

# An Analysis of Sustainable Manufacturing Practices in Malaysian Smes

N.Hami, F.M.Yamin, S.M.Shafie, M.R.Muhamad

**ABSTRACT:** *This paper aims to explore the sustainable manufacturing practices (SMP) which are being applied in the studied firms and what is the perceived effect that these have on sustainability performance. Adopting exploratory methodology approach, a multi-case study analysis was used to obtain a deeper insight into the SMP implementation and sustainability performance within two small and medium enterprises (SMEs) in Malaysia. Interviews were conducted with relevant staffs who are knowledgeable on the subject area studied in all three firms. SMP is not yet fully implemented in the studied firms. However, some of the environmentally friendly and socially responsible practices are already implemented in these firms including cleaner production, eco-efficiency, supplier relation, employee relation, and customer relation. Based on the respondents' opinions, it also can be concluded that the implementation of such practices would enhance the economic, environmental, and social sustainability performance of the studied firms but limited in the certain aspects. The findings of this study provide a good foundation to understand the SMP and their contribution to sustainability performance particularly in the context of Malaysian SMEs.*

**KEYWORDS:** *Sustainable Manufacturing Practice, Sustainability, Small and Medium Enterprise Case Study, Malaysia.*

## 1. INTRODUCTION

Realizing the need for being environmentally friendly and socially responsible for the realization of being a developed nation, sustainable manufacturing practices has become one of the strategic focuses on 11<sup>th</sup> Malaysian Plan.

**Revised Manuscript Received on June 01, 2019.**

**N.Hami, F.M.Yamin, S.M.Shafie,** School of Technology Management and Logistics, College of Business, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia.

**M.R.Muhamad,** Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian, Tunjung, Melaka, Malaysia.

To be a developed nation, it is important for Malaysian firms to improve their economic performance altogether with protecting the natural environment and enhancing the social welfare. Unfortunately, although there are various incentives given by diverse authorities for fostering the development of sustainable production, the responsibility of Malaysian manufacturing firms in improving their social and environmental performance is still questionable. Employing survey among 36 manufacturing firms from electrical and electronic, engineering supporting and machinery industries, ref. [1] found that the adoption of sustainable practices (i.e. 6R approach (*reduce, reuse, recycle, recover, redesign, remanufacture*)) is still in the modest level. Conducting study among 150 manufacturing firms (consists of 105 large firms and 44 small and medium sized firms), ref. [2] found that while the implementation of internally-focused sustainable manufacturing practices is quite good, the implementation of externally focused sustainable manufacturing practices is slightly moderate, demonstrating that the firms are still not fully integrate the sustainability standards and principles when dealing with the interests of external stakeholders such as customers, suppliers, and local communities. The manufacturers need to take proactive steps by incorporating sustainability concepts into their company strategy and actions [3]. Due to limitations in some areas such as technology and innovation, human capital development and access to financing, Small and Medium Enterprises (SMEs) are expected to face a greater challenge on being sustainable compared to large firms.

SMEs play a significant role in economic development of Malaysia. SMEs account for a large proportion of businesses, approximately 97.3% of establishments, in this country [4]. Contributing to 32.5% of gross domestic product (GDP) and 17% of export, SMEs employ 57% of the country's workforce in 2011 [4]. It is expected that about 41% of GDP, 25% of exports and 62% of employment will be offered by SMEs [5] and the value added production of SMEs to be around RM120 billion or 50% of total production in the

manufacturing sector by 2020 [6]. Although the contribution of SMEs to GDP were increased in recent years (36% of GDP in 2010 compared to 32.2% of GDP in 2016) [7], these 1) performances were still behind compared to the achievements recorded by the middle-income countries (39%) and high-income countries (51%) in average [8]. To be a high-income nation, it is important for SMEs to achieve greater economic performance simultaneously with better environmental and social performance. SMEs have to respond to the challenges related to economic, 2) environmental and social sustainability [9]. They need to implement sustainable practices in order to improve their sustainability performance. However, as asserted by ref. [10], SMEs are slow to adopt sustainable practices. Moreover, they are also reluctant to admit that they do not properly manage the environment issues [11]. Since there is still little research discussing sustainability and sustainable manufacturing practices particularly in the context of SMEs, a study on these issues is needed. It is important to get an in-depth information of the implementation of sustainable manufacturing practices among Malaysian SMEs in the manufacturing sector.

