

PRODUCT INNOVATION, MARKETING INNOVATION AND BUSINESS PERFORMANCE RELATIONSHIP OF MALAYSIAN PRODUCT INDUSTRIES: MEDIATING EFFECT OF DESIGN MANAGEMENT

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Abstract. Due to the increasing significance of design management and innovation to business performance, it is critical for the product sectors to stay up with the world's rapid changes in economic model and technology. As a result, industrialized countries regard design management as a competency that falls under the umbrella of innovation management. The objectives of this study are to identify the relationship between product innovation and marketing innovation on the business performance of Malaysian product industries, to analyze the effect of product innovation and marketing innovation on design management of Malaysian product industries, to examine the effect of design management on the business performance of Malaysian product industries and to test the mediating effect of design management between innovation and marketing innovation. This study uses a mixed method of qualitative and quantitative research design to collect data from 386 respondents from Malaysia's product industries. Simple random sampling was utilized to acquire the required data using a verified questionnaire. Furthermore, the qualitative survey data was analyzed using the Partial Least Square Structural Equation Model (SmartPLS3-SEM) in early phase as back data for qualitative method and for qualitative concerns, the researcher is using Likert scale form for subject matter expert to validate the gathered data with the hypothesis based on the findings of this study to check on the validity of the data gathered. In accordance to this research, the researcher defines "Malaysian Product Industries" as a group of small and medium enterprises in the services, primary agriculture and Information & Communication Technology (ICT) sectors that are enterprises and private company with full-time employees not exceeding 50 or with annual sales turnover not exceeding RM5 million. This study presents empirical evidence that the effect of design management on the relationship between innovation types and business success in Malaysia's product industries could lead to increased company performance. This research could assist the product industries better their businesses by identifying critical factors that contribute to greater business performance.

Keywords: *Product innovation, marketing innovation, design management, business performance, Structural Equation Modeling.*

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1. Introduction

Design is the foundation of all human activities and which explain the basis of design thinking process (Najafi & Mohammadi, 2015). Design is a process that controls, regulates and encourages the creativity in the organization (Ibrahim *et al.*, 2020; 2019). Design is an identification process that describes the firm for itself, its clients, investors and distinguishes it from its rivals as well as the center of its success. Design comes into the action through different performance, such as; executive management, organizational communications, research development of production and marketing. Moreover, design is a managerial and innovative process which can help an organization to survive in an excessive competitive environment. Additionally, design management (DM) has become increasingly significant for competitiveness; it has attracted the attention of scholars and practitioners. DM has been empirically related to the company's performance (Hertenstein *et al.*, 2005) and it acts an important role in ascertaining the effects of investment in design on firm performance. Therefore, design management define as a practice of managing design projects, supply chain strategies to regulate creative process, support a creative culture and develop a framework and organization for design (Design Management Institute, 2010).

Design management has influenced all industries, with only a few manufacturing businesses focusing on it. Companies such as Samsung Electronics and LG Electronics have built a global design management system (Jackson, 2016) to assist them to improved overall performance and to become market leaders in a competitive business world. These companies are currently improving the quality of design management by securing design leadership and identity. Non-manufacturing firms, such as construction, industrial systems, service corporations, state-owned enterprises and government institutions, have recently joined their ranks (Oakland, 2014). As a result, design management has emerged as a critical topic in management.

Problem Statement

In today's industrialized culture, companies must constantly cut costs and improve value-added processes to analyze the numerous organizational segments that are required not only to be innovative, persistent and competitive in the global market, as it is becoming increasingly difficult and inconsistent for companies to benefit only by creating innovative products. As a solution, design management can play a crucial role in boosting the level of innovation (Design Management Institute, 2010).

Design as a creative process is multi-specialty, repeatable and individualized, as well as involved in many areas of administrative decision-making; hence, it goes beyond the generation of visual results while research, market strategy, branding, engineering, new product creation, manufacturing planning, communication policy and the distribution process are all part of the design process.

In conjunction to this, design management covers both function as an adjustment strategy for creativity and a workplace activity that controls, regulates and supports innovation. Corporate management, on the other hand, must address innovation, in which organizational structures and procedures that raise a company's value are organized. Although management innovations are not required to foster effective innovation, human capital is (Najafi & Mohammadi, 2015; Tolio *et al.*, 2017). Nevertheless, innovation in a corporation can be fostered by effective management and thereby, create a long-lasting advantage as well as boost competitiveness.

The innovation capacity is viewed uninterruptedly as a main significant factor in sustaining and developing competitive advantage (Camisón & Villar-López, 2014). In this regard, for organizational survival it is necessary to be innovative and to take care of the innovation management process as it is no longer sufficient to do only better rather than doing innovative. Whereas, the effective innovation must require in every part and process of an organization and innovation need to be transformational or incremental regardless the type of organization (Amabile & Pratt, 2016). Innovation is not for paradigm shifting, but organizations should have endeavoured for the larger innovations (Karimi & Walter, 2016).

Innovation represents the core renewal process in any institute for its development and for achieving growth and sustaining performance (Snyder *et al.*, 2016). It is naturally important to practice creative and innovative tasks within the organization naturally and which should be supported by top management in the working environment. Dul & Ceylan (2014), explain innovation as a special instrument of entrepreneurs by which they can grab the opportunity to be prime in different business or services. Felker *et al.* (2016), tried to ensure that through innovation it is possible to present new, advance and better products and services into the marketplace through innovation.

