The Effects of Eco-Design Practice on Green Product Innovation in Malaysian Interior Design Company

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Abstract— **nowadays, in order to face increasing competition, interior businesses must differentiate through innovation, but also crucially by positioning themselves with respect to eco-design practice, in order to improve green product innovation. Malaysian interior design companies are particularly lacking of eco-design practice and week in green product innovation. Consequently, the interior design business sector is under incredible strain, and it has failed to provide maximum advantages and to minimize economic and environmental problems of Malaysia. Even though the significant effects of eco-design practice on green product innovation in developed countries have been observed, the necessity of this strategic orientation is still overlooked by the researchers in the underdeveloped and emerging countries, especially in Malaysia. Thus, the aim of this study is to investigate the effects of eco-design practice of waste material recycling (WMR) on green product innovation in Malaysian interior design company. This study used a quantitative method, and a cross-sectional study was carried out through self-administered questionnaires. The target population of this study was the designers in interior companies in Malaysia. Stratified random sampling was used to select 285 designers of interior design companies as respondents. Data were analyzed using the SEM-AMOS version 22.0. This study found that eco-design practice of waste material recycling (WMR) had significant direct effects on the green product innovation in Malaysian interior design companies (β = 0.658, p< 0.001, R2 = 0.493). The empirical findings of the present study provide the basis for recommendations for interior design companies in enhancing their green product innovation, and for policy-makers to design environment friendly interior design companies support programs.**

Index Terms— **Eco-design, Eco-design Practice, Innovation, Green Product Innovation, Interior –design Company, Malaysia**

I. INTRODUCTION

Over the past few decades, concern about the environment has become not only a significant public issue but also a crucial topic in academic research. A positive change in consumer behavior towards environmentally related products can be seen due to the increased level of environmental awareness (Delafrooz, Taleghani, and Nouri 2013). This change contributed to the start of the green revolution to prevent further damage to the environment. The challenges realizing firms all over the world include global warming, declining natural resources, a demand for goods which are environmentally friendly and pollution control. They are forced to demote their effect to the environment due to increasing awareness of environmental problems brought about by economic activities (Wakulele, Odock, Chepkulei, and Kiswili, 2016). Hence, many countries have implemented environmental protection laws to reduce the environment impact of industry (Yang and Chen, 2011). Therefore, the efforts of industry to improve the environmental performance of its production cycles are has increased and it has become a primary objective in many contexts (Barbiroli and Raggi, 2003). Innovations which obtain total or partial improvements to the environmental performance or that show a quicker or slower return on investment are gathered (Barbiroli and Raggi, 2003). Under the trends of strict international environmental regulations, conventions of environmental protection and popular environmental awareness of consumers impact the rules and patterns of the global industrial competition in the industries around the world (Chen et al., 2016; Chen, 2018). Therefore, corporate environmental management will play an important role in today business spheres.

All technologies and innovations which have developed a new product or service have made a positive contribution to the environment. This context reflects to a new product innovation that delivers environmental benefits. These benefits can be concluded as savings in energy, decreasing in CO2 emissions, savings in water use, improvements in recycling, increase in biodiversity, and reduction in environmental pollution. innovation can create growth and competitive capability, increase productivity and economic wealth for firms. It can also reduce waste and environmental damage for planet, provide better goods and services at a cheaper price and create jobs for people (Carrion-Flores and Innes, 2010). Consequently, it can be said that Eco-design and green product innovation are the key factors to sustainability for firms and countries.

Hence, to meet these green demands, companies have to come up with innovative products and processes by implementing green technologies, eco-design, and international environmental management systems (Haws et al., 2014). So that, the objective of this study is to analyze the effect of eco-design practice of waste material recycling (WMR) on green products innovation which is going to reduce environmental impact during a product's life cycle (Wakulele et al., 2016).

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II. Literature Review

Eco-design Practice

Eco-design is defined as a set of designing whose aim is at the creation of eco-efficient products and processes; the concept was developed by the World Business Council for Sustainable Development (WBCSD) at the Rio, it is a proactive process which is very detailed and entailing. It influences all the stages of a life cycle of products including: raw material extraction, production, packaging, distribution, use, recovery, and recycling (Jeswiet & Hauschild, 2005). It is a new approach to product design and it involves identifying environmental aspects connected with the product development from waste materials recycling (Nowosielski, Spilka & Kania, 2007). Karlsson and Luttropp (2006) defined it as a sustainable solution of products and services changes that reduce negative sustainability and maximize positive sustainability and impacts economic, environmental, social and ethical throughout and beyond the life-cycle a product. Fiskel and Wapman (1994) defined Eco-design as a process which considers design performances with respect to environmental, health and safety over the product and process of product recycling from waste material and get the finished products, like office furniture from waste wood and glass.

Eco-design practice is one of the practices of Green supply chain management (GSCM) and is known by other names which includes; design for environment, green design, environmentally conscious design, life cycle design, clean design and sustainable design. It usually takes place early in the product's design from waste materials so as to ensure that environmental consequences (Gheorghe & Ishii, 2008). Eco-design practice is an approach that might help reducing the damages of the industrial activities. In Eco-design practice strategy wheel and product life cycle explanation Halila and Rundquist (2011), Hemel (1995), Singhal (2012) explain them as: design for use of raw materials, design for manufacture, design for distribution, design for product use and design for end of life.

