The barriers of implementing green product design in the Malaysian manufacturing industry

Muhammad Fakhrul Yusuf[1*], Rashidah Ramle [2], Muhammad Zaim Samsubahar[1]

[1] Faculty of Industrial Management, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Pahang, Malaysia

[2] Faculty of Computer and Mathematical Sciences, Universiti Teknologi Mara, Cawangan Perlis, Kampus Arau, 02600 Arau, Perlis

[*]Corresponding author's email: mfakhrul@ump.edu.my

ABSTRACT: By implementing green product design, manufacturers can achieve benefits such as cost reduction, market expansion to international markets, and improved sustainability. However, the implementation of green product design is not direct, there are barriers that need to be considered. The aim of this study is to investigate the relationship of four barriers (attitude & perception, information, resources and technical) in relation to the implementation of green product design in Malaysian manufacturing industry. Data was collected using questionnaire survey. There are 90 (3%) responses out of 3007 emails sent. Smart PLS version 3 was used to conduct the analysis. The result showed that attitude & perception barrier have a significant impact on the implementation of green product design, while information, technical and resources are not significant. This research will help to improve the understanding of the barriers that prevent manufacturers from implementing green product design.

Keywords: *Green Product Design; Eco-design; Sustainable Development*

1. INTRODUCTION

On the global stage, several organizations have begun to look at businesses from different perspectives that incorporate certain elements such as social and environmental factors. Malaysian manufacturing industry is facing sustainability problem due to imbalance between rapid industrial development and environment. Negative impacts have emerged in the Malaysian environment such as rapid depletion of natural resources, hazardous waste, and toxins pollutions [1]. Green product design approach is an essential practice as it reduces cost, provides good competitive advantage and corporate image while protecting the environment for the society [2].

Therefore, this research aims to evaluate the barriers in implementing green product design in manufacturing industry in Malaysia. Manufacturers need to identify these barriers as it can hinder the successful implementation of green product design.

2. LITERATURE REVIEW

Green product design

Green product design can be defined as a company that takes the initiative to produce a product that meets the standard and quality by combining product design and green practices, including improving the recovery of product value throughout its life cycle prior to disposal [3]. Furthermore, green product design is a knowledge-based resource because intangible assets consisting of skills, creativity, and abilities are created and used to meet the demands of the current market while at the same time provide competitive advantage [4].

Barriers

Perron [5] and Zailani et al. [6] identified the barriers that hinder green implementation categorised as internal barrier namely attitude & perception barrier, information barrier, technical barrier and resource barrier. Internal factors have a stronger impact on green implementation, especially when the resource-based view (RBV) notes the importance of internal resources that are valuable, rare, inimitable, and non-substitutable [7]. Therefore, these internal barriers were selected for the study.

Top management tends to have a negative attitude towards green product design because the company may incur additional costs such as eco-design tools when green product design is implemented in their company, resulting in lower profit on sales. In order to implement green product design in an organization, the management team must have sufficient knowledge about green product design. The technical barrier arises in an organization due to the resistance of an organization to adopt green product design technology. There are two classifications of sub-barriers of resource barriers, namely funding issues and human resource expertise [5]–[7]. Thus, we hypothesize;

H1/ H2/ H3/ H4: Attitude & perception barrier/ Information barrier/ Technical barrier/ Resource barrier has a negative relationship with the implementation of green product design in manufacturing industry

3. METHODOLOGY

This quantitative research used a single cross-sectional survey for the data. The target respondent was a senior or middle management in manufacturing companies in Malaysia. The assessment instrument was based on validated measurements found in the literature on green product design, green manufacturing and green supply chain management. Eighteen items were implemented in the survey to measure green product design [8] and thirty-four items were implemented in the

survey to measure attitude & perception, technical, information and resource barriers variables [9].

4. RESULTS AND DISCUSSION

Analysis results of the items' factor loading, the average variance extract (AVE) and the composite reliability (CR) are revealed in the convergent validity for being tested. All the reflective items of the factor loadings were above the suggested value. Therefore, the results shown that all the reflective items have accepted the convergent validity tests, thus being recognized dependable to be used in the study. Table 1 showed only attitude & perception barrier has a significant relationship with green product design implementation.