Innovation as a method of revolving opportunity into a new idea and widely practice it for getting better performance. Chatterji & Fabrizio (2014), recommended that to offer a new product or service to customers, innovation can be used as a novel technical and administrative knowledge. Consequently, we can conclude that innovation is a process which can introduce new policies, products, processes, services, projects and so on for an organization. In financial market, banking institutions need to innovate banking products or services in response to shifting client demands, lifestyles and to exploit opportunities offered by changing marketplaces, advancing technology, which will help to gain competitive advantage and better performance. Hence, organizational innovation activities are pro-vital in connection with, services, processes, operations, products and people.

Therefore, there is an ongoing search for finding new ways to manage organizations to best foster innovation. Consequently, one of the relatively new and undeveloped management theories that have evolved is design management. However, product manufacturing industries require being dynamic and countries necessitate setting up transformation program to develop industrial performance where key ambition will be generating better innovation.

Literature Review

Business Performance (BP)

Business Performance is defined as a series of complex tasks that mix talents. One is based on an economic culture that emphasizes the importance of external market conditions in determining business success, while the other is based on a sociological and behavioral concept that investigates organizational features and their relevance to corporate success drivers' knowledge towards industrial advancement. Both research streams are utilized to control company performance (Mantea & Anis, 2014).

However, little attention is given to the firm's competitive position within this school of thought and little work has been done to combine the two streams and investigate the comparative influence of each on firm performance (Camisón & Villar-López, 2014). It is also defined as the process of examining, assessing and evaluating the

execution of stated organizational and individual objectives over time. It is possible for this method to be formal or informal (Cheng *et al.*, 2014).

Product Innovation (ProIn)

Product innovation can be defined as the creation of a new product from new materials (i.e. new product) or the modification of an existing product to meet the needs of consumers by improving the current product (Ibrahim, 1999). Product innovation may also be defined as new changes in activities that aim to convey the main item and make it more appealing to the client.

It is capable to utilized new knowledge or innovation by relying on new applications or a combination of current learning or developments. Hanse, it also contains presenting a comparable product market or service that aim to create a new product by improving the features of previous accessible products or services (Chatterji & Fabrizio, 2014).

As of the deviation from the existing product innovation to the user, the impact of quality or alliance is improved. The end result of using creative, better elements with greater features and qualities over existing ones. However, product innovation leads to shorter product cycles that change user needs by utilizing modern technologies. Result achieved by studying current available product on market, understand market demands, exhibit new products or improvised existing ones to cater user needs. Accepting user requests, implement current advances and maintain strong company ties will result in successful manufacturing.

Marketing Innovation (MktIn)

Marketing innovation focuses on improving the mix of targeted markets and improving service to the targeted markets. It encourages superior to explore new potential markets, utilizing innovative approaches to deal with the focused markets comprises which market segmented to more manageable segments as critical if the goal is to maximize corporate profitability. The uneven market division will not bring as much as the perfect blend of concentrated markets, meaning that any improvements made are overestimated (Kiiyuru, 2014).

It is mostly the responsibility of marketing experts to provide such information. This responsibility may occasionally protect simply the defining evidence of present and expected future structural market possibilities (Pride *et al.*, 2012). The structure is more than a single, basic technique to market segmentation. There are numerous criteria for separating, ranging from objective standards based on measurement data to subjective criteria based on customer and corporate purchase behavior lifestyle attitudes.

Design Management (DM)

Design management is an emerging subject that separates the management role from the design function of a project. DM is useful in developing legal techniques and procedures that can turn design into a core corporate skill (Tauriainen *et al.*, 2016; Tolio *et al.*, 2017).

Then, design management is various and there are many points of view on the value of design management. It is becoming more popular in recent construction projects. It is strongly tied to project management in that it must deliver a fully coordinated design on schedule while meeting all stakeholder needs (Kerzner & Kerzner, 2017).

Furthermore, DM can be defined as a successful arrangement of line managers of an organization's design assets based on its business objectives. It is typically focused with the organizational context of design, with distinct evidence of certain plan

disciplines that are vital to resolving critical management difficulties and the education of managers to successfully apply design.

In a nutshell, design management is the business side of design, which includes ongoing procedures, business decisions and techniques that enable development and make adequately planned items, management, correspondences, situations and brands to improve personal satisfaction and provide structural success.

Innovation and Business Performance

Antonnet (2014) to examined the impact of product innovation using qualitative data to access primary information sources on the financial performance of Kenya commercial banks, using survey research questionnaires and face-to-face exploratory interviews.

In this primary phase study, the researcher using quantitative method of conducted a survey to 106 managers from various industries and branches to acquire information on bank performance and product innovation.

Based on the researcher survey data, the formal, core and augmented product innovation, able to clarify 6.5% ($R^2=0.065$) of the variation in financial performance and as to the lapse results, augmented and core product innovation showed slight relationship with bank financial success.

Mahmoud et al. (2016) studied the relationship between learning orientation, innovation and market orientation and secondly, analyzed the influence of market orientation, innovation and learning orientation on company business performance in the Ghanaian banking domain. The researcher used multiple linear regression techniques to analyze data gathered from senior managers of 28 banks in Ghana during the data collection stages and the results revealed that market orientation has a positive relationship with innovation, whereas learning orientation has a significant influence on innovation. This shows that the link between market orientation and business success was mediated by innovation. Mir et al. (2016) examined how innovation affects the success of New Zealand SMEs. Data was received from 83 environmentally conscious SMEs.

