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DYNAMIC PRODUCT PROLIFERATION AND FIRM PERFORMANCE IMPLICATIONS

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ABSTRACT

Product proliferation is a product strategy whereby a firm increases the number of products it offers to attract and satisfy diverse customer needs, to create barriers to entry, disperse risk, and develop economies of scope.

Despite the importance of product proliferation decisions for firm performance, and significant extant research, the performance consequences of product proliferation activities are unclear, with equivocal results emerging in the literature. Adopting a dynamic approach, we specify the conceptual domain of product proliferation and explore different facets (within-niche, new-niche) of product proliferation. In doing so, this research aims to develop a better understanding of the benefits and/or drawbacks of product proliferation activity and develop a model that explicitly considers non-linear relationships and articulates the impact of potential moderators. The moderators explored include: scopification (a variable that captures how product expansion occurs), which can create managerial complexities, and potentially erode performance outcomes

of product proliferation; R&D expenditure (a proxy for firm R&D effort), which could support the development of both new technology (exploration) and better application of the existing technologies (exploitation) and, thus, enhance product proliferation performance outcomes; marketing expenditure (a proxy for marketing efforts), which could support product promotion and increase the performance outcomes of proliferation efforts; product cannibalisation, where sales and market share outcomes are eroded due to the lack of difference between the new and existing products; and intensity of competition (the level of competition in a market), which requires different market research costs and the costs of market research in a low competition market might be lower, and thus enhances the outcomes of proliferation.

This research aims to make an academic contribution by describing two key facets of dynamic product proliferation, explaining how these may shape performance, and exploring the potential moderators that determine the performance consequences of product proliferation strategies. As a result, the study will also make a managerial contribution by providing information that managers can feed into the design of product portfolios, that can shape organisational innovation policy, and that can help managers allocate business resources more effectively.

INTRODUCTION

In today's highly competitive markets, product strategy has become an essential part of a company's business strategies. This is because a company has to effectively manage its product portfolio to compete with their rivals and survive in the marketplace. Product proliferation is a strategy whereby a firm increases the number of products it offers in order to satisfy various objectives, such as: attracting and satisfying diverse customer needs (Hill and Jones, 2008); creating barriers to entry; dispersing risk (Berman, 2011); and developing economies of scope (Lambertini, 2009). For example, Coty, one of the world's leading fragrance companies, by introducing numerous new fragrances each year under various brand names (e.g., Adidas, Calvin Klein, Davidoff, Katy Perry, Playboy, and many others) to attract different customer segments, proliferates products at a relatively high rate. However, not all companies can effectively and successfully implement product proliferation. For example, in the past Mitsubishi Motors had a broad range of car models targeted at different customer segments, but decided to refocus their product portfolio on a few specific segments (e.g., SUVs, pick-up truck and eco cars) to better compete in the crowded automotive market.

Despite the importance of product proliferation decisions for firm performance, and significant extant research, the performance consequences of product proliferation activities are unclear, with equivocal results emerging in the literature. This lack of agreement in the research findings could be grounded in the fact that product proliferation is a somewhat complex phenomenon that lacks clear consensus in term of definition and operationalisation. Firstly, most scholars agree that, at its heart, product proliferation is a dynamic process involving increases over time in product offerings to

fill product space in the market (Schmalensee 1978; Connor, 1981; Bertini et al., 012; Moreno and Terwiesch, 2016). However, extant operationalizations of product proliferation do not typically capture the dynamic nature of the construct, and hence the impact of proliferation remains uncharted. Indeed, in many instances, the operationalization of proliferation is not directly measured, but is merely implied based on the size of the firm's current product portfolio: a large number of products in the current portfolio, for instance, indicates that proliferation has taken place at some prior time, and so the size of the current product portfolio is used to infer the existence of past proliferation (Connor, 1981; Barroso and Giarrantana, 2013). There are problems with the latter approach, since it does not provide information on current proliferation activity, or its link with the success of a firm.

A second complication is that product space filling can be implemented in different ways: for example, it can occur within existing niches or product lines (termed 'within-niche proliferation'), or it can occur through the creation of new products to fill market space within new product lines that target new market niches (termed 'new-niche proliferation') (see Barroso and Giarrantana, 2013). Potentially, each kind of product proliferation will have different causal impacts on business success, and different nomological networks. However, the performance consequences of these different facets of proliferation have not been empirically investigated.

Third, it also seems likely that the success of firms' product proliferation activities will be dependent on numerous internal factors (e.g. resources available to support R&D, manufacturing, distribution, promotion and marketing expenditure; product deletion strategy; size of current portfolio), and external factors (e.g. intensity of competitive activity, consumer demand). Yet, research into the potential moderating factors that determine when different product proliferation strategies are most or least successful is scarce.

Therefore, this paper sets out to clarify the conceptual domain of product proliferation, and in so doing, highlight its dynamic nature and its multidimensionality. Thus, product proliferation is defined as a dynamic construct, that can have different facets (within-niche, new-niche). In addition, this paper also explores several potential moderators, which might affect the success of product proliferation. In sum, the current research aims to develop a better understanding of the benefits and/or drawbacks of product proliferation activity. This paper will firstly review product proliferation literature. Then it will be followed by a proposed conceptual model, a discussion of a methodology to assess the model, and a discussion of the study's implications.

LITERATURE REVIEW

Product proliferation

Defining product proliferation is complex, because researchers define product proliferation in different ways and, hence, operationalise their research in different

ways. Most researchers agree that product proliferation is a dynamic process involving increases over time in product offerings to fill product space in the market (Schmalensee 1978; Connor, 1981; Bertini et al., 2012; Moreno and Terwiesch, 2016). However, despite this relatively universal agreement on product proliferation as a dynamic concept, many scholars operationalise product proliferation in a static way (e.g. Barroso and Giarrantana, 2013; Bayus and Putis 1999, Connor, 1981), only looking at the number of product offerings. While it is true that this static measurement captures the status of a company having many products, caused by past product proliferation activity, it does not capture the real dynamism that underpins the product proliferation concept. Instead, it illustrates proliferation efforts at some prior time, and the size of the current product portfolio is used to infer the existence of proliferation (Connor, 1981; Barroso and Giarrantana, 2013), but since it does not provide information on current proliferation activity, it does not shed light on how the product space filling process impacts on the success of the firm. Hence, some scholars suggest that dynamic measurements of product proliferation are required, such as the net growth of the stock keeping unit (SKU) or by using a a ratio of growth in SKUs (Connor, 1981). However, these dynamic approaches to the assessment of proliferation have not yet been implemented.

