

# Green Purchasing Practices and Environmental Performance

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**Abstract** — Green purchasing aims to minimize negative environmental impacts in manufacturing process and transportation by using durable, recyclable and reusable materials. This study aims investigate the impact of green purchasing practices including green product, green process and green supplier on environmental and business performance in the context of Malaysian manufacturing companies. A total of 156 questionnaires were distributed to different industry sectors. The findings show that green product, green process and green supplier are significantly and positively related to environmental performance. In addition, green product is the main predictor of the environmental performance. Ultimately, the results could offer useful guidance for green purchasing practices implementation in Malaysian manufacturing companies and provide a springboard for further empirical research in the area. Even though many researchers were worked on the annealed tubes, very few researchers were reported about the rate of energy absorption.

**Keywords**— Green purchasing, Environmental performance

## 1. Introduction

Purchasing strategies could enhance manufacturing performance of an organization [1]. Since the 1980s global competition has intensified, firms recognised the impact of high volume of purchased materials and work-in-process inventories on operation cost, product quality and delivery lead time [2]. Undeniably, purchasing department is a key business participant in a supply chain [3] that connects a firm with its suppliers through acquisition of required materials, services and equipment for production processes [4], [5]. The main goals of purchasing include ensuring

smooth flows of raw materials at the lowest total cost, maximising customer satisfaction and improving quality of the finished goods [2].

Purchasing is one of the key strategic business process used by many companies to perform series of activities [5], [6]. Purchasing function plays a vital role in choosing the right product as purchased raw materials, components, parts and supplies can signify more than 50 percent of sales dollar [2], [5]. Therefore, selecting the right suppliers is one of the important tasks of purchasing which directly reduces purchasing risk and maximises overall value to the buyer organisation [7]. Additionally, purchasing can be served as a crucial link between the sources of supply and the organisational itself. As competitive pressures become more acute, buyer organisations are increasingly demanding their suppliers to fulfil stringent requirements in terms of quality, quantity, cost, product mix and delivery efficiency [8] in order to gain a competitive advantage. Consequently, this demand has increased the strategic role of purchasing in today business setting. In fact, purchasing function has become a holistic and comprehensive acquisition strategy to perform activities from supplier evaluation and certification, supplier development, supplier recognition programs, supplier relationship management to sourcing [2].

Purchasing can contribute a significant environmental threat in terms of discarded packaging materials. Over time, the level of awareness on global warming and other environmental issues has increased significantly, making a concern for companies to “green” their purchasing. Green purchasing takes into account the environmental and social responsibility in purchasing process [6]. The environmentally-conscious purchasing initiatives include the

procurement of products and services that meet environmental objectives such as reduced sources of wastages, recycling, reuse, resource reduction and substitution of materials [3]. Green purchasing is about buying environmental-friendly raw materials, suppliers' environmental certification and requirements compliance as well as fulfilling environmental objectives [9]. In a similar vein, green purchasing is the practice of choosing suppliers that provide eco-friendly materials and services [4]. Green purchasing aims to minimise negative environmental impacts in manufacturing process and transportation by using durable, recyclable and reusable materials [10]. Companies that practised environmental strategy in purchasing benefitted from cost savings, better public image and decreased liability [2]. Companies that are able to leverage their green supply base with lower cost, higher quality and concern about environment aspects [11] to impact their total cost structure and product quality will have a competitive advantage in their markets.

On the other hand, green purchasing is defined as a sustainable purchasing. The study defined green purchasing as a responsibility in supporting sustainability and considered sustainability has a significant relationship between product focus and natural environment [12]. Based on International Green Purchasing Network (IGPN) [13], green purchasing is defined as the purchase of any product and service that results in a minimum environmental impact and the used of comparable price to demonstrate social responsibility and ethics. Purchasing department needs to strike a balance between quality, cost, functions, environment, social and ethical aspects in order to purchase a product or service in accordance with qualified green purchasing activity. In actuality, organizations adopt green purchasing strategies in response to the increased concern about sustainability the environment [10]. This is because green purchasing function involves the selection and procurement of green materials to meet the requirement for organizational eco-friendly products. Therefore, green purchasing is referred as a strategic function for reduction waste and materials selection through environmental standards.