The studies indicated that eco-innovation improved firm performance. However, the outcome showed that, while eco-friendly direction does not directly affect company success, it does increase the positive impact of innovation on business performance. The results also showed that green-oriented industries would gain more performance advantages from innovation when they committed more organizational resources.

Wanyoike (2016) showed a link between innovation strategies and competitive advantage in Mombasa County, Kenya logistics enterprises. The research design was a cross-sectional descriptive survey. In this research study, Purposive sampling, a technique prevalent in non-probability sampling techniques, was used by researcher to select respondents for interviews and administrative of questionnaires. Closed-ended questionnaires were also used to obtain primary data from branch managers, human resource managers and operations managers. The research showed a significant fundamental relationship between innovation and competition at the 5% level.

Overall, a beneficial relationship existed between the enterprises' competitive edge and their innovation efforts. As a result, innovative methods have a major effect on the competitive advantage of logistics firms in Mombasa County.

Gërguri-Rashiti et al. (2017) examined the impact of innovation activities on business performance using the Business Environment Enterprise Performance Survey. The data came from three waves of firm-level data: 2002, 2005 and 2008. They also employed the dynamic technique to assess the effectiveness of various innovation efforts.

According to the outcome, the prospect of organizations accepting innovative initiatives has been shown to improve corporate performance. Bayraktar et al. (2017) looked at the relationships between competitive tactics, innovation and company performance in Turkish manufacturing enterprises. The data was collected from top management of the firms using the Computer Assistant Telephone Interviewing technique and the findings indicated that competitive strategies lead to innovation, which in turn raises firm performance. Ndesaulwa & Kikula (2017) investigated the effect of Innovation on Performance of Small and Medium Enterprises (SMEs) in Tanzania.

The study's outcome indicated that innovation had a beneficial effect on the company's performance. This requires an explanation of both scenarios. The first theme is that investments in technology and innovation should be viewed as positive contributions to the firm's effectiveness rather than as cost figures that drain the organization (as they are usually viewed in the traditional accounting and finance method).

The second theme is that such investment demands should be linked to production expenses in order to accurately reflect the company's resource use. Furthermore, the higher ratio reflects the company's administration's strong commitment to investing in the acquisition and development of new technologies, whereas a lower figure suggests the inverse and actually relates to an old-school, non-innovation attitude to firm development methods. As a result, the following hypotheses are proposed for the study:

1. H1 There is a significant effect of product innovation on Business performance and
2. H2 There is a significant effect of marketing innovation on Business performance.

Innovation and Design Management

Wang (2012) examines all of the aspects and patterns in design management by analyzing the core concept of design management, while also clarifying the relationship between innovation and design management. The goal of this article is to explain how to integrate all levels of design management and how to use a more appropriate method to coordinate the relationships of necessary design resources, design strategy and design activities in order to achieve organizational goals and create an effective production environment.

Hedström & Wennberg (2017) compared and contrasted the South Korean and Swedish perspectives on design management and innovation. In addition, the results of a quick questionnaire survey were utilized as the foundation for determining how Swedish and Korean individuals see the subject. The questionnaire was created specifically for this study and the results contain replies to design-innovation-related questions from 35 Swedish and 35 Korean persons. The study found that, whereas South Korea has a policy for innovation-related design and a government entity dedicated to these issues, Sweden does not, the countries share many parallels in their approaches to the subject.

Jansson et al. (2016) studied how design breakdown enabled Lean Product Development Flow and look-ahead planning in an industrialized house-building framework where an open platform is employed in Sweden. The use of KI-VP resulted in a better cross-functional awareness of activity linkages, which is a critical aspect in achieving flexibility and a coordinated workflow. Moreover, by expanding design regulation, look-ahead planning was carried out and applied in the control of design flow. Regulation through design breakdown provides a center for knowledge and creativity,

allowing for the development of the open stage utilizing a bottom-up strategy and raising the production flow.

Prudhomme (2017) investigated the design philosophy for innovation in the context of organizational culture. They examined the present literature on design philosophy for innovation and narratives of growing design philosophy for innovation in practice, using the concept of nine innovation culture impasses as an organizational scheme. It is argued that the value of design philosophy lies in the tension between seemingly opposing modes of thought, such as intuitive thinking versus analytic thinking and iterative thinking versus linear thinking. Design philosophy must be ingrained in an organizational culture capable of maintaining a vibrant balance on integer of major tensions in new advancements in order to be displayed. It is demonstrated that the innovation impasses framework can be used as a tool.

3. H3 There is a significant effect of Product innovation on Design management and

4. H4 There is a significant effect of Marketing innovation on Design management.

Design Management and Business Performance

Bibby et al. (2006), studied the reflect on the deployment of a design management to improve performance in a major UK civil and building design and construction company. It investigates the impact of the training initiative, critical practices and a suite of 25 tools on design management performance across the company. The methodology included a structured questionnaire, design management maturity assessment, semi-structured interviews and a case study. Moreover, the study highlights benefits delivered by the initiative as well as the practices and tools crucial to successful design management. A range of implementation barriers that affect the success of design management practices is also highlighted together with strategies used on a design and build project to overcome them.

