

Effect of Industrial Design Management and Innovation on Business Performance: An Empirical Evidence of Malaysian Industrial Product Companies

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Abstract

Due to the growth of Industrial design management and innovation value in creating a sustainable competitive advantage, few studies have been done to quantify the contribution of industrial design management and innovation towards business performance. This study applied PLS Structural equation modeling (PLS-SEM) method to analyze the effect of industrial design management and innovation on business performance of Malaysian industrial product companies. A total of 450 responses from the employees were obtained but only 400 valid responses were used for the analysis. The results revealed that industrial design management and innovation have an influence on the business performance of Malaysian industrial product companies. The path coefficient of industrial Design Management and Business Performance is 0.783387. Moreover, the path coefficient of Innovation and Business Performance is 0.123332 and the result of R^2 is 0.757063. The finding also showed that industrial design management and innovation have positive and significant relationship with the business performance of Malaysian industrial product companies. Therefore, the findings of the study will guide the industrial product companies to focus on industrial design management and innovation processes that needed to be improved in order to expedite the business performance.

Keywords: Industrial Design Management; Innovation; Business Performance; PLS-SEM

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I. Introduction

In the present global economic environment, it is vital for the design companies to keep pace with the rapid vicissitudes of the economic model and technology that the world is heading towards (Felker, Jomo, & Rasiah, 2013). However, literatures in innovation showed that design industry has often been criticized for preventing transformation and for failing to adopt innovative approaches to improve performance (Tajudin, Ibrahim & Ismail, 2015). Moreover, industrial design management has an important role to increase the values of company such as competitive advantage, and improve the level of customer satisfaction. Innovation is regarded as the basic element to reach competitive advantage, customer satisfaction and to realize their desires (Reguia, 2014). With increasing competition in most industries on an international scale, innovation becomes one of the most important factors distinguishing success from failure (Glindo & Meindez, 2014).

An effective and workable design program is essential to improve coordination between disciplines and exert managerial control over the design process, but, it is usually programmed to achieve the required timings of information release to contractors, followed by the preceding procurement activities and finally the design (Hasan & Ali, 2015). This low priority of design in project planning is attributed to construction accounting for the majority of the project costs.

However, there is now an increasing recognition that design efficiency and costs are heavily dependent on the quality of the design solution, information, and the quality of the design process (Trott, 2012). Considerable advances have been made in design management, but there are still few examples of total success and also, little effort is given to planning the design in detail in the belief that it is not possible for such a creative and iterative process (Soto-Acosta, Popa, & Palacios-Marqués, 2016). These situations are perpetuated by a lack of understanding in the design information flow, dependency and availability of suitable planning techniques especially in the developing countries including Malaysia (Zailani, Govindan, Shaharudin & Kuan, 2017).

Therefore, the design process needs effective planning and control to minimize the effects of complexity and uncertainty (Bouranta et al., 2017). The major issues in design management are design problems such as poor briefing and communication, inadequacies in the technical knowledge of designers, lack of coordination between disciplines. In Malaysia, there is a lack of confidence in pre-planning for design work and lack of adequate documentation, deficient or missing input information, unbalanced resource allocation and erratic decisions (Umrani, Johl & Ibrahim, 2017).

Due to the growing significance of industrial design and innovation to human life in general and business performance in particular, many empirical studies were conducted to investigate the relationship between this strategic factor and business performance (Bon, & Mustafa, 2013, Dul, & Ceylan, 2014, Lee, Ooi, Chong, & Seow, 2014, Lai, 2016, Peng, Quan, Zhang, & Dubinsky, 2016, Agus, & Ahmad, 2017, Bouranta, et al, 2017, Soto-Acosta, Popa, & Palacios-Marqués, 2016, Ng, Hamid, & Yusof, 2017, Shanker, Bhanugopan, Van der Heijden, & Farrell, 2017). However, none of the mentioned studies examined the effect of industrial design management and innovation on business performance of industrial product companies in Malaysia. For the sake

of knowledge development, the intention of this study is to bridge this identified gap in the literature by examining the effect of industrial design management and innovation on business performance of industrial product companies in Malaysia. The findings in this study would be useful for theoretical discussion as well as for policy formulation and business performance development.