The aim of this paper is to examine the sustainable manufacturing in the context of two case studies with manufacturers from small and medium enterprises (SMEs) in Malaysia. Specifically, this paper will analyze:

- 1) which sustainable manufacturing practices were or are being implemented in the firms studied; and
- 2) what is the perceived effect of these practices on the sustainability performance of the firms studied.

The next section explains the research methodology employed in the study.

**2. METHODOLOGY**

A case study approach was conducted in this paper in order to gather in-depth, rich data on sustainability and sustainable manufacturing practices. Since there is still lacking empirical research that studies sustainability and SMP in Malaysian SMEs industries within its real-life context, exploratory case study technique was chosen to gather and analyze data comprehensively in this research. Multiple case study analysis was used by selecting two distinct manufacturing firms as indicated in Table 1. The firms were chosen based on a set of specific criteria including:

The number of full-time employees is less than 200 or

annual sales turnover is less than RM50 million since the focus of this study is SMEs.

Having recognizable standard related to quality management system, environmental management system, and occupational health and safety system such as ISO 90001 (Quality Management System Standard), ISO 14001 (Environmental Management System Standard) and OHSAS 18001 (Occupational Health and Safety Management Standard).

Implementing sustainable manufacturing practices for a period of at least three years.

Characteristics	Firms studied	
	Manufacturer A	Manufacturer B
Ownership	Subsidiary of public listed company at Singapore	Subsidiary of multinational company
Annual sales turnover	RM 34 million	RM 20 million
Number of full-time	149	131
Industrial type	Printing	Automotive components and parts
Products manufactured	Labels, sticker printing, silk-screening, nameplates, die-cutting	Car carpets, car mats insulators, silencers, trunk carpets and other
Achievement/ certification	ISO9001:2008 (since 2000); ISO14001 (since 2000); OHSAS18001 (since 2001)	ISO 9001:2008 (since 2002); ISO 14001 (since 2002); OHSAS 18001 (since 2002); TS 16949 (since 2006)

Table1:Description of firms studied

The primary data was collected through semi-structured interviews with several relevant staffs in each selected firms such as production or operations managers, assistant production manager, production engineer, and human resource executive who are knowledgeable on the subject area studied. Initially, an interview protocol was developed by the researchers before pre-tested by a group of leading academicians. The interviews were conducted on a face to face basis mainly using note taking and a tape recorder. On average, each session of the interview taken one and half hours between April and May 2017. Phone call interviews were used where appropriate for strengthening the data and information. The data can be summarized as follows:

Demographic details of the firms.

- 1) Sustainable manufacturing practices that were or being implemented.
- 2) Effect of sustainable manufacturing practices on the sustainability performance.



### 3. CASE STUDY RESULTS

#### 3.1 Firm A

*Background.* The firm A engages in printing industry which was established in 1994. Located on the northwest coast of Peninsular Malaysia, firm A is one of the leading **premium labels and die cut components converters** in Asia Region. The firm involves in the **printing of self-adhesive label, barcode labels, nameplates, die-cut insulators, silk screens, label converters**, various high-performance labels, security and destructible labels, and stamping of precision plastic parts. Since its establishment, firm A has achieved numerous international accreditations such as ISO 9001, ISO 14001, and OHSAS 18001. Emphasizing on both local and international market, firm A has sales turnover around RM 34 million per year. Currently, the firm employs 149 full-time employees, consisting of both local and foreign workers.