Hallak (2015), investigated an understanding of how an implementation of design management of multinational corporations' international R&D processes can help them create a long-lasting competitive edge. Furthermore, essential factors for a successful implementation of design management are to be identified and analysed. The empirical material has been collected through six qualitative interviews by a case study at Mölnlycke Health Care, a Swedish multinational corporation within the healthcare industry. The study discovered that design management can foster differentiation and enhanced customer satisfaction. However, the outcomes are strongly linked to improved organizational structure and informal communication that design management also emphasizes, the latter labelled as 'design thinking'. Furthermore, when providing the design, function more influence in the product development process, it becomes a common denominator between R&D and marketing. Therefore, new strategic perspectives for organizational change, innovation and competitive strength can be recognized.

The integration and comparison of two SMEs facilitate the inductive implications for the delineation of a design management model and reduces the potential for controversy. The proposed model implies both theoretical and practical contributions: contributing to design management literature on SMEs and suggesting a practice-based process model for SMEs in improving their performance. This model expands the potential of design integration in SMEs and may motivate SMEs to participate in design support programs to improve performance. Sustainable aspects of the model are subject for future research. Hence, the hypothesis of the study is giving below:

5. H5 There is a significant effect of Design management on Business performance.

Mediating Effect of Design Management on Innovation Types and Business Performance Relationship

Chiva & Alegre (2009), examined the impact of design investment on company performance and how the relationship is mediated by design management. This study used a quantitative method through questionnaires. Structural equation modelling was used to check the study hypotheses on a data collected from the Italian and Spanish ceramic industries. The outcomes suggested that design management, improved firm performance; this study too, providing empirical evidence that investing in design is significantly linked to design management lastly, design management plays an important part in examining the impact of design investment on firm performance. Organizations that achieve design successfully and proficiently accomplish preferable execution over those that don't.

Fernández-Mesa et al. (2012), presented that the design management mediator relationship between organizational learning capability (OLC) and product innovation performance. Structural equation modelling was used to test the research hypotheses on an SME data set from the Italian and Spanish ceramic tile industry. The results suggest that organizational learning capability enhances product innovation. Furthermore, the design management capability plays a significant role in determining the effects of the organizational learning capability on product innovation.

Landoni et al. (2016), contributed to the understanding of design have recognized two main obstructions: the absence of a common language on design and poor analysis of the dynamics that describe the association among investment in design and competitive performance. They examined six mediums and small-sized enterprises (SMEs) Italy that have established funding for a policy intended to improve design innovation abilities. They also presented and discussed five diverse design innovation abilities and examined their role in mediating between investment in design and competitive performance. Hence, the hypotheses of the study are giving below:

6. H6 Design management mediates the relationship between product innovation and business performance and

7. H7 Design management mediates the relationship between marketing innovation and business performance.

Small Medium Industry in Malaysia

According to Muhammad (2010), Small and Medium Enterprises (SMEs) are important to the country's economic success as Malaysia is one of the world's most open economies which aligned with the current trend of economic expansion and rapid industrial development. Alight with the Ninth Malaysian Plan (2006-2010), the government is developing and designing a SME development strategy to support SMEs in meeting new business difficulties in a competitive global business environment. Musa & Chinniah (2016) also define SMI as Malaysian Small Medium-sized Enterprises (SMEs) as the largest business institution.

Wecorporate.com (2023), defines SMI as Small and Medium Industries (SMEs) which operated locally, with the majority of the company's accounting for more than 98% of total business, contributing over 65% to employment and more than 50% of the country's domestic product.

Although the estimates in Malaysia are lower, Small and Medium Enterprises have the ability to significantly contribute to the economy and provide solid foundations to

generate new industry growth while strengthening existing industries for future national growth. The figure below shows the criteria of SMI in Malaysia:

Organisation	Criteria		
 Bank Negara	Sector	Sales Turnover	Employee Count
	Manufacturing	<RM50 million	<200
	Services & Others	<RM20 million	<75
 Ministry of Human Resources	No. of Employees		
	Micro		<75
	Small		76-200
	Medium		>200
 LHDN	<ul style="list-style-type: none"> • Paid-up Capital of <RM2.5 million • Annual Sales Turnover <RM5 million 		

Figure 1. Criteria of SMI

Wecorporate.com (2023), also stated that “In Malaysia, there is a difference in the definition of industry due to differences in goals and functions among the parties involved”. A small industry is defined by the Small Industry Development Coordination Council as one having fixed assets of less than RM250,000 (Fong, 1987). As seen in the figure above, Small and Medium Industries are divided into two sectors: manufacturing and service. The three characteristics evaluated are sector, sales turnover and employee count.

Malaysian SMEs have developed from a commodity-based to a manufacturing industry generating a variety of consumer items, according to Musa & Chinniah (2016). SMEs support the growth of employment in a growing labor market and new 'techno-perineurial' opportunities, particularly in Selangor (19.5%), W.P. Kuala Lumpur and W.P. Putrajaya (13.1%), Johor (10.7%), Perak (9.3%), Sarawak (6.8%), Sabah (6.3%) and Penang (6.3%) (Chin, 2006; SME Corp. Malaysia, 2011). The Census results also revealed that Malaysia than half of the SMEs were located in Selangor, WP Kuala Lumpur, Johor and Perak. Meanwhile, SMEs in Sabah and Sarawak accounted for 13.1% of all SMEs in Malaysia.