Furthermore, simple measures of dynamic product proliferation (such as growth in SKUs) may not actually capture the full nature of product proliferation, since the latter can take more than one form. Barroso and Giarrantana (2013) describe two types of how product space could be filled, which are 'within-niche' and 'new-niche'. Within-niche occurs when a company focus on only one submarket and introduces products within that submarket, as can be seen in figure 1. A good example can be seen from Rolls Royce Motor Cars, which is a luxury car company focusing only on the luxury sedan market but has several car models all targeted at this market. On the other hand, new-niche refers to a strategy in which a firm focuses on new submarkets and releases products within this new product class, as can be seen in figure 2. For example, Toyota has cars in many different car segments because they expand their product lines to attract different customer segments, such as SUVs, compact cars, and so on.

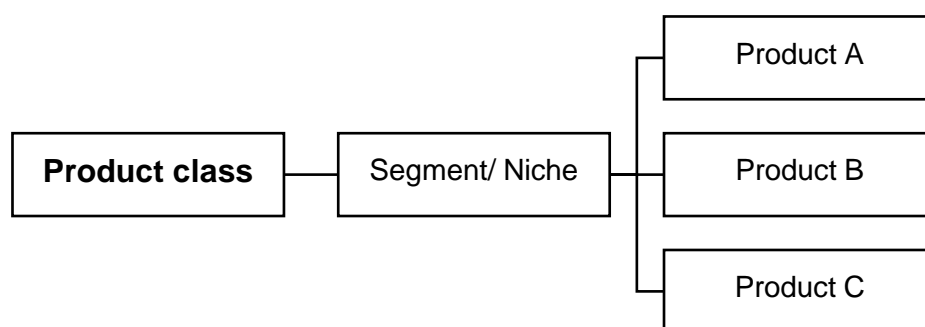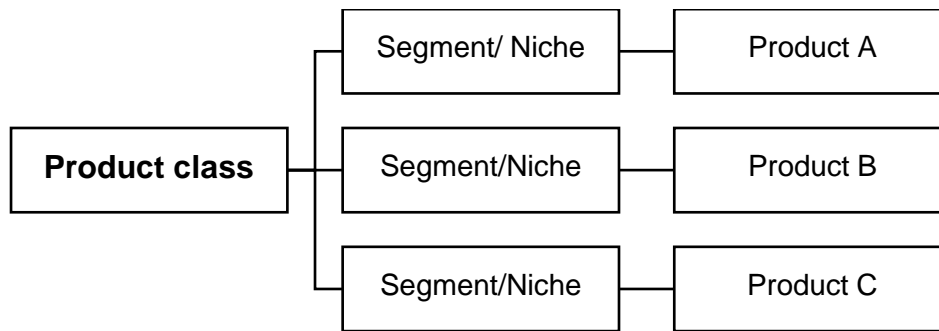Figure 1: Within niche (Barroso and Giarrantana, 2013)

Figure 2: New-niche (Barroso and Giarrantana, 2013)

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                         ┌──────────────────┐      ┌──────────────────┐
                         │  Segment/ Niche  │──────│    Product A     │
                         └──────────────────┘      └──────────────────┘
┌──────────────────┐     ┌──────────────────┐      ┌──────────────────┐
│  Product class   │─────│  Segment/Niche   │──────│    Product B     │
└──────────────────┘     └──────────────────┘      └──────────────────┘
                         ┌──────────────────┐      ┌──────────────────┐
                         │  Segment/Niche   │──────│    Product C     │
                         └──────────────────┘      └──────────────────┘
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However, while Barroso and Giarrantana highlight an important addition to the proliferation literature, their conceptualisation of within- and new-niche proliferation still only provide a snapshot of the current portfolio. While we agree that it is important to capture these two very different facets of proliferation, we argue that their terminology may not best capture the dynamic element of product proliferation effectively. In this research, within-niche proliferation is called "Densification", because a company using this strategy will exhibit a narrow focus for their product space filling within current segments, causing an increase in products within their current market space and, thus, focused on densifying the segment or segments in which they operate. An example of what this might look like in a single segment can be seen in figure 3. New-niche proliferation is termed "Expansion", because, by expanding to a new segment(s), the market scope of the firm will be extended beyond where it currently operates, as can be seen in figure 4. These new terms aim to capture the dynamic nature of these within-niche or new-niche activities, using terms that relate to how the firm has proliferated rather than just where. Indeed, some firms will proliferate across both product spaces, both densifying within their current markets and expanding their market scope of the firm within a given time frame.

