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Applying a Multiple Convergent Process in Achieving a Successful of New Product Development

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ABSTRACT

New Product Development (NPD) is critical for companies to improve their business results. However, few companies can benefit from such a process because it is difficult to determine how and which NPD processes should be designed to develop a leading-edge product. The objective of this study is to find out the appropriate and best approach for implementing an NPD process in a company. The Multiple Convergent Process (MCP) framework model is applied by borrowing the framework model of (Baker & Hart, 2007). The objective of the MCP framework model is to apply a parallel mechanism of NPD phases to work towards the same point or common outcome without delaying the next phase. This study applies a descriptive research method by describing the steps of the MCP model and using literature reviews. Fifty-two publications from 1990 to 2018 were reviewed. Major and related topics such as NPD, innovation, multiple convergent points, idea generation - evaluation - concept and selection, and factors for successful NPD were considered.

Keywords: *NPD, MCP, NPD phases, innovation*

JEL Classification: D02, D20, M11

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INTRODUCTION

Many believe that new product development (NPD) is now becoming a lever for companies to achieve sustainability. According to (Andrade-Valbuena & Merigo, 2018; Schilling & Hill, 1998), the importance of NPD has increased dramatically in recent decades as a dominant competitive factor in many industries. Moreover, as (R. G. Cooper, 2004) mentions, new product development in the enterprise is critical to the survival and success of the modern enterprise. This is also confirmed by (Mu et al., 2017), who argue that NPD has become essential for the survival of companies, as NPD plays an important role in building competitive advantage for companies (Salomo et al., 2007). According to (Kahn, 2005), NPD is defined as the overall process of strategizing, organising, conceptualising, creating and evaluating product and marketing plans, and commercialising a new product. Similarly, (Barclay et al., 2000) pointed out that the term NPD is about the involvement and

management of a series of projects of products that are completely new in the world. Thus, the goal of NPD is to transform an idea into a tangible, physical asset (Davila, 2000).

In fact, not many companies have succeeded in using NPD projects to improve their company's performance. (R. G. Cooper, 2013) found that only 56 percent of corporate NPD projects meet their financial goals and only 51 percent are launched on time. Moreover, the failure rate of NPD projects in U.S. companies ranges from 40 to 90 percent (Judson et al., 2006), and even only about 10 percent of all products developed make a significant contribution to corporate sales and profits (Barclay et al., 2000). Therefore, (Mahle, 2007) warns that managing innovations such as NPD projects is difficult because it requires an overwhelming process and involves many people in different departments of the company. In addition, (Rekettye, 2003) claimed that there might be a problem in analysing the relationships between product innovation and marketing innovation because they are not related. He argued that dominant development products should also be accompanied by dominant marketing factors from the beginning.

This study attempt to finding out what is the appropriate and best approach to implement the NPD process in the company and what success factors should be applied for a lucrative NPD.

RESEARCH METHODOLOGY

To achieve the above goal, the Multiple Convergent Process (MCP) framework model is applied following the framework model of (Baker & Hart, 2007). The objective of the MCP framework model is to apply a parallel mechanism of NPD phases to work towards the same point or common outcome without delaying the next phase. Consequently, this model can be a more accurate indicator of current NPD management and can be implemented in most organisations (Hollensen, 2019). This study applied a descriptive research method by describing the phases of the MCP model through searching and reviewing journals and academic publications. A literature search was conducted to evaluate 52 publications from 1990 to 2018. This narrowed down important and related topics such as NPD, innovation, multiple points of convergence, idea generation - evaluation - concept and selection, and successful NPD factors. To draw a parallel with the MCP framework model for a successful NPD process, NPD success factors are also proposed.

