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# Influence of Top Management Commitment, Stakeholder Pressure and Public Concern on Sustainable Environmental Manufacturing Practices in Malaysia: Data Screening and Preliminary Analysis

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***Abstract:***
*This research paper explored the screening procedures and preliminary analysis of the data collected regarding the influence of top management commitment, stakeholder pressure and public concern on sustainable environmental manufacturing practices in the Malaysian manufacturing industry.One hundred and three companies from different Malaysian manufacturing industry completed the mail-administered questionnaire on a 6-point Likert scale. The collected data was analysed by using Statistical Package for Social Sciences (SPSS) application software version 20. Towards the achievement of the satisfaction of the assumptions of multivariate analysis, data screening and preliminary analysis was performed. Precisely, the missing values, outliers, normality and multicollinearity test were conducted and the results show that the data were fit and qualified for further use in the multivariate analysis.*

***Keywords:*** *top Management commitment,stakeholder pressure, Public concern, sustainable environmentalmanufacturing practice, data screening, preliminary analysis.*

## 1. Introduction

Data screening is an essential part of multivariate analysis as it helps researchers to ensure that the data underlying the analysis meet all the requirements of the multivariate analysis (Hair, Black, Babin & Anderson, 2010).In addition, by examining and screening the data collected before analysis, researchers gain a critical insight into the characteristics of the data. To this present moment, scientific investigations have been conducted by giving little or no consideration to the initial data screening and preliminary analysis, this is due to the mundane and inconsequential task involved in examining and screening of data (Hair et al., 2010). However, such neglect of initial data screening may be disastrous on the result of multivariate analysis, as the result of the estimated standard error may be inflated (Chenick, 2008). Hence, the significance of the statistical coefficient of a regression based path model are underestimated (Kura, 2014; Ringle, Sarstedt, & Straub, 2012).Considering the background presented above, this study presented the procedures of data screening and further conducted the following preliminary analysis: (1) detection and treatment of missing value (2) assessment and treatment of outliers (3) normality test and (4) multicollinearity test (Hair, Money, Samoel & Page, 2007; Tabanick & Fidel, 2007).By so doing, the review of literatures in this study is presented in the following section of the paper.

## 2. Literature Review

The U.S. Department of commerce (2010) defined sustainable environmental manufacturing for the purpose of commerce as the initiatives by creating manufactured products by using processes that minimize the negative environmental impacts, conserve energy and natural resources by providing a safe and economically sound environment for employees, communities and consumers. Schoenherr & Talluri (2012) viewed sustainable environmental practices as techniques, policies and the procedures taken by a firm with specific aim of monitoring and controlling the effects of the operations of the firm on the natural environment.

Evidences from literatures have shown that sustainable manufacturing has globally received great interests from researchers (Shah & Ward, 2007; Schoenherr & Talluri, 2012). This is linked with the Bruntland commission and their campaign for a sustainable development that is "meeting the need of the present generation without compromising the ability of the future generation to meet

their own needs" (OECD, 1987). This has therefore motivated many manufacturing organizations and governments to seek and embark on sustainable environmental manufacturing practices. Hence, research on sustainable environmental practices among manufacturing companies is important, especially the investigation of the antecedent factors.Omar & Samuel (2011) among the few empirical studies in Malaysia examined the stages of environmental management in Malaysia. He classified environmental practices in Malaysian manufacturing firms into five (5) different stages based on the five-stage categorization of Hunt & Aurter (1996). The study found that Malaysian manufacturing firms irrespective of their ownership type are in the third stage of environmental manufacturing practices. They perceive environmental initiative as a corporate social responsibility with moderate effort to ensure compliance with environmental regulations. At this stage, environmental practices are only seen as ethical behaviours without considering it as a strategic factor to achieving better firm performance.