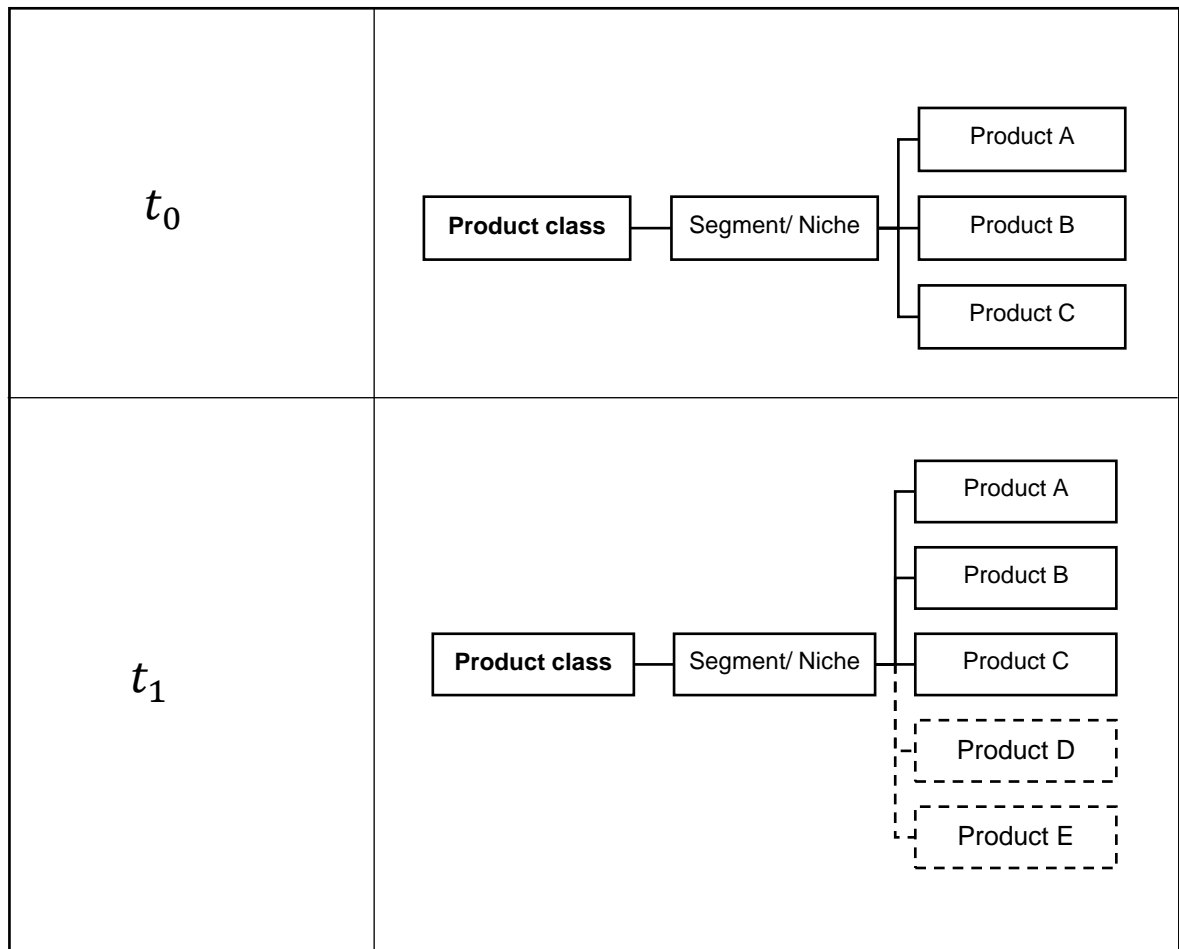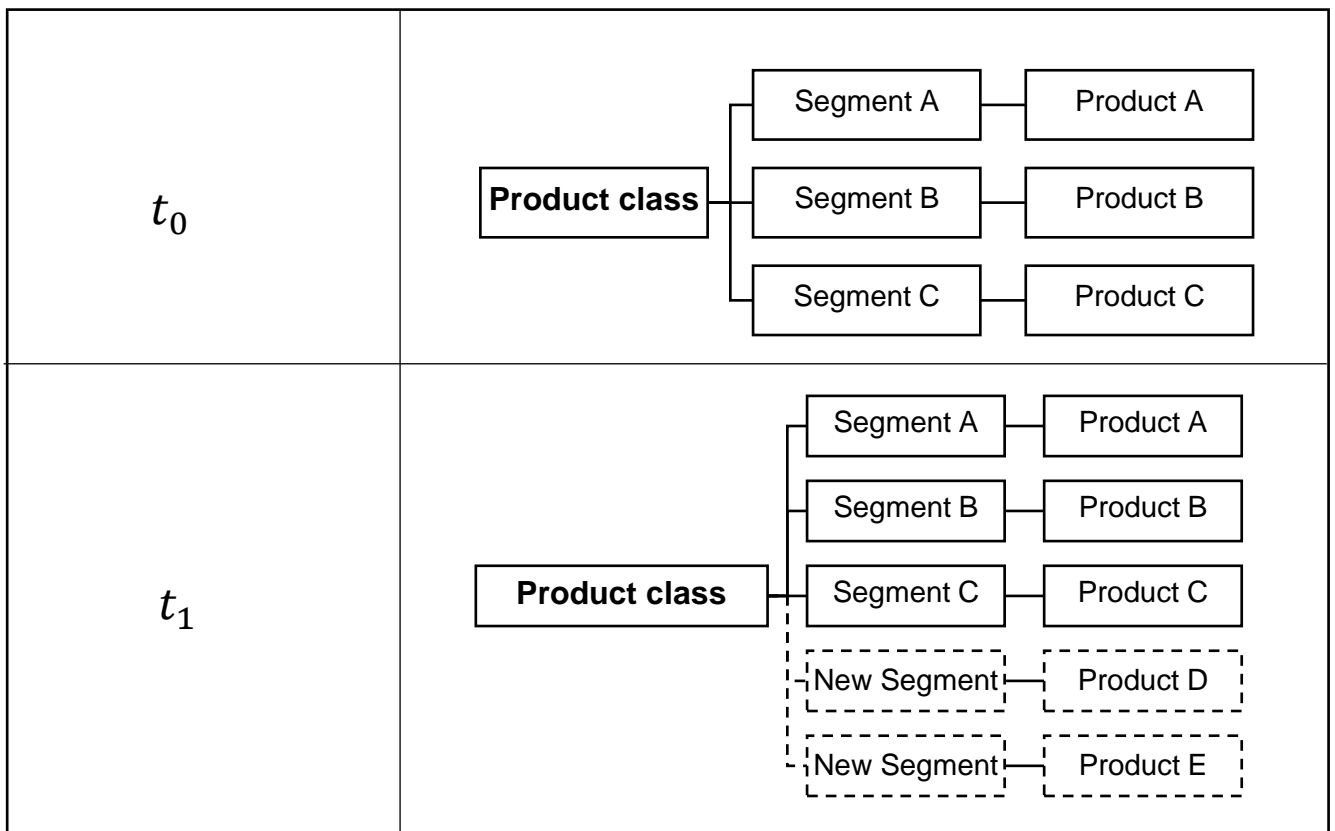Figure 3: Densification (Adapted from Barroso and Giarrantana, 2013)