However, in Malaysia, the industrial product companies have contributed significantly in instituting the infrastructure necessary for socio economic improvement and offering directly to economic growth (Ng, Hamid, & Yusof, 2017). Moreover, the vital components of a healthy and functioning economy which are determined by the government offices, educational institutions, transportation infrastructure, tourist attractions, housing, commercial property are built and sustained by the design industry (Lee, Ooi, Chong, & Seow, 2014). The Economic Transformation Program (ETP) stated by the Prime Minister of Malaysia revealed 131 entry point projects and 60 business opportunities that would support to boost Malaysia's gross national income (Ibrahim, Roy, Ahmed, & Imtiaz, 2010).

In addition, Malaysia has strategically highlighted industrial design and innovation as the important issue for greater growth and has identified the significance of design and innovation as the catalyst for the country's long-term success (Khor & Udin, 2013). This is also emphasized in the ETP that identifies the importance of design and innovation as the impetus in achieving Malaysia's Vision 2020 (Tajuddin, Iberahim, & Ismail, 2015). Hence, Malaysia's intention of becoming an industrialized country and a high-income economy status by the year 2020 can be realized by accentuating towards the industry's improved and greater performance through design and innovation (Zailani, Govindan, Shaharudin, & Kuan, 2017).

II. Literature Review

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 medium and small sized enterprises (SMEs) Italy that have established funding from a policy intended to improve design innovation abilities. They also presented and discussed five diverse design innovation abilities and examined their role in mediating the association among investment in design and competitive performance.

Heisig et al (2016) examined the visions of the global knowledge management (KM) community in the research area of KM and business performance and classified important prospect research themes. They interviewed 222 informants in 38 countries to collect data on KM skilled visions regarding the prospect research requirements of the KM arena. The value influence of KM needs further research despite specialists approving on the difficulties involved in resolving this challenge. However, more research areas classified were associated with the impact of KM to maintain business strategy, decision-making, intellectual capital, organizational learning, knowledge sharing, productivity, innovation performance and competitive advantage.

Similarly, Prajogo, (2016) examined the role business environments as contingency factors which influence the efficiency of diverse types of innovation strategies in bringing business performance. They collected data from 207 manufacturing firms in Australia. The findings revealed that dynamic environments reinforce the influence of product innovation on business performance. Also, the competitive environments, on the other hand, decline the influence of product innovation on business performance but reinforce the influence of practice innovation on business performance.

Prajogo, (2016) provided a new analysis regarding the influence of a Standardized Innovation Management System (SIMS) on company innovation competence, innovation performance, and corporate results that are an exceptional influence on innovation management literature. They focused on the standard UNE 166002 that is one of the first national provable SIMSs that survived internationally. It is one of the initial SIMSs in the globe that has gotten an adequate level of recognition to support an empirical study. To examine its influence on companies, an interactive model was established and investigated using hypotheses regarding with the key dimensions.

Peng, Quan, Zhang, Dubinsky, (2016) Motivated by the apparent existence of the productivity paradox in China, revisited the question of how information technology (IT) influence firm performance. Leveraging the process-based assessment of IT, they found a theoretical framework for the mediation dynamics for the association among IT competencies and performance. They collected the data from 127 companies in China. The results showed that a firm's management competencies to succeed both its internal and external business practices entirely mediated the influence of IT on firm performance. The results also showed that only the coherent integration of IT competence with firm's capability to enhance business practices and to develop management of supply chains could improve firm performance.

Singh, Chakraborty, and Roy, (2016) provided the empirical evidence of green innovation to motivate manufacturing MSMEs toward environmentally responsible activities. The findings strongly validated the impact of green innovation and innovation drivers with 61% variance explained for firm's business performance. Moreover, they have found that green organisational innovation and green procedure have a significant influence on business performance as associated to green product innovation.

