

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 growing significance of design management and innovation to business performance, in particular, it is vital for the product industries to keep pace with the rapid changes of the economic model and technology that the world is heading towards. Therefore, the developed countries consider design management as a competence that comes under the umbrella of innovation management. The objectives of this study are to determine the relationship among product innovation and marketing innovation on business performance of product industries in Malaysia, to analyse the effect of product innovation and marketing innovation on design management of product industries in Malaysia, to examine the effect of design management on the business performance of product industries in Malaysia and to test the mediating effect of design management between innovation types and business performance relationship of product industries in Malaysia. The quantitative research design approach was used in this study to collect data from 386 respondents selected from the product industries in Malaysia. The required data were obtained using simple random sampling by a validated questionnaire. Furthermore, the data collected from the survey were analyzed using Partial Least Square Structural Equation Model (SmartPLS3-SEM). The results of this study showed all the direct relationships are not significant whereas, all mediating effects are significant. This study provides empirical evidence that the effect of design management on the relationship between innovation types and business performance could lead to higher

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business performance of product industries in Malaysia. The product industries may be benefited from this study in improving their businesses as this study has come up with the critical dimensions that could lead to better business performance.

Keywords: *Product Innovation, Marketing Innovation, Design Management, Business Performance, Structural Equation Modeling, SmartPLS3.*

I. Introduction

According to Najafi & Mohammadi (2015), whatever we do is design, as design is the foundation of all human activities and which explain the basis of design thinking process. Design is a process that controls, regulates and encourages the creativity in the organization (Reason, 2016). Design is an identification process that describes the firm for itself, its clients, investors and distinguishes it from its rivals as well as the centre of its success. (Rummler, & Brache, 2012) mention that design comes into the action through different performance, such as; executive management, organizational communications, research development of production and marketing. Moreover, Rummler, & Brache (2012), claim that 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 (Parker et al., 2002). 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 (Gracia- Morales et al., 2012).

Design management is now spreading to the overall industries, a few manufacturing companies paid attention to design management. Since then, companies such as Samsung Electronics and LG Electronics have developed a global design management system (Jackson et al., 2007) Which help them to gain overall better performance and also to help them to become the market leader in the competitive business world. These firms are now upgrading the quality of design management, such as securing design leadership and identity. Non-manufacturing companies, including construction, industrial systems, service companies, state-owned companies and government institutions, have recently joined their ranks (Oakland, 2014). Hence, design management has become a significant issue in management (Strategy Samsung Economic Research Institute, 2007).

Joshi, Sidhu, & Kansal, (2013) claimed that companies constantly need to reduce costs and improve the value-adding processes to assess the various parts of the organization. Moreover, they are required to be innovative. Moreover, if they want to persist in the long run, and to compete in the global market. In today's advance society, it becomes persistently more difficult and no longer enough for companies to increase their profitability, only through creating innovative products (Hill & Hill, 2012). Design management can improve the level of innovation (Von, 2011). Thus, design inventive process has multispecialty and repeatable personality and it goes beyond the production of mere visual results because design is involved in many areas of managerial decision- making. Hence, design is an internal managerial

activity that includes market research, marketing strategy, brand development, engineering, new product development, production planning, communication policies and distribution process (Najafi & Mohammadi, 2015). Design management is a tool for adjusting the innovation and it is an activity which controls, regulates and encourages the innovation in the company (Igartua, Garrigos & Oliver, 2010). The designer Specialty is similar to the entrepreneur (Best, 2006). Whereas, innovation is also a matter for the management of corporations. Managerial innovations are examples of new organizational structures and processes that add value to a company (Birkinshaw, Hamel, & Mol, 2008). Although innovations related to management are not vital aspects of fostering successful innovation, but, it is the human capital itself (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 (Hamel, 2006).

In this regard Camisón & Villar-López (2014), stated that the innovation capacity is viewed uninterruptedly as a main significant factor in sustaining and developing competitive advantage. In this regard, Chiva & Alegre, (2009), claimed that 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, Amabile & Pratt (2016), recommend that 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. Karimi & Walter (2016), mention that an innovation is not for paradigm shifting, but organizations should have endeavoured for the larger innovations.