Previous researches revealed that many firms respond to the issues of environment while other companies with related circumstance do not respond despite the existence of regulatory requirements (Bansal and Roth, 2000). The explanation of the rationale behind organizational response to environmental issues has been provided by past literatures. Chien and Shih (2007), Harmut and Sami (2006) identified the reasons that drive organizations to adopt environmental practices, such reasons are: Stakeholders pressure (Chien & Shih, 2007, Henriques & Sharma, 2005; Darmal et al., 2010) and because "it pays to be green" including ethical concerns, top management commitment/initiatives and public concerns (Carter et al 2009; Banerjee 2003). These factors are of widespread interest among firms with their ability to predict the response of firms in implementing sustainable environmental practices is limited (Bansal & Roth, 2000). As such, this study regards top management commitment, stakeholder pressure and public concern as the factors that drive the implementation of sustainable environmental manufacturing practices.

Top management commitment refers to the involvement and the support received from the top management of organizations towards adding value and shaping the environmental manufacturing practices implemented by the firm (Drumwright, 1994). Top management of an organization shows their commitment to the implementation of environmental practices through direct involvement in the environmental issues of the firm (Carter *et al.,* 2009). This commitment is shown by appointing senior managers to oversee the environmental issues of the firm (Banerjee *et al*., 1998). Top management must understand the implementation of the environmental initiatives and make provision for the necessary resources for the successful implementation of environmental practices (Yen & Yen, 2012).

Past researches assert that the commitment and support of top management have tendency of influencing the proactiveness of the implementation of environmental manufacturing practices through human resources management activities (Gonzalez-Benito & Gonzalez Benito, 2006; Zutshi & Sohal, 2004). Top management is significant in setting realistic objectives for environmental initiatives, providing related trainings to the employees, giving factual decisions, enhancing team work efforts towards environmental practices implementation, and providing priority and attention to both the internal and the external stakeholders of the organization (Deros, *et al*., 2009). Wee & Quazi (2005) and Huang & Wu (2010) regard top management commitment as a critical and vital factor of proactive environmental management practices. Huang & Wu (2010) found top management commitment as significant to the implementation of green initiatives. As a result of the above discussion, top management commitment is regarded as an antecedent factor of SEMP and it is posited in this study that top management commitment will positively influence sustainable environmental manufacturing practices.

Stakeholder pressure refers to the influence exerted by individuals or groups on companies (Henrique & Sadorsky, 1999). Any company facing a high level of pressure from stakeholders direct their environmental activities towards the awareness of stakeholders of the risk borne by their manufacturing activities (Al-Tuwajiri *et al*., 2004). Following the empirical investigation of the past researchers, it has been established that there tend to be a positive relationship between the stakeholder pressure and implementation of SEMP. Bansal & Roth (2000) found a relationship between stakeholder pressure and corporate ecological response. Gonzalez-Benito & Gonzalez-Benito (2005) identified a positive relationship between perceived stakeholder environmental pressure and environmental logistic practices. Cespedes-Lorente (2003) found a positive relationship between stakeholders' pressure and the adoption of corporate environmental practices. Also, Henrique & Sadorsky (1999) found that pressure from regulatory, organizational and community stakeholders drive firm to implement environmental management practices. As a result of the discussion above, it is hypothesized that stakeholder pressure will positively influence sustainable environmental manufacturing practices.

Public concern in this study regards to the individual sensitivity towards environmental issues (Berkiroglu, 2011). Recently, more attention has been given by the public to the unsustainable environmental practices (Banerjee, 2003; Stisser, 1994). For example, many manufacturing firms have been forced to close down through public interest litigation and the intervention of the judiciary through public concern (UNEP, 1992). The concern of the public focus more on the: provision for better health services and improvement in the standard of living with main target towards alleviating environmental degradation (land, water and air); loss or reduce habitation as a result of unsustainable acquisition of raw materials for industrialization; and globalization of standards for the environment and social ethic in the manufacturing sector.

Evidences from the past empirical studies on environmental practices have shown that public concern motivates the implementation of environmental practices (Carter *et al.,* 2009; Banerjee *et al*. 2003). Firms implement environmental green practices as response to the concern of the public (Carter *et al*. 2009). The result of the research of Banerjee *et al*. (2003) on corporate environmentalism reveals that public concern is an antecedent of corporate environmentalism. Individual will be more concern and sensitive to the following issues: more difficulties in getting access to more energy (Berkiroglu, 2011). There will be much more problems in the future as a result of the changes in the climate (Hamans, 2009). Firms will have to minimize wastefulness in resources and enhance efficiency (Hamans, 2009). The cost of resources will be more expensive (Hamans, 2009). Firms causing more harm to the environment in the future will be fined (Berkiroglu, 2011). As a result of the above discussion, public concern is hypothesized to positively influence sustainable environmental manufacturing practices.