Zainol, Abas, and Ariffin, (2016) conceptualized the supply chain amalgamation and technological innovation for the business performance of aquaculture contract farming countryside in Malaysia. Established from the SCM philosophy, it highlighted on the three correlated variables of supply chain amalgamation, such as external amalgamation with supply chain risks and customers, external amalgamation with suppliers, and technological innovation, and the relative between the variables in focus that conceivably could produce a potential favorable business performance. Therefore, ability to conceptualized, observed and give due recognition to the possible comparative between these variables in question by the potential aquaculture contract farming contributors, possibly could bring about a perceptive commitment for the improvement of the aquaculture business performance.

Furthermore, Mahmoud, Blankson, Owusu-Frimpong, Nwankwo, and Trang, (2016) examined the relationship between learning orientation, innovation, and market orientation; and second, measures the role

of market orientation, learning orientation and innovation, on firms' business performance in Ghanaian banking domain. The collected the data from senior managers of 28 banks in Ghana and analysed using multiple linear regression techniques. The analysis revealed that market orientation has a significant relationship with innovation whereas learning orientation has significant influence on innovation. Furthermore, innovation mediated the association among market orientation and business performance.

Visnjic, Wiengarten, and Neely, (2016) studied the performance influence of service business model innovation and its interaction with product innovation. Applying the lenses of the demand-based view on value design and complementarity, the performance influence of two main service business models is observed: the customer-oriented model and product-oriented model, the executed equally with product innovation. The analysis showed that the interaction among service business model innovation and product innovation benefits the long-term performance joined with a degree of short-term performance sacrifice. Moreover, the service business model innovation in separation from product innovation outcomes in short-run return increases, however, long-run knowledge loss and, therefore, market performance decrease.

Soto-Acosta, Popa, and Palacios-Marqués, (2016) extended the previous studies on the organizational influence of Internet technologies by examining factors influencing e-business use and its effect on organizational innovation in manufacturing Small and Medium-Size Enterprises (SMEs). The also examined the mediating impact of organizational innovation on the association between e-business and firm performance. The collected the data from the dataset of 175 Spanish manufacturing SMEs. They employed partial least squares (PLS) structural equation modeling techniques for the analysis. The results confirmed that e-business use arises from internal organizational and resources rather than from external pressure. Moreover, the results revealed that e-business use was positively related to firm performance via organizational innovation.

Mir, Casadesús, and Petnji, (2016) investigated the influence of eco-innovation on business performance SMEs in New Zealand. The collected the data from 83 green-oriented SMEs. The results suggested that eco-innovation has a positive influence on business performance. Moreover, the findings revealed that although environmental orientation does not directly influence business performance, it improves the positive influence of eco-innovation on business performance. The results also indicated that green-oriented firms would gain more performance benefit of eco-innovation when they obligate more organizational resources.

Recently, Campbell and Park (2017) explored factors relating to self-interest, corporate social responsibility, and resource-based strategy to help predict small business performance across a total of provinces containing retailing and service-based industries. Relating *instrumental stakeholder approach* and the *resource-based view* suggested that resources such as intellectual capital, entrepreneurial orientation, and social capital along with strategic management of community as a stakeholder contributed to small business performance. They employed structural equational modeling and found that small businesses sustained the significance of both instrumental stakeholder approach and the resource-based view of general performance.

Ramanathan, He, Black, Ghobadian, and Gallear, (2017) investigated the associations between firms' innovation, environmental regulations, and private sustainability benefits. They used nine case studies of Chinese and UK firms. The analysis revealed that depending on firms' capabilities and resources, those that implement a more dynamic approach to respond to environmental rules innovatively and take an active approach to achieve their environmental performance are commonly well able to obtain the private benefits of sustainability.

Bayraktar, Hancerliogullari, Cetinguc, and Calisir, (2017) studied the interactions among competitive strategies, innovation, and firm performance in Turkish manufacturing companies. They collected the data from top management of the firms through Computer Assistant Telephone Interviewing technique. They employed structural equation modeling using partial least squares approach. The findings indicated that competitive strategies lead to innovation, which, in turn, raise the firm performance.