Snyder, Witell, Gustafsson, Fombelle, & Kristensson (2016), emphasize on their study that innovation represents the core renewal process in any institute for its development and for achieving growth and sustaining performance. 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), explains innovation as a special instrument of entrepreneurs by which they can grab the opportunity to be prime in different business or services. Felker, Jomo, & Rasiah (2016), tried to ensure that through innovation it is possible to present new, advance, and better products and services into the marketplace through innovation.

Brem, Nylund, & Schuster (2016), has explained 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 (Von, 2011). 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 (Rowley, Baregheh, & Sambrook, 2011). Hence, organizational innovation activities are provital 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 (Maria & Del, 2013). Consequently, one of the relatively new and undeveloped management theories that have evolved is design management (Lockwood, 2011). 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.

II. Literature Review

2.1 Business Performance (BP)

Performance is denoted as a complex series of actions that integrate skills and knowledge for industrial development (Stam, Arzlanian, & Elfring, 2014). According to Pantea, Gligor, & Anis (2014), the determination of firm performance is based on two key flows of research. The first one is based primarily on an economic tradition, which highlights the significance of external market factors in defining firm success. The other one develops on the sociological and behavioural concept which observes organizational features and their suitability with the situation of firm's success determinants (Bitektine, 2011).

Whereas, little care is given to the firm's competitive position within this school of thought and less has been performed to assimilate the two streams and assess the comparative effect of each on firm performance (Camison, & Villar-Lopez, 2014). It is also defined as the process, which is carried out to analyse, examine and evaluate the performance of specified objectives over a period of time for the organization and individual. This process can be formal and informal forms as well (Cheng, Yang, & Sheu, 2014).

2.2 Product Innovation (ProIn)

Product innovation can be described as the making new product from fresh materials (i.e. new product) or the change of existing product to satisfy the consumer needs by improving the present product (Amara & Landry, 2005). Product innovation can likewise be characterized as new changes in those activities that are endeavoured to convey the centre product and make it more interesting to the client (Trinkfuss, 2013). Product innovations are those that are equipped for making utilization of new information or innovation and depend on new uses or a mixture of current learning or advances (Mairesse, & Mohnen, 2010). Moreover, product innovation incorporates bringing into another comparable product market or services with the purpose of making new product through advancing the properties of the present products or services previously available in the market (Chatterji, & Fabrizio, 2014). Therefore, their proposed use by customers, quality or alliance is improved from deviating of the present product. This should to be possible through the use of innovation, better substances, which enhanced features and characteristics than the present ones (Barquet, Oliveira, Amigo, Cunha & Rozenfeld, 2013).

Nonetheless, product innovation rises up out of shortening product cycles that rise up out of altering customer needs and propelled technologies (Cooper, 2011). Product innovation is done through dissecting what is at existing in the market, perceiving the business divisions needs identifying with the product required and along in this way displaying another product or upgrading existing ones to meet those wants. Accepting the particular customer wants, latest developments, breaking point of suppliers and having solid interior firm associations will lead a profitable product innovation (Adriopoulos & Dawson, 2014).

2.3 Marketing Innovation (MktIn)

Marketing innovation is stressed over improving the mixture of focused markets and how best to serve the focused markets (Huizingh, 2011). It motivates to recognize superior or new potential markets, and better or new ways to deal with help focused markets (Foster, & Kaplan, 2011). Market segmentation, which incorporates parcelling a total prospective market into slighter more workable parts, is fundamentally noteworthy if the reason for existing is to enhance the profitability of a business to the most extreme. The fragmented market division will not bring as much as the ideal blend of focused markets, denoting that benefits, which may have been gained, are misjudge (Kiiyuru, 2014).

It is the major responsibility of marketing specialists to contribute such bits of knowledge. Occasionally this responsibility probably shields solely the differentiating proof of current and likely future structural market possibilities (Pride, Ferrell, Lukas, Schembri, & Niininen, 2012). The structure is, besides only a solitary, straight way to divide markets. A broad assortment of possible criteria exists for dividing, stretching out from target benchmarks in perspective of measurement data through to subjective criteria in light of lifestyle explanations of costumer and business purchasing conduct (Lawless & Anderson, 1996).