Eco-design practice involves selection of low-impact materials, materials which are non-hazardous, non-exhaustible materials, low energy content materials, recycled materials and recyclable materials. Also includes reduction of material, weight reduction and reduction in volume. Some materials and additives are better avoided because they are toxic or may cause toxic emissions during production, use or when dumped. Non-replenishable materials should be avoided since the source can become exhausted with time (Halila and Rundquist, 2011). Reduction of material used is one of the main issues addressed by Eco-design for the energy using products, and it is one of the priorities for products not using energy. Whether they are manufactured close to the customer or not, it does not make a difference in terms of quantity of material needed. The difference comes from the environmental burden created by the extraction of raw materials. Globalization may shift the raw material extraction to the manufacturing region. On the other hand, the life cycle perspective may include in the material selection analysis the location of the production site (Hemel, 1995).

Eco-design practice includes production techniques optimization, having alternative production techniques, low/clean energy use, fewer production processes, reduction in waste generation, few/clean production consumables. Good design should also have production phase in mind. Production techniques should have a low environmental impact: They should also minimize the use of auxiliary materials and energy, should lead to limited losses of raw material and generate little waste as possible (Singhal, 2012). Eco-design influences the efficiency of the manufacturing process as well. From the point of view of Eco-design, decisions on the choice of the manufacturing processes are trade-offs between economic and environmental criteria. Outsourcing allows less control over the manufacturing processes, and there may be a high discrepancy between the design intention (and thus the estimated environmental performance of the processes) and reality at the supplier (different manufacturing processes and waste management) (Horbach, Rammer, Rennings, 2012).

Eco-design practice involves efficient distribution system, transport mode which is efficient, less/clean packaging, and efficient logistics. Environmentally efficient distribution is there to ensure that the product is transported efficiently from the factory doors to the retailer and finally to the user for consumption. It relates to the product, its packaging, its mode of transport, and the logistics involved. If a project involves analysis of packaging, then the packaging should be regarded as a product in itself, with its own life cycle. The main aim is to reduce transport by working with local suppliers to avoid long-distance transport. (Horbach et al., 1997) Eco-design includes the avoidance of environmentally harmful forms of transport hence the choice of transport mode is important. The huge increase in the distance a product travels before reaching the customer, as opposed to locally produced goods, is probably the main negative effect on environment. Although these are the consequences of prevailing economic decisions, optimizing the weight and/or the volume of the product and its package plays an important role in reducing both environmental impact and cost due to transportation (Sarkis, 2012).

Eco-design practice includes reduction of the environmental impact in the user stage; consumption of low energy, few/clean consumables needed during use, ensuring clean energy source and no energy/auxiliary material use. What is important during use are energy and waste. Products should be designed with use of the lowest energy consuming components. Clean energy sources greatly reduce the harmful emissions from the environment, especially energy-intensive products. Product should be designed so that it uses the least harmful source of energy as well as encourage the use of clean and renewable energy sources (Sharma, & Henriques, 2005). From an environmental point of view, the use phase contributes the most to the environmental impact for two broad categories: energy using products and products making use of consumable.

Eco-design aims at reducing the energy and the quantity of consumables during the life time. There is a positive correlation between the energy consumption, cost of ownership and negative impact on environment. This state of the facts induced no incentive for producers to aim efforts towards this direction. The increased awareness of the consumers on the environmental issues has put pressure on companies to reduce energy consumption, combined with eco-labeling and smart marketing strategies (Sarkis, 2012).

Eco-design practice also involves optimization of end-of-life system, reuse of product, material recycling, and clean incineration. Product's end-of-life system refers to what

happens to the product after its initial lifetime. It aims at ensuring reuse of valuable product components and proper waste management. Reusing the product and its components or materials can reduce the environmental impact of a product by reinvesting the materials and energy involved in its manufacture while preventing hazardous emissions (Hemel & Brezet, 1997).

Green Product Innovation

New or modified product through recycling waste materials aiming towards reducing environmental impact is known as Green product innovation (Ghisetti and Rennings, 2014; 2010). According to Amores-Salvadó, Castro, and Navas-lópez (2014); Ghisetti and Rennings (2014); Horbach, Rammer, and Rennings (2012) green product innovation indicates innovation or development the product through recycling waste materials and utilizing of eco-friendly materials as well as recovered materials because this approach can reduce environmental impact in the input measures; it also includes product modifications that are aimed to reduce energy conservation, pollution prevention during products' usage. Some researchers consider that the biggest problem affecting the environment is caused by the use and emissions of products (Amores-Salvadó, Castro, and Navas-lópez, 2014). Environmental pressure and attraction from market motivate green product innovation, which has become a new trend of firm innovation (Dangelico, and Pontrandolfo, 2015). Del & Gonzalez (2019) defines green product innovation as a developing of product with low input of material and energy to produce less pollution along the product life cycles (PLC) either in the manufacturing process, product usage or disposal stage (Rashid, Yahya, Shamee, Jabar, Sedek, & Halim (2014).

Over the years, many authorities and agencies, both national and international, have attempted to establish standards for product greenness through treaties, regulations, practices and guidelines. Though the standards may vary, they are generally concerned with the ecological, human health as well as social, cultural, and economic impacts of a product. A product is considered outperforming a conventional or competing product in greenness if it imposes less burden on the environment in terms of energy and raw materials requirements, air emissions, waterborne effluents, solid waste and other environmental releases incurred throughout its product life cycle (Goepp, 2013).

A green and innovative product is a product characterized by its (1) taking into account of the recyclability and disposal issues throughout its life cycle; (2) usage of materials which are recycled and recyclable and which are less polluting, non-polluting or non-toxic; (3) due consideration to energy use, human toxicity, ecological impact and sustainability issues at every stage of its life cycle; and (4) incorporation of a continual impact assessment and improvement mechanism in the product development cycle (Chin et al., 2017).

