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## **A CASE STUDY ANALYSIS OF SUSTAINABLE MANUFACTURING PRACTICE IN MALAYSIAN MANUFACTURING FIRM**

<sup>1</sup>Nor Rafidah Mohd Alias, <sup>2</sup>Norsiah Hami, & <sup>3</sup>Shafini Mohd Shafie

<sup>1, 2, 3</sup> School of Technology Management and Logistics, College of Business,  
Universiti Utara Malaysia,  
06010 Sintok, Kedah, Malaysia

Corresponding author: [norrafidahalias@gmail.com](mailto:norrafidahalias@gmail.com)

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### **ABSTRACT**

*The aim of the present study is to explore the implementation of sustainable manufacturing practice in Malaysian manufacturing firms. In specific, there are three research questions that guide the study such as: (i) which type of sustainable manufacturing practice is being implemented by the studied firms?; (ii) why do the studied firms tend to implement sustainable manufacturing practice in their operations?; and (iii) what are the impacts of implementing sustainable manufacturing practice on the firms. An electrical and electronic firm located in Penang was chosen as the study sample, and the data was collected from the firm by using semi-structured questions. A manager who had both technical and management knowledge and experience in operational and business activities in the chosen firm was interviewed. The interview was recorded, transcribed, and analysed based on the research questions. The findings of the present study discover the various types of sustainable manufacturing practices being implemented by the firm, two drivers (i.e. internal and external drivers) that motivate the firm to implement sustainable manufacturing practice, and the impacts of sustainable manufacturing implementation in the aspect of economic, environmental, and social sustainability of the firm. The present study is very useful as it offers some theoretical and practical contributions.*

**Keywords:** Sustainable manufacturing, sustainable manufacturing practice, sustainability, case study, interview

## INTRODUCTION

The manufacturing sector plays a significant role in contributing towards the economic growth in various countries. Unfortunately, manufacturing activities also lead to environmental issues such as generating a large amount of waste, air pollution, exploitation of natural resources, and a large amount of energy consumption. Inefficiency in manufacturing operations leads to the damage of the natural environment and eventually harm to social well-being.

Manufacturing firms should be environmentally friendly and socially responsible while carrying out their business operations. Many environmental and social issues have emerged in relation to manufacturing activities. The emergence of the concept of sustainability has transformed the existence of manufacturing firms as isolated economic entities. Elkington (1994) defined sustainability as the expansion of the corporate perspective that considers environmental, social, and economic aspects. Besides generating economic values for the benefits of shareholders and investors, sustainability extends the accountability of manufacturing firms to be responsible towards environmental protection and support the creation of a sustainable society by considering the welfare of other stakeholders such as employees, suppliers, customers, and local communities. Pursuing better sustainability performance has become a strategic agenda of many manufacturing firms nowadays, which is highlighted in their business vision (Nordin, Ashari, & Rajemi, 2014).

The significant role of sustainable manufacturing practice in improving economic, environmental, and social sustainability has been recognised in various past studies. Sustainable manufacturing is defined as the establishment of manufactured products that helps to reduce negative environmental impacts and protect energy and natural resources to ensure an environment that is safe for employees, communities, and customers and is economically sound (US Department of Commerce, 2013). In earlier days, the implementation of sustainable manufacturing practice is more focused on protecting the natural environment. In 2008, Abdul Rashid et al claimed that the key to an environmental initiative is a sustainable manufacturing. Sustainable manufacturing is related to the minimisation of the intensity of material utilisation, use of energy, emission, and the forming of unwanted by-products while keeping, or enhancing, the value of products to the society as well as the organisation (OECD, 2009). Embracing the wider context of sustainable manufacturing practice, Hami (2017) argued that while targeting better environmental performance, sustainable manufacturing practice will simultaneously contribute to wealth creation (i.e. economic sustainability) and social well-being.

Manufacturing firms should be encouraged to implement sustainable manufacturing practice in enhancing manufacturing sustainability in the aspects of economic, environmental, and social. Since the turn of the new millennium, drivers towards the implementation of sustainable manufacturing practice have been getting stronger in most parts of business and society (Seidel et al., 2007; Jafartayari, 2010; Millar & Russell, 2011; Rosen & Kishawy, 2012; Vinodh & Joy, 2012). While many past studies have been carried out related to sustainable manufacturing practice and sustainability performance, the qualitative studies that focus on individual firms are still insufficient. It is important to determine how well individual firms respond to the imperative of becoming a sustainable business, as many firms remain confused about whether and how to internalise natural environmental and social considerations into their operational and business

activities. The purpose of the present paper is to explore the implementation of sustainable manufacturing practice in an individual manufacturing firm. In specific, three research questions will guide the present study as follows:

1. Which type of sustainable manufacturing practice is being implemented by the firm under study?
2. Why does the firm tend to implement sustainable manufacturing practice in its operations?
3. What are the impacts of implementing sustainable manufacturing practice on the firm studied?

