K, Sengupta K, Akkermans H, van Wassenhove L (2010) Get Fat Fast: Surviving Stage-Gate® in NPD. Journal of Product Innovation Management, 27(6): 828-839