**3. Methods**

*3.1. Participants and Procedures*

This study is comprised of the registered manufacturing companies with more than 50 full-time employees in the entire manufacturing industry in Malaysia. Following the assertion of Jamian, Rahman, Ismail and Ismail (2012) and Carter, Prasnikar, and Carter, (2009), small firms are constrained by financial resources and difficulties in assigning expertise to tackle sustainable developmental issues. Thus, companies with more than 50 full-time employees are regarded as technically and financially feasible for implementing sustainable environmental manufacturing practices (Carter et al., 2009).

Based on the statistics obtained from the directory of the Federation of Malaysian Manufacturer (FMM, 2013), 1580 companies with more than 50 full-time employees were registered in the Malaysian manufacturing industry. By using the sample size table created by Krejcie and Morgan (1970), approximately 310 sample size is required for a given population of 1,580.In order to increase the response rate of the current study as suggested by Salkind (1977), the population was reduced by 50% which results in 790. A total of 790 questionnaires were distributed using stratified random sampling, out of which 103 usablequestionnaires were returned.

Furthermore, among the total 103companies that responded, majority of the respondents are environmental, health & safety manager/executive (50.5%), followed by other position (19.4%), production/ manufacturing manager/executive (17.5%)and operation manager/executive position (12.6%). In term of working experience,majority of the respondents have between 1-5 year experience, 24.3% have 6-10 year working experience, 19.4% have more than 10 years working experience while 8.7% possess less than 1 year working experience of their current position. Similarly, 45% of the respondents have between 1-5 years total working experiences with their company, 29.1% have more than 10 year experience, 18.1% are between 6-10 years working experience while 6.8% have less than 1 year working experience in their company.

The demographic profile shows that electrical, electronic and computing & allied components (30.1%), followed by chemicals and allied products category (16.5%), and next is the company that falls within the other category (14.6%), rubber and plastic industry (12.6 %), food and beverage industry (10.7%), basic metal & allied components (5.8%), motor vehicle, Trailers and transport equipment sector (4.9 %), Paper and allied products (2.9%)and textile, wearing apparels and dying of fur category represents the minority percentage (1.9%). Also, majority of the companies is certified in ISO 14001 (55.3%) indicating the awareness of environmental manufacturing practices in the companies. In addition, multinational companies dominated the study with 45.6%, followed by the private enterprise (35%), the foreign invested enterprises (10.7%), while the joint venture and state owned enterprise have 4.9% and 3.9 % respectively. In term of the size of the companies which is represented by the number of full-time employees of the companies, 46% of the companies have above 251 full-time employees, 28.2% has 151-250 employees while the remainder 25% have between 51 and 150 full-time employees representing indicates that the respondent companies are large enough, knowledgeable and feasible for this study.

*3.2. Measures*

The measures of the variables in this study were adapted from previous literatures similar to this study.All the items used were measured on a scale of 1- 6 in which "1" indicates strongly disagree and "6" indicates strongly agree. Specifically, items used in measuring sustainable environmental manufacturing practices was adapted from Gonzalez-Benito and Gonzalez-Benito (2006), top management commitment was measured with items adapted from Benerjee *et al* (2003); Carter *et al.* (2009) Stakeholder pressure was measured with items adapted from Alvares-Gills *et al.,* (2007): while public concern was measured with items adapted from Carter et al., (2009) and Benerjee et al. (2003).