2.4 Design Management (DM)

Design Management is an emergent professional discipline which separates the management function of a project's design phase from the design function. DM is instrumental in making legitimate methods and procedures that can consolidate design into the centre competency of business (Tauriainen, Marttinen, Dave, and Koskela, 2016, Tolio, et al., 2017). Subsequently, design management is multifaceted and there is an extensive variety of perspectives on the significance of design management (Colledani, Tolio, Fischer, Iung, Lanza, Schmitt, & Vánca, 2014). It is becoming increasingly important in modern construction projects (Gray and Hughes, 2001). It is closely aligned to project management, it must provide a fully co-ordinated design, on time, meeting all stakeholder needs and it does this by co-ordinating, controlling and monitoring design activities while interfacing with other project and external parties (Kerzner, & Kerzner, 2017). It is a task typically carried out by a design manager or team of managers depending on a project's size and complexity. However, Gray and Hughes (2001), suggest that while there needs to be a single point of responsibility to control the production of construction information they also believe DM is the responsibility of the whole project team.

Furthermore, DM is the successful arrangement by line supervisors of the design assets accessible to an association in the compatibility of its corporate targets. It is in this manner specifically worried about the organisational situation of design, with the distinguishing proof with particular plan disciplines which are significant to the determination of important management matters, and with the preparation of administrators to utilize design successfully. Basically, design management is the business side of the design. Design management includes the on-going procedures, business choices, and techniques that empower development and make adequately planned items, management, correspondences, situations, and brands that improve the personal satisfaction and give organisational achievement (Engvall, Lampa, Levin, Wickman, and Öfverholm, 2014; Jenkins, Cumming, Scott, and Cairncross, 2014).

2.5 Innovation and Business Performance

Antonnet (2013) evaluated the impact of product innovation on the financial performance of commercial banks in Kenya. The research gathered qualitative data through primary information sources via data gathering instruments, namely research questionnaires and face to face interviews. Additionally, secondary data were collected from 2014 audited annual financial statements of the worried commercial banks and available by CBK. The research used a census of all the 106 managers in charge of different sectors and branches to gather information on bank performance and product innovation. The result proposed that 6.5% ($R^2=0.065$) of the adjustment in financial performance may be clarified by formal product innovation, core product innovation and augmented product innovation. The regression outcome showed that augmented product innovation and core product innovation don't have any relationship with the financial -performance of banks. Nevertheless, the outcome revealed a negative relationship between formal product innovation and the financial performance of commercial banks in Kenya. Njagi (2014) determined the effect of product innovation on the profitability of private manufacturing companies in Nairobi County. The study collected the data from 45 private manufacturing companies using convenience random sampling, which was approximately 11.9% of all the private manufacturing firms in Nairobi County. Descriptive statistics such as mean, medium were used in this study, and standard deviation to describe the data collected. Data presentation was done by the use of percentages and frequency tables. The study found a significant and positive correlation between product innovation and ROA. The outcome also revealed that the correlation between inflation rate and ROA is negative and significant. Cost of production was also found to be negatively and significantly associated with ROA. The study concluded that product innovation has positive effects on profitability.

Mahmoud et al. (2016), studied the relationship between learning orientation, innovation, and market orientation; and second, measures the role of market orientation, innovation and learning orientation, on companies' business performance in the Ghanaian banking domain. The data gathered from senior managers of 28 banks in Ghana and analysed using multiple linear regression techniques. The analysis revealed that market orientation has a positive relationship with innovation whereas learning orientation has a significant influence on innovation. Furthermore, innovation

mediated the association between market orientation and business performance. Mir, Casadesús, and Petnji (2016), investigated the effect of innovation on business performance SMEs in New Zealand. Data gathered from 83 green-oriented SMEs. The outcome proposed that eco-innovation has a positive effect on business performance. Furthermore, the result revealed that although environmental orientation does not directly affect business performance, it advances the positive effect of innovation on business performance. The outcome also indicated that green-oriented companies would add more performance advantage of innovation when they obligate more organizational resources. Wanyoike (2016), established the relationship between innovation strategies and competitive advantage in Logistics firms in Mombasa County, Kenya. The cross-sectional descriptive survey was used as the research design. The study used purposive sampling found in non-probability sampling techniques to select respondents for interviews and administration of questionnaires. Primary data were collected using closed-ended questionnaires target respondents were the Branch managers, human resource managers and operations managers. The research found out the causal relationship between innovation and competition was significant at the 5% level. Overall a positive relationship existed between innovation strategies employed and the firms' competitive advantage. Therefore, this implied that the innovation strategies significantly influence competitive advantage of the logistics firms in Mombasa County.