*Sustainable manufacturing practices.* Firm A tries to manage sustainability issues by implementing various types of sustainable manufacturing practices such as cleaner production, eco-efficiency, employee-oriented sustainable practices, supplier-oriented sustainable practices, and customer-oriented sustainable practices. Leading by the chief executive director, the top management of firm A put a high priority in protecting the natural environment. The full commitment toward improving environmental and social sustainability from the top fosters the adoption of cleaner production in the operations department as well as eco-efficiency approach at the whole department within the firm. Firm A acquires new technology, digital print machine, which is more sustainable compared to a conventional machine. Besides that, the firm also continuously make efforts to optimize manufacturing process to reduce waste and emissions, adopt 3R (*reduce, reuse, recycle*) approach and seek alternative resources to substitute non-environmental friendly materials and supplies. For the time being, firm A spend a significant amount of investment for a new big project to produce renewable energy through solar technology.

Embracing the notion of employees as an asset of the organization, firm A emphasizes the welfare of its employees. Aside from adhering industry safety regulations, the firm care for employees' personal development, and involving employees in making decisions particularly related to the daily operations. In order to support work-life balance, firm A provides accommodation and facilities such

as prayer room, reading corner, and karaoke room. The employees also only work 5 days per week.

With regard to the customers, firm A has its own philosophy, "customers pay salary to the firm". Being socially responsible toward customers become a high priority in this firm. For example, the firm develops a close relationship with the customer to get mutual benefits simultaneously with protecting the natural environment. The firm will advise its customers in product design. Lastly, firm A also monitors and collaborates with its suppliers to improve environmental sustainability. Beside cost factor, the firms choose suppliers based on environmental criteria. Firm A and suppliers will share the know-how and problems with each other to improve operational and business performance.

*Sustainability performance.* As informed by respondents, the adoption of some sustainable manufacturing practices in firm B has positive effects on the sustainability performance of the firm. In the aspect of economic, firm B manage to reduce costs and lead time approximately 50% and 20% respectively for the last three years. The implementation of such practices also improve product quality, customer service and reputation, increase productivity, revenues and market share, and better new market opportunities. With regard to environmental sustainability, the level of water usage, energy consumption, solid waste and waste water emissions of firm A for the last three years were reduced.

Concentrating on employees, customers, and suppliers, firm A manages to improve social wellbeing related to these stakeholders such as increase employee satisfaction, better recruitment and staff retention, increase occupational health and safety, improve employees' skill, improve suppliers' commitment toward environmental protection, and increase customers' satisfaction.

#### 3.2 Firm B

*Background.* The firm B is an automotive component and parts manufacturer which is located on the west coast of Peninsular Malaysia. The firm is one of the four subsidiaries owned by a multinational company. The firm manufactures top quality molded car carpets, car mats insulators, silencers, trunk carpets and other components. Founded in 1994, Firm B has achieved various international accreditations for the manufacturing of automotive components such as the certification of ISO 9001, ISO 14001, OHSAS 18001, and TS 16949. Currently, the firm has annual sales

turnover around RM20 million with local and international customers. Firm B employs 131 full-time employees, consisting of local and foreign workers.

*Sustainable manufacturing practices.* As demands from both internal and external stakeholders, firm B tries to be environmentally and socially responsible by adopting several sustainable manufacturing practices such as cleaner production, eco-efficiency, employee-oriented sustainable practices, supplier-oriented sustainable practices, and customer-oriented sustainable practices. In order to reduce resource consumption, pollution emission and waste generated in the operations department and within the entire level of organization as well as increase employee skill, occupational health and safety, and employee satisfaction, firm A continuously tries to improve its process design, optimize manufacturing processes, apply 3R approach, acquiring cleaner technology, and improve work practices and maintenance. All of such practices must be aligned with nine predetermined objectives which were monitored regularly by the top management including:

- 1) Reduce and minimize the generation of scheduled waste.
- 2) Reduce usage of paper.
- 3) Reduce usage of electricity.
- 4) Reduced usage of liquefied petroleum gas (LPG).
- 5) Recycle paper.
- 6) Achieve zero leakage, spillage and burst of chemicals, and scheduled wastes.
- 7) Achieve zero overflows of waste.
- 8) Achieve zero fire breakout.
- 9) Achieve zero accident and injury.

