

## Acceptability of Sustainable Green Practices: Perception of Electrical & Electronics Manufacturing SMEs

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Business and legal aspects of environmental management have developed greatly and generated huge interest in recent decades. Organisations are rapidly changing their structures, systems, work process and activities. This changing environment calls for Small Medium Enterprises (SMEs) managers to manage and respond to the changes in appropriate manner. Despite of wide-range of studies over the last decade, the question on whether green initiatives complement SMEs sustainable green practices remain inconclusive. Anchoring to the arguments on the tenets of sustainable green practices, the present study leads to determine the pattern and dimension of green initiatives consists of energy management, water conservation and waste management within Electrical and Electronics (E&E) manufacturing SMEs, as well as examining the influences of Green Technology policy awareness in building sustainable green practices. A questionnaire based survey collected data from managers of 195 E&E manufacturing SMEs. Results indicate that E&E manufacturing SMEs managers aware and recognised the importance of energy management, water conservation, waste management towards sustainable green practices. The findings also indicate that E&E manufacturing SMEs in Malaysia are still not aware and not perceived Green Technology policy as an important factor towards sustainable green practices. An environmental management monitoring, education, training systems and policy recommendation was formulated to promote sustainable green practices in E&E manufacturing SMEs and other SMEs to hop on the Go-green bandwagon, particularly those without any green practice in place.

### 1. Introduction

Nowadays, with the continuous economic development, the environmental pollution has been intensified, and more attention of the public has been paid to the relationship between the enterprise business activity and ecology environment (Nian et al., 2017). Malaysia is known as one of the industrialised countries, whereby the economy mainly depends on the SME sector. In recent years, sustainability and green practices are among the vital management issues faced by SMEs generally, and E&E manufacturing SMEs specifically, due to the growing awareness in environmental matters among managers, consumers, governments, social groups and employees. The greening practices of E&E manufacturing SMEs in Malaysia warrant investigation because this sector is predicted to outweigh the combined environmental impact of large companies (Hillary, 2000). Broadly, sustainable green practices and their outcomes have been addressed from various different perspectives, ranging from the application of green technologies as a mean to gain competitive advantage, to the perception of environmental regulation as a driver for innovation and improvement of the competitive position. Despite this, attention has normally been devoted to large firms and thus disregarding this development in E&E manufacturing SMEs, which, after all, constitute the “brick-and-mortar” in many economies. On account of this, the impact of E&E manufacturing SMEs on the natural environment remains significant and therefore, researchers and academicians should not overlook it. This allows formulating the overall research question that has guided this study: “What are the pattern and dimension of green initiatives and green technology policy awareness within E&E manufacturing SMEs in building sustainable green practices?”

## 2. Sustainable green practices in SME

By definition, there are very limited operations of SMEs individually, which are impossible or have minimum impact on the environment compared to large businesses (Gadenne et al., 2009). On the contrary, there has been an increasing concern in relation to the impact of business on the environment and numerous reasons highlighted on why SMEs cause so many environmental problems. Despite this, Parker et al. (2009) stated that SMEs are facing scarcity resources, knowledge, technical capabilities and natural resource inefficiencies in dealing with environmental pollution and ecological modernization due to their smaller capacities. Furthermore, SMEs should adopt the principle of cleaner production, use the clean energy and raw materials, and apply the advanced technology and equipment to improve the comprehensive utilization of management and other measures to reduce pollution from the source to improve resource efficiency, in order to reduce or eliminate the hazards to human health and the environment (Ming, 2017). Another essential point is that the small scale and spread location of SMEs have led to the shortening of regulation enforcement and control by the state authorities. Environmental NGO or concerned citizen has power in pressing noticeable SMEs and larger industrial polluters into ecological transformation, even though SMEs are not strong on the radar for them. There is a general agreement that precise data concerning SMEs environmental impact is very limited. There is still a considerable pressure on SMEs that they are enormous polluters and there are undeniably significant impacts on ecological systems due to the infinite number of SMEs and their spread locations. The studies on sustainable green practices of SMEs are still at an infancy level, although there has been vast literature in relation to how and to what extent the production processes and products in major industries of developed countries are being reoriented to include sustainability requirements and conditions. It can be judged that SMEs do not well-understood about environmental impact and to date and there are limited researchers increase the current understanding of the trends surrounding environmental sustainability and environmental performance. A comprehensive study is needed in order to support SMEs and assist them towards sustainable and environmentally sound practices.