Table 1. Summary of Hypotheses Testing of PLS Path Model

	Hypothesis	Beta Value	Standard Deviation	T value	P values	Lower limit	Upper limit	f^2
H1	Attitude & perception -> Green product design implementation	0.423	0.183	2.311	0.021	0.002	0.739	0.093
H2	Information > Green product design implementation	0.336	0.192	1.754	0.08	-0.078	0.648	0.065
H3	Resource -> Green product design implementation	-0.1	0.197	0.507	0.613	-0.422	0.364	0.004
H4	Technical -> Green product design implementation	-0.208	0.157	1.325	0.186	-0.459	0.134	0.022

This study found that attitude & perception barrier have a significant impact on the level of implementation of green product design. This can be interpreted as the higher the attitude & perception barrier, the lower the implementation for green product design. The lack of organizational initiatives and commitment of time and cost hinder the implementation of green product design. Due to this circumstance, it is difficult for management to implement fundamental changes in the organization.

Information barrier had no significant impact on the implementation of green product design. This means that manufacturers are aware of the information about the environmental goals and benefits of green product design. In other words, this shows that the green activities initiated by the government have created some awareness among the community members as well as the industry. However, without the integration and updating of information from time to time to stakeholders, the implementation of good green practices may be difficult as any implementation needs support and cooperation from all parties involved.

The resource barrier did not have a significant impact on the implementation of green product design. Two main barriers to the implementation of green product design are lack of financial resources and qualified personnel. Insufficient environmental resources, such as the experience, number, commitment, and knowledge, lead to a lack of internal expertise in an organization. The lack of qualified personnel for green practice initiatives is a serious problem because the progress and importance of green product design is new in Malaysia.

The technical barrier did not have a significant impact on the implementation of green product design. Majority of SMEs have low motivation to discover other solutions in their product design to meet the environmental requirements. This is because Malaysian consumers tend to look at the functionality and aesthetics of the product first rather than its environmental characteristics.

5. CONCLUSION

In conclusion, only one barrier was found that hinder the green product design implementation which is the attitude & perception barrier. The researcher did not found significant relationship between information, resource and technical barrier and the implementation of green product design.

ACKNOWLEDGEMENT

The authors would like to thank the Ministry of Higher Education for providing financial support under Fundamental Research Grant Scheme (FRGS) No. FRGS/1/2019/SS03/UMP/02/2 and UMP Fundamental Research Grant RDU182202-1.

REFERENCES

[1] N. R. Ibrahim and N. N. M. Noordin, "Understanding the Issue of Plastic Waste Pollution in Malaysia : A Case for Human Security," *J. Media Inf. Warf.*, vol. 13, no. 1, pp. 105–140, 2020.

[2] G. Cheirchanteri, "Green materials and applications, the future for a green product design," *Sustain. Mediterr. Constr.*, 2019.

[3] A. Romli, P. Prickett, R. Setchi, and S. Soe, "Integrated eco-design decision-making for sustainable product development," *International Journal of Production Research*. 2015.

[4] D. Czarnecka-Komorowska and K. Wiszumirska, "Sustainability design of plastic packaging for the Circular Economy," *Polimery/Polymers*, 2020.

[5] G. M. . Perron, "Barriers to Environmental Performance Improvements in Canadian SMEs Barriers to Environmental Performance Improvements in Canadian SMEs," Dalhousie University, 2005.

[6] S. Zailani, K. Govindan, M. R. Shaharudin, and E. E. L. Kuan, "Barriers to product return management in automotive manufacturing firms in Malaysia," *J. Clean. Prod.*, vol. 141, pp. 22–40, Jan. 2017.

[7] T. K. Eltayeb and S. Zailani, "Going Green through Green Supply Chain Initiatives Toward Environmental Sustainability," *Oper. Supply Chain Manag. An Int. J.*, pp. 93–110, Dec. 2014.

[8] K. S. Khor and Z. Mohamed Udin, "Reverse logistics in Malaysia: Investigating the effect of green product design and resource commitment," *Resour. Conserv. Recycl.*, vol. 81, pp. 71–80, Dec. 2013.

[9] R. A. R. Ghazilla, N. Sakundarini, S. H. Abdul-Rashid, N. S. Ayub, E. U. Olugu, and S. N. Musa, "Drivers and Barriers Analysis for Green Manufacturing Practices in Malaysian SMEs: A Preliminary Findings," *Procedia CIRP*, vol. 26, pp. 658–663, 2015.