The selection of a firm as a study case and the selection of potential respondent have been conducted carefully to ensure the validity and reliability of the data. The important criterion that has been used in the selection process is the firm should have recognition from any respected authorities related to its efforts on environmental management such as the ISO 14001 certification. In the aspect of the respondent, the target respondent involved personnel who have knowledge and experience in the subject studied.

The present study offers some significant contributions and implication. The study contributes to the body of knowledge by providing data and information about sustainable manufacturing practice and firm performance. The findings of the present study discovered the determinant factors, the type of sustainable manufacturing practice implemented, and the impact of such practice on sustainability performance. In the aspect of practical contribution, the findings of the present study can serve as a source of reference for policymakers, industrial practitioners, researchers, and other interested parties. Lastly, the present study can help the studied firm to evaluate its current practices for continuous improvements and eventually improve its sustainability performance. The present paper is structured as follows. Section 2 describes the research methodology applied in the present study. The findings of the study are presented and discussed in Section 3. Finally, Section 4 summarises the findings of the study and suggests the direction of future research.

## **RESEARCH METHODOLOGY**

Since the nature of the study is exploratory and needs in-depth information on the subject matter, a qualitative approach has been chosen to conduct the present study. Employing a single case study to obtain data about the implementation of sustainable manufacturing practice, a firm who has an ISO 14001 certification was selected. The firm was also chosen based on its willingness to cooperate or participate and its experience in sustainable manufacturing practice.

The present study conducted an individual face-to-face interview to collect the primary data from the respondents. The data was collected by first contacting the selected firm to gain its agreement to become a study case in the present study. The purpose of the study has been explained to the firm. The semi-structured questions have been prepared to guide the interview session. The interview was conducted in the form of a one-to-one discussion. It was held on 16<sup>th</sup> October 2017 at 1.00 p.m. and located in Penang, Malaysia. The respondent is a manager in the firm studied who has both technical and management knowledge and experience in the business and

operations in the firm. The data was recorded and transcribed. The data is summarised as follows:

1. Demographic details of the firm.
2. Type of sustainable manufacturing practice being implemented.
3. Drivers for implementing sustainable manufacturing practice.
4. Impact of the implementation of sustainable manufacturing practice on firm performance.

In addition, the data was collected from the website of the firm studied. Various information regarding the background and achievement of the firm has been accessed from the website.

## CASE STUDY RESULT AND DISCUSSION

### Background

The firm under study is located in Penang, Malaysia. The firm manufactures electrical and electronics components since 22 years ago. The main customers of the firm are local and international electrical and electronics product makers. Since its establishment, the firm has achieved numerous international accreditations including ISO 9001 (Quality Management System standard) and ISO 14001 (Environmental Management System standard). The following table summarises the characteristics of the firm studied.

**Table 1.**

*Description of the firm studied*

| Characteristic                | Description                                                                       |
|-------------------------------|-----------------------------------------------------------------------------------|
| Annual sales turnover         | More than RM50 million                                                            |
| Number of full-time employees | More than 75                                                                      |
| Industrial type               | Electrical and electronics                                                        |
| Products manufactured         | Die-cut parts and parts assembly for electrical, electronics, and ICT industries. |
| Achievement/ certification    | ISO 9002:1994 (since 2000); ISO 9001: 2000 (since 2012) ISO 14001 (since 2004)    |

### Type of sustainable manufacturing practice

The firm studied attempts to manage the issue of sustainability by implementing various types of sustainable manufacturing practice in its operations. Engaging with the concepts of prevention, eco-efficiency, environmental strategy, and full life cycle, the firm adopted the 3R approach (Reduce, Reuse, and Recycle) in conducting its operational and business activities. In manufacturing operations, the design of the process focuses on reducing energy and material resources consumption. The firm also tries to optimise the process to reduce solid waste and emissions. The firm attempts to seek alternative materials to substitute its non-environmentally friendly materials on a continuous basis. The firm reuses and recycles some products or the

components of the products. Defected products that have been produced will not be disposed but will be recycled. According to the respondent, the firm managed to reduce industrial waste as well as the consumption of non-environmentally friendly materials and processes. Besides concentrating on manufacturing operations, the sustainable efforts are extended to the management aspects. For example, the firm studied adopts the paperless concept. Based on this concept, any information related to the management will be updated through an online system or delivered by electronic mail instead of using paper or hard copies. In addition, some of the defected products or components and waste that are generated during the manufacturing operations will be reused or recycled for the use of management.