Cheng and Chen, (2017) explored how firm service innovation mediated the relationship between market orientation and business performance in China. They used Structural equation modeling based on a cross-section ($n = 260$) of 5 years of supply chain business data (2009–2013). They found that firm market orientation and service innovation have significant positive impact on business performance. Furthermore, the results revealed that market orientation was mediated by the influence of service innovation on business performance.

Jajja, Kannan, Brah, and Hassan, (2017) used resource dependence theory to hypothesize that a buyer's innovation strategy improves supplier innovation effort and a buyer-supplier association that maintains product innovation. These in turn positively influence buyer product innovation results and business performance. Likewise, it is claimed that the buyer-supplier association positively moderated the influence of supplier innovation effort on product innovation. They used hierarchical linear regression and structural equation modeling to test hypotheses. The findings supported all hypotheses and suggested that company (buyer) age and variables associated with buyer commitment with international markets directly affect performance. The findings likewise indicated that the buyer-supplier association does not moderate the association among innovation strategy and innovation performance.

Rangus and Slavec, (2017) investigated the association among organizational features, firm's innovation and business performance. Specifically, they examined how absorptive capacity, employee involvement and decentralization influence firm's innovation, which in turn influence business performance. They collected the data from 421 manufacturing and service firms. The results found that decentralization being positively connected to employee involvement, absorptive capacity, and firm's innovation performance. Moreover, the results revealed that employee involvement and absorptive capacity mediated the association among decentralization and firm's innovation performance. The results also suggested that firm's innovation performance positively influence firm's business performance.

III. Methodology

3.1 Research Design

The quantitative research design is the main approach was used in this study. This kind of study requires collecting numerical data by means of structured questionnaires or observation guides to gather primary data from people (Lewis, 2015). According to Creswell and Poth (2017), information gathered by figures is quantitative. In another view by Leavy (2017), quantitative research method is a method used to analyse numeric information in the form of statistical method. Therefore, this study collected the data from industrial product companies in Malaysia quantitative research can analyse the data and determine the quantity and the extent to which certain phenomenon in the form of numbers is statistically accurate and reliable.

3.2 Data collection

This study was conducted in Malaysia, and the data collected through a self-administered questionnaire. However, the respondents were asked to complete the survey on their own. The purpose of choosing self-administered questionnaire in this study is that it reduces cost by eliminating the interviewer device and items such as computer software (Willett, et al, 2017). Moreover, there is no interruption from the interviewer as the respondents could answer the questionnaire at their own time. The study used the structured questionnaire for the survey to measure the research constructs. Moreover, in quantitative research, the credibility of the study is largely based on the development of the instrument used to measure the underlying concept (Edmonds, & Kennedy, 2016). Furthermore, the study employed probability sampling design using simple random sampling. In simple random sampling, every element in the population has a known, equal chance of being selected as a subject (Hopkins, 2017). The sample size of this study was 400 from the entire target population. Therefore, in this study the sample size will be calculated according to the simplified decision model which was developed by Krejcie and Morgan (1970).

3.3 Theoretical Framework

The framework of this study is based on previous studies which examined the relationship between innovation and industrial design management, design management and innovation, design management and business performance. The several empirical studies reviewed here showed mixed results and conclusions. In some studies, strong and positive relationships were found to exist between the variables, and in some the relationships are weak. Other studies reported different results. This mixture of findings and conclusions comes from differences in methodology, the country as well as the number of observations. These disparities have vitally affected business performance. This study focuses on these three fronts. This study will bridge this identified gap in the literature by examining the role of industrial design management and innovation on business performance of industrial product companies in Malaysia. The theoretical framework is depicted in figure 1