Mohamad (2021) stated that Small Medium Enterprises (SMEs) establish as backbone of the Malaysian economy by represent the largest type of business in the country and hence make significant contributions. However, referring to previous research on SMEs in Malaysia from 2001 to the most recent (2020) studies, it was discovered that SMEs faced a variety of obstacles, challenges and hindrances, inhibiting the expansion of their operations. Many SMEs encounter obstacles to ensuring their long-term sustainability as well as maintaining competitive in a changing market and environment. Mustapa (2021), also mentioned that small and medium-sized enterprises (SMEs) contribute significantly to economic growth in Malaysia.

However, since the coronavirus outbreak, Malaysian SME company activity has been significantly hindered. As a result, during this COVID-19 pandemic crisis, government business supports and assistance are critical because if SMEs fail, the country suffers.

Jayashree (2021) stated that since the beginning of the first industrial revolution, technology and innovation have been critical for improving firm performance and

sustainability (Ramanathan, 2017). Sustainable manufacturing methods are advantageous because they reduce overall waste in both what goes in and what comes out (Jayashree, 2021). Because businesses have a leading role in the global economy, their involvement in achieving sustainability and understanding its significance is vital (Hong, 2017). Striving for sustainability goals can provide firms with competitive advantages, which can be quantified using the triple bottom line (TBL): social equality, ecological integrity and financial success (Rauter, 2019). It also offers organizations with a long-term cachet that may be used in marketing and to assist customers in making decisions (Deng-Westphal, 2019).

As a result of this statement, local SMI must adapt their approach to corporate management and rather than playing a supporting position, take the lead in order to thrive in this worldwide world.

Researchers sought a case study on Ramly Burger's effective business strategy as one of the leading SMI company in Malaysia. According to Aishah (2021), Ramly Food Processing Private Limited used a range of marketing techniques to initially promote its halal frozen and fast-food goods and by doing so, the company captured the Muslim market segment both domestically and globally. Second, the company has distinguished itself from other frozen and fast-food goods by producing halal-certified products that adhere to Malaysia's Muslim community. Ramly has employed social media marketing to sell their products and engage with their customers by having this. Third, Ramly has sponsored a number of events, including concerts, sporting events and food festivals, in order to increase brand awareness and attract a bigger audience.

This creative technique would allow them to promote their brand identity and become well-known both locally and worldwide. Fourthly, Ramly has placed its products in numerous retail places such as supermarkets, convenience stores and fast-food chains to increase visibility and accessibility.

In conjunction to this, the SMI company have increased the visibility of his product to the general public while still adhering to the Innovate Product and Marketing, to Perform the Business Based on Excel Design Management. In this study, the researcher will be using this case study as to be validate by the subject matter expert against the acquired hypothesis.

An organization such as the Malaysian Design Council (MDC) is also playing an important role in educate, assisting SMI in creating their own product and company branding by establishing the "Malaysia Good Design Award", which is the highest design recognition from the Malaysian Government through MDC and endorses products that bear quality in design manufacturing. Having the recognition gives a good reputation for the company in terms of both trust and assurance in business, as well as long-term product confidence among consumers (https://www.mrm.gov.my/recognition_mgda.asp).

Based on the preceding, the current study's researchers would like to confirm whether design management will be used as a mediator in the current study between ProIn and BP linkages, as well as MktIn and BP interactions with moderating variables (such as strategic goals) against the hypothesis generated align with the objectives. Determine the relationship between product innovation and marketing innovation on the business performance of Malaysian product industries, investigate the effect of product innovation and marketing innovation on design management of Malaysian product industries and test the mediating effect of design management between innovation types and business performance.

Research Framework

The framework of this study is based on the works of previous literatures. The previous studies examined the relationship between innovation and business performance, design management and innovation, design management and business performance.

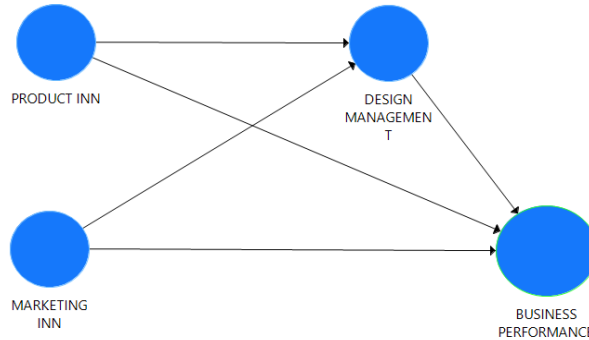


Figure 2. Research framework of the study

Based on the research framework of the study (shown in figure 2), the various empirical investigations evaluated here produced mixed results and conclusions. Some studies find strong positive and negative connections between variables, whereas others find weak relationships. Other investigations have shown different outcomes. This disparity in findings and conclusions is due to differences in methodology, country and quantity of observations. This mismatch in the studied area has a significant impact on corporate performance. Thus, this study filled a gap in the literature by investigating the effect of design management as a mediating variable between product and marketing innovation on the business performance of Malaysian product sectors.