Many researchers have emphasized the importance of green purchasing in green supply chain management practices. Green purchasing activities provides opportunity for electronics firms to increase sustainable performance [14]. Green

purchasing is one the essential function in supply chain activities to improve environmental and economic performance. In addition, green purchasing can be categorized as operational capabilities and dynamic capabilities [15]. The relationship between supplier and purchaser can be strengthened through collaborative green practices [16]. The purchasers must take responsibility to educate suppliers and demonstrate a full commitment to achieve highly effective environmental performance [17]. Undeniably, the characteristic, knowledge, ambitions, equipment and actions of the suppliers could have significant impacts towards green purchasing.

The other benefits of implementing green purchasing include source reduction and waste elimination. Actually, an effective ways for firms to control environmental problems is to focus on waste prevention by controlling the source through green purchasing. The findings suggest that company which progressively reduces packaging wastes such as biodegradable packages could increase the role of green purchasing. The study also found that buying firms in United States are involved in green purchasing due to the threat of regulatory pressures [9]. Nevertheless, regulatory pressures create business opportunities for competitive advantage. Companies that followed stricter regulatory requirements benefitted from cost savings, better public image and decreased environmental liability [2].

In reviewing and consolidating the literature, three core green purchasing practices emerge, including green product, green process and green suppliers. The green purchasing has attracted considerable scholarly interest, but, it has not yet received sufficient attention in academic research in the Malaysian purchasing context. Malaysian Productivity Corporation (MPC) conducted a survey to investigate how Malaysian business leaders rank their business challenges and strategies [18]. From the reports, the sustainability was ranked as an important challenge by Malaysian chief executive officer. In order to meet the challenge, firms need to execute two strategies: (i) ensure that sustainability to be part of corporate brand, and (ii) encourage improvements in sustainability performance on the part of suppliers and other business partners. It is clear that green purchasing is essential to sustaining competitive advantage.

Therefore, due to various limitations, this study is carried out to answer two research

questions: (i) what are the relationships between green purchasing practices (green product, green process and green supplier) and environmental performance? (ii) Which green purchasing practice is the best predictor of environmental and business performance?

## 2. Proposed Research Framework

The main objective of this study is to investigate the relationship between green purchasing practices and environmental performance. Studies [9], [18]–[21] have proposed numerous green purchasing practices. Based on the literature, this study proposed that green product, green process and green supplier are the most important green purchasing practices for firms to improve environmental performance. The environmental performance includes reduction in solid or liquid waste, reduction in air emission, improvement in environmental compliance, preservation of environment and enhancement in waste disposal [22].

## 3. Hypotheses Development

### 3.1 Green Product

Green product includes product content requirement, labelling and stewardship. The product content requirement is one of the strategies that is considered common when applying green practices. Buyer, vendor and supplier must work together to create an environmental friendly product. They should apply 3R (reuse, recycle and reduce) to maintain product quality and reduce costs. In addition, the purchased materials need to be hazardous free and follow strict regulation. As for the product content labelling, firms need to clearly list all ingredients on the product label. Some countries use green label to differentiate green product than other products. Also, product stewardship is needed in green product because it requires high level of commitment from the organisation to be responsible in managing the impact of the purchased materials from supplier to the end of the product life cycle [18]. The firm must work together with their suppliers during buying phase in order to achieve an environment friendly production and performance. The practice of green product requires firms to source environmental friendly raw materials, substitute environmentally questionable raw materials by

environmental friendly raw materials, reduce purchased volume of items that are difficult to dispose of or are harmful to the ecosystem, and reduce the use of hazardous virgin materials by purchasing a higher percentage of recycled or reusable materials. Evidently, these green product practices have significant impacts on environmental performance [22]. In addition, green material is a critical driver for business performance [23]. Therefore, the following hypothesis is developed:

*H1: Green product is significantly and positively related to environmental performance.*

### 3.2 Green Process

Green process is one of the categories for supplier selection. Green process requires supplier to provide information about environmental aspects and specify product components containing no hazardous material [22]. The practices of recycling, scrapping, reusing, using low density packaging, sorting for non-toxic incineration and using biodegradable packaging are one of major waste management process in practising green purchasing [9]. Green process practices include using environmentally friendly raw material, designing the product that reduced consumption of material and energy, reusing, recycling, recovery of material in component parts, and reducing or avoiding used of hazardous product, optimizing the process to minimise the waste and emission, and using reverse logistic in the company [24]. Green process requires firms to select suppliers by using environmental criteria, require suppliers to provide environmental impacts of the products content, specify that the products must not contain environmentally undesirable attributes and require suppliers to provide information about their environmental aspects [22].

Green supplier selection and evaluation process can be complex and multi-criteria problems, which includes both qualitative and quantitative dimension of supplier performance. Green supplier selection consists of eight main criteria and thirty one sub-criteria that include non-green criteria such as quality, delivery time, cost, service and strategic alliance as well as green criteria like environmental management, pollution control and green product [19]. Most of the time, purchasers will purchase goods and services from environmental responsibility supplier who could offer low cost and high quality [25]. Purchasing

needs to address the relationship between environmental factors and supplier selection. The potential liability for disposal hazardous material, cost, state and federal regulation are most important influences in supplier selection.

The key elements in supplier selection towards green process include organisational framework, supplier selection model, factor and criteria affecting supplier selection and beneficial buyer-supplier relationship. The study also claimed that purchasers have important roles in selecting the supplier and they must have profound understandings of green purchasing. This is because a proper environmental supplier selection could enhance business performance by controlling purchasing costs and reducing number of suppliers [21]. Also, green process has a significant impact on environmental performance [26]. Based on the above discussions, the following hypothesis is developed:

*H2: Green process is significantly and positively related to environmental performance.*

### 3.3 Green Supplier

Organisation interacts with suppliers to acquire raw materials and components for its manufacturing process through creating closer and more collaborative relationships. Supplier relationship involves cooperative efforts between supplier and buyer; it also includes coordination and collaboration between them in terms of ability to respond fast and meet requirements of the product and service. Green supplier is important to achieve competitive advantage [27]. Supplier environmental criteria includes holding environmental awareness seminar for supplier, helping supplier to establish own Environmental Management System (EMS), sharing and bringing other suppliers in the same industry, informing supplier about benefits in green practices, requiring supplier to take environmental actions, requiring supplier to adapt environment practices, arranging fund for environment program and conducting audit to appraise environmental performance of the supplier [17]. Green supplier practices including hold awareness seminars for suppliers, urge suppliers to take environmental actions, guide suppliers to establish their own EMS, bring together suppliers in the same industry to share their know-how and problems, send in-house company auditors to appraise suppliers'

environmental performance and urge suppliers to take back their packaging are suggested to have a positive impact on environmental performance [22]. As such, the hypothesis is proposed as follows:

*H3: Green supplier is significantly and positively related to environmental performance.*

## 4. Research Methodology

A research design is important to guide the data collection and data analysis. A research design is a "blueprint for the collection, measurement, and analysis of data, based on the research questions of the study" [28, p. 95]. This study is a conclusive research design that applies quantitative method. This study used a quantitative approach to investigate the relationship between green purchasing practices and environmental performance.

This study used convenience sampling technique through hand delivery questionnaire to the manufacturing companies in Malaysia in order to increase the response rate. A total of 156 sets of questionnaires were collected in three months.