Figure 4: Expansion (Adapted from Barroso and Giarrantana, 2013)

Product Proliferation research is also complicated by being studied at different levels. In marketing research, researcher's attempts to conduct research into product proliferation can be divided into three research streams. The first stream looks at product proliferation at the R&D level and tends to focus on how to develop new products and new product development strategies. For example, Katila and Ahuja (2002) look at search behaviour of firms to develop new products. Cooper and Kleinschmidt (1995), Atuahene-Gima (1995), Dwyer and Mellor (1991), and Griffin (1997) studied the critical success factors for new product development. However, in terms of exploring product proliferation, this work can only examine which products are added and why. The second stream of work looks at the marketing and brand perspective. In marketing and brand perspective research, product proliferation is viewed as a product portfolio management activity, which involves strategic product management decisions to the portfolio, from a business perspective. In this regard, researchers have looked at firm's actions at the product portfolio level, and explore the performance impact of product proliferation efforts, including Barroso and Giarratana (2013), Connor (1981), Bayus and Putis (1999) and Li and Greenwood (2004). However, the results from their research are still debatable because the findings are equivocal and the measures used are static, rather than dynamic, thus calling into question whether product proliferation efforts are really being assessed, as opposed to just the size of the portfolios. For example, both Tanriverdi and Lee (2008) and Sorenson (2000) have found a positive relationship, whereas scholars such as Bayus and Putis (1999) and Li and Greenwood (2004) have found the relationship to be negative. Therefore, performance outcome of product proliferation is still questionable.

Measurement issues might be a possible reason to determine why product proliferation is still debatable. When looking at the definition of product proliferation, the researchers agree that it is an increase over time in product offerings to fill product space in the market. However, looking at either the size of product offering or the number of new product addition might not fit well to the definition as it does not capture the net change in product portfolio. In fact, at product portfolio level, there is not only product adding activity, but there is also product deletion (churn) as a part of product management activity and this deletion activity affects the net change of product portfolio. Therefore, looking only at product addition might not reflect the net change in the product portfolio. For example, two firms could launch five new products within the time period studied, however, firm A could delete three products. Therefore, the net growth of SKU for firm A would be two, whereas the net growth of SKU of another firm (firm B) would be five because firm B did not delete any products. With churn ignored, researchers might fail to assess the actual change in product portfolio level and this might result in different outcome. By considering product churn, it will allow a more appropriate assessment of the actual number of new products, which enables researchers to capture the dynamic in product portfolio level.

The last stream of product proliferation research looks at proliferation effects from a customer's perspective. For example, Huffman and Kahn (1998) identified customer confusion caused by large varieties of products, and Turnbull et al., (2000)

found higher levels of customer confusion in highly dynamic product markets. This research provides valuable insights into the potential moderators of product proliferation from a firm's perspective, because it articulates what might cause confusion, for example.

In the current research, we adopt a marketing and brand level perspective, and we do this for several reasons. First, decisions about spending on product proliferation activities are likely to be taken at these levels, including decisions about adding and deleting products, to manage the product portfolio. Second, product proliferation activity affects firm-level competitiveness, and thus, focusing on this level allows an understanding of how firm-level decisions affect performance. Third, understanding how internal capabilities and external factors affect performance outcomes requires a firm-level focus. Hence, by focusing on this level of analysis, it is possible to capture the dynamic of product portfolio and this allows managerial insights to be drawn regarding the portfolio changes made and their impact on firm performance.

As can be seen from above review, product proliferation is a complex strategy because product space filling activity can be employed in two different ways (densification and expansion) and each product space filling method might impact differently on business success and create different nomological networks because of different filling mechanisms. Therefore, there is a need to clarify the performance outcome of each filling approach, and their combination, in order to provide theoretical insights into the proliferation concept and managerial insights that will help Portfolio Managers to select the right filling approach when implementing product proliferation.