LITERATURE REVIEWS

MCP Framework Model

The main reason for applying the MCP framework model in implementing the best NPD process is that the previous models of NPD process such as state-gate systems (R. G. Cooper, 1990), portfolio management (R. G. Cooper et al., 1997, 2000; Robert. Cooper et al., 2001), R & D portfolio (R. G. Cooper et al., 1998), new products (R. G. Cooper, 2013), focus only on the internal organisational factors and apply only the sequential process from exploration to commercialization of products. These approaches are already outdated when it comes to the complexity of current and future product development. As (Baker & Hart, 2007) argue, more integrated and cross-functional departmental networking is needed to achieve high quality new products. Moreover, from the beginning, this new model has involved key parties, namely customers and suppliers, in the idea generation of the NPD process. In short,

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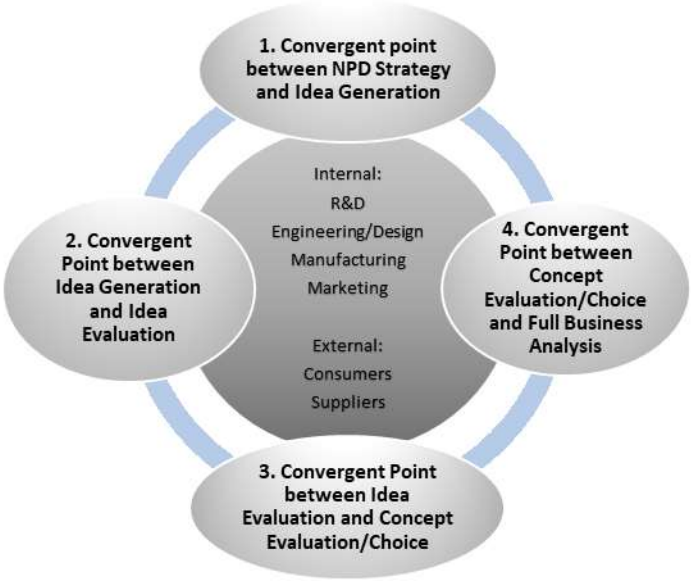
the MCP framework model not only involved internal departments in collaboration, but also involved key external parties in an integrated teamwork in every NPD process, from new product strategy to the convergent point of full business analysis (Hollensen, 2019). Figure 1 shows the summary of the MCP framework model.



Source: adapted from (Baker & Hart, 2007)

Figure 1. Summarise of the Multiple Convergent Process (MCP) Framework Model

The MCP framework model consists of four convergent NPD processes, including the convergent point between new product strategy and idea generation, the convergent point between idea generation and idea evaluation, the convergent point between idea evaluation and concept evaluation and selection, and the convergent point between concept evaluation/selection and full business analysis. There are also six stakeholders, namely external stakeholders - customers, suppliers - and internal stakeholders - R&D, engineering/design, production and marketing. Next, the MCP framework model process and the role of external and internal parties are described.

Convergent Point between NPD Strategy and Idea Generation

As discussed by (Baker & Hart, 2007), a convergent point means to cause the different stages of processes that are close to each other to move toward the same point. The convergent point in these areas is needed to ensure that there is a continuous knowledge building process between tacit and explicit knowledge formed through idea generation that should be consistent with the NPD strategy process within the organisation (Baker & Hart, 2007; Hart & Baker, 1994; Nonaka, 1994). This is because, as (Veryzer, 1998) warned, a discontinuous innovation and idea generation process could have unpleasant consequences for the convergent phase.

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For the internal parties within the organisation, i.e., R&D, the convergent point here is tied into the ongoing project phases. Similarly, other internal parties, such as the design department and the manufacturing department, are involved with ongoing design projects and process improvement projects, respectively. From the marketing perspective, competitive analysis and market forecasting and trends are required (Hart & Baker, 1994). However, for the external parties, i.e., customers and suppliers, there is a different, converging view. For customers, specific requirements and potential improvements are needed, while for suppliers, a change in the product line may be needed at the convergence point between the NPD strategy and idea generation.