## 5. Research Findings

### 5.1 Firmographic Profile

In this study, firmographics include job position, industry classifications, year of company establishment and firm size. A total of 156 companies participated in this study. The respondents included 59 CEOs/managing directors/owners (37.8%), 50 supply chain managers/purchasing managers/material managers (32.8%) and 47 others (32.1%). The others consisted of general/project managers, business/sales/product development managers or senior purchasing executives. In general, a higher number of respondents worked for the industry of food product and beverages (32.1%), machinery and equipment (8.3%) and electrical machinery and apparatus (8.3%) than the other industry groups. Approximately 40% of firms had been established between 5 to 10 years. In addition, 70.5% of the respondents worked for small firms employing fewer than 50 employees.

### 5.2 Normality Test

The normality test is used to determine whether a data set resembles the normal distribution. The test for normality can be either graphical or numerical. The graphical methods include drawing a histogram, stem-and-leaf plot, box-plot, normal probability plot, and detrended normal plot. The numerical methods involve computing the Shapiro-Wilk, Shapiro-Francia, and Skewness/Kurtosis tests [29]. The numerical method of the Skewness/Kurtosis test was used to assess univariate normality. The values of skewness and kurtosis of variables should fall within the recommended value of +1.0 to -1.0 in order to meet the assumptions of univariate normality. In addition, Mardia's coefficient of multivariate kurtosis was used to check for multivariate normality [30]. Similarly, Mardia's coefficient falls within the range from -1.96 to 1.96 as the threshold value for multivariate normality. The results show that the skewness and kurtosis values of this study fall within the suggested ranges. Therefore, data of this study is normal distributed.

### 5.3 Reliability Test

Reliability is determined by measuring the consistency and stability of a measurement test or instrument before data entry into the system. Consistency in reliability means that the repeated test on the same thing will deliver the same outcomes [31]. Cronbach's alpha is a reliability coefficient consisting of a number of intercorrelated items in a set. Internal consistency reliability will get stronger if the Cronbach's alpha is closer to 1 [31]. Reliability analysis was conducted using an internal consistency method via Cronbach's alpha. A Cronbach's alpha value of 0.7 or more is an acceptable reliability coefficient [32]. In this study, the Cronbach's  $\alpha$  values for all the factors were found to be well above the acceptable value of .70. The results are sufficient to establish the reliability of all the constructs.

### 5.3 Multicollinearity Test

Multicollinearity test was performed before multiple regression analysis. For this study, the multicollinearity test was conducted to examine

the value of tolerance which is more than 0.1 and variance inflation factor (VIF) value which is less than 10. The result shows that there is no high correlation among independent variables; therefore no multicollinearity problem is detected in the study.

### 5.4 Multiple Regression

Multiple regression was used to test the research hypotheses and to explore the strength of the relationships between the dependent variables (environmental performance and three independent variables (green purchasing practices)). The result shows that green product, green process and green supplier are significant positively related to environmental performance at p-value less than 0.05. This means the H1, H2 and H3 are supported. The adjusted  $R^2$  of 0.337 illustrated that 33.7% of the variance had been significantly explained by the independent variables. After that, beta or standardized regression coefficients were identified. Green product has the highest beta value (0.415) that would impact the environmental performance the most. Therefore, it would result in a change of 0.415 standard deviations in the environmental performance.

## 6. Conclusion

The findings have proved that green purchasing practices including green product, green process and green supplier are significantly and positively related to environmental performance. Green product is the strong predictor of environmental performance. This means when companies practise green product, it will enhance the environmental performance significantly. In fact, green product plays an important criterion to company because purchasing company requires suppliers to source environmental friendly raw materials in order to reduce the hazardous material when producing the product. This result is consistent with the findings that the green product practices have significant impacts on environmental performance [22], [33], [34]

The findings of this study are expected to have implications for managers and practitioners, especially for those in manufacturing industry. First, it provides managers with a useful tool to evaluate current green purchasing strategies. Second, the results of the study supported the claim

that the executions of green purchasing practices including green product, green process and green supplier have positive impacts on environmental performance. As a result, managers can easily gain a general overview of the implementation of suitable green purchasing strategies for enhanced environmental performance.

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