Green product innovation indicates technologies that are involved in waste recycling, pollution-prevention, green product designs (Chen & Chang, 2013). According to Halila and Rundquist (2011), the term, eco-innovation is often used to identify those innovations that contribute to a sustainable environment through ecological improvements specially through waste recycling. Green product innovations are defined by Beise and Rennings (2015) as applications consist of new or modified processes, techniques, practices, systems and products to avoid or reduce environmental harms expressly through waste recycling. In this study, green product innovation is defined as all the measures taken by relevant stakeholders to develop and modified product from recycling the waste material and also promote the development of new office furniture as the green products from waste materials which contribute to minimize negative environmental impacts and attain specific ecological goals.

Effect of Eco-design Practice on Green Product Innovation

Green product innovation is that new or modified product aimed towards reducing environmental impact which is commonly accepted (Horbach, Rammer, Rennings, 2012; Ghisetti, & Rennings, 2014). It includes the introduction and improvement in the product through the utilization of eco-friendly materials or recovered materials because this approach can reduce environmental impact in the input measures; it also includes product modifications that are aimed to reduce energy conservation, pollution prevention during products' usage (Horbach, Rammer, Rennings, 2012; Amores-Salvadó, Castro, Navas-lópez, 2014; Ghisetti, & Rennings, 2014). Some researchers consider that the biggest problem affecting the environment is caused by the use and emissions of products (Amores-Salvadó et al., 2014).

A survey from McKinsey indicated that 60% of the interviewed CEOs believed that dealing with environmental change and exploring new market possess strategic implications to long-term flourishing of firms (Ambec, & Lanoie, 2008). Environmental pressure and attraction from market motivate green product innovation, which has become a new trend of firm innovation (Dangelico, & Pontrandolfo, 2015). Due to the tremendous uncertainty and high requirement on infrastructure and consuming habits, the radical innovation does not take up a large portion in industry at present (Dangelico, & Pontrandolfo, 2015). Thus, this paper mainly focuses on the innovation of green product. In the existing research, many scholars have emphasized the importance of green innovation to firms. The ability of green innovation helps to reduce the cost of firm and to improve firm's competitiveness (Ambec, & Lanoie, 2008; Del, & Gonzalez, 2019). Firms will be better able to face resource depletion and energy price fluctuations by carrying out green innovation (Sharma, & Henriques, 2005). Meanwhile, with the gradual improvement of consumers' environmental awareness, green product innovation could optimize corporate image to improve competitiveness (Weng, Chen, & Chen, 2015). Lanoie & Ambec further summarizes the ways of green product innovation to improve firm performance, including better access to certain markets and differentiating product (Ambec, & Lanoie, 2008).

By using recycled materials to manufacture products could reduce cost and increase revenue. When compared to the initial input of raw materials, recycled materials are relatively inexpensive. For example, recycled paper costs lower than the original pulp paper. Many countries encourage firms to reuse wasted materials, and this kind of product innovation will be subsidized by the State, so the firm's income will be increased (Ambec, & Lanoie, 2008). Moreover, the use of recycled materials can also help firms to develop markets. For example, the public sectors in the United States and the United Kingdom (UK) have special requirements of raw

materials in the public procurement process, such as the reuse of recycled materials and the sustainability of raw materials (Dangelico, 2016; Delmas, & Toffel, 2018).

Changing product design to reduce the energy/resources consumption and the environmental impact in the use of products could increase the firm's market share and sales revenue. Private firms have taken steps to "green" their supply chains. Green suppliers will be rewarded more. For example, Body Shop, Wal-Mart and other companies have developed a rigorous evaluation system for suppliers, they also implement an integral incentive program to encourage merchandise buyers to purchase green products. Driven by these socially responsible retailers, the market share of green product manufacturers is expanded. Furthermore, green products are also conducive to the innovation of firms to implement the differentiation strategy in order to develop a niche market. Sales data in the European market shows that sales of products with green labels have grown rapidly in the past 10 years (Ghisetti, & Rennings, 2014). Existing studies have revealed that firms can capture market and increase incomes through developing environmental-friendly products (Ghisetti, & Rennings, 2014; Sharma, & Henriques, 2005; Weng, Chen, & Chen, 2015).

Borchardt, Wendt, Pereira, and Sellitto (2014) conducted a study on redesign of a component based on Eco-design practices: environmental impact and cost reduction achievements and the results strengthened the ideas presented in the theoretical framework that the introduction of new technologies based on Eco-design can help firm create competitive advantage, improve the company's public image, and address legal requirements. The main contribution of the case has been the confirmation about Eco-design construct that could be further researched in the industry. Further analysis of technological ability and market potential to accept a redesigned product provide managerial support to the Eco-design team. Whereas, some studies do not identify a positive impact of environmental proactively on financial performance, Watson, Klingenberg, Polito and Geurts (2004) in a study on the impact of environmental management system implementation on organizational performance found that the data analyzed did not show any significant difference in organizational performance between environmental management adopters and non-environmental management adopters.

Hence the argument that environmental management adopters experience significantly higher levels of profitability and market values compared to non-environmental management adopters could not be substantiated in the findings. While the results from Wagner (2015) in a study on how to reconcile environmental and economic performance to improve corporate sustainability confirmed inversely U-shaped relationship between environmental management and economic performance in the fixed effects models. The positive part of the relationship was found to be relatively weak. For the input-oriented environmental performance index, no significant relationship could be detected. Lopez Gamero, Molina Azorın,and Claver Cortes (2017) did a study to establish the whole relationship between environmental variables, Eco-designing practice, firm performance with competitive advantage and firm resources as mediating variables and found all the relationships are positive and they also found out that this led to improvement of environmental performance and firm performance through reducing pollution, decreasing costs and improving credibility and reputation while also contribute to the development of valuable capabilities which increase the competitive advantage of the firm.