2. Materials and Methods

In this research study, the researcher used a mix approach that includes qualitative (interviews) in the primary phase and quantitative (PLS-SEM) in the secondary phase, culminating in a Likert scale as described below. In the qualitative method, the subject matter expert will assess the seven hypotheses created in order to select the most appropriate to answer the research question in the result and discussion area. The theoretical model of this study consists of seven variables and all of these variables are tested by modifying questionnaires from previous studies whose reliability and validity have been validated. A 5-Likert scale is employed, with a range of 1 (strongly disagree) to 5 (strongly agree). Product innovation and marketing innovation are made up of four items adopted from Cascio (2011), design management is made up of five items and business performance is made up of five items adapted from Prajogo (2016). The data have been collected from Malaysian product firms for the current study and 440 questionnaires were distributed to top management, with only 410 questionnaires returned and 24 questionnaires deleted due to missing values. As a consequence, 386 questionnaires were used to conduct the study.

3. Results and Discussion

In this research, researchers examined the theoretical model using a Partial Least Squares (PLS-SEM) technique. Previous researchers shown that the PLS-SEM approach is appropriate for both simple and sophisticated research models; also, there is no need to do normality tests with subtlety (Bamgbade *et al.*, 2015). In addition, when compared to other methodologies, such as CB-SEM, this method generates better estimation results for indicating construct validity (Hair *et al.*, 2014). Two models are required in PLS-SME: measurement and structural. Both of these models are used in the current research.

Measurement Model

According to Hair et al. (2014), three things are determined in the PLS tool's running measurement model. The first is content validity, followed by convergent validity and finally discriminant validity.

Content Validity

Some studies show that content validity is assessed using cross-loading, which means that the value of the measured variable should be greater than the value of other research variables in the same rows and columns (Hair *et al.*, 2014), as shown in Table 1.

Table 1. Factor loading and cross loadings

Variable	Items	BP	DM	MktIn	ProIn
Business Performance	BP1	0.766	0.089	0.477	0.244
	BP2	0.830	0.040	0.479	0.196
	BP3	0.806	0.135	0.423	0.214
	BP4	0.879	0.059	0.444	0.201
	BP5	0.864	0.055	0.425	0.242
Design Management	DM1	0.157	0.808	0.071	0.219
	DM2	0.090	0.808	0.114	0.224
	DM3	0.082	0.829	0.046	0.268
	DM4	0.057	0.760	0.043	0.217
	DM5	0.426	0.755	0.142	0.231
Marketing Innovation	MI1	0.114	0.225	0.806	0.135
	MI2	0.045	0.269	0.779	0.114
	MI3	0.044	0.218	0.807	0.044
	MI4	0.143	0.232	0.719	0.141
Product Innovation	PRI1	0.244	0.089	0.477	0.851
	PRI2	0.196	0.040	0.479	0.876
	PRI3	0.214	0.135	0.423	0.872
	PRI4	0.201	0.059	0.444	0.751

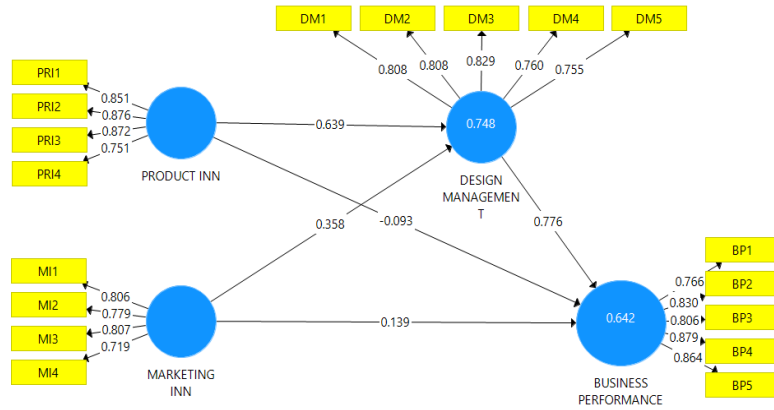


Figure 3. Measurement Model

Table 2. Convergent Validity

Variable	Items	Loadings	AVE	CR	Cronbach Alpha	R2
Business Performance	BP1	0.766	0.689	0.917	0.887	0.642
	BP2	0.830				
	BP3	0.806				
	BP4	0.879				
	BP5	0.864				
Design Management	DM1	0.808	0.628	0.894	0.852	0.748
	DM2	0.808				
	DM3	0.829				
	DM4	0.760				
	DM5	0.755				
Marketing Innovation	MI1	0.806	0.606	0.860	0.798	
	MI2	0.779				
	MI3	0.807				
	MI4	0.719				
Product Innovation	PRI1	0.851	0.704	0.904	0.858	
	PRI2	0.876				
	PRI3	0.872				
	PRI4	0.751				

Table 2 shows that the standardized requirement is met by factor loadings, CR and AVE. Factor loadings must be greater than 0.60, AVE values must be bigger than 0.50 and CR values must be greater than 0.60 (Hoque & Awang, 2019; Fornell & Larcker, 1981). Internal dependability among items will be achieved when the Cronbach Alpha value is 0.7 or above (Hoque & Awang, 2019; Fornell & Larcker, 1981).

As a result, the current study meets the criteria for convergent validity. Table 3 shows that the current study data meets the discriminant validity requirement proposed by Fornell & Larcker (1981), which states that diagonal elements must be greater than off-diagonal components in the same rows and columns.