Gërguri-Rashiti, Ramadani, Abazi, Dana and Ratten (2017), used the Business Environment Enterprise Performance Survey to examine the influence of innovation activities on firm performance. The sourced the data from firm-level data in the three rounds: 2002, 2005, and 2008. They also applied the dynamic approach to assessing the changes that arise from the influence of innovation activities. The analysis found that the probability of the companies to accept innovation activities has revealed to expand business performance. Bayraktar, Hancerliogullari, Cetinguc, and Calisir, (2017), studied the interactions among competitive strategies, innovation, and firm performance in Turkish manufacturing companies. The collected the data from top management of the firms through Computer Assistant Telephone Interviewing technique. They employed structural equation modelling using partial least squares approach. The findings indicated that competitive strategies lead to innovation, which, in turn, raise the firm performance. Ndesaulwa and Kikula (2017) explored the effect of Innovation on Performance of Small and Medium Enterprises (SMEs) in Tanzania. The outcome showed that the innovation has a positive effect on the effectiveness and performance of companies requires an explanation on two topics. The first topic is that investments in technology and innovation should be treated as positive contributions into the effectiveness of the company rather than as cost figures that exhaust the company (as they are frequently treated in the classical approach of accountancy and finance). The second point is that such investment requests to be connected to the production costs to reflect the true use of the company's resources. Moreover, a greater ratio is an indication of the company administration's great level of commitment to invest in the absorption and innovation of new technologies, while a lower figure indicated the reverse and really points to an old style, non-innovation approach to firm improvement strategies. Hence, the hypotheses of the study are giving below:

H₁ There is a significant effect of product innovation on Business performance. and

H₂ There is a significant effect of marketing innovation on Business performance.

2.6 Innovation and Design Management

Wang (2012), focuses on the basic concept of design management, researches on all the factors and patterns in design management through analysing the content of design management, meanwhile, clarifies the relationship between innovation and design management. The purpose of the paper is to clarify 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, accomplish organization objectives and create an effective production condition. Hedström & Wennberg (2017), discussed the differences and similarities between the South Korean and the Swedish view on design management in relation to innovation. Also, the result of a brief questionnaire study has been used as basic material to find out how Swedish and Korean people look upon the subject matter. The questionnaire was carried out for this study exclusively and the results include answers on design-innovation-related questions from 35 Swedish and 35 Korean people. The result of the study showed that even though South Korea has a policy for innovation related design and a governmental organ working exclusively with these questions, which Sweden has not, the countries share a lot of similarities in their approaches towards the subject.

Jansson, Viklund, and Lidelöw (2016), investigated how design breakdown allowed Lean Product Development Flow and look-ahead planning in an industrialized house-building framework where an open platform is used in Sweden. The execution of KI-VP managed to an improved cross-functional understanding of associations among activities, which are a significant factor in accomplishing flexibility and a coordinated workflow. Moreover, by expanding design regulation, look-ahead planning was executed and used in the management of design flow. Regulation via design breakdown, offers a centre for knowledge, innovation that allowed development of the open stage using a bottom-up method and raises the production flow.

Prudhomme (2017), discussed the design philosophy for innovation in the wider perception of organizational culture. They used the framework of nine innovation culture impasses as an organizing scheme to examine the current literature on design philosophy for innovation and accounts of expanding design philosophy for innovation in practice. It is contended that the power of design philosophy is in the strain among apparently opposite means of thinking, such as intuitive thinking against analytic thinking, and thinking in iterative practices against linear thinking. For design philosophy to display, it is required to be embedded in an organizational culture is capable of sustaining a vibrant balance on integer of important tensions in innovative developments. It is shown that the innovation impasses framework can be used as a systematic tool to assess what degree organizations are armed to benefit from design philosophy for innovation. Hence the hypotheses of the study are giving below:

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

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

2.7 Design Management and Business Performance

Cook & Pasquire (2001), explored the relationship between the management of design projects and improved performance construction industry the data for the model has been derived from two active case study projects. The literature review and survey research provide an analytical framework on which the model is based. A close correlation has been found to exist between effective management and project performance. It is hoped that this research will help manifest an efficient, successful and profitable working environment where Engineers are better able to bridge the gap between management theory and practice so as to achieve improved performance, and ultimately achieve competitive advantage. Bibby, Austin & Bouchlaghem (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. Mattias and Stefan (2015), presents the development of a design management model for SMEs, using two regional SME cases and applying a process-based design intervention, the challenges of the SMEs are addressed and reduced in a more efficient and effective way. Therefore, new strategic perspectives for organisational change, innovation and competitive strength can be recognised. 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 programmes to improve performance. Sustainable aspects of the model are subject for future research. Hence, the hypothesis of the study is giving below:

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

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

Chiva and 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, Alegre-Vidal, Chiva-Gómez, and Gutiérrez-Gracia (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, Dell'Era, Ferraloro, Peradotto, Karlsson, and Verganti, (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:

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

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

2.9 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. The several empirical studies reviewed here showed mixed results and conclusions. In some studies, strong positive and relationships are found to exist between the variables, and in some the relationships are weak. Other studies report different results. This mixture of findings and conclusions comes from differences in methodology, the country as well as the number of observations. This disparity of the study area vitally affects the business performance. Thus, this study bridged the identified gap in the literature by examining the role of design management as a

mediating variable between Product and marketing innovation on business performance of product industries in Malaysia. The research framework is depicted in figure 1.1.

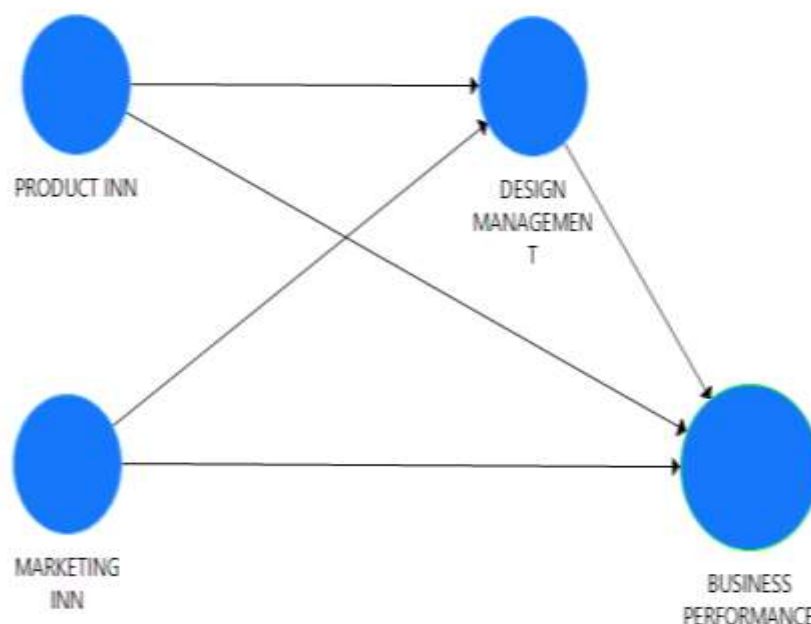


Figure 1. Research Framework of the Study

III. Methodology

The theoretical model of this study consists of seven variables and all these variables are measured by adapting the questionnaire from some of the prior studies since their reliability as well as validity had been established. 5-Likert scales is used that has a range within 1 (strongly disagree) to 5 (strongly agree). Product innovation consists of 4 items adapted from Njagi, (2016), Marketing innovation consists of 4 items adapted from Cascio, (2011), Design management consists of 5 items adapted from Megchun, (2010) and Business performance consists of 5 items adapted from Prajogo, (2016).

3.1 Data collection

For current research, data were collected from the product industries in Malaysia and 440 questionnaires were distributed among top management and only 410 questionnaires received back and 24 questionnaires exclude due to missing values. Hence, 386 were questionnaires used for the analysis.