In the literature, there is some evidence that eco-design activities are positively related to market performance of green product innovation (Rajasekaran, & Gnanapandithan, 2013). Eco-design in products is one of the sources of product differentiation (Hart & Ahuja, 2015), which in turn is positively linked to competitive advantage or above-average returns (Porter, 1985). Thus, Dangelico, Pujari and Pierpaolo Pontrandolfo (2016) and Rajasekaran, & Gnanapandithan (2013) found in their studies that there is a significant relationship between eco-design practice and green product innovation. Grounded on the above mixed argument, this research proposed the following hypothesis:

H_1. There is a significant positive effect of Eco-design practice of waste material recycling (WMR) on green product innovation of interior design companies in Malaysia.

The Conceptual Framework

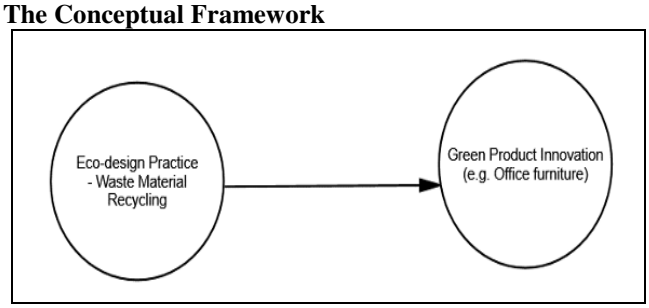

Figure 1: Research Framework

III. Research Methodology

The determination of this research is to examine the effects of Eco-design practice of waste material recycling (WMR) on green product innovation of interior design companies in Malaysia. The target population of this study was the designers in interior companies in Malaysia. Stratified random sampling was used to select 285 designers of interior design companies as respondents. Thus, a self-administered questionnaire was distributed to 342 designers but a total of 285 usable questionnaires were received back. Grounded on gender, male constituted 56.1% while female represented 43.9% of the sample population.

The measures of Eco-design practice of waste material recycling (WMR) were evaluated through a measurement instrument developed by Wakulele et al. (2016). having 6 items grouped into 1 dimension. Lastly, 5-items scale grouped into one dimensions namely green product innovation by Ma, Yin, Pan, Cui, Xin, & Rao (2018) were used in this study to measure green product innovation. Respondents were made to respond and rate using 5-point interval scale with 1 denoting strongly disagree and 5 as strongly agree with the items statement.

The researchers of this study employed SEM using IBM-SPSS-AMOS 25.00 software for analysis and testing the hypothesis as SEM is a Second Generation method of analyzing technique (Hoque *et al.,* 2017c). In SEM, at first the researchers validated the measurement model of the latent constructs using the Confirmatory Factor Analysis (CFA)

procedure (Hoque *et al.*, 2018a; Hoque *et al.*, 2018b; Hoque *et al.,* 2017c; Hoque *et al.,* 2017d; Hoque and Awang, 2016a; Hoque and Awang, 2016b). After validating the measurement model, the researchers execute the path model procedure.

IV. Results

Measurement Model

The validation of a measuring model requires validity, reliability, and unidimensionality at the beginning of the study (Hoque and Awang, 2019; Hoque et al., 2018b; Hoque et al. 2017b; Hoque et al. 2017c; Yusof et al. 2017). Hoque et al. (2017a); Hair et al. (2014) have stated in their study that unilaterality was achieved when the loading factor for all items was positive for a minimum value of 0.6. Incremental fitness, absolute fitness and Parsimonious fit criteria are satisfied when the assessment model complies with then construct validity is reached. Moreover, when not every structure in a model is closely linked, discrimination is accomplished (Awang, 2015; Hair *et al.,* 2010; Fornell and Larcker, 1981). On the other side, Awang et al. (2017a); Hoque, Awang, and Ghani (2016); Awang (2015); Hair et al. (2010); Fornell and Larcker (1981) indicated that Construct reliability comfort through CR and AVE characteristics and that the minimum value threshold is 0.6 and 0.5 respectively.