### 2.1 Green Initiatives

The processes and activities undertaken to reduce wastes and emissions are known as green initiatives in order to improve productivity and reduce waste, the effort started with remote incidents, such as turning off the lights or machines to systematic patterns of practices like automatic production lines. The green initiatives can begin with the changes in business operations and/or strategies leading to the innovations of product designs, renovations of production processes and modification of production technologies. In this study, the management of energy, water and waste that help to reduce the generation of waste or minimise waste by-production, reduce energy consumption, minimise water usage and enhance material utilisation are the activities that included in the green initiatives. Hagelaar and van der Vorst (2001) explained that there has been a sign of the growth of green-related concepts including life-cycle analysis due to the implementation of green initiatives in business process. The greening process, as explained by various green related concepts of eco-development, do affect a range of business operations whether continuously or discontinuously, such as managing production processes (waste disposal, air emission, pollution control), handling outputs (green and clean products) and purchasing input (raw materials and assemble parts). The greening process is similar to environmentally responsible manufacturing. There are different forms of green initiatives: from the efforts taken to meet the environmental legislations and the continuous improvement of the business and production processes. Hart (1995) stated that the vital operation of green initiatives is to "develop green technologies and to implement strategies that drastically reduce the environmental burden", whilst green initiatives may be perceived and implemented in different ways by SMEs. Therefore, the current study intends to investigate the perspectives and explanatory situation adjoining the three green initiatives (energy management, water conservation and waste management) towards environmental sustainability in E&E manufacturing SMEs.

### 2.2 Green Technology Policy

Green Technology adoption involves executing new or modified processes, techniques and systems to reduce environmental harmfulness and reduce the negative impact of human activities. In Malaysia, the Malaysia Green Technology Corporation (GTM) has been entrusted to promote green technology. GTM outlines green technology as the process, products, equipment or systems which fulfil the criteria of minimises degradation of the environment, reduces greenhouse gas emissions, promotes the use of renewable resources and conserves the use of energy and natural resources. The adoption of green practices can be viewed as an innovation process with the application of administrative knowledge. For instance, manufacturing activity, financial resources, human resources, innovative ability and technological approach are significant factors that influenced green technology adoption for SMEs as argued by Del Brío and Junquera (2003). On the other hand, there are three common characteristics, namely nature of technology, the capabilities of the

organisation and the external environment, do affect the adoption of green technologies based on the literature of technical innovation. In environmental management, the characteristics of environmental knowledge are important. In conclusion, technological characteristics should be considered in order to analyse the adoption of green technologies for SMEs. The experimental studies analysing on how organisational, environmental and technological factors, concurrently influence the adoption of green technologies in E&E manufacturing SMEs are still in lack. An understanding of green technology policy awareness is essential for SME managers in implementing sustainable green practices.

### 3. Methodology

This study utilised a questionnaire-based survey and employed two phases of data collection process. The first phase of data collection is to draw respondent's demographic profile and basic companies information (e.g. gender, age, years of attachment in the organisation, company's main activity, employees size and ISO 14000 accreditation). In the later part, the data collection investigates the managers' perception towards green initiatives question related to energy management, water conservation, waste management, Green Technology Policy awareness and sustainable green practices. The variables categorised into three following categories: 'most important', 'important', and 'less important' by linking to the current environmental scenario in Malaysia. The second phase of the data collection process emphasises on the criteria ranking which affect the sustainable green practices decision making process in E&E manufacturing SMEs. Each of the green initiatives has its own measures which examined to the E&E manufacturing SMEs managers. It requires the managers to rate the importance of each criterion according to the given Likert scales. The relevant measures were ranked by using the factor loading method. The target population for this study consists of 1735 E&E manufacturing SMEs in Malaysia, identified from the SME Corp. Malaysia (2011). Considering the size of the target population and their various locations across the country, it was considered appropriate to take a representative sample of the population. 1,000 E&E manufacturing SMEs were chosen by using random sampling method based on the firms' specific activity. Out of the 1000 manufacturing, E&E manufacturing SMEs contacted, only 195 E&E manufacturing SMEs returned the survey via conventional mail. The overall response rate was 19.5 %. Pertaining to the questionnaire's lower return rate, Macpherson and Wilson (2003) stated that low rates of participation in research among SME managers are normal.