IV. Statistical analysis results

In this paper, we have employed a Partial Least Square (PLS-SEM) approach to examine the theoretical model. Some of the prior researchers proved that PLS-SEM approach is suitable for both research models such as simple and complex; also there is no need to perform normality test with

subtleness (Bamgbade et al., 2015; Hair et al., 2014). In addition, this approach gives better results of estimation to establish construct validities as compared to another approach such as CB-SEM (Hair et al., 2014). There is a need of two models in PLS-SME such as measurement and structural model. In the current study, we use both of these models.

4.1 Measurement model

According to Hair et al. (2013), in the running measurement model in PLS tool we ascertain three things. First, content validity, second, convergent validity, and the final one is discriminant validity.

4.1.1 Content Validity

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

Some studies reveal that content validity is calculated by using cross-loading and it refers to that the value of the measured variable should be higher than other study variables in the same rows as well as columns (Chin, 1998b; Hair, 2010) as shown in Table 1.

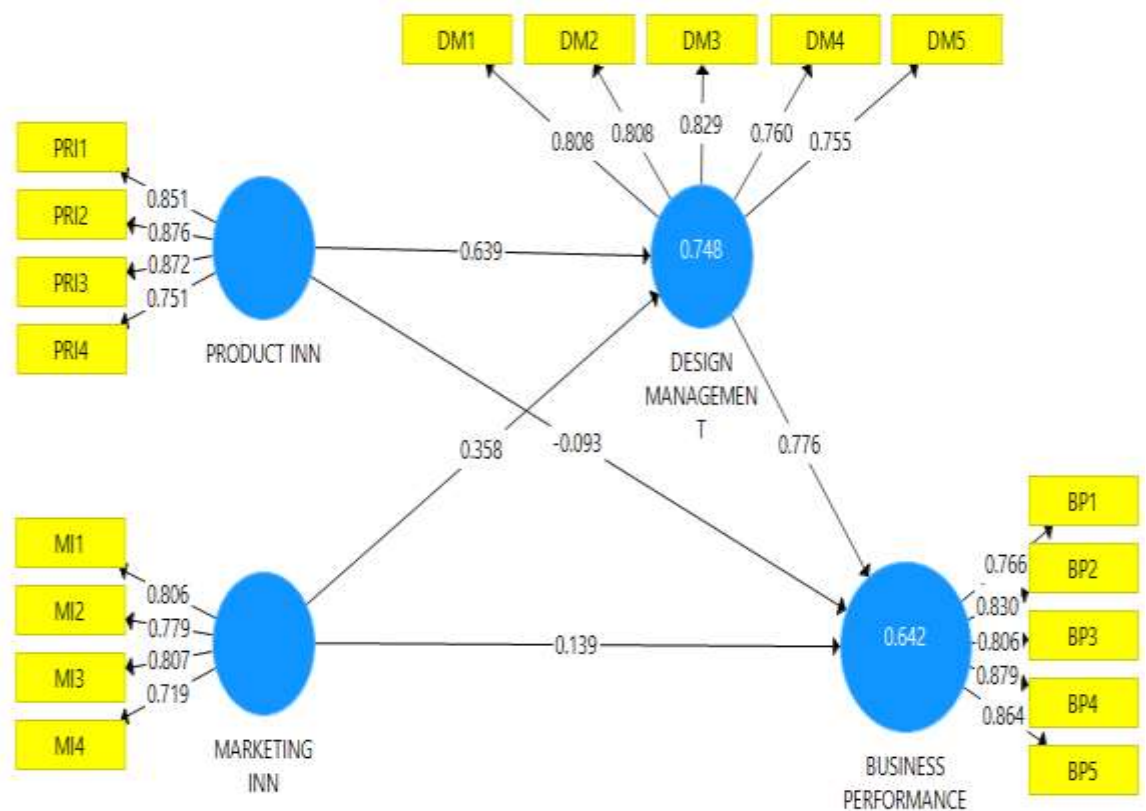


Figure. 2. Measurement Model

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				
	DM2	0.808				
	DM3	0.829	0.628	0.894	0.852	0.748
	DM4	0.760				
	DM5	0.755				
Marketing Innovation	MI1	0.806				
	MI2	0.779				
	MI3	0.807	0.606	0.860	0.798	
	MI4	0.719				
Product Innovation	PRI1	0.851				
	PRI2	0.876				
	PRI3	0.872	0.704	0.904	0.858	
	PRI4	0.751				