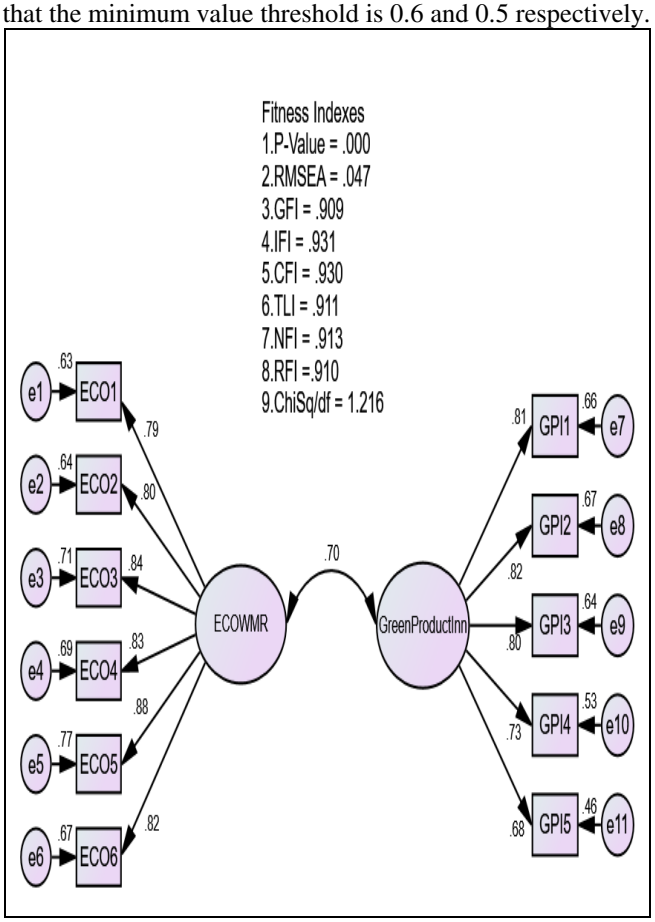

Figure II: Pooled CFA Results and All Fitness Indexes

Internal reliability of the items in this research is accomplished as the Cronbach Alpha score indicates that the minimum value is 0.7 or higher (Awang et al., 2017a; Fornell and Larcker, 1981; Nunnally, 1978). As, P-Value=.000; RMSEA=.047; GFI=.909; IFI=.931; CFI=.930; TLI=.911; NFI=.913; RFI=.910; ChiSq / df=1.216 (shown in Figure II), therefore, the measurement model of the latent Eco-design practice of WMR and Green Product Innovation constructs have met the requirement as well as signifies a satisfactory fit to the data and result of all indexes was good. This research therefore achieved the legitimacy of the construct in the structure of the model (Hoque, Siddiqui, Awang, and Baharu, 2018c; Awang et al., 2017a; Awang et al., 2017b; Hoque and Awang, 2016a; Awang 2015).

Table I: Items Description, Internal Reliability, Composite Reliability and Convergent Validity

Construct & Dimensions	Dimensions & Items	Item Factor Loading	Cronbach's Alpha	CR (above 0.6)	AVE (above 0.5)
Eco-design practice of WMR	ECO1	0.79	0.919	0.928	0.684
	ECO2	0.80			
	ECO3	0.84			
	ECO4	0.83			
	ECO5	0.88			
	ECO6	0.82			
Green Product Innovation	GPI1	0.81	0.897	0.879	0.593
	GPI2	0.82			
	GPI3	0.80			
	GPI4	0.73			
	GPI5	0.68			

The values of factor loading for every item of two constructs that comprise of both Eco-design practice of WMR and Green Product Innovation together with the Cronbach Alpha, CR and AVE for every construct as shown in Table I which indicated both latent constructs have achieved Unidimensionality; Convergent Validity, Internal and Construct Reliability.

The diagonal value in the Discriminant Validity Index Summary Table II, is the value of $\sqrt[3]{AVE}$ for the respective constructs, while other values are the correlation between constructs. As the $\sqrt[3]{AVE}$ for the respective constructs are greater than the correlation values (i.e., 0.710) in their rows, and columns, hence, Discriminant validity of the constructs is achieved for the model (Hoque et al., 2018a, Hoque et al., 2018b; Awang et al., 2017a; Hoque et al., 2017c, Hoque et al., 2017d; Yusof et al., 2017; Hoque and Awang, 2016a; Hoque and Awang, 2016b; Fornell and Larcker, 1981).

Table II: Discriminant Validity Index Summary

Construct	Eco-design practice of WMR	Green Product Innovation
Eco-design practice of WMR	**0.827**	
Green Product Innovation	0.710	**0.770**

V. The Structural Model

The hypothesis H1 is supported, as shown in Figure III. In H1, Eco-design practice of WMR has a significant positive direct effect on Green Product Innovation of the interior design companies (β=0.658, P=.001). Green Product Innovation variance of 49.3% is explained by the structural model.

Table III: Squared Multiple Correlations (R^2)

Variable	Estimate (R^2)
Green Product Innovation	**0.493**

Table III above shows that 49.3 percent of its variance is explained by the predictor of Green Product Innovation. The error variance in green product innovation in other statements amounts to about 50.7 percent of the change in innovation output.

Table IV: Standardized Regression Weights of CE on IP

Variable	Path	Variable	Estimate
Green Product Innovation	←	Eco-design practice of WMR	**0.710**

The Eco-design practice of WMR impact on green product innovation output was found in Table IV based in Figure III at 71.0%, while 29.0% did not influence green product innovation.