RESEARCH MODEL AND HYPOTHESES

Figure 5: Proposed research model
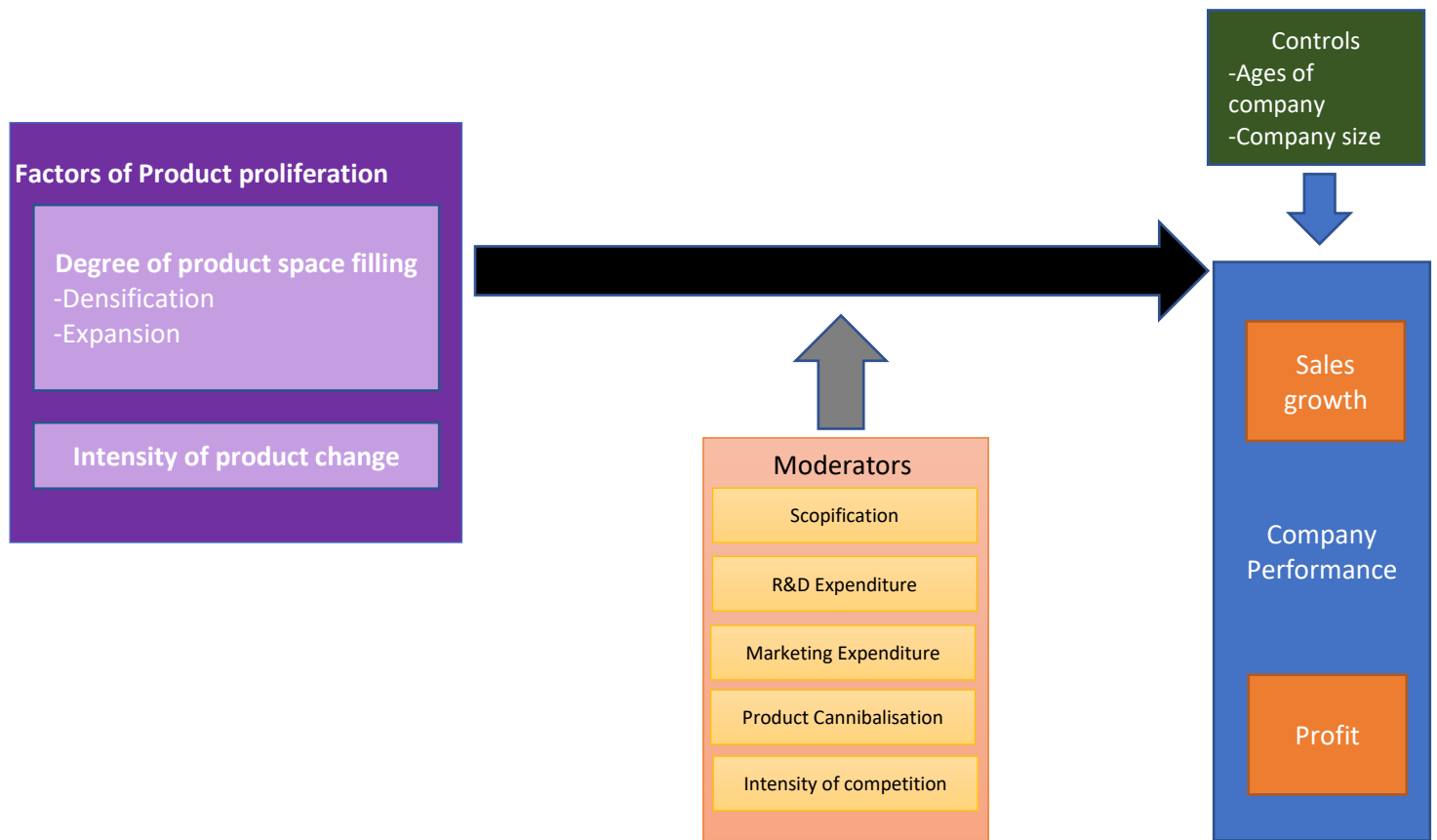
According to figure 5 above, the main focus is on examining the performance outcome of product proliferation. Product proliferation is a strategy involving efforts across the firm (and potentially beyond into the firm's network) and requires significant resources. Thus, understanding the performance outcome of these efforts is a key issue for firms undertaking proliferation activity. Product proliferation is proposed as an integration of densification and expansion, in line with work of Barroso and Giarrantana (2013). Unlike research that examines the nature of product proliferation as a static construct (such as Connor, 1981; Barroso and Giarrantana, 2013), this research views product proliferation as a dynamic construct, considering product churn (deletion) as an essential part of product portfolio management activities. However, adopting this dynamic approach can create problems, for example, when more products are deleted than added, causing a negative or zero net SKUs changes. Intensity of product change has been developed as a facet of product proliferation (see details in measurement development section), in order to alleviate this problem. Sales growth and gross profit are selected as measurements of company performance. This is because product

proliferation aims to satisfy various customers' needs (Lehmann and Winer, 2005), thus attracting more customers, leading to sales growth. Gross profit allows for an assessment of the net result of proliferation efforts after the costs of producing and marketing the products, thus enabling the researcher to measure a key firm performance outcome (Kang and Montoya, 2014). Essentially, product proliferation only makes sense as a business strategy if it grows sales and/or achieves greater profitability.

Product proliferation

Product proliferation efforts might affect firm performance differently depending on product space filling approaches (densification and expansion). In term of densification, with a low to medium level of densification, a company might enjoy benefits such as sales growth, and increased market share, because new products can satisfy customers' needs and attract new customers to buy products. However, it is not unreasonable to think that the benefits of densification might not have a linear performance relationship, in that beyond a certain level of densification, positive performance outcomes might decline, due to customer confusion and cannibalisation effects. Therefore, we hypothesise that:

H1: There is an inverted U-shape relationship between the degree of densification of a firm's product proliferation and company performance

In term of expansion, with a low to medium level of expansion, a company might enjoy benefits because new products can satisfy different customers' needs across segments/niches. However, when the degree of expansion reaches a certain point, performance might be eroded because the products might use different platforms leading to diseconomies of scope and diseconomies of scale (Tanriverdi and Lee, 2008), and there might be brand stretch issues. This is because new products might not fit the brand characteristics and the success of new products might be eroded (Monga and John, 2010). Hence, we hypothesise that:

H2: There is an inverted U-shape relationship between the degree of expansion of a firm's product proliferation and company performance

Furthermore, companies can intensively implement product proliferation by combining both densification and expansion strategies. When the company intensively fills in the market space with a high degree of densification and a high degree of expansion, the company might also enjoy benefits from market expansion and increased sales. However, in this situation, the benefits from economies of scale would gradually reduce as the degree of scope and densification increase. In addition, the benefits of scope would fall off more rapidly under high levels of densification due to diseconomies, costs, less R&D capability, and resource consumption. Therefore, the researcher proposes the hypothesis below:

H3: Under both a high level of densification and expansion, the inverted U-shape relationship between the degree of expansion of a firm's product proliferation and their company performance is more pronounced

Moderators

Product proliferation is believed, by numerous scholars (e.g.Mocker and Ross (2017); Berman (2011)) and managers, to cause business failure, through the development and sale of too many products. However, there are many companies implementing product proliferation strategies successfully. For example, Toyota has become one of the leaders in the automotive industry through a combination of densifying, through additional model lines within current market segments and expanding into new market segments with new models and lines. So why do some firms succeed and others fail? Answering this question, requires the study of boundary conditions of product proliferation. However, currently, there is limited research exploring potential moderators of the product proliferation, firm performance relationship. This section introduces four moderators that are predicted to moderate this relationship, including Scopification, R&D expenditure, marketing expenditure, product cannibalisation, and intensity of competition respectively.