Beside guaranteed observation of industry safety regulations, firm B also provide some accommodation (such as hostel) and facilities to the employees to support work-life balance (such as pantry).

While being socially responsible toward employees, firm B also put a high priority on its suppliers and customers welfare. For example, the firm will brief suppliers to set up their own environmental programs, and sending internal auditors to appraise the environmental performance of suppliers once a year. The selection of suppliers also is made by a set of criteria including their environmental performance.

The main customer of the firm is local and international automotive makers. Being socially responsible toward customers, firm B use reuse boxes for packaging, provide

credible information about product materials and processes to the customers and integrate the customers' feedback into its business activities. Firm A also spends a significant amount of money to hire a qualified contractor for managing its waste in a sustainable manner. The firm needs to fulfill customers' expectation as indicating by good performance rating for ensuring continuous business relationships.

*Sustainability performance.* As informed by respondents, there is a number of the positive contribution of sustainable manufacturing practices on improving sustainability performance. In the aspect of economic, firm B manage to reduce costs, improve product quality, customer service, and corporate image, increase productivity and revenues, and better new market opportunities. With regard to environmental sustainability, firm B manage to reduce energy consumption and solid waste about 90% for the last three years.

Resulting from adopting sustainable practices as revealed earlier, firm B manage to improve social wellbeing related to employees, suppliers, and customers such as increase employee satisfaction, better recruitment and staff retention, increase occupational health and safety, improve employees' skill, improve suppliers' commitment toward environmental protection, and increase customers' satisfaction.

## 4. DISCUSSION

The concepts of sustainability and sustainable manufacturing were evolved as an adaptation to changing business environment. Pursuing better operational and business performance without disregard environmental and social wellbeing has given rise to a series of sustainable manufacturing practices. As summarized by ref. [12], there are numerous sustainable practices in manufacturing industries such as cleaner production, eco-efficiency, employee relation, supplier relation, customer relation, community relation, closed-loop production, and industrial relations.

However, analyzing two case studies representing two SMEs from different manufacturing industries, this paper found that only five types of sustainable manufacturing practices were or being implemented by firms studied. These practices are cleaner production, eco-efficiency, employee relation, supplier relation, and customer relation. Due to some limitations faced by SMEs particularly lack financial resources, the firms studied unable to adopt more sustainable 6R approach (i.e.

closed-loop production). They are merely focused on 3R approach but only on certain activities.

The firms studied also being socially responsible toward employees, customers, and suppliers. In general, the firms not actively involved in any programs to improve communal performance such as regularly providing donation or sponsorship, active involvement in the creation of better general conditions in the local community, and cooperation with local community and authorities towards environmental protection. In addition, there are no efforts in collaborating with neighborhood organizations to improve environmental and social performance (i.e. industrial relation).

Regarding what effects the sustainable manufacturing practices have brought to the sustainability performance of firms, respondents tend to agree that such practices can increase economic, environmental and social performance but limited to certain aspects. The five types of sustainable practices that were implemented by firms studied positively contribute mainly to economic performance. The contribution towards environmental protection is still lacking compared to economic and social aspects. As stated by respondents, they need to generate more profits first before acquire cleaner technologies and operate in a sustainable manner comprehensively.

## 5. CONCLUSION

This paper has explored the sustainable manufacturing practices and the perceived effect that these practices have on sustainability performance in two Malaysian SMEs. An analysis has led to the identification of the five sustainable practices which are being applied in the studied firms such as cleaner production, eco-efficiency, employee-oriented sustainable practices, supplier-oriented sustainable practices, and customer-oriented sustainable practices. Due to several limitations, the study found that none of the case study firms actively involved in community programs to improve environmental sustainability and society (local community) wellbeing. The effects of sustainable manufacturing practices across all studied firms are consistent with the extant studies. In general, being environmentally friendly and socially responsible when dealing with employee, supplier, and the customer would lead to better sustainability performance of the firm.