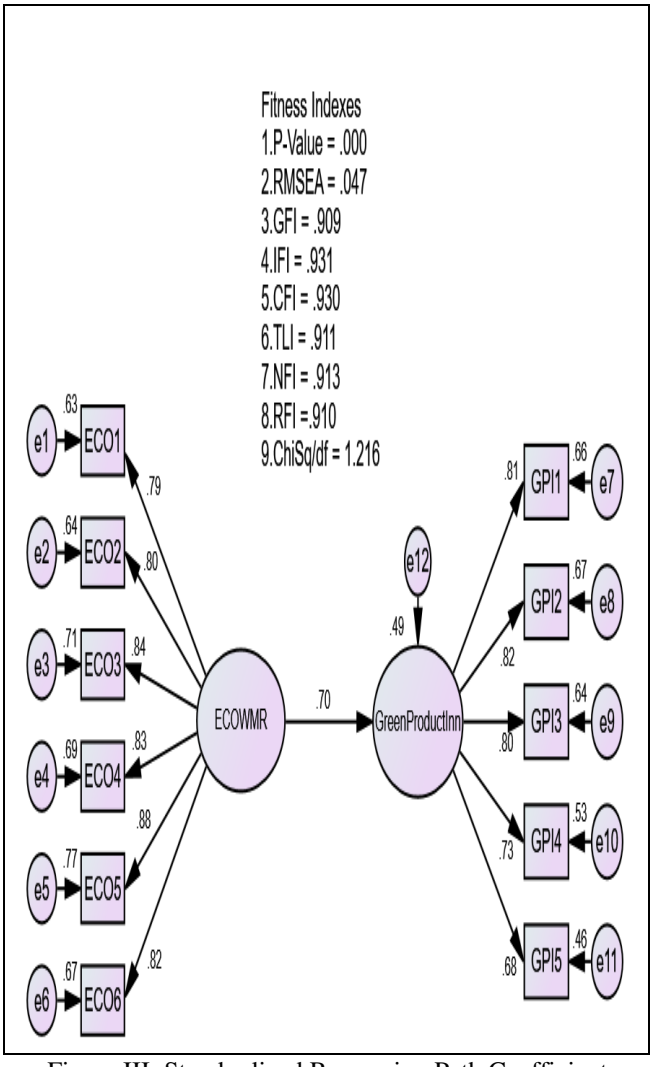

Figure III: Standardized Regression Path Coefficient

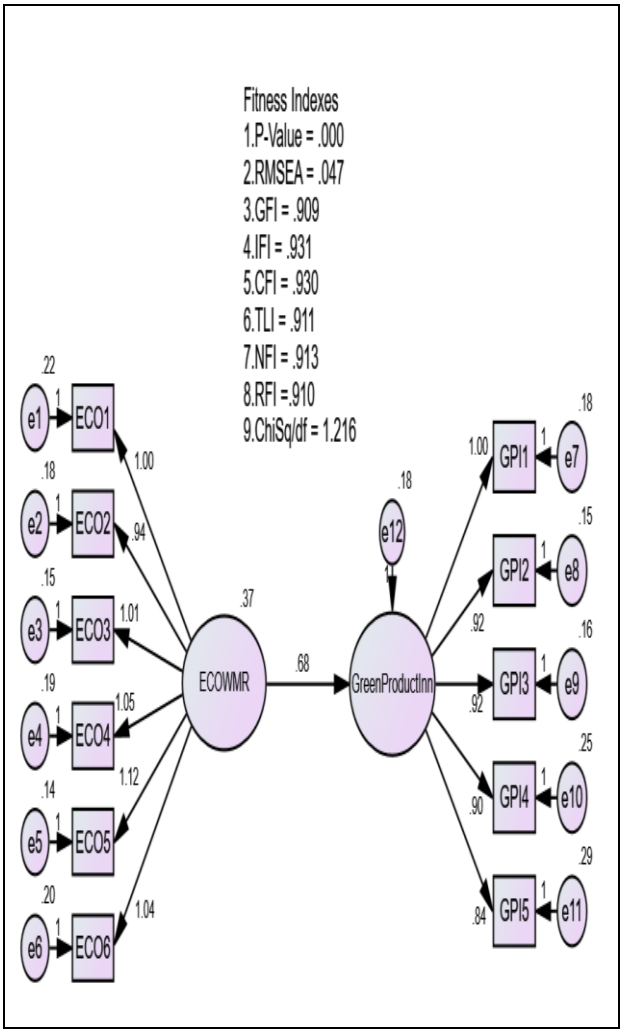

Figure IV: Unstandardized Regression Path Coefficient

The unstandardized regression weight (i.e. shown in Figure IV) stated that the beta coefficient test that estimates the Eco-design practice of WMR construct's impacts on the Green Product Innovation construct.

TABLE V: Regression Weight for Path Estimate

			Estimate	S.E.	C.R.	P	Result
Green Product Innovation	←	Eco-design practice of WMR	**.658**	**0.081**	**8.158**	0.001	Significant

The hypothesis of this study was spelt out as: there is a significant positive effect of Eco-design practice of waste material recycling (WMR) on green product innovation of interior design companies in Malaysia. The result in Table V showed that the level of significance for regression weight indicates that the probability of getting a CR as large as 8.158 in absolute value is 0.001. In other words, the effect of Eco-design practice of waste material recycling (WMR) on green product innovation of the companies is highly significant. Consequently, the beta coefficient for the effect of Eco-design practice of waste material recycling (WMR) on green product innovation was .658, which means that for each unit increase in Eco-design practice of waste material recycling (WMR), Green product Innovation increased by .658. Therefore, the hypothesis was supported.

CONCLUSION

The paper analyzes how Eco-design practice of waste material recycling (WMR) can influence the green product innovation of interior design companies in Malaysia. The conclusion from this study is that Eco-design practice of WMR has a positive and highly significant effect on green product innovation of interior design companies in Malaysia. Hence, it can be resolute that Eco-design practice of WMR can pull the success, survival and green product innovation of interior design companies in Malaysia. Further, a study on Eco-design practice of WMR approach implementation could provide information as to what can mediate or moderate the tactic to enhance green product innovation of interior design companies in Malaysia.