Table 2 shows that factor loadings, CR, and AVE fulfill the standardized criterion (Hair Jr et al., 2013). Factor loadings should be greater than 0.60, AVE values also must be greater than 0.50, and CR value should be higher than 0.60 achieved (Hoque & Awang, 2019; Hoque, 2018a; Hoque, Siddiqui, & Awang, 2018d; Siddiqui & Hoque, 2018; Hoque et al., 2017c; Hoque, Gwadabe, & Rahman, 2017d; Hoque et al., 2017a, Hoque et al., 2017c; Hoque and Awang, 2016a; Hair et al., 2014; Fornell and Larcker, 1981). The Internal reliability among the items will be achieved when the value of Cronbach Alpha shows the minimum value is 0.7 or more (Hoque & Awang, 2019; Hoque, Awang, Baharu, & Siddiqui, 2018a; Hoque et al., 2018b; Hoque et al., 2018c; Hoque et al., 2018e; Hoque, Awang, & Ghani 2016; Hoque & Awang, 2016b; Fornell and Larcker, 1981). Hence, the current study fulfils the requirements of convergent validity. Table 3 demonstrates that the current study data fulfils the discriminant validity criterion as

suggested by Fornell and Larcker (1981) that above the value of diagonal must be greater than off-diagonal elements in same rows as well as columns (Hoque & Awang, 2019; Siddiqui & Hoque, 2018).

Table 3 Discriminant validity (Fornell-Larcker)

	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

4.2 The Structural Model and Hypotheses Testing

Now ascertain the direct associations of exogenous variables such as the Product Innovation, Marketing Innovation and Design Management on the endogenous variable that is Business Performance. Fig. 3 demonstrates whether or not the beta values and t-value in confirming hypotheses are accepted or not.