Furthermore, the firm adopts an approach called Three-New Activities. This approach refers to the activities aiming to develop "new" product(s), create "new" application(s), and generate "new" demand(s) (Ukon, 2016). The firm studied procures environmentally friendly products and collects useful information through the Three-New Activities approach. The firm will create new products and applications as well as generate new demands from its customers based on the environmental concept. In the manufacturing process, the firm attempts to reduce chemical substances in production. Chemical can harm many people, especially the employees who manage the chemical substance chemically and the consumers who will use the products. Besides concentrating on improving social well-being, eliminating the use of chemical substance in producing products is also important to protect the natural environment (Hjeresen, 2002).

Apart from being socially responsible towards its employees, customers, and consumers, the firm also cares for its suppliers. The firm chooses its suppliers based on environmental criteria. The firm guides suppliers to set up their own environmental programme through the application of green standard procurements. The firm also requests the suppliers to build a system appropriately to control chemical substances contained in process materials and secondary material that may affect their product. Suppliers need to report the presence of the prohibited or controlled substance to the firm studied.

### **Drivers of sustainable manufacturing practice implementation**

Generally, there are two drivers pursued by the firm in implementing sustainable manufacturing practice in its operational and business activities, namely internal and external drivers. Internally, being environmentally friendly and socially responsible become a part of the vision of the firm studied. The vision has been translated into the slogan, "Considering the environmental preservation, we will provide products and services to fulfil our social responsibility commitments". Embracing the notion of the slogan, the firm needs to implement sustainable manufacturing practice in its organisation. The slogan will guide the top management and employees on how to behave. Based on the slogan, the firm will continuously improve environmental sustainability by adopting the environmental management system and engage in the prevention of contamination. An environmental management system (EMS) consists of a collection of internal policies, assessments, plans, and implementation actions (Coglianese & Nash, 2001), affecting the entire organisational unit and its relationships with the natural environment. Therefore, the firm implements the sustainable manufacturing practice as an incentive to consider the environmental preservations in manufacturing.

Externally, complying with law and regulation requirements become one of the drivers or motives in implementing sustainable manufacturing practice in the firm studied. The firm should follow and comply with environmental regulations. The firm conducts its business in compliance with applicable national and international laws and regulations. The firm should fulfil the entire requirements of the ISO 14001 standard, which is related to environmental management. Fulfilling customer requirements is another external driver for implementing sustainable manufacturing practice in the firm studied. The firm manufactures and offers sub-assembly products to other manufacturing firms. The main customers of the firm are electrical and electronics product manufacturers. The firm is required to supply sustainable components to its industrial customers so that the customers could produce sustainable products. The customers requests for eco-friendly supplies that do not pollute the environment. The firm adopts customer relationship management (CRM), which is a process by which a firm maximises customer information in an effort to increase loyalty and retain customers' business over their lifetimes (Choy, Fan, & Lo, 2003). The firm could manage its customers' requirements based on CRM.

Social responsibility should be a concern for all industrial activities. Social responsibility is one of the external drivers leading to the implementation of sustainable manufacturing practice in the firm. Indeed, many industrial activities might be a cause to the pollution of the environment. This will affect the local communities who live near to the industrial area. Normally, industrial pollution might affect public health and safety. Controlling pollution is one of the measures in corporate social responsibility (Bragdon & Marlin, 1972; Folger & Nutt, 1975; Spicer, 1978). Pollution control, however, reflects only one aspect of social responsibility and is only valid for certain industries (Bragdon & Marlin, 1972). Moreover, the firm concerns with its employees' welfare. An employee plays a vital role in the organisation because the organisation is nothing without the employee in production. The management plans to ensure that the employees in the operations department are not exposed to hazardous materials. The safety culture of an organisation has also been recognised as being an important determinant of the safety and health of employees (Danna & Griffin, 1999). The operations department could avoid using many chemical substances in manufacturing processes and substituting them with eco-friendly materials. The management aims to protect its employees' health and safety.