Table 3. Discriminant validity

	BP	DM	MktIn	ProIn
Business Performance	0.830			
Design Management	0.791	0.793		
Marketing Innovation	0.603	0.653	0.779	
Product Innovation	0.595	0.805	0.462	0.839

The Structural Model and Hypotheses Testing

As per the above, it is to determine the direct relationships between exogenous variables such as Product Innovation, Marketing Innovation and Design Management and the endogenous variable Business Performance. Figure 4 shows whether the beta values and t-values in confirming hypotheses are accepted or rejected.

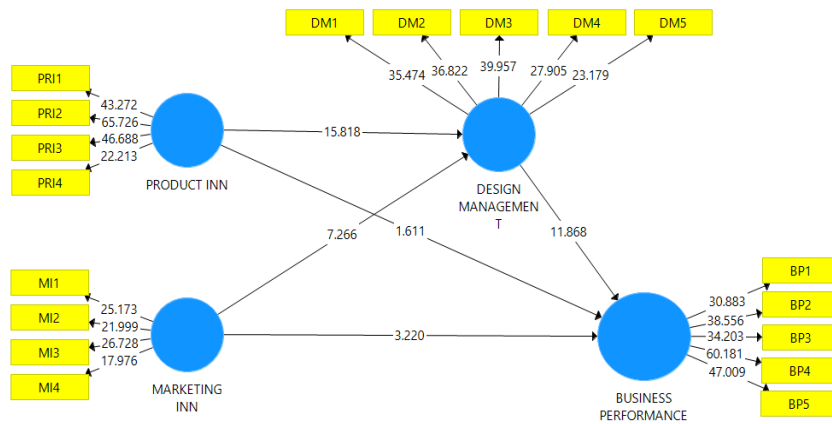


Figure 4. Structural Model

Table 4. Direct Relationships

	Paths	Original Sample	Sample Mean	Standard Deviation	T Statistics (O/STDEV)	P Values	Results
H₁	ProIn → BP	-0.093	-0.095	0.058	1.611	0.108	Not Sig.
H₂	MktIn → BP	0.139	0.144	0.043	3.220	0.001	Sig.
H₃	ProIn → DM	0.639	0.635	0.040	15.818	0.000	Sig.
H₄	MktIn → DM	0.358	0.363	0.049	7.266	0.000	Sig.
H₅	DM → BP	0.776	0.775	0.065	11.868	0.000	Sig.

In this study, there are five hypotheses with direct correlations and only one of the five hypotheses was rejected. Product Innovation, for example, has no significant influence on business performance (= -0.093, t-value = 1.611, p > 0.05), therefore hypothesis H1 is not supported. Furthermore, Marketing Innovation has a favorable impact on Business Performance (= 0.139, t-value = 3.220, p < 0.05), supporting Hypothesis H2. Product Innovation has an effect on Design Management (= 0.639, t-value = 15.818, p < 0.05) and supported the third hypothesis H3. Marketing Innovation had a positive impact on OP (= 0.358, t-value = 7.266, p < 0.05) and the fourth hypothesis H4 was accepted. Furthermore, Design Management has a favorable impact on Business Performance (= 0.776, t-value = 11.868, p < 0.05), supporting the fifth hypothesis H5.

Mediation Testing

Design Management plays a significant mediating role between Product Innovation, Marketing Innovation and Business Performance. It meaningfully and definitely mediates the relationship between Product Innovation and Business Performance ($\beta=0.496$, $t\text{-value}=9.641$, $p<0.05$) and supported the hypothesis H6. Moreover, Design Management significantly and positively mediates the relationship between the Marketing Innovation and Business Performance ($\beta=0.277$, $t\text{-value}=6.128$, $p<0.05$) and H7 is accepted.

Table 5. Indirect Relationships

	Paths	Original Sample	Sample Mean	Standard Deviation	T Statistics (O/STDEV)	P Values	Results
H₆	ProIn → BP	0.496	0.492	0.051	9.641	0.000	Accepted
H₇	MktIn → BP	0.277	0.281	0.045	6.128	0.000	Accepted

The Predictive Relevant of Study Model

The predictive utility of the model is measured by R2 in the current study. All exogenic factors contributed to the explanation of the endogenetic variable, according to R2 values (Hoque & Awang, 2019). Table 6 shows that all external variables account for 74.8% of the variance in design management. While external factors account for 64.2% of business performance. R2 values between 0.02 and 0.13 indicate a minor influence, R2 values between 0.13 and 0.26 indicate a moderate effect and R2 values greater than 0.26 show a large influence. In the current study, R2 has a significant impact on design management and company performance (Hair *et al.*, 2014).

Table 6. The Predictive Relevance of the Model

Total	R Square
Design Management	0.748
Business Performance	0.642

The Effect Size of a Model

R-square reveals the strength of model that how well all exogenous constructs explained endogenous construct. To calculate the effect size (f^2) there is a need to first remove one exogenous construct and run a model to find R-square by excluding the contribution of that construct, then R-square excluded subtract from R-square is included and follow the below formula (Hair *et al.*, 2014).

$$f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}}$$

The effect size (f^2) is smaller when $f^2 = 0.02$, effect size is moderated when $f^2 = 0.15$ and effect size is high when $f^2 = 0.35$ (Hair *et al.*, 2014). Below Table 7 and 8 show all exogenous variables have smaller effects while the internal supply chain process maintains the highest effect.