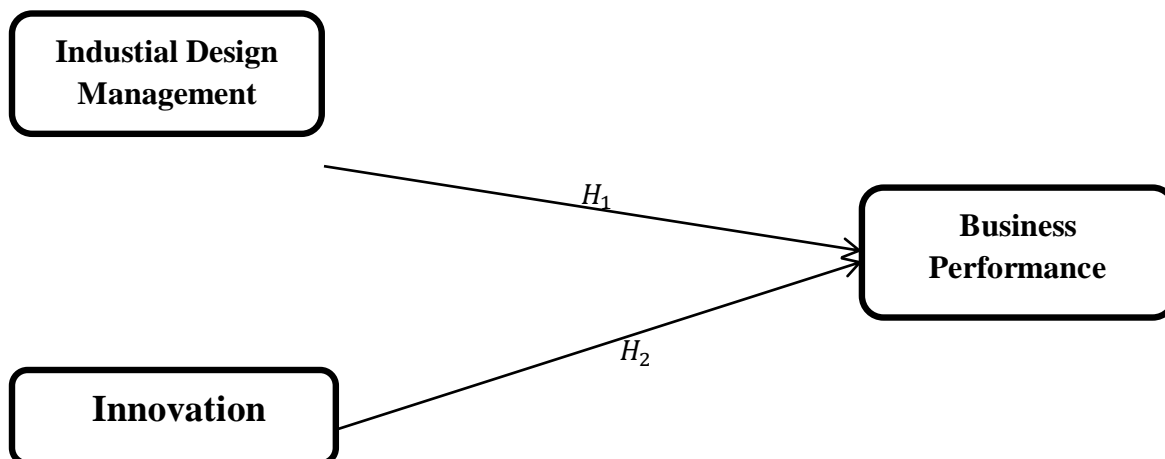


Figure 1 Theoretical Framework

The research hypotheses are:

H₁: There is a positive effect of Industrial design management on the business performance of Malaysian industrial product companies.

H₂: There is a positive effect of innovation on business performance of Malaysian industrial product companies.

IV. Result and Discussion

Companies' respondent's characteristics

In the descriptive analysis, the study evaluated the distribution of the data across some demographic characteristics of the respondents. Based on this study, the respondents were asked to indicate their gender, age, highest educational level, year of services, type of position and what market does the organization serve. Below is the table showing how the 400 respondents are distributed according to the selected demographic characteristics. The result showed the gender of the respondents in this study in which majority of the respondents are male. Out of 400 respondents, 249 (62.3%) are male respondents, while the remaining 151 (37.8%) are female respondents.

However, majority of the respondents of this study are between the ages of 35-44 years old indicating 29.3% of the total respondents. Similarly, 108 respondents (27%) are between the ages of 25-34, while 97 respondents (24.34%) are between the ages of 45-54. Moreover, 56 respondents (14.0%) are between the ages of 55-64 and 22 respondents (5.50) are between 65 years and above.

In addition, the highest educational level of the respondents in this study revealed that only 32 respondents (8%) in this study have attended high school. Similarly, 91 respondents (22.8%) have attended college as their highest educational level. On the other hand, 201 respondents (50.3%) had a bachelor degree. This means that

majority of the respondents in this study had a bachelor degree for their highest educational level. Moreover, 47 respondents (11.8%) had a master degree as their highest educational qualification, while the remaining 29 respondents (7.3%) had Ph.D. as their highest educational qualification.

The result also revealed the years of service of the respondents. It showed that 54 respondents (13.5%) are between 6-10 years. Similarly, 102 respondents (25.5%) are between less than 6 years. On the other hand, 108 respondents (27.0%) are between 11-15 years, while 115 respondents (28.8%) are between 16-20 years.

Conversely, the title of the position of respondents revealed that 81 respondents (20.3%) are customer services. This means that majority of the respondents in this study are customer services. Similarly, 76 respondents (19.0%) are the branch managers. On the other hand, 93 respondents (23.3%) are designers, while 72 respondents (18.0%) are design managers. Lastly, the remaining 78 respondents (12.6%) are others.