### **Impact of sustainable manufacturing practice implementation on sustainability performance**

The present study explores the impact of the implementation of sustainable manufacturing practice on the performance of the firm studied. Performance can be defined as a critical concern that is basically pursued by an organisation (Lin & Fang, 2006). It is an important matter and aspect of a manufacturing strategy because it is an integrated concept that exposes the outcome result of the operation of the firm (Kafetzopoulos, 2014; Pethiban & Goh, 2011). According to the respondent, implementing sustainable manufacturing practice offers numerous advantages or benefits that improve the firm's sustainability performance. As claimed by Hami (2017), sustainable manufacturing practice could improve economic, environmental, and social sustainability. The manufacturing firms in Malaysia are highly focused on production-bound when implementing sustainable manufacturing practice and the sustainable manufacturing process has a significant impact on all elements of sustainability (Abdul-Rashid, Sakundarini, Ghazilla, & Thurasamy, 2017).

The firm studied managed to reduce the overall cost of implementing sustainable manufacturing practice. This is because the firm recycled materials and reused products or components of the products. The life cycle of the defected products was increased through the recycling process. In addition, the firm reduced the consumption of energy and utilisation of water in production. Reducing water usage is one of the easiest ways for cost savings. Simple and inexpensive measures can typically reduce water consumption by up to 50%. The firm minimised the usage of water and reused the waste water in production. Since the cost is reduced, the revenue of the firm has increased, which eventually will lead to more profits generated. High potential of sustainable manufacturing practice helps to cut costs and improve competitiveness by reducing resource consumption and thus creating less waste (Pusavec, Krajnik, & Kopac, 2010).

The firm managed to improve customer service. This is related to CRM. The customers required the firm to fulfil their demand on time. The implementation of sustainable manufacturing practice helps to reduce lead times. The lead times are the times between when customer orders are made and when the orders are complete. The customers of the firm consist of industrial customers who need supplies to produce their products as scheduled to meet their customers' demand. Therefore, this is important for the firm to reduce the lead time by implementing sustainable manufacturing practice. Customers will be satisfied when the order is made and completed within a fast period, and thus, customer service will be improved. Indeed, customer satisfaction is related to the profitability of a firm (Rust, 1993).

The reputation of the firm studied has improved since implementing sustainable manufacturing practice. With an ISO 14001 certification, the firm adhered and followed the rules and regulations to prevent or at least control and treat environmental pollution. Moreover, all manufacturing industries should use eco-friendly materials and products. Industrial customers will choose a supplier based on environmental criteria.

Since the customers are satisfied with the performance of the firm under study, the relationship between the firm and customers are long-lasting; consequently, the firm's profit can increase, which leads to an increase in market share. When the reputation of the studied company is better, the firm can penetrate new market opportunities. The studied company also can be known worldwide. The findings of the present study support the previous studies, which found that an organisation's proactive environmental activities lead to improved business performance (Russo & Fouts, 1997; Hart & Ahuja, 1996; Rivera 2002; Stanwick & Stanwick, 2001).

The firm managed to increase environmental sustainability by implementing sustainable manufacturing practice in its operational and business activities. As argued by Abdul Rashid et al. (2008), the key to an environmental initiative is sustainable manufacturing. The firm reused water and made sure the water used was not contaminated. Therefore, water usage and waste water emission can be reduced. Hazardous input usage can also be reduced, as aside from the control of environmental problems that will not become issues anymore. The importance of sustainable manufacturing practice can be seen when the production can be controlled and can protect the natural environment wisely. When the natural environment can be protected, both the public and occupational health and safety can also be improved as well as the increase in the satisfaction of employees, customers, and local communities. In short, by implementing

sustainable manufacturing practice, the firm managed to improve environmental and social sustainability altogether with economic sustainability.

## CONCLUSION

The aim of the present study is to explore the implementation of sustainable manufacturing practice in a Malaysian manufacturing firm. By selecting one of the manufacturing firms located in Penang that has ISO 9001 and ISO 14001 certification; the present study seeks to find an answer to all three research questions. Responding to the first research question, there are various types of sustainable manufacturing practice that are implemented by the firm such as 3R approach, Three-New Activities, and being socially responsible towards employees, customers, and suppliers. With regard to the second research question, both internal and external factors drive or become a motivation for implementing sustainable manufacturing practice in the firm. Responding to the third research question, in general, the implementation of sustainable manufacturing practice contributed towards the better performance of the firm in the aspects of economic, environmental, and social sustainability. There are several limitations of the present study. The current study is limited to only one firm (single case study) and cannot reveal objective data regarding the firm's performance due to private and confidential matters. Considering the limitation of the study, future research is suggested to conduct multiple case studies so that comparative studies can be carried out. Moreover, more case studies can expand the generalisation of the findings. The present study is expected to improve the awareness of environmental protection and social responsibility, especially among manufacturing firms. In addition, the study will guide and promote the implementation of environmentally friendly and socially responsible initiatives to other firms in various manufacturing industries.

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