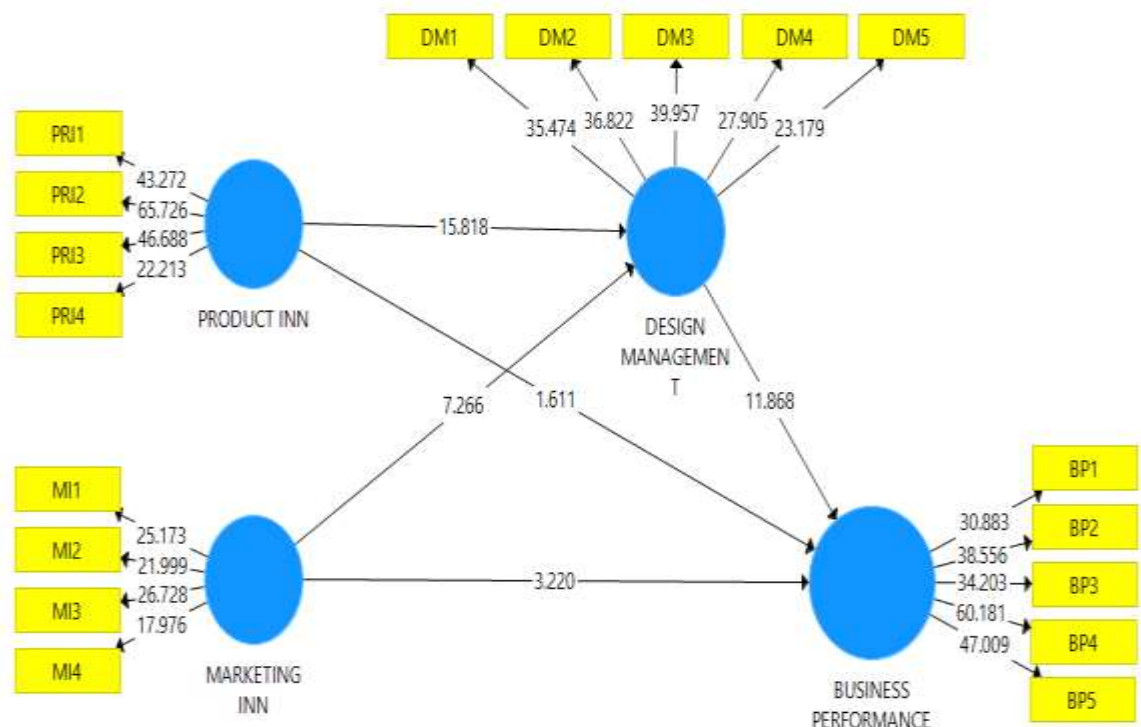


Figure. 3. Structural Model

In this study, there are five hypotheses that have direct relationships and out of five hypotheses only one hypotheses were not accepted. For example, Product Innovation has not significant influence on

Business Performance ($\beta=-0.093$, $t\text{-value}=1.611$, $p>0.05$) and the hypothesis H1 is not supported. Moreover, a Marketing Innovation has a positive impact on Business Performance ($\beta=0.139$, $t\text{-value}=3.220$, $p<0.05$) and the hypotheses H2 is supported. Product Innovation has a positive impact on Design Management ($\beta=0.639$, $t\text{-value}=15.818$, $p<0.05$) and supported the third hypothesis H3. Marketing Innovation has a positive impact on OP ($\beta=0.358$, $t\text{-value}=7.266$, $p<0.05$) and accepted the fourth hypothesis H4. Moreover, Design Management has a positive impact on Business Performance ($\beta=0.776$, $t\text{-value}=11.868$, $p<0.05$) and supported the fifth hypothesis H5.

Table 4 Direct Relationships

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

4.3 Mediation Testing

Design Management plays a significant mediating role between Product Innovation, Marketing Innovation, and Business Performance. Design Management significantly and positively 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 \rightarrow BP	0.496	0.492	0.051	9.641	0.000	Accepted
H7	MktIn \rightarrow BP	0.277	0.281	0.045	6.128	0.000	Accepted

4.4 The Predictive Relevant of Study Model

In the current study, one thing is determined for the predictive relevance of model that is R². R² values mean that all exogenous variables jointly explained the endogenous variable (Hoque, 2018a; Hoque et al., 2018a; Hoque et al., 2018d; Siddiqui, & Hoque, 2018). Table 6 shows that 74.8% design management is explained by all exogenous variables. While 64.2% business performance is explained by all exogenous variables. According to Cohen (1988), the R² value in the range of 0.02 to 0.13 shows weak, the R² value in the range of 0.13 to 0.26 represents moderate, and R² value more than 0.26 indicates high effect. In the current study, R² for design management and business performance show high effect.

Table 6 The Predictive Relevance of the Model

Total	R Square
Design Management	0.748
Business Performance	0.642

4.5 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 (f²) 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 Jr et al., 2014).

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

The effect size (f²) is smaller when f² = 0.02, effect size is moderated when f² = 0.15, and effect size is high when f² = 0.35 (Cohen, 1988). 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	R ² Included	R ² excluded	R ² included – R ² excluded	1 – R ² 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

V. Discussion and Conclusion

The aim of the existing research was to determine the effect of product innovation and marketing innovation on business performance with the mediating effect of design management. The findings have revealed that a product innovation had not significant effect on business performance and marketing innovation had significant effect on business performance. The findings are consistent with the other results of Rousseau, et al. (2016); Huang, and Li, (2017); Doluca, et al. (2018). Moreover, product innovation and marketing innovation both have significant effect on design management. The results are similar to the results Merono-Cerdán, et al. (2018); Huang, and Li, (2017). Furthermore, design management has significant effect on business performance. The findings are consistent with the work accomplished by Prajogo, et al. (2016); and Peng, Quan, Zhang, & Dubinsky (2016). Meanwhile, design management significantly mediates the relationship between product innovation and business performance as well as the relationship between marketing innovation and business performance. The findings are consistent with the work accomplished by Landoni, Dell'Era, Ferraloro, Peradotto, Karlsson, and Verganti, (2016).

VI. Limitations and future directions

The present research has lots of strong points but there are also some limitations. The current study has used design management as a mediating variable between ProIn and BP as well as MktIn and BP relationships. However, there is a need to use moderating variables (e.g. strategic goals) also in future.

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