Table 7. Effect Size of exogenous constructs on endogenous construct (DM)

Independent Variables	R2 Included	R2 excluded	R2 included – R2 excluded	1 – R2 included	Total Effect
ProIn	.748	.529	.219	.252	.869
MktIn	.748	.588	.160	.252	.634

Table 8. Effect Size of exogenous constructs on the endogenous construct (BP)

Independent Variables	R2 Included	R2 excluded	R2 included – R2 excluded	1 – R2 included	Total Effect
ProIn	.642	.551	.091	.358	.254
MktIn	.642	.578	.064	.358	.178
DM	.642	.599	.043	.358	.120

The current study uses a quantitative method in the early stages to determine the effectiveness of product and marketing innovation to determine the business success, with design management acting as a moderator. Product innovation, according to the study, had no significant impact on business success, however marketing innovation did.

To conclude, design management, it has a significant impact on business performance, Design management and based on the findings, significantly referees the relationship between product innovation and company performance, as well as it relates between marketing innovation and business performance. The findings are consistent with those of Landoni et al. (2016). Nevertheless, these data analysis are only meant to support the qualitative method.

As for qualitative findings through the validation results obtained from 10 management experts in related interviews through the Likert scale survey all stated that all the hypotheses presented were accurate with only 4 and 5 Likert readings with a percentage of 80% - 91%. The validation process consists of two items: first, the outcome of the Likert scale diagramed on Malaysian SMI company against the seven hypotheses and second, the outcome of the Likert scale on the seven hypotheses based on subject matter expert comment. The diagram is shown as follows:

TOPIC		PRODUCT INNOVATION, MARKETING INNOVATION AND BUSINESS PERFORMANCE RELATIONSHIP OF MALAYSIAN PRODUCT INDUSTRIES: MEDIATING EFFECT OF DESIGN MANAGEMENT																																													
LIKERT SCALE		SCORE : MOST AGREE = 5 , AGREE = 4 , NEUTRAL = 3 , NOT AGREE = 2 , MOST NOT AGREE = 1																																													
No	HIPHOTHESIS	H1 THERE IS A SIGNIFICANT EFFECT OF PRODUCT INNOVATION ON BUSINESS PERFORMANCE.					H2 THERE IS A SIGNIFICANT EFFECT OF MARKETING INNOVATION ON BUSINESS PERFORMANCE.					H3 THERE IS A SIGNIFICANT EFFECT OF PRODUCT INNOVATION ON DESIGN MANAGEMENT.					H4 THERE IS A SIGNIFICANT EFFECT OF MARKETING INNOVATION ON DESIGN MANAGEMENT.					H5 THERE IS A SIGNIFICANT EFFECT OF DESIGN MANAGEMENT ON BUSINESS PERFORMANCE.					H6 DESIGN MANAGEMENT MEDIATES THE RELATIONSHIP BETWEEN PRODUCT INNOVATION AND BUSINESS PERFORMANCE.					H7 DESIGN MANAGEMENT MEDIATES THE RELATIONSHIP BETWEEN MARKETING INNOVATION AND BUSINESS PERFORMANCE.					REMARKS										
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5											
SCALING SUBJECT EXPERT		100%																																													
1	MDC DESIGN MANAGER				x							x																																	x	88	
2	ENTREPRENEUR				x							x																																		x	91
3	PRODUCT MANAGER				x							x																																		x	88
4	INDUSTRIAL DESIGN MANAGER				x							x																																		x	85
5	PRODUCTION MANAGER				x							x																																		x	82

Figure 5. The outcome of the Likert scale diagramed on Malaysian SMI company against the seven hypotheses

i. To **identify** the relationship between product innovation and marketing innovation on the business performance of Malaysian product industries.

The researchers have highlighted some of the international and local SMI activities, from which it can be concluded that international SMI are equipped with advanced technology, strong funding and far advance in technology, particularly on IR5.0, in comparison to local SMI, which were not strong in funding and needed to be prepared to sustain themselves and set up their own R&D to go further internationally. Not all industries, such as Ramly Food Processing, are as robust as others, such as furniture and auto components.

ii. To **analyze** the effect of product innovation and marketing innovation on design management of Malaysian product industries.

To address objective number two, the research findings show that the majority of corporate management have innovated their product and marketing, resulting in a strong and beneficial impact on the outcome between the type of innovation used (on the product) and the commercial performance of the good or service sector (on the creative promotion), as demonstrated by the case study of Ramly Food Processing Sdn Bhd.

iii. To **examine** the effect of design management on the business performance of Malaysian product industries.

In this case, the researcher has pointed out that SMI companies are being assisted by some government agencies in encouraging them to be innovative in terms of product, marketing and even design management, such as Malaysia Design Council, which organizes design promotion activities such as organizing Good Design Mark, Young Designer Award, recognizing designers through Cide and providing design seminars, among others. These will equip them to withstand the globalization wave that is sweeping the world.

To **test** the mediating effect of design management between innovation and marketing innovation.

To investigate the seven hypotheses, the research used both quantitative and qualitative methods, including PLM SEM and interviews and expert validation.

As to recap, the proposed strategy is particularly beneficial as a guideline for Malaysian SMEs that previously lacked an easily understood framework for effective professional practice through Product Innovation, Marketing Innovation, and business performance Relation Malaysia Product Industries.

As a result, each SME can widen their product market beyond suppliers and trade before realizing product efficacy, innovative marketing and consistent performance in their particular SEMs through R&D and Commercial. Moderating variables (such as strategic goals) must be included in the management of all SMEs in Malaysia in the future.

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