**4. Results and Discussion**

Out of the total 790 survey questionnaires distributed, 135 sample responses were obtained to have filled and returned the distributed questionnaires. However, a total of 103 questionnaires wasusable. Precisely, 32 questionnaires were not included in the data analysis as a result of the two major reasons. Firstly, some of the excluded questionnaires are incomplete as a result of the presence of pages of missing value per case. Precisely, 27 questionnaires were rejected due to this reason. Secondly, issue of non-qualified respondents is also a cause for excluding some questionnaires from further analysis. Exactly five responses were excluded from the analysis due to issues relating to respondents not qualified for the analysis. It is important to exclude such questionnaires or data from the analysis as they do not represent the sample and may not reflect the concept under examination (Hair *et al.*, 1998; Cousineau & Chartier, 2010).

A total of 103 respondents represent the sample size of this study, which provided an effective response rate of approximately 13% covering a broad range of Malaysian manufacturing sector. This response rate of 13% in postal survey is a common response rate within the context of research in Malaysian manufacturing companies (Wong *et al.,* 2011; Jusoh *et al.,* 2008). A similar response rate of 12.6% was obtained by Wong *et al.,* (2011) and 11.5% was obtained by Ahmed and Hassan (2003) in their study in Malaysia. Therefore, a response rate of 13% denoting 103 responses was considered reasonable and it was used in this study.

Upon the collection the usable questionnaires, the collected responses were coded and inserted into the Statistical Package for Social Sciences (SPSS) software version 20 and subsequent preliminary analysis such as missing value, detection of Outliers, normality test and multicollinearity test were conducted.

*4.1. Missing Value Analysis*

Sixteen (16) among the 4,071 data points in the originalSPSS datasets are randomly missing, which accounted for 0.393% of the entire datasets. In specific, sustainable environmental manufacturing practice (SEMP) has 12 missing value, stakeholder pressure

has one, top management commitment has two missing value, while public concern has one missing value.Though, there is no acceptable percentage of missing valueat which a valid statistical inference can be made (Kura, et al., 2014), but a missing data of 1% is considered as not posing any threat, below 5% is regarded as bearable and manageable while a missing data of about 15% poses a great threat and requires a sophisticated technique to resolve (Acuna & Rodrigues, 2004).

Missing data are treated at the initial stage with pre-replacing method while the embedded method is employed later at the data mining stage. However, no method is regarded as the best in treating missing data but a suitable method can be used based on the nature of data analysis method to be employed and the related cost and time constraints available. Concerning this study, the missing data of less than 1% poses no threat (Acuna & Rodrigues, 2004) and it was therefore treated by replacement using the mean value of the k nearest neighbor. This method was employed because it is unique and able to replace data in relation to both its quantitative and the qualitative attributes of the missing value (Lin *et al.,* 2004). The total and the percentage of the randomly missing value in this study is presented in Table 1 below.

| Latent Variables | Number of missing values |
|---|---|
| Sustainable environmental manufaturing practice (SEMP) | 12 |
| Stakeholder pressure | 1 |
| Top management commitment | 2 |
| Public concern | 1 |
| Total | 16 out of 4,071 data points |
| Percentage | 0.393% |

*Table 1: Result of the missing value analysis*

Note: percentage of the missing value is determined by dividing the total number of datasets by the number of the randomly missing value and multiplied by 100.

*4.2. Assessment of Outliers*

Upon the replacement of the missing values, this study further went ahead to assess the presence of outliers. Barnett and Lewis (1994) defined outliers "as observations or subsets of observations which appear to be inconsistent with the remainder of the data". It represents extreme responses to a particular observation and it is undesirable because it symbolizes that an observation indicates an unusual permutation of two or more variables (Bryne, 2010; Hu *et al.*, 1990). The presence of outliers in a regression analysis is undesirable as it can influence the estimates of the regression co-efficient and results into an unreliable results (Veradi & Crux, 2008). The first detection of outliers was conducted by checking thefrequency tables for the data outside the minimum and maximum value label due to entry errors. Based on this, no value was found outside the value range.Next is the assessment of the data set for univariate outliers, which was done by using the standardized values (Z value) with a cut-off point of ±3.29 ($p < .05$) (Tabachnick & Fidell, 2007). 5 cases of outliers were found. Specifically, these cases are: 1, 4, 9, 66 and 103.Table 2 below presents the results of the cases identified as outliers.

