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Sustainable Manufacturing Drivers and Firm Performance among Malaysian Manufacturing Firms

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Abstract: The critical Sustainable Manufacturing (SM) drivers are becoming a widely interest area among scholars and researchers in the manufacturing industries. Moreover, Sustainable Manufacturing Practices (SMP) are the important element to enhance firm's sustainability performance. Hence, this study aims to identify the relationship between SM drivers and firm performance through a proposed theoretical model in the Malaysian manufacturing industry. The model was developed and empirically tested through survey data obtained from 323 manufacturing firms. The study provides empirical insights on how resource availability and market forces positively influence firm performance. This study contributes to the existing literatures by enriching SM drivers that lead to the firm performance. The conclusion drawn involves implications to the SM, by considering the roles of policy and regulation, strategic leadership, resource availability and market forces in research literature.

Key words: Sustainable manufacturing, drivers, firm performance, manufacturing, triple bottom line

INTRODUCTION

The current manufacturing industries have been shifting fast due to the increasing awareness in the sustainable practices in manufacturing activities. The global development of Sustainable Manufacturing Practices (SMP) has emerged from Sustainable Manufacturing (SM) concept which aims to minimise the negative impact of manufacturing activities to the environment (Zubir *et al*., 2012). The negative impacts encompass industrial waste, air pollution, material toxicity and increased Green House Gases (GHG).

Moreover, the need of sustainable production has arisen because of the SM practices among large manufacturing firms in Malaysia. The definition of SMP is extensively developed among scholars since the first concept of SD emerged in 1980's, thus SMP classification are varies between each other. SMP can be mainly classified based on activities and performance improvement which may include human behaviour, maintenance, production scheduling and emissions reduction which are in regards with the SM specific issues (Roberts and Ball, 2014). However, Rachuri *et al*. (2009) claimed that SMP is best understood in terms of information across products, process and management (operational) aspects.

Recently, a research conducted by Hami *et al*. (2015) has defined SMP as firm's intra and inter-organisational practices that integrate environmental, economic and social aspects into operational and business activities in which the difference is based on the sustainable thinking orientation. In addition, from US Department of Commerce, SMP is defined as the techniques, policies and procedures that are used by a firm in creating manufactured products, adopting processes which minimise negative environmental impacts, conserve energy and natural resources, economically sound as well as being safe for the employees, consumers and communities (Roberts and Ball, 2014).

The SM implementation is not only focused to large manufacturing firm, in fact the entire supply chains along the manufacturing activities are involved in ensuring the SMP success. However, the practices employed for manufacturing sustainability are uncommon in Small and Medium-sized Enterprises (SMEs) as compared to large firms (Jamian *et al*., 2012). Hence, SMP has imposed sustainability practices to be adopted by Huang *et al*. (2012). In addition, there is an increasing number of companies that are demonstrating their individual efforts to become more environmentally friendly (Currin, 2012) to address the public concern of the current environmental disaster.

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A comprehensive literature review on SM studies across different industries and countries indicates that the preservation of Triple Bottom Line (TBL) impact or firm performance is a major concern in SMP implementation. In particular, the SM comprehensive approach aims to minimise resource consumption, reduce waste (energy and chemical/hazardous solid waste) (Gaussin *et al*., 2013), environmental emission (i.e., no solvent and zero air emission) (Galeazzo *et al*., 2014) as well as bringing down environmental pollutant (Zailani *et al*., 2012). Moreover, SM is regarded as a comprehensive strategy to achieve sustainability in manufacturing (Mahmood *et al*., 2014).

From the Malaysian perspective in regards with sustainability approach, The Ministry of Energy, Green Technology and Water had launched National Green Technology Policy in 2009 as a holistic approach to encourage green technology in the country. Since then, the Malaysian government continuously introduces numerous programmes and provides incentives to ensure that the aspiration towards sustainability development is realised. Consequently, within a short period of time there are many green entrepreneurs that are involved in nurturing the green economy and SM practices with various names, strategies and approaches.

In addition, factors such as intense global competition, rapid technological changes, advance in manufacturing and information technology and wiser customers have coerced manufacturers to adopt SMP (Karim *et al*., 2008). A growing number of firms has begun working towards SM implementation because of increased concerns regarding increased rate in pollution, natural resource depletion and global warming. Recently, SMP is aggressively implemented in manufacturing firms, thus becoming one of the important agendas at the heart of this century's policy and industrial practices. These concepts are now popular among policy makers and business leaders in recent years in which business solutions and entrepreneurial are encourage to come up with the ideas in tackling environmental challenges as well as economic and social issues (OECD, 2009).

However, Habidin *et al*. (2013) indicates that there is no studies which have clearly identified factor that is leading to SM adoption in the manufacturing industries especially in developing countries such as Malaysia (Cai and Zhou, 2014). Despite several arguments regarding the main sustainability drivers among researchers, they mutually agreed that there is no answer regarding firm's motivation to adopt sustainability initiatives by either a combination of two or more factors (Currin, 2012) or mixture of internal and external drivers (Cai and Zhou, 2014). This research intends to contribute to the knowledge in regards to the antecedent factors or drivers that influence the SM implementation and their impact towards firm performance. This research is focused on selected industries of manufacturing sector in Malaysia in which a theoretical model on SM drivers is proposed and the driver's impact on firm performance from an empirical investigation was conducted.