In addition, the market that the respondent's organization serves showed that 174 respondents (43.5%) are local market. Nonetheless, 114 respondents (28.5%) are foreign market and 112 respondents (28%) are global market.

Table 1 Respondent's Demographic

	Number of Respondents	Percentage
Gender		
Male	249	62.3
Female	151	37.8
Total	400	100
Age		
25-34 years	108	27
35-44 years	117	29.3
45-54 years	97	24.34
55-64 years	56	14
65 above	22	5.50

Total	400	100
Highest Educational Level		
High school	32	8
College	91	22.8
Bachelor	201	50.3
Master	47	11.8
PhD	29	7.3
Total	400	100
Years of Service		
Less than 6 years	102	25.5
6-10 years	54	13.5
11-15 years	108	27.0
16-20 years	115	28.8
Total	400	100
Title of the position		
Branch Managers	76	19.0
Designers	93	23.3
Design Manager	72	18.0
Customer Services	81	20.3
Others	78	12.6
Total	400	100

Market Serve		
Local Market	174	43.5
Foreign Market	114	28.5
Global Market	112	28
Total	400	100

Assessment of Reflective Measurement Models

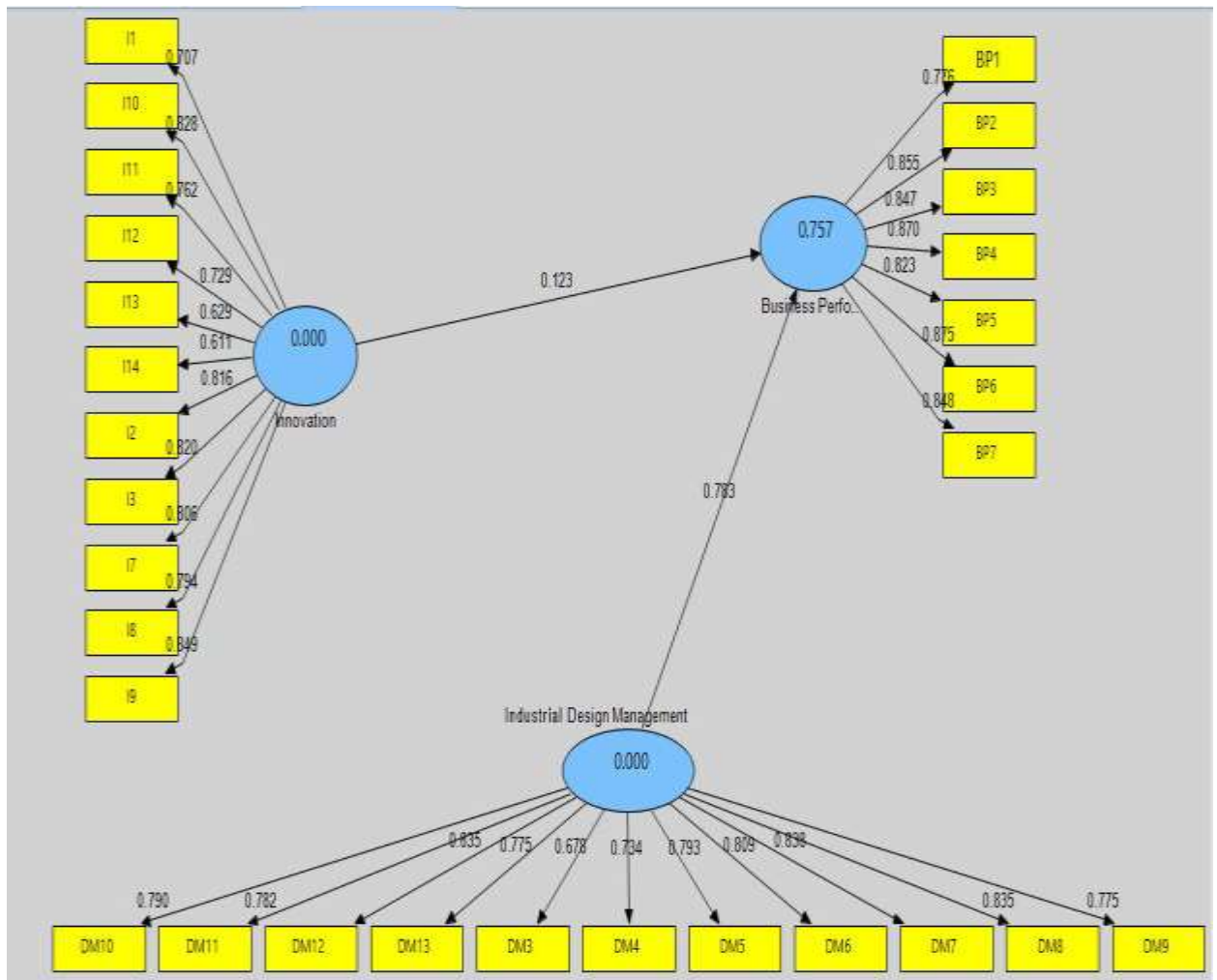


Figure 2 PLS software model

Table 2 Loadings and cross-loadings analysis for discriminant validity

	Business Performance	Industrial Design Management	Innovation
BP1	0.776711		
BP2	0.855445		
BP3	0.846627		
BP4	0.870119		
BP5	0.822553		
BP6	0.874685		
BP7	0.847490		
DM10		0.789986	
DM11		0.782160	
DM12		0.834797	
DM13		0.775223	
DM3		0.678288	
DM4		0.734275	
DM5		0.793526	
DM6		0.808788	

DM7	0.837619	
DM8	0.835047	
DM9	0.774938	
I1		0.707220
I10		0.828327
I11		0.762067
I12		0.729299
I13		0.628997
I14		0.610606
I2		0.815927
I3		0.820379
I7		0.806056
I8		0.794001
I9		0.849156

Table 3 Validity, Convergent Validity, and Discriminant Validity of Constructs

	Composite Reliability	AVE	Cronbach's Alpha
Business Performance	0.944755	0.709837	0.931603

Industrial.Design Management	0.946983	0.619655	0.938303
Innovation	0.938229	0.582488	0.927199