As supported by (Lagrosen, 2005), the application of an interactive NPD process should involve both suppliers and customers from the beginning. This was reiterated by (Chang, 2019), who believes that continuous involvement of customers in the various NPD phases can bring synergistic benefits to both the company and the customers. (Morgan et al., 2019) also believe that collaboration between companies and customers can improve the speed of the NPD process and commercial products. However, as (Enkel et al., 2005) noted, there are many risks that should be anticipated before deeply engaging customers in the company's NPD process. These risks include loss of expertise due to disloyal customers, dependence on customers' views, dependence on customers' requirements or personality, limitation to mere incremental innovations, serving a niche market, and misunderstandings between customers and employees.

Involving suppliers in the NPD process could also have a positive impact on the organisation (Sjoerdsma & van Weele, 2015; Yoo et al., 2015). Their research has shown that supplier involvement has a positive impact on knowledge transfer and NPD performance of the organisation. However, in order to get a greater impact from suppliers, they should have a similar orientation and culture prerequisite as the company, otherwise the result could be disastrous (Schoenherr & Wagner, 2016). In addition, as suggested by (Takeishi, 2001), a company should have certain capabilities to coordinate and manage its relationships if it wants to successfully engage its suppliers.

Convergent Point between Idea Generation and Idea Evaluation

On this point, another convergent step should be taken, namely external and internal organisation. As suggested by (Baker & Hart, 2007) for the internal organisation, feasibility studies and initial time forecasts should be performed for both the R&D and engineering/design departments. This was reinforced by (Veryzer & De Mozota, 2005), who claimed that user-centred design has an impact on improving collaborative NPD from process orientation to improving ideation. (Roper et al., 2016) also argued that the best design could enhance NPD performance in the process phases. For the production department, on the other hand, the impact on capital and factory should be considered. Finally, for the marketing department, a comparison process is required to analyse potential competitive markets and establish initial budgets for smoothing the process (Baker & Hart, 2007).

For the parties in the external organisation, a change in specifications from the supplier's perspective can be measured at convergent points between idea generation and idea evaluation. It is an anticipation process from both sides (Hart & Baker, 1994). On the customer side, it is then a matter of changing ideas and entering preferences to enrich the process of convergent stages.

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Convergent Point between Idea Evaluation and Concept Evaluation/Choice

From the internal side of the research and development department, this convergence phase has already begun with the development of a more detailed technical concept. Even more, this phase also involves an analysis of material costs (Baker & Hart, 2007). (Frankort, 2016) claims that the R&D department is more productive with partners who have more technological knowledge to develop a better NPD. Also, in the engineering/design department, the cost of early design concept has already developed. However, in the production facility, attention is not only paid to the cost, but also to the evaluation of the impact in determining the resources for the alternative concepts. According to (Nafisi et al., 2016), the involvement of manufacturing in the early stages of NPD projects can have many benefits, as not only can operating costs be reduced, but also high quality and shorter time to market can be achieved. On the marketing side, a more comprehensive market assessment, concept testing/positioning, and product pricing are the main converging points that should be measured (Hart & Baker, 1994; Iskamto, 2021).

On the external side, however, a different approach might be taken. From the supplier's perspective, more developmental work on changes to new products is desirable to achieve convergence between idea evaluation and concept evaluation/selection. From the customer perspective, on the other hand, establishing collaboration on concepts, both technically and commercially, is essential for implementing such a convergent point (Baker & Hart, 2007; Iskamto, 2020).

Convergent Point between Concept Evaluation/Choice and Full Business Analysis

The final step that should be taken for the NPD process phases is to apply a convergence point between the concept evaluation/selection and the full business analysis. As far as the internal organisation is concerned, most of the processes dealing with the development of physical products take place in the R&D department as well as in the engineering and design department. In the manufacturing department, on the other hand, changes to the production process are required. From the marketing perspective, the development of marketing and go-to-market plans for products has already begun (Baker & Hart, 2007; Y. Zhang & Guan, 2017).