The main limitation of this study is in the number of firms studied and the access of quantitative data in Malaysian firms. The future research is suggested to include more firms to strengthen the findings. It is also suggested that the

same protocol is tested in large firms in order to determine whether the size of a firm affect the implementation of sustainable manufacturing practices.

## ACKNOWLEDGMENTS

We would like to express our gratitude to the Ministry of Higher Education Malaysia and Universiti Utara Malaysia for the research funding and to everyone who has contributed to the completion of this study. This research was supported by the Fundamental Research Grant Scheme (FRGS).

## REFERENCES

- [1] S. Jafartayari, "Awareness of sustainable manufacturing practices in Malaysian manufacturers," M.S. thesis, Universiti Teknologi Malaysia, Skudai, Johor, 2012.
- [2] N. Hami, "sustainable manufacturing practices and sustainability performance mediated by innovation performance," Ph.D. dissertation, Faculty of Manufacturing Technology, Univiversiti Teknikal Malaysia Melaka, Durian Tunggal, Melaka, 2015.
- [3] Shakeel, P.M., Tolba, A., Al-Makhadmeh, Zafer Al-Makhadmeh, Mustafa Musa Jaber, "Automatic detection of lung cancer from biomedical data set using discrete AdaBoost optimized ensemble learning generalized neural networks", Neural Computing and Applications, 2019, pp1-14. <https://doi.org/10.1007/s00521-018-03972-2>
- [4] Department of Statistics Malaysia, "SME Census 2011, Economic Census 2011," Department of Statistics Malaysia, 2011.
- [5] H. Hashim, "Overview of SME sector in Malaysia," in Malaysia-India SME Forum, Mandarin Oriental, 23 September 2013.
- [6] Jarrar, M. T., Minai, M. S., Al-Bsheish, M., Meri, A., & Jaber, M. (2019). Hospital nurse shift length, patient-centered care, and the perceived quality and patient safety. *The International journal of health planning and management*, 34(1), e387-e396.
- [7] SME Corporation Malaysia, "SME annual report 2015/2016," SME Corp., 2016.
- [8] SME Corporation Malaysia, "SME Annual Report 2011/2012," SME Corp.
- [9] D. Chen, S. Thiede, T. Schudeleit, and C. Hermann, "A holistic and rapid sustainability assessment tool for manufacturing SMEs," *CRP Annals-Manufacturing Technology*, vol. 63, pp.437-440, 2014.
- [10] J. K. Khatri, and B. Metri, "SWOT-AHP approach for sustainable manufacturing strategy selection: A case of Indian SME", *Global Business Review*, vol. 17, pp. 1211-1226, 2016.
- [11] M. B. Fernandez-Vine, T. Gomez-Navarro, and S. F. Capuz-Rizo, "Eco-efficiency in the SMEs of Venezuela: Current status and perspectives", *Journal of Cleaner*

- Production, vol. 18, pp. 736-746, 2010.
- [12] N. Hami, M. R. Muhamad, and Z. Ebrahim, "The impact of sustainable manufacturing practices on sustainability", *JurnalTeknologi*, vol. 78, pp. 139-152, 2016.
- [13] S. H. Abdul-Rashid, N. Sakundarini, R. A. Raja Ghazilla, and R. Thurasamy, "The impact of sustainable manufacturing practices on sustainability performance", *International Journal of Operations and Production Management*, vol. 37, pp. 182-204, 2017.
- [14] SMIDEC, "SME performance report,"Percetakan Nasional Malaysia Berhad, Kuala Lumpur, 2002.
- [15] Meri, Ahmed, M. K. Hasan, Mahmoud Danace, Mustafa Jaber, NurhizamSafei, Mohammed Dauwed, Sura K. Abd, and Mohammed Al-bsheish. "Modelling the utilization of cloud health information systems in the Iraqi public healthcare sector." *Telematics and Informatics* 36 (2019): 132-146.