The convergent validity was achieved through composite reliability (CR) and average variance extracted (AVE) of Industrial design management, innovation, and business performance. As indicated in Table 3 above, all values were above 0.6 in the case of composite reliability (CR) and above 0.5 with regard to average variance extracted (AVE). However, Table 2 indicated that the unidimensionality of the measurement items was achieved since all the factor loadings exceeded the required value of 0.6 as recommended by Awang (2014).

Moreover, the convergent validity is achieved when all items in a measurement model are statistically significant. The convergent validity could also be verified by computing the Average Variance Extracted (AVE) for every construct. The value of AVE should be 0.5 or higher for this validity to achieve. Table 3 showed the Average Variance Extracted (AVE) of industrial design management, innovation, and business performance respectively. Thus, retaining the low factor loading items in a model could cause the construct to fail Convergent Validity. Therefore, based on this result, convergent validity was achieved and the study can proceed to further analysis. In addition, the internal reliability indicated how strong the measuring items are holding together in measuring the respective construct. This reliability is achieved when the value of Cronbach's Alpha exceeds 0.7 (Salam and Hoque, 2019; Hoque 2019; Hoque and Awang, 2019; Hoque, Siddiqui, Awang, and Baharu, 2018c; Hoque et al., 2017b; Hoque et al., 2017c; Hoque and Awang, 2016a; Awang et al., 2017a; Awang et al., 2017b; Awang, 2015). Therefore, the result of Table 3 above showed that the values of Cronbach's Alpha exceed 0.7 as suggested by Hair (2010). The study could delete one of the identified items and run the measurement model. The study could also constraint the redundant pair as "free parameter estimate". Another requirement for discriminant validity is that the correlation between exogenous constructs should not exceed 0.85. The correlation value exceeding 0.85 indicated the two exogenous constructs are redundant or having serious multicollinearity problem. The discriminant validity of this study was also achieved since the measurement model was free from redundant items as recommended by Awang (2014) and Hair et al. (2010).