From an external perspective, i.e., from the customer's perspective, a smooth convergence process is required when an internal and functional performance test is conducted prior to the introduction of true NPD. (Chang, 2019) further states that continuous involvement of customers from the beginning in all phases of NPD can lead to synergy, from ideation to development to launch. Meanwhile, suppliers need to develop further the required parts before launching an NPD. Following the MCP framework model for an excellent NPD process, (Baker & Hart, 2007) also proposed success factors for NPD.

NPD SUCCESSFUL FACTORS

The NPD success factors consist of six factors, namely strategy, organisational structure, management, information, people, and process. These factors should be considered by all organisations to make their NPD process a worthwhile outcome, with emphasis on people

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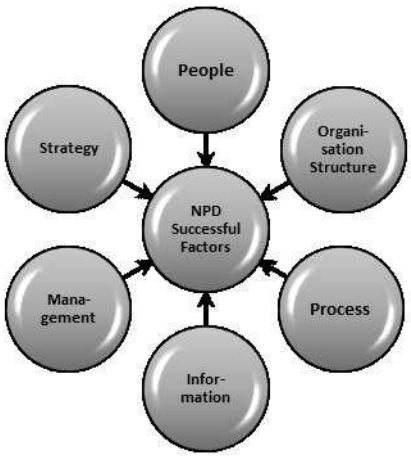
and process (Hart & Baker, 1994). Figure 2 summarises the six determinants of NPD success factors.



Source: adapted from (Baker & Hart, 2007)

Figure 2. Summarise of NPD Successful Factors

Strategy, Organisational Structure, Management and Information

According to (Ancona et al., 2019; Calantone et al., 1995; Xiong et al., 2021), NPD activities should start at the strategic level, where corporate CEOs identify the strategic values, vision, and mission of the organisation; because there is no roadmap that shows the right way to effectively implement NPD in organisations. However, (Burgelman, 2005) took a different view. He argued that the strategic and organisational structural context could be directly influenced toward NPD activities through either a bottom-up strategy, i.e., a strategy shaped by the structural context, or a top-down strategy, i.e., a structure shaped by the strategy. (Sull, 2005) defines the strategic context as the official strategy of an organisation that drives initiatives that are consistent with the strategy, while the organisational structural context is defined as organisational levers, such as information systems, performance targets, organisational design, that can be manipulated by top management to indirectly influence what type of strategic initiatives are defined and selected. According to (Burgelman, 2005), NPD is an enterprise-wide effort, meaning that it affects both the top and bottom levels of the organisation. In other words, NPD occurs at both the strategic and structural levels of the organisation. At the strategic level, NPD should be considered as part of the company's grand plan, goals, and direction for competing and marketing selected products. The organisational structural level, on the other hand, is about the management process, mechanism, daily operations, style, and how resources are allocated (Baker & Hart, 2007). Therefore, the strategic and organisational context are important factors for the successful development of NPD projects in organisations. The main challenge is how the strategic and organisational structural context can influence the work of NPD projects by selecting, maintaining, and varying the allocation of resources within the organisation. In summary, as (Bower & Gilbert, 2005) noted, the structure and process characteristics of resource allocation have important implications for organisational strategy.

Good innovation projects such as an NPD cannot go well without top management support and the best information within the organisation. Therefore, top management should focus their attention on allocating resources effectively and efficiently that apply good communication, technical aspects, and supportive authority within their organisation (Baker

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& Hart, 2007; Chollet et al., 2012; Rodríguez et al., 2008). In addition, effective and efficient information should include at least a general marketing approach, external communication channels, and provide technical information about the NPD process (Baker & Hart, 2007). Otherwise, companies will lose their competitiveness and will not be able to achieve their business results. It is clear that managing innovation or NPD projects is difficult and risky and presents many challenges (Handfield & Lawson, 2007). However, (Mahle, 2007) argued that the biggest challenge is not in an invention, but in how to properly implement the innovation.