### 4. Findings

This finding is divided into two sections. Section one discloses the demographic result and percentage distribution of variables whereas the second section reveals the factor analysis. Drawn from the result, the respondents consist of 85.4 % males and 14.6 % females. The largest age group ranges between 41 to 50 years (53.8 %), followed by 31 to 40 years (27.3 %), above 51 years (15.8 %) and below 30 years (3.1 %). Almost half of the respondents have six to ten years attachment in the organisation (49.6 %), followed by more than 10 years (25.8 %), two to five years (23.8 %) and less than two years (0.8 %). Top three main activities of the E&E manufacturing SMEs surveyed are manufacturers of consumer electronics (41.9 %), manufacturers of electronic component and boards (20.4 %) and manufacturers of other electric equipment (37.7 %). The majority of the respondents are working in medium sized SME with 75 to 200 employees (75 %), while another 25 % working in small sized SME with 5 to 75 employees. Most of the company (75.8 %) did not have accreditation from ISO 14000.

#### 4.1 Percentage Distribution of Variables

In this section, Table 1 shows the percentage distribution of all variables and the result ranked according to the priority level of most important to less important as perceived by E&E manufacturing SMEs.

*Table 1: Percentage Distribution of Variables*

Priority	Green Initiatives			Green Technology Policy Awareness	Sustainable Green Practices
	Energy management	Water conservation	Waste management		
Most Important	57.7 %	66.2 %	76.5 %	18.1 %	65.0 %
Important	32.7 %	28.8 %	21.2 %	27.3 %	34.2 %
Less Important	9.6 %	5.0 %	2.3 %	54.6 %	0.8 %

Almost the entire studied E&E manufacturing SMEs are aware and recognised the importance of energy management, water conservation and waste management towards sustainable green practices in E&E

manufacturing SMEs. Around half (54.6 %) of the E&E manufacturing SMEs in Malaysia are still not aware and not perceived Green Technology policy as an important factor towards sustainable green practices. These findings indicate that the SME managers still lack knowledge and information on Green Technology benefits which will impede SMEs to contribute to environmental degradation.

#### 4.2 The Ranking Criteria

In order to establish the criteria ranking, factor analysis was conducted on 32 constructs using the Principal Component Analysis (PCA) with Varimax rotation (Hair, et al., 2010). The result of Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was 0.921 with the Bartlett's test of Sphericity significant at the value of 0.000, which indicated the sample adequacy with statistical significance. The results shown in Table 2 demonstrate a degree of convergent validity for 24 items as they had loadings above 0.50 on their expected constructs. 8 items with loading less than the abovementioned value are excluded. 'Promotes the reuse of water in production process by using the most environmentally safe procedures available' and 'minimises the amount of water used for its process activities' in water management seemed to be the highly undertaken practices, judging by their factor loading values of 0.874 and 0.867. The sub-criteria 'carries out environmental audits at regular intervals' and 'regularly monitors trends in water usage' appeared as the least popular practice compared to the other practices as observed from their low factor loading value of 0.599 and 0.571. In connecting these sub-criteria with sustainable green practices, this study through factor analysis have enhanced the understanding by evaluating the role of energy management, water conservation and waste management capabilities on the effective implementation of sustainable green practices.

Table 2: Factor Analysis Result

Criteria	Sub-criteria	Factor loading	Sub-criteria	Factor loading
Energy management	Minimises the amount of energy used for its process activities	0.842	Utilises sustainable energy sources wherever possible	0.664
	Minimise the amount of emissions of contaminants to air	0.839	Uses energy-efficient equipment and products for production process	0.615
	Set measurable targets for reducing energy usage	0.744		
Water conservation	Minimises the amount of water used for its process activities.	0.867	Promotes recycling of water with re-circulating cooling system	0.692
	Promotes the reuse of water in production process by using the most environmentally safe procedures available	0.874	Fixed water-efficient devices and equipment to control the water usage	0.687
	Set measurable targets for reducing water usage	0.771	Regularly monitors trends in water usage	0.571
Waste management	Minimises the amount of waste resulting from its process activities and products	0.792	Ensures the disposal of hazardous waste appropriately by complying with all existing legislation standards	0.656
	Sets measurable targets for waste reduction	0.734	Has waste storage facilities that meet environmental requirements	0.635
Green Technology Policy Awareness	Energy Efficiency	0.782	Green Technology Financing	0.629
	Carbon Footprint	0.732	Scheme (GTFS)	
	Carbon Trading Credits	0.668		
Sustainable Green Practices	Manufactures product in a way that minimises impacts on the environment	0.824	Emphasise the importance of environmental policy	0.652
	Products are designed by emphasising the importance of environmental impact	0.821	Carries out environmental audits at regular intervals	0.599
	Utilises Life Cycle Analysis to assess the environmental impact of the product	0.685		