Assessment of the Structural Model

Table 4 Path Coefficients structural model

Relationship	Path Coefficient	Standard Error (STERR)	P-value	Decision	R2
Industrial Design Management Business Performance	0.783387	0.044012	***	Achieved	0.757063
Innovation Business Performance	0.123332	0.052466	***	Achieved	

Valuation of the structural model shall examine how well the empirical data support the industrial design management and innovation of Malaysian industrial product company’s theory. Therefore, the path coefficients and R² values were investigated. Path coefficient represented hypothesized associations of the constructs. Path coefficient close to +1 showed a strong positive association while close to -1 showed strong negative relation (Ringle, Sarstedt, & Zimmermann, 2011). The significance of the path coefficients was tested by using bootstrapping procedure. Table 4 showed the P-value for the path coefficients structural model. Constructed on the P-value, the relationship between industrial design management and business performance, innovation, and business performance were achieved. Moreover, the result of the direct effect showed that the hypothesized relationship between design management and the business performance of Malaysian industrial product companies is positive and statistically significant as proposed by the study.

The beta estimate in the relationship between industrial design management and business performance of Malaysian industrial product companies is 0.783 with a probability value of (***) which is lower than the level of 0.05. This revealed that a decrease of industrial design management by 1% will lead to a decrease in business performance of Malaysian industrial product companies by 0.783. This research hypothesis is supported by the data. The study concluded that industrial design management has a significant positive effect on the business performance of Malaysian industrial product companies. This result is consistent with the previous studies of Landoni, Dell’Era, Ferraloro, Peradotto, Karlsson, and Verganti (2016); Heisig et al. (2016); Prajogo (2016); Peng, Quan, Zhang, and Dubinsky (2016); Jajja, Kannan, Brah, and Hassan (2017); and Rangus and Slavec (2017).

In addition, the result of the direct effect showed that the hypothesized relationship between innovation and business performance of Malaysian industrial product companies is positive and statistically significant as proposed

by the study. The beta estimate in the relationship between innovation and business performance of Malaysian industrial product companies is 0.123 with a probability value of (***) which is lower than the level of 0.05. This indicated that an increase of innovation by 1% will lead to an increase of business performance of Malaysian industrial product companies by 0.123. This research hypothesis is supported by the data. The study concluded that innovation has a significant positive effect on business performance of Malaysian industrial product companies.

This result is consistent with previous studies of Ngo and O'cass (2013); Singh, Chakraborty, and Roy (2016); Zainol, Abas, and Ariffin (2016); Jyoti, Chahal, and Rani (2017); Campbell and Park (2017); Gërguri-Rashiti, Ramadani, Abazi-Alili, Dana, and Ratten (2017); and Bayraktar, Hancerliogullari, Cetinguc, and Calisir (2017). The results also revealed that business performance has R^2 in the structural equation model. The result of Table 4 estimated that the predictors of business performance explained 76% of its variance. This means that the error variance of business performance was approximately 24% of the variance of business performance itself.

V. Limitations of the study

The limitations of this study include the choice of only industrial product companies and employees may make a generalization of the research findings unreasonable. The self-reporting approach of the data gathering process also suggests the possibility of participant self-reporting bias.

VI. Conclusion

This study aims to examine the effect of industrial design management and innovation on business performance of Malaysian industrial product companies. Based on the PLS-SEM results, all model estimate criteria have been met; therefore, indicating the reliability and validity of the industrial design management and innovation of Malaysian industrial product companies' structure. The two hypotheses tested revealed that they were positively and statistically significant. Moreover, the findings of this study recommended that the Malaysian industrial product companies' industrial design management and innovation was significant and correlated to the business performance. It was also confirmed that innovation and industrial design management would lead to greater business performance. Consequently, managers should emphasize on improving and refining the company's related industrial design management and innovation funding, policies, the skill of the human resources and amenities in the design of prototyping procedure and development.

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