| Items | Cases with Z-value greater than ±3.29 |
|---|---|
| SEMP2 | 1 |
| SEMP3 | 66 |
| SEMP4 | 66 |
| SEMP7 | 1 |
| SEMP13 | 4 |
| SEMP18 | 4 |
| SEMP20 | 4 |
| SP2 | 40 |
| TMC6 | 1, 66 |
| TMC7 | 1 |
| TMC8 | 9 |
| SEMP1 | 9 |
| SEMP6 | 103 |
| SEMP12 | 4 |
| TMC5 | 1 |

*Table 2: Identified outlying cases using standardized value (Z-Value)*

This study further followed an approach used by Bartholme (2011) to examine the effects of the outliers on the overall measure of the variables to determine whether the outliers should be removed or retained. The approach entails a comparison of the mean and standard deviation of the items when the outliers are included or removed. Table 3 presents the effects of the identified outliers on the overall measures of the variables.

| Items | Mean Incl 5 cases | Mean Excl 5 cases | Difference | Std. Dev. Incl 5 cases | Std. Dev. Excl 5 cases | Difference |
|---|---|---|---|---|---|---|
| SEMP2 | 4.65 | 4.66 | -0.01 | 1.045 | 1.044 | 0.002 |
| SEMP3 | 4.62 | 4.68 | -0.06 | 1.067 | 1.085 | -0.017 |
| SEMP4 | 4.98 | 4.97 | 0.01 | .896 | .789 | 0.107 |
| SEMP13 | 4.88 | 4.85 | 0.04 | .808 | .821 | -0.013 |
| SEMP18 | 5.23 | 5.18 | 0.06 | .819 | .795 | 0.024 |
| SEMP20 | 4.85 | 4.85 | 0.00 | .879 | .872 | 0.007 |
| SEMP16 | 4.34 | 4.32 | 0.02 | 1.107 | 1.082 | 0.025 |
| SEMP12 | 5.06 | 5.08 | -0.02 | .884 | 0.864 | 0.020 |
| TMC5 | 4.75 | 4.75 | 0.01 | .834 | .786 | 0.048 |
| TMC8 | 4.60 | 4.61 | -0.01 | .911 | .793 | 0.118 |
| TMC7 | 4.79 | 4.81 | -0.03 | .800 | .755 | 0.046 |
| TMC6 | 4.49 | 4.50 | -0.01 | .979 | .982 | -0.003 |
| SP2 | 4.72 | 4.71 | 0.01 | .797 | .816 | -0.019 |

*Table 3: Effects of the identified outliers on the overall measures of the variables*

Table 2 above indicates that 5 cases were identified as outliers in this study. However, Table 3 shows that the outliers do not posses a strong effect on the overall measures of the study. Following the recommendation of Hair et al., (2010), such outlier's cases should be retained in the analysis unless they are demonstratably prove as non-representative of the observation. Therefore, this study retained the 5 univariate outliers for further multivariate analysis to improve the generalizability of the study population.

*4.3. Test of Normality*

PLS-SEM is a non-parametric statistical method that does not really require data to be normally distributed,as accurate estimation can be produced with non-normal data (Haenlein, & Henseler, 2009; Wetzels, Odekerken-Schroder, & Van Oppen, 2009; Hair *et al.*, 2011; Henseler *et al.*, 2009). However, extremely skewed or Kurtoic data may inflate the bootstrappedstandard error (Chernick, 2008). Hence, it is appropriate to examine that the data are set not too far from normal distribution (Hair *et al.*, 2013).

In respect to the background of this study, Kolmogorov-Smirnov and Shapiro-Wilk test was used in examining the normality of the distribution of data in this study. The significant value of Shapiro-Wilk test greater than 0.05 P>0.05) indicates data normality (Pallant, 2011). In this study, the Shapiro-Wilk test shows that the data were normally distributed, except for variable stakeholderpressure (SP) and top management commitment (TMC) which are having values lesser than 0.05. However, this result is acceptable in PLS-SEM, as it is capable of providing accurate estimation with non-normal data. Though, the data should not be too far from normality (Hair et al., 2013). Table 4 below shows the result of the normality test conducted in this study.

| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| SP | .180 | 103 | .000 | .674 | 103 | .000 |
| SEMP | .077 | 103 | .148 | .986 | 103 | .367 |
| TMC | .148 | 103 | .010 | .953 | 103 | .101 |
| PC | .092 | 103 | .030 | .977 | 103 | .065 |

*Table 4: Tests of Normality*
*a.Lilliefors Significance Correction*

*4.4. Multicollinearity Test*

Multicolinearity indicates a situation in which there is high linear correlation among the independent variables (Hair *et al.*, 2010). The presence of multicolinearity does not indicate a good regression model. It complicates the interpretation of any relationship due to its difficulties in ascertaining the effects of a single variable on the other (Nawanir, Teong & Othman, 2013). In particular, multicollinearity distorts the estimates of a regression coefficients and their statistical significant test (Hair, Black, Babin, Anderson, & Tatham, 2006) by inflating the standard error of a coefficient and in-turn renders the coefficient statistically insignificant ((Tabachnick, & Fidell, 2007). High correlation (r = 0.9 and above) among the independent variables is an indication of multicollinearity (Pallant, 2011). High correlation (r = 0.9 and above) among the independent variables is an indication of multicollinearity (Pallant, 2011).

Two methods are used in diagnosing multicollinearity (Peng, & Lai, 2012). The first considers the correlation matrix among the independent variables. High correlation (r = 0.9 and above) among the independent variables is an indication of multicollinearity (Pallant, 2011). Table 5 below presents the correlation matrix of all the independent variables.

| No | Latent Variables | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| 1 | Sustainable environmental manufacturing practices | 1 | | | |
| 2 | Stakeholder Pressure | .127 | 1 | | |
| 3 | Top management commitment | .603** | .249* | 1 | |
| 4 | Public concern | .418** | .188 | .527** | 1 |
| **Note**: **. Correlation is significant at the 0.01 level (2-tailed). | | | | | |

*Table 5:Correlation matrix of the independent variables*

Table 5 shows that the result of the correlation between the independent variables (stakeholder pressure, top management commitment and public concern are sufficiently below the threshold value of 0.90 as suggested by Pallant (2011). Thus, the variables are independent and are not highly correlated with each other.

The second method for dectecting multicollinearity is by examining the tolerance and the variance inflated factors in a regression analysis.Tolerance value indicates how much of the variability of the independent values is not explained by the other independent variables in the model while VIF is an inverse of the tolerance value. A tolerance value of 0.2 or below, VIF value of 5 or higher and condition index higher than 30 indicate the presence of multicolinearity (Hair, Ringle & Sarstedt, 2011). Table 6 below presents the tolerance and VIF values of the independent variables.

| Latent Variables | Collinearity Statistics | | Condition Index |
|---|---|---|---|
| | Tolerance | VIF | |
| | | | 1.000 |
| Stakeholder Pressure | .933 | 1.071 | 10.574 |
| Top management commitment | .699 | 1.431 | 16.819 |
| Public concern | .719 | 1.391 | 21.120 |

*Table 6:Tolerance and Variance Inflated Factor (VIF)*

The result, as indicated in Table 6shows that all the tolerance value are higher than 0.2, the VIF values are below 5 and the condition indexes are lower than 30, indicating that multicolinearity is not a threat in this study.

**5. Conclusion**

Many scientific investigations have been conducted by giving little or no consideration to the initial data screening and preliminary analysis, this is due to the mundane and inconsequential task involved in examining and screening of data. However, such neglect of initial data screening may be disastrous on the result of multivariate analysis, as the result of the estimated standard error may be inflated. Therefore, this study was presented to enlighten researchers on an essential part of multivariate analysis to ensure that the data underlying the analysis meet all the requirements of the multivariate analysis. In addition, by examining and screening the data collected before analysis, researchers will gain a critical insight into the characteristics of the data. Upon the proper examination and treatment of missing values, outliers, normality distribution of data and multicollinearity in this study, it was evidence that the preliminary assumptions of multivariate analysis were not violated, as such, it is recommended that the data is fit to be used for further multivariate analysis including the measurement and structural model in PLS-SEM analysis technique.

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