<u>scopification</u>

Scopification refers to how product expansion occurs under different expansion strategies. This is because expansion does not explain how product line changes over time, only focusing on the number of products that fits the expansion category. Thus, two firms might have the same level of expansion, but this expansion effort might have different product scope. For example, a company might introduce two new products, where both new products enter the same new segment. Whereas another company might introduce two new products, in which the products enter two different segments (one product for each new segment). This difference in scope coverage might lead to different performance results because when a company expands their product scope to new markets, new product lines might increase complexity in their operations, because new products might not use the same products platforms, leading to diseconomies of scope and diseconomies of scale (Tanriverdi and Lee, 2008) and require additional resources to support their launch (Baumol, Panza, and Willing,1983; Lancaster, 1979; Lancaster 1990; Moorthy, 1984). Therefore, we hypothesise:

H4: Performance outcome of expansion will be higher when there is a low degree of scopification

<u>research and development (R&D) expenditure</u>

R&D decisions are important for driving new product development and creating a competitive advantage for a firm (Coad and Rao, 2010). This is because R&D generates new knowledge and commercialises this new knowledge into new products and services (Chiesa, 2001). In addition, R&D efforts also enable firms to improve their existing products and innovation capability (Gentry and Shen 2013). In addition, Garcia et al. (2003) point out that investment in R&D delivers both new technology (exploration) and better application of the existing technologies (exploitation). R&D activity is normally measured by using either actual R&D spending or R&D intensity, which is a ratio of actual R&D spending to sales (Bromiley et al, 2017).

Even though R&D expenditure is an important factor in new product development, R&D expenditure has never been taken into consideration with regards to product proliferation research. R&D spending would indicate how much a company pays attention to R&D activity within the firm. By focusing on R&D activity, a company could undertake more product proliferation, employing densification, expansion or a combination of densification and expansion strategies. Particularly for expansion, a company with high R&D expenditure would be better able to differentiate new products and help customers to distinguish from the existing product lines and thus, generate additional sales and market share as a result. Thus, we hypothesise that:

H5: The relationship between densification and company performance would be stronger when there is a high level of R&D expenditure

H6: The relationship between expansion and company performance would be stronger when there is a high level of R&D expenditure

marketing expenditure

Marketing is a process of value creation and relationship management with customers aiming to receive value from customer values (Kotler and Armstrong, 2012). It involves many important activities such as managing product, price, place, and promotion (Kotler and Armstrong, 2012). In order to increase the success of new products, it is important for a company to invest in marketing activities such as sales training, advertising, sales promotion and so on. Marketing expenditure is therefore chosen as a proxy to measure marketing efforts made by a firm.

Even though marketing expenditure is an important activity to promote new products, it has never been taken into an account of product proliferation research before. In fact, the higher level of marketing expenditure might increase a chance of new product success, because the company can utilise this expenditure to train their sales staffs and implement better promotional activities, which might increase the success of product proliferation (both densification and expansion) and lead to higher performance as a result. Therefore, we hypothesise:

H7: The relationship between densification and company performance would be stronger when there is a high level of marketing expenditure.

H8: The relationship between expansion and company performance would be stronger when there is a high level of R&D expenditure.

product cannibalisation

When a company introduces new products as part of a product proliferation strategy, there might be a risk of product canibalisation, which occurs when the sale of a new product takes over the sales of an existing product (Harvey and Kerin, 1979). Lomax and McWilliam (2001) suggest two levels of cannibalisation effects. The first level is cannibalisation from the parent brand (Lomax and McWilliam (2001), the second is cannibalisation from other firm brands (Lomax and McWilliam, 2001). When

a company introduces a new product, an ideal state is that the new product should obtain new sales from competitors (Mason and Milne, 1994). However, in reality, the degree of cannibalisation can be between 0% and 100% ((Mason and Milne, 1994). Thus, when a firm implements a product proliferation strategy, there is a chance that new products introduced by a firm might take sales away from existing products. Therefore, instead of gaining new sales, the performance outcome of product proliferation activities might be eroded due to this cannibalisation effect.

In terms of product proliferation efforts, it is possible that the effect of product cannibalisation might be different depending on the product space filling strategy adopted. While there is no prior research exploring this phenomenon, it is not unreasonable to believe that product cannibalisation is more likely to occur when implementing a densification strategy, rather than an expansion strategy. This is because densification involves filling space within a current market segment, thus, as the level of densification increases, the level of product similarity or overlap is likely to increase accordingly. Extant research tells us that product similarity leads to product cannibalisation (Buday, 1989). In contrast, proliferation efforts focused on extending the scope of the firm to new market segments are less likely to cause cannibalisation of current products, as they are not targeted at the same segment. Thus, we hypothesise:

H9: A higher level of product cannibalisation reduce performance outcome of densification

intensity of competition

Beside internal factors, Intensity of competition might be an external factor that impacts the outcome of product proliferation. In general, there are three main competitions, including perfect competition (many companies offering the same products), monopolistic competition (many firms offering differentiated products), oligopoly (a few firms dominate the market), and monopoly (an only one company in the market) (Krugman and Wells, 2012). In economic research, firms in oligopoly tend to recognise their mutual dependence and they tend to engage in coopetition to limit competition and this coopetition leads to increase in costs and reduce performance (Scherer and Ross 1990). However, when the number of firm increases, coopetition is less likely to occur (Williamson, 1965). In fact, in this high competition, it is difficult for a firm to find unique opportunities and market research activities is costlier (Derfus et al, 2008). In addition, Defus et al. (2008) also mention that in an oligopoly market, customers tend to pay attention to the new actions of dominant firms. Therefore, product proliferation might perform better when the competition is not high because the costs of market research are lower (Derfus et al, 2008) and the customers tend to be more responsive to company's actions. Particularly, expansion strategy, it might be a significant movement of a company to attract customers in new segments. Therefore, we hypothesise:

H10: The performance outcome of expansion strategy will be higher when there is less competition

Firm performance

Firm performance is considered as a centre of strategic management because it involves testing of any strategies overtimes (Schendel and Hofer,1979). In general, Venkatraman and Ramanujam (1986) classified firm performance into two main layers, including financial performance, business performance, and organisational effectiveness. The first layer is financial oriented and hence focus on the financial impact in a company (e.g. sales growth, ROI). The second layer takes into accounts of both financial and operational performance (e.g. market share). In addition, Krasnikov and Jayachandran (2008) conclude two main performance measurements in relation to firm capabilities. Those two key performance indicators include market performance and efficiency performance. The first indicator refers to indicators used to measure the effectiveness of market, which includes "market share, profitability, and sales" (Krasnikov and Jayachandran, 2008). Whereas the latter refers to indicators that could measure the efficiency of operations, which includes "cost reduction, lead-time reduction, and time to market" (Krasnikov and Jayachandran, 2008).