Literature review

Drivers of sustainable manufacturing: Past scholars in sustainability field has a rich stream of literatures which discuss the factors leading to sustainability initiatives. Many researchers has highlighted SM drivers that contribute and influence manufacturer's to implement sustainable initiatives (Adebambo *et al*., 2013; Cai and Zhou, 2014; Currin, 2012; Dora *et al*., 2013; Habidin *et al*., 2013; Menguc *et al*., 2010; Sambasivan and Fei, 2008; Seidel *et al*., 2010). These factors are of widespread interest among firms with their specific ability to predict the firm's response in implementing sustainable practices (Bansal and Roth, 2000). As such this study involves policy and regulation, strategic leadership, resource availability and market forces as the antecedent factors that drive the SM implementation.

Policy and regulation: The first SM driver is policy and regulation whereby SM practices are strongly influenced by policy and regulation (Bansal and Roth, 2000; Eltayeb *et al*., 2009, 2011), signifying the important factors that affect a firm's decision making in sustainability efforts. Moreover, policy and regulation are considered as SMP driver because firms will face risk of legal consequences and negative effects, tarnishing their reputation and image if they ignore laws (Schrettle *et al*., 2012). Furthermore, externalities arise when the production of a good or service results in some costs such as pollution damage in which the absence of regulation is unlikely to be borne by the producer (Henriques and Sadorsky, 1999).

In particular to SM related studies, policy and regulation is known as one of the leading factors discovered throughout literatures. For example, Gunasekaran and Spalanzani (2012) has found that government legislation, regulation and incentive as one of major drivers for sustainability operations, this is supported by other scholars (Currin, 2012; Gunasekaran and Spalanzani, 2012; Hong *et al*., 2012; Jayaraman *et al*., 2012; Matsumoto and Umeda, 2011; MSA, 2009; Schrettle *et al*., 2012; Zhu *et al*., 2010).

The strong influence of policy and regulation is due to several reasons. The increased awareness among consumers leads to various pressures imposed on manufacturing firms to improve their environmental performance, particularly through establishment of government policy on sustainability. Moreover, some manufacturing firms have started to introduce sustainability assessment to ensure proper supervision on actual status of products and operations with respect to SM (Fan *et al*., 2010). Furthermore, adoption of certain policies may increase a firm's legitimacy to operate (Zhu *et al*., 2010) thus provides value to the firms from the standpoint of external actors and or stakeholders.

In addition, increased issues in environment and resource depletion has caused stricter regulations to be enacted by regulators at all levels thus increasing both formal and informal environmental education channels, owing to environmental awareness among the public (Westkamper *et al*., 2000; Zhu *et al*., 2010).

Laws and regulations have increasingly positioned sustainability at the top of most manufacturing firm's strategy in enhancing the firm performance (Heilala *et al*., 2008; Smith and Perks (2010) suggested that manufacturing firm can enhance its competitiveness and performance via improvement in terms of environmental performance due to environmental policy and regulation compliance. Therefore, it is argued that policy and regulation serves as a guideline and encouragement for firms to ensure its successful and effective execution of SMP activities in order to achieve greater enhancement in firm performance. Accordingly, the following is predicted:

- H_1: Policy and regulation are positively related to firm performance

Strategic leadership: In achieving successful SMP, manufacturing firms need to have strong support from the top management. Most importantly is the way the leader is reacting with current competitive landscape driven by technological revolution and increasing globalisation in business and economic activity (Hitt *et al*., 2010). SM, like any other businesses have influence, present risk and opportunity thus strategic leadership is required from both government and industry (MSA, 2009) to ensure all level involvement in the manufacturing activities. Furthermore, strategic leadership behaviours has proven to be associated with executive influence on innovation processes (Elenkov *et al*., 2005).

Strategic leadership discussed in this study is in the manufacturing firm context to better understand the top management roles in affecting SMP implementation. In fact, managers have significant ability through strategic leadership when it comes to the formulation and implementation of various processes, including sustainability strategy, structure, actions and systems in affecting sustainability performance (Epstein and Buhovac, 2009). Moreover, strategic leadership is needed in the 21st century firms which involves the development of firm's resources and capabilities, emphasising on human and social capital in which both are significant contributors to the firm performance (Ireland and Hitt, 2005).

Additionally, strategic leadership roles in firms are very critical success factor of SMP within the firms (Jamian *et al*., 2012). Generally, leadership is defined as securing the commitment of top management and developing incentives systems to reward leaders at all levels who are developing and pushing for the SMP adoption (Szekely and Knirsch, 2005). This is important as firms need a clear and direct leadership to define how the business is conducted based on a new set of market factors due to environmental sustainability in its application across the whole business sector which is still relatively new. Whereby, there are many aspects that will inevitably shape leadership thinking (MSA, 2009).