REFERENCES

[1] Ambec, S.; Lanoie, P. (2008). Does it pay to be green? A systematic overview. Acad. Manag. Perspect, 22, 45–62.
[2] Amores-Salvadó, J.; Castro, M.; Navas-lópez, J. (2014). Green corporate image: Moderating the connection between environmental product innovation and firm performance Journal of Clean Product, 83, 356–365.
[3] Awang, Z. (2015). SEM made simple: A Gentle Approach to Learning Structural Equation Modeling. Bandar Baru Bangi: MPWS Rich Resources.
[4] Awang, Z., Ahmed, U., Hoque, A.S.M.M., Siddiqui, B.A., Dahri, A.S., & Muda, H. (2017a). The Mediating Role of Meaningful Work in the Relationship Between Career Growth Opportunities and Work Engagement, International Academic Confernce on Business and Economics (IACBE 2017), Faculty of Economics and Management Sciences (FESP), Universiti Sultan Zainal Abidin (UniSZA), October 07-08.
[5] Barbiroli, G., & Ragi, A. (2013). A method for evaluating the overall technical and economic performance of environmental innovations in production cycles. Journal of Cleaner Production, 11, 365-374.
[6] Beise, M. & Rennings, K. (2015). Lead markets and regulation: a framework for analyzing the international diffusion of environmental innovations, Ecological Economics, Vol.52 No.1, pp.5-17.
[7] Carrion-Flores, C.E., & Innes, R. (2010). Environmental innovation and environmental performance. Journal of Environmental Economics and Management, 59, 27-42.
[8] Chen, Y. S., & Chang, C. H. (2013). Greenwash and green trust: The mediation effects of green consumer confusion and green perceived risk. Journal of Business Ethics, 114(3), 489-500.
[9] Chenn, Y-S., (2018). The positive effect of green intellectual capital on competitive advantages of firms. Journal of Business Ethics, 77, 271-286.
[10] Chenn, Y-S., Lai, S-B., & Wen, C.T. (2016). The influence of green innovation performance on corporate advantage in Taiwan. Journal of Business Ethics, 67(4), 331-339.
[11] Chin, C. H., Chin, C. L., & Wong, W. P. M. (2017). The Implementation of Green Marketing Tools in Rural Tourism: The Readiness of Tourists? Journal of Hospitality Marketing & Management, 1-20.
[12] Dangelico, R.M.; Pontrandolfo, P. (2015). Being 'green and competitive': The impact of environmental actions and collaborations on firm performance. Bus. Strategy Environ, 24, 413–430.
[13] Delafrooz, N., Taleghani, M., & Nouri, B. (2014). Effect of green marketing on consumer purchase behavior. QScience Connect, 5.
[14] Delmas, M.A.; Toffel, M.W. (2018). Organizational responses to environmental demands: Opending the black box. Strateg. Manag. J., 29, 1027–1055.
[15] Fiksel, J., & Wapman, K. (1994). How to design for environment and minimize life cycle cost. In Electronics and the Environment, 1994. ISEE 1994., Proceedings., 1994 IEEE International Symposium on (pp. 75-80). IEEE.
[16] Fornell, C., & Larcker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error, Journal of Marketing Research, 18, (1), 39-50.
[17] Gheorghe, R., & Ishii, K. (2007, January). Eco-Design Value Alignment: Keys to Success. In ASME 2007 International Mechanical Engineering Congress and Exposition (pp. 267-277). American Society of Mechanical Engineers.
[18] Ghisetti, C.; Rennings, K. (2014). Environmental innovations and profitability: How does it pay to be green? An empirical analysis on the German innovation survey. Journal of Clean Product, 75, 106–117.
[19] Goepp, V., Rose, B. and Caillaud, E. (2013). Coupling reference modelling and performance evaluation for the effective integration of eco-design tools into the design process. International Journal of Computer Integrated Manufacturing, 44(1), 1-18.
[20] Hair, J.F.; Black, W.C.; Babin, B.J.; & Anderson, R.E. (2010). Multivariate Data Analysis, Seventh Edition. Prentice Hall, Upper Saddle River, New Jersey.
[21] Halila, F., & Rundquist, J. (2011). The development and market success of eco-innovations: a comparative study of ecoinnovations in Sweden. European Journal of Innovation Management, 14(3), 278-302.
[22] Haws, K. L., Winterich, K. P., & Naylor, R. W. (2014). Seeing the world through GREEN-tinted glasses: Green consumption values and responses to environmentally friendly products. Journal of Consumer Psychology, 24(3), 336-354.
[23] Hoque, A.S.M.M. (2018). Digital Device Addiction Effect on Lifestyle of Generation Z in Bangladesh. Asian People Journal (APJ), 1(2), 21-44.
[24] Hoque, A.S.M.M. (2018a). The effect of entrepreneurial orientation on Bangladeshi SME performance: Role of organizational culture. International Journal of Data and Network Science, 2(1), 1-14.
[25] Hoque, A.S.M.M. (2018b). Does government support policy moderate the relationship between entrepreneurial orientation and Bangladeshi SME performance? A SEM approach. International Journal of Business Economics and Management Studies, 6(3), 37-59.
[26] Hoque, A.S.M.M., & Awang, Z. (2016a). The Sway of Entrepreneurial Marketing on Firm Performance: Case of Small and Medium Enterprises (SMEs) in Bangladesh, Terengganu International Business and Economics Conference (TiBEC-V), Terengganu, Universiti Teknologi Mara (UiTM), pp. 174-194.
[27] Hoque, A.S.M.M., & Awang, Z. (2016b). Exploratory Factor Analysis of Entrepreneurial Marketing: Scale Development and Validation in the SME context of Bangladesh, International Social Sciences and Tourism Research Conference, Terengganu, UniSZA, pp. 20-22.
[28] Hoque, A.S.M.M., & Awang, Z. (2016c). The Impact of Marketing Strategy on Small and Medium Scale Enterprises (SMEs): Case Study in Bangladesh. International Postgraduate Research Conference (IPRC 2016), Universiti Sultan Zainal Abidin (UniSZA), Gong Badak Campus, Kuala Terengganu, Malaysia, October 8-10.
[29] Hoque, A.S.M.M., & Awang, Z. (2019). Does gender difference play moderating role in the relationship