OPERATIONALISATION

In order to achieve research objectives, it is essential to operationalise the research appropriately. Due to the dynamic nature of product proliferation, the researchers developed new measurements for product proliferation. Scopification is also developed to measure how expansion occurs. The researchers also adapt existing measurement for R&D expenditure, marketing expenditure, and product cannibalisation.

Product proliferation: Densification

Densification is a strategy where a company develops or adds new products to existing product lines, causing densification of product space within a current segment/niche. At the same time, a company might also decide to delete their obsolete or unsuccessful products from these segments/niches. Hence, to capture the dynamic change of a firm's product portfolio, the research operationalises densification using the following equation:

$$\text{Densification} = (No.\,of\,New\,products\,within\,existing\,line(s) - Deletions)$$

Figure 6: An example of the use of a densification product proliferation strategy
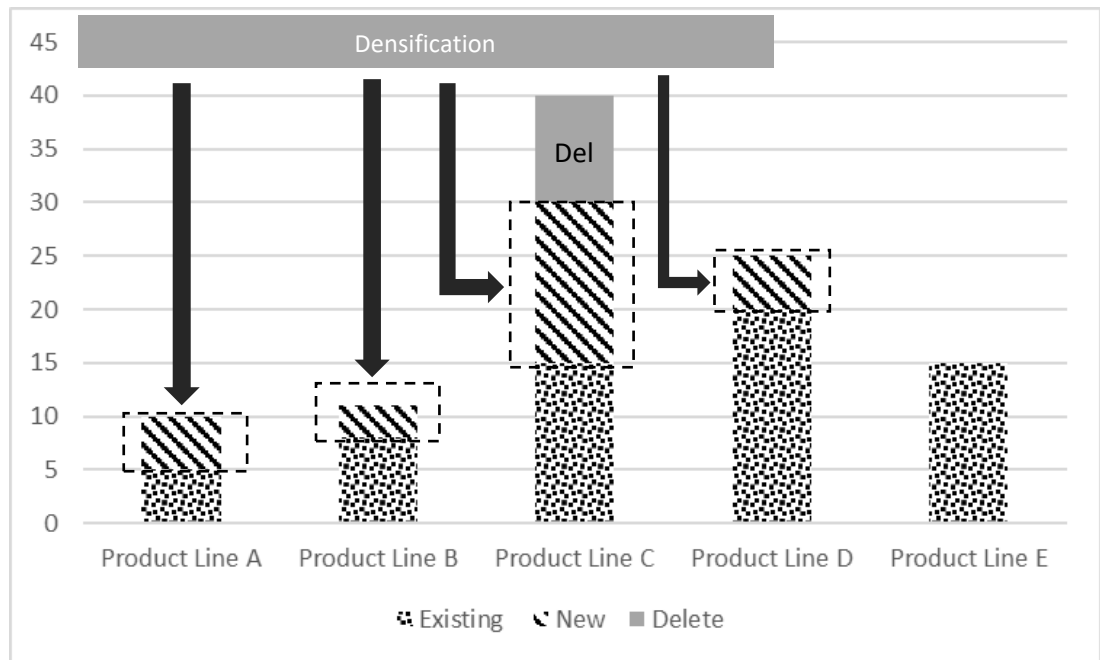
According to figure 6, a company using a densification strategy could have many choices to manage its current product line. For product lines A, B, and D, figure 4 suggests the company added new products to the existing models, three, five and five respectively. The company might not make any changes to product line E, but might add fifteen new products and delete obsolete ten products from product line C. By using the densification equation to this example, 28-10 = 18 products have been added to the firm's product portfolio.

Product proliferation: Expansion

Expansion is another way of filling product space into the market. Under an expansion strategy, a firm launches new products in new product lines that are not direct additions to existing product lines. An expansion strategy, thus, expands the market scope of a company and this strategy would be different from densification efforts, in the sense that it is about filling new market space in an area where the company did not previously operate. Thus, expansion does not include product deletions and replacements, because product deletion and replacement are dynamic product portfolio management activities at a pre-existing product line level. It is, therefore, measured by the following formula:

Expansion = $No. of\ New\ products\ in\ new\ line(s)$

Figure 7: An example of an expansion product proliferation strategy
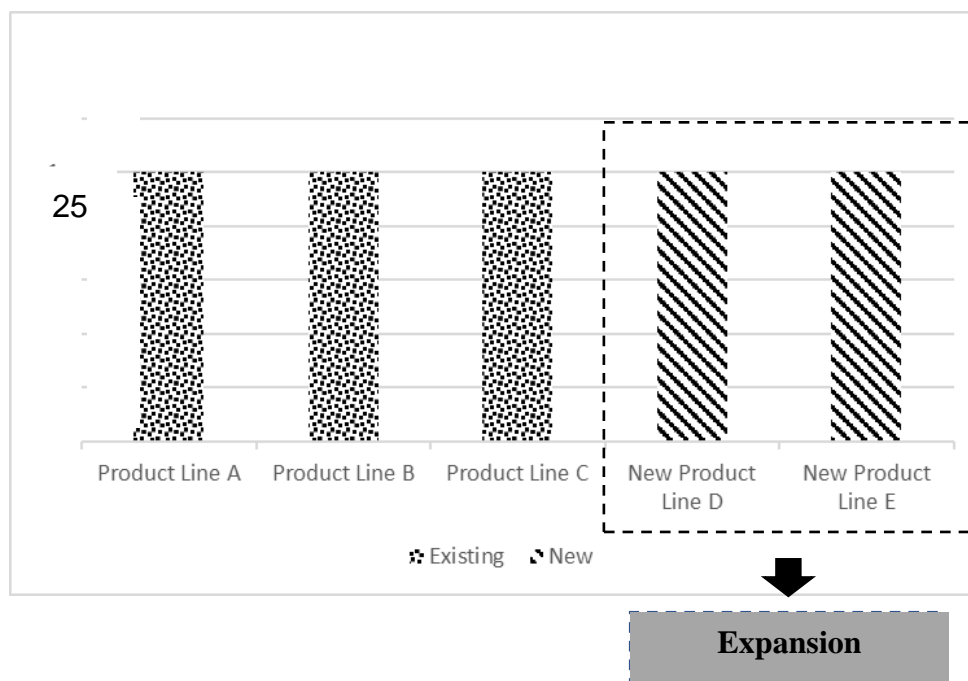
According to figure 7, a company previously had seventy-five products in three product lines A, B and C. the company, then, decided to expand its product lines by introducing fifty new products across two new lines, D and E. In this instance, expansion would equal fifty.