In other words, it requires an effective mental model of managers to make the best decision regarding the implementation of NPD projects. The term mental model is considered a paradigmatic concept of an integrative set of ideas and practises that shape the way people see and interact with the world (Senge, 2006). Senge elaborated that mental models are deeply held assumptions, values, and images that shape the way people think and act about the world around them. Thus, a leader's mental model signifies how top management sees, thinks, and acts about their organisation. According to (Senge, 2006), leaders of organisations engaged in NPD projects should possess at least two aspects of an effective mental model: They should understand how and why NPD as an enterprise-wide system is important for organisational growth and development, and they should understand how such systems are determined by success at the product level. In addition, (Bean & Radford, 2000) noted that NPD project development must involve all levels of management and functional competencies within the organisation. Thus, top management should encourage creativity and create an optimal environment for innovation (Kremer et al., 2019; Page, 1993). For this reason, (Hill & Levenhagen, 1995; Vink et al., 2018) pointed out that top management must develop a vision or mental model of how the environment works (sense making) and be able to communicate this to others and then gain their support (sense giving). Similarly, (Madhavan & Grover, 1998; W. Zhang et al., 2022) suggested that top management should view NPD projects as knowledge-creating activities and empower NPD teams to engage in such activities so that the entire organisation benefits from these processes.

NPD Process and People

As (Tolonen et al., 2017) noted, the NPD process can be considered a strategic activity. Furthermore, (Baker & Hart, 2007) stated that the NPD process is a sequential progression of NPD phases in time, from pre-development to development, commercialization, and launch. (Kahn, 2005), on the other hand, defined the NPD process as a series of tasks, steps, and phases that describe the normal means by which a company repeatedly transforms embryonic ideas into saleable products or services. As (Chaudhuri & Boer, 2016) point out, the goal of the NPD process is to remove uncertainty to the point where the organisation can create a set of information to describe and define how these products can be produced, marketed, and supported. (Christensen, 1997) suggested that five steps be considered in the implementation process: Sharing ideas with all stakeholders in the organisation; standardising the concept by using the product development funnel framework; continually linking it to the organisation's strategy; establishing project classification; and codifying the project in a project charter or contract book in the organisation's information system.

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Employee involvement in the NPD process is a critical factor in the outcome of new inventions because it integrates multifunctional coordination and best team communication to create a product champion (Roy et al., 2018). They also claim that building a teamwork culture for NPD success could enrich NPD team capabilities by supporting and socialising team members' creativity in developing and producing new inventions and innovations. However, a weaker teamwork culture may occur when a member or some members drop out due to resignation or dismissal. To overcome such a weaker teamwork culture, (Tang et al., 2015) suggest the use of cross-functional teams in the NPD process within the company. The main advantage of this team is that team members can contribute their diverse knowledge to the project. As a result, the NPD process can fully utilise and integrate the different expertise of each member.

CONCLUSION AND LIMITATION

It is undeniable that NPD is of utmost importance for organisations to improve their business results, both in the present and in the future. However, not many organisations can benefit from such a process because it is difficult to determine how and which NPD processes should be designed to achieve a top product within the organisation.

Applying the MCP model is one of the best solutions for NPD phases, as this model provides not only collaboration among internal departments, but also collaboration with external parties to form an integrated team in each NPD process, from the convergent point of new product strategy to the point of full business analysis. In addition, this model has proven to apply a parallel mechanism of NPD phases to move towards the same point or common outcome without delaying the next phase by executing the convergent point between new product strategy and idea generation - the convergent point between idea generation and idea evaluation - the convergent point between idea evaluation and concept evaluation and selection - and the convergent point between concept evaluation/selection and full business analysis. To obtain successful champion products, six determinants of successful NPD were proposed, consisting of strategy, organisational structure, management, information, people, and process. Both the MCP model and the six NPD success determinants can be the best measurement indicators and approach in most companies when it comes to achieving the best NPD result.

However, this report has a limitation in that no primary research was conducted and consideration should be given to the type of organisation in which the circumstances of these two methods can be applied.

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