## 5. Discussion

The findings show that there is a positive relationship exists between green initiatives (energy management, water conservation and waste management) with sustainable green practice in E&E manufacturing SMEs. The percentage distribution of Green Technology policy awareness is neither statistically significant nor an influence on sustainable green practices in E&E manufacturing SMEs. This could be due to three reasons. First, the SMEs managers lack of green knowledge and adopt conservative strategy as the costs of understanding and responding to Government's mitigation policies are not immediate offsets. Secondly, the changes in patterns of demand for goods and services as a result of increasing awareness, ethical purchasing and pro-environmental behaviour among customers, impact businesses and their competitiveness, through which the E&E manufacturing SMEs managers may seek comparative advantage in green businesses, where no such advantage naturally lies. Thirdly, going green is seen as adopting technological innovations to achieve corporate social responsibility, and this is a costly affair. In other words, when managers of these firms do not see any further market opportunities in adopting advanced environmental practices that exceed the norm of the industry, or to exceed the requirements of their stakeholders, they are less motivated to invest in developing internal capabilities to improve their level of pro-activity.

The presented study makes a conceptual impact in highlighting the relationship among constructs in green initiatives through factor analysis, which enhanced the understanding by evaluating the role of energy management, water conservation and waste management capabilities on the effective implementation of sustainable green practices. The results are of interest to managers faced with decisions regarding sustainable green practices. While some SMEs view sustainable green practices as a cost of doing business, findings of this study provide evidence of benefits such as cost reduction and quality improvement in the long run. The results of this study can assist managers to understand what defines a well-developed green initiative and what other firms are doing in regards to sustainable green practices. The study initiates a resolution of the conflict between competing paradigms that drive sustainable green practices.

There are relevant implications for practitioners and governments based on our findings. The importance of green initiatives was demonstrated in this study while improving the sustainability of E&E manufacturing SMEs to form a managerial point of view. It is crucial for E&E manufacturing SMEs to incorporate environmental management training systems into their organisations. The business decision of environmental management requires years of continuous organisational commitment and it is not made at a single point in time. It is suggested that E&E manufacturing SMEs appoint an environmental manager classified under green job category for green initiatives implementation and incorporate "four pillars" of Green Technology Policy into organisation's corporate strategic agendas. From the government perspective, the level of perceived uncertainty should be reduced by government assistance to SMEs based on the results in order to ensure the successfulness of green initiatives. There are various programmes that may reduce the perceived uncertainty. For instance, training programmes such as green technology adoption for SMEs owners/managers. The understanding of green technology changes may be achieved and a clearer view of potential evolution on the sustainability of development that will conserve the natural environment and resources can be provided. In addition the government should intervene through regulatory development of framework, incentives, and development of Green Technology and sustainable green practices infrastructures in SMEs. In spite of this, the government introduced funds such as the Green Technology Fund Scheme (GTFS) to encourage SMEs to take their first step in implementing green-based business. The Malaysian government's support is the most important factor, which could influence an organization or SME to adopt an environmentally proactive strategy or sustainable green practices

## 6. Conclusions

Globalization has encouraged the emergence of customers who are environmentally conscious and supportive of sustainable green practices. The results of this study indicate the emergence of a valid and reliable sustainable green practices construct and report the impact of this construct on business performance. The sustainable green practices can be considered as a new but overlooked capability of operations management. It is considered overlooked because typically little is known about these systems, despite several international standards and environmental system concern. The key issue for E&E manufacturing SMEs at the present is to distinguish the risk of potential earning if the implementation of sustainable green practices is not to protect the environment from deteriorating. The increasing effect on the environment is significant and may lead to biodiversity loss and natural resources degradation and E&E manufacturing SMEs have an important role to play. Sustainable green practices and green technology offer the opportunity for E&E manufacturing SMEs to introduce products and services that also benefit SMEs in economic such as increasing the market base, cost savings and better business profits and at the same time also protect and

preserve the environment. Since green technology is a key driver of sustainable green practices adoption among E&E manufacturing SMEs, more aggressive approach by the government should be taken in implementing laws and regulations that are related to SMEs and not just large corporations. Even the findings suggest that SMEs are less concerned or less motivated about being involved in green technology which will enhance their sustainable green practices. This may be due to the three reasons discussed earlier and resource constraints of manufacturing SMEs. As the number of small and medium size firms in Malaysia has increased dramatically over the past few years, the Malaysian government should consider providing more financial and non-financial incentives to motivate these SMEs to be proactive in enhancing their environmental capabilities and performance. In addition to promote the sustainable green practice, there should be easy access to the information and advice on environmental programmes that are affordable and suitable for SMEs. Through this way, SMEs are more convinced by the information and advice whereby long-term financial benefits and demonstrates their social responsibility can be contributed by sustainable green practices.

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