between entrepreneurial marketing and Bangladeshi SME performance? Accounting, 5(1), 35-52.
[30] Hoque, A.S.M.M., Awang, Z., & Ghani, N.A. (2016). Conceptual Model for Quality of Life in the Perspective of Social Entrepreneurship. International Conference on Science, Engineering, Management and Social Science (ICSEMSS 2016), Universiti Teknologi Malaysia (UTM), Johor Bahru, Malaysia, October 6-8.
[31] Hoque, A.S.M.M., Awang, Z., & Gwadabe, U.M. (2018g). The Effect of Entrepreneurial Marketing on Bangladeshi SME performance and the Role of Organizational Culture: A Structural Equation Modelling. Journal of Management and Operation Research, 1, 1-21.
[32] Hoque, A.S.M.M., Awang, Z., & Salam, S. (2017a). The Effects of Relationship Marketing on Firm Performance: Small and Medium Enterprises (SMEs) in Bangladesh, 1st International Conference on Business and Management (ICBM-2017), BRAC Business School (BBS), BRAC University, Dhaka, Bangladesh, September 21-22.
[33] Hoque, A.S.M.M., Awang, Z., & Siddiqui, B.A. (2017b). Technopreneurial Intention among University Students of Business Courses in Malaysia: A Structural Equation Modeling. International Journal of Entrepreneurship and Small & Medium Enterprise (IJESME), 4, 1-16.
[34] Hoque, A.S.M.M., Awang, Z., Baharu, S.M.A.T., & Siddiqui, B.A., (2018a). Upshot of Generation 'Z' Entrepreneurs' E-lifestyle on Bangladeshi SME Performance in the Digital Era. International Journal of Entrepreneurship and Small & Medium Enterprise (IJESME), 5(July), 97-118.
[35] Hoque, A.S.M.M., Awang, Z., Jusoff, K., Salleh, F., & Muda, H. (2017c). Social Business Efficiency: Instrument Development and Validation Procedure using Structural Equation Modelling, International Business Management, 11(1), 222-231.
[36] Hoque, A.S.M.M., Awang, Z., Muda, H., & Salleh, F. (2018b). Ramification of crowdfunding on Bangladeshi entrepreneur's self-efficacy. Accounting, 4(4),129-138. DOI: https://doi.org/10.5267/j.ac.2018.4.001
[37] Hoque, A.S.M.M., Awang, Z., Siddiqui, B. A., & Sabiu, M.S. (2018c). Role of Employee Engagement on Compensation System and Employee Performance Relationship among Telecommunication Service Providers in Bangladesh. International Journal of Human Resource Studies, 8(3), 19-37.
[38] Hoque, A.S.M.M., Gwadabe, U.M., & Rahman, M.A. (2017d). Corporate Entrepreneurship Upshot on Innovation Performance: The Mediation of Employee Engagement. Journal of Humanities, Language, Culture and Business, 1(6), 54-67.
[39] Hoque, A.S.M.M., Siddiqui, B.A., & Awang, Z. (2018d). Technopreneurial Competency Effect on Technology-based SME Performance: A Structural Equation Modelling on Bangladeshi SMEs. International Journal of Entrepreneurship and Small & Medium Enterprise (IJESME), 5(July), 55-73.
[40] Hoque, A.S.M.M., Siddiqui, B.A., & Awang, Z. (2018e). Technopreneurial Competencies Effects on Bangladeshi SME Performance: A Structural Equation Modeling. 2nd ASIA International Multidisciplinary Conference (AIMC 2018), Faculty of Management, Universiti Teknologi Malaysia (UTM), Johor Bahru, Malaysia, May 12-13.
[41] Hoque, A.S.M.M., Siddiqui, B.A., Awang, Z., & Baharu, S.M.A.T. (2018f). Exploratory Factor Analysis of Entrepreneurial Orientation in the Context of Bangladeshi Small and Medium Enterprises (SMEs). European Journal of Management and Marketing Studies, 3(2), 81-94.
[42] Horbach, J.; Rammer, C.; & Rennings, K. (2012). Determinants of eco-innovation by types of environmental impact: The role of regulatory push/pull, technology push or market pull. Ecol. Econ. 78, 112–122.
[43] Horbach, J.; Rammer, C.; Rennings, K. (2012). Determinants of eco-innovation by types of environmental impact: The role of regulatory push/pull, technology push or market pull. Ecol. Econ. 78, 112–122.
[44] Jeswiet, J., & Hauschild, M. (2005). Eco-design and future environmental impacts. Materials & design, 26(7), 629-634.
[45] Karlsson, R., & Luttropp, C. (2006). Eco-design: what's happening? An overview of the subject area of Ecodesign and of the papers in this special issue. Journal of Cleaner Production, 14(15), 1291-1298.
[46] Ma, Y., Yin, Q., Pan, Y., Cui, W., Xin, B., & Rao, Z. (2018). Green Product Innovation and Firm Performance: Assessing the Moderating Effect of Novelty-Centered and Efficiency-Centered Business Model Design. Sustainability, 10(18), 1-13.
[47] Nowosielski, R., Kania, A., & Spilka, M. (2007). Development of ecomaterials and materials technologies. Journal of Achievements in Materials and Manufacturing Engineering, 21(1), 27-30.
[48] Rajasekaran, M. R., & Gnanapandithan, N. (2013). A Study on Green Product and Innovation for Sustainable Development. Global Journal of Management and Business Studies, 3(6), 625-632.
[49] Rostam, R.Y., Adnan, H., Ahmad, N., Ismail, F.Z., Rosman, M.R. (2014). Relationship between Supply, Demand and Opportunity of Interior Designers Graduates in Malaysia Construction Industry. MAGNT Research Report, 3(4), 46-53.
[50] Wagner, M. (2005). How to reconcile environmental and economic performance to improve corporate sustainability: corporate environmental strategies in the European paper industry. Journal of Environmental Management, 76(2), 105-118.
[51] Wakulele, S.R; Odock, S.; Chepkulei, B.; & Kiswili, N.E. (2016). Effect of Eco-design Practices on the Performance of Manufacturing Firms in Mombasa Country, Kenya. International Journal of Business and Social Science, 7(8), 108-132.