Product proliferation: Intensity of change

Even though the above-mentioned formula might be able to capture the net growth of the SKUs of a company, the formula has a flaw when there is more product deletion than product addition, causing a negative number for the net growth of SKUs, or zero proliferation when additions and deletions are equal. In order to overcome this issue, the researcher developed an "intensity of product change" equation, which measures the total change of products within the existing line by adding the number of product deletions to the number of new product, thus, providing an overall measure of product change. The following formula is proposed to measure Intensity of product change:

Intensity of product change = No. of new products + No. of product deletions

Scopification

When a firm implements an expansion strategy, product coverage will be expanded to new segments/niches. However, expansion does not capture the dynamics in product lines level. Even though firms might have the same level of expansion, but their segments coverage might be different and impact on firm performance differently. Therefore, scopification is developed to capture the change in product coverage of a firm and will be measured by using the following;

Scopification = No. of new product line(s)

Figure 8: Scopification

According to figure 8, a company previously had three product lines A, B and C. the company, then, decided to expand its product lines by introducing two new lines, D and E. In this instance, scopification would equal two.

R&D expenditure

R&D is an essential activity of a company because it generates new knowledge, technology, and new products to a firm. R&D expenditure is chosen as an indicator to measure R&D efforts in this research because R&D expenditure provides details on firm's efforts on R&D activities (Lin et al., 2006). In this research, R&D expenditure will be measured by using actual spending on R&D activity in USD.

Marketing expenditure

Marketing is also an important activity of a company to promote products and services. By focusing on marketing activities, it might help a company to implement product proliferation successfully. Marketing expenditure has chosen a proxy to measure marketing efforts of a company to promote products and services. In this research, marketing expenditure will be measured by using actual spending on marketing activity in USD.

Product cannibalisation

As mentioned in literature review chapter that product cannibalisation is a phenomenon where a new product takes up the sales of the existing products, it might influence on performance outcomes of product proliferation. There are several ways to measure product cannibalisation. In this research, we adapt Lomax and McWillian (1997)'s method to calculate product cannibalisation by using a percentage of the share of new product lines, which is taken as a share loss of the existing product lines. Hence, in this research, product cannibalisation will be calculated by;

Cannibalisation = Percentage of new products' sales contributed by the share of the existing products

Intensity of competition

Market concentration, using particularly Herfindahl-Hirschman Index (HHI), is a widely accepted method to measure the competitions because it can measure inequalities among competitors (Boyd, 1995). In addition, HHI can also be used as a proxy for competition in economics (e.g. Edwards, 1977) and management research (e.g. Derfus, 008). HHI can indicate the type of market competition such as high level of concentration means less competitive (Han et al, 2011). Thus, intensity of competition will be calculated by using Herfindahl-Hirschman Index (HHI) and is calculated by the summation of squared market shares of all companies in the market

HHI = $\sum_{i=1}^{N} S_i^2$ where S_i is the market share of firm i

Firm performance

Firm performance has been researched in relation to many business concepts and researchers use different performance indicators depending on the nature of research. In this research, the researcher will use profit and sales growth as market performance indicators, because product proliferation is believed to satisfy customers' needs better and hence generate additional sales (Hill and Jones, 2008), and/or profit (Kang and Montoya, 2014), by improving the cost-revenue ratio. Therefore, by using profit and sales growth, the researcher would be able to verify if product proliferation activities are undertaken to achieve key firm performance objectives.

IMPLICATION

As mentioned earlier, performance outcome of product proliferation is still debatable and by far there is limited number of research that explore boundary conditions of product proliferation. This research aims to make an academic contribution by outlining the nature of dynamic product proliferation dimension and developing appropriate measures and articulating key moderators that could maximise or minimise the performance outcome of a firm's product proliferation strategy. The new measures for product proliferation could help researchers in product proliferation area to measure product proliferation more accurately and this will lead to accurate research outcome as a result. In addition, the key moderators proposed in this research might guide the future researchers to investigate boundary conditions for product proliferation in the future. Also, the current study makes a managerial contribution by providing information that feeds into the design of product portfolios, that shapes organisational innovation policy, and that helps managers to allocate business resources more effectively.

CONCLUSION

Product proliferation is a product strategy whereby a firm increases the number of products it offers to satisfy various business objectives. Although many researchers have researched product proliferation, the performance outcomes of product proliferation activities are still debatable due to equivocal literature and measurements. This research has clarified the dynamic nature of product proliferation and proposed new measurements for each type of product proliferation (densification and expansion). Furthermore, this research also proposed the key moderators (including Scopification, R&D expenditure, Marketing expenditure, product cannibalisation, and intensity of competition) that could maximise or minimise the performance outcome of product proliferation. This would provide a clear understanding of the nature of product proliferation, its measurement, and potential key moderators for future researchers. This research also helps managers by giving information that could help them to design their product portfolio and utilise their resources more effectively.

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