Various authors from the previous studies such as Avery and Bergsteiner (2011), Ireland and Hitt (2005), Szekely and Knirsch (2005) have acknowledged that a greater firm performance is resulted from responsible leaders that are able to strategically build strong organisational capacity with full commitment to the sustainability efforts. Their studies depicts that an effective strategic leadership ensures firm performance improvement considering in the turbulent and unpredictable environments (Ireland and Hitt, 2005). Thus, engagement with valuable strategies and ethics particularly sustainability practices is one of the capabilities needed for an effective strategic leadership in the new competitive setting (Hitt *et al*., 2010). Consequently, the hypothesis is created in which:

- H_2: Strategic leadership is positively related to firm performance

Resource availability: Studies have found that resource availability in manufacturing firms does influence sustainable practices (Gunasekaran and Spalanzani, 2012; Schrettle *et al*., 2012) and performance whereby firms that possess resources view SM as an opportunity. The transition leads to SM performance that requires significant capabilities and resources to support manufacturing firms in adopting SM (MSA, 2009) which

cannot be accomplished without adequate resources. According to RBV, firms possess a unique set of tangible and intangible resources as their competitive advantage (Avery and Bergsteiner, 2011; Ireland and Hitt, 2005; Székely and Knirsch, 2005). Firms need to possess a collection of valuable, rare, imperfectly imitable and non-substitutable resources to potentially acquire competitive advantage. These resources are significantly valuable which considered as an opportunity, besides reducing risk and uncertainties in the firm's surrounding (Barney, 1991). Therefore, misallocation and inefficient handling of available resources will contribute to the failure (Razak *et al*., 2016). Moreover, RBV focuses on the resources and capabilities organised by a firm that inspire persistent performance discrepancies among firms (Peteraf and Barney, 2003).

Resources available such as skilled worker potentially affects the degree and type of useful SM options to be considered (Melnyk *et al*., 2003), thus, indicates link between resources available and their influence on firm performance. Moreover, firm performance attributing to SM also depends on training, organisational infrastructure, tools and human resource based action (Henderson and Evans, 2000). In addition, to provide sustainable products or services, manufacturing firms need to integrate different types of resources such as human skills and knowledge, natural materials and social structures, by using machinery, infrastructures and financial assets (Mittal and Sangwan, 2014). Furthermore, the availability of appropriate and modern manufacturing equipment along with a skilled workforce are essential to enhance firm performance (Thomas *et al*., 2012a). Sustainable firm will maintain and enhance these capital assets optimumly, rather than exhausting them. The set-up of the manufacturing processes constitutes the interrelation of the manufacturing operation, its available resources and TBL performance. Hence, it is suggested that fully utilisation of internal and external resources available in firms will contribute to a better firm performance. Thus, the hypothesis suggested:

- H_3: Resource availability is positively related to firm performance

Market forces: Many scholars highlighted that one major factor that contributes to the SM is market forces or sometimes it is referred as stakeholder pressure or market pressure (Melnyk *et al*., 2003; Schrettle *et al*., 2012). Generally, market forces is classified into three which is customer, competitor and supplier as the exogenous factors that influence firm's sustainability efforts and performance (Schrettle *et al*., 2012). In addition, product's market pressure has caused manufacturers to reconsider the role of environmental practices in their firm's strategies and operations (Zhu *et al*., 2013).

Supplier forces are pressures exerted by suppliers, who have already adopted sustainable initiatives, thus, influencing firms to adopt similar initiatives (Carter and Ellram, 1998). Therefore, involvement with environmentally-cautious suppliers can bring a positive feedback to the manufacturer's capability in dealing with SM. Besides, forces from competitors include pressures that induce firm to adopt SM to combat competition and gain competitive advantage (Henderson and Evans, 2000; Melnyk *et al*., 2003). Firms tend to pursue SM and increase their performance as a result of stiff competition among them. It is believed that firms with well-developed environmental management culture are more likely to notice critical signals in environment which could hugely impact their survival so that the firms can gain a competitive edge over their competitors (Kim and Lee, 2012). Moreover, customer force pressures firms to undertake environmental standard (Gunasekaran and Spalanzani, 2012) and prefer products that are environmentally friendly (Bhaskaran *et al*., 2006). This signifies that customer power and demand really affect the supply side, in which manufacturing firms become more conscious in producing green products according to the demand in the present market. Furthermore, customers represent major portion of financial stakeholders who buy products and services from firms (Eltayeb and Zailani, 2011).

Therefore, manufacturing firms in high competitive industry and due to market uncertainty need to be alert and stay reactive to the market forces in changing manufacturing environment. Previous results have shown that manufacturing firms experience greater firm performance due to successful adjustment and response towards market forces. For instance, customer with awareness on environment and human health is increasing, this has influenced the products that they purchase and there are those who prefer eco-labeled products. Moreover, buying decision is also influenced by supplier performance on environmental issues (Matopoulos and Bourlakis, 2010). These pressures urged manufacturing firms to adopt more environmentally sustainable operation and improve their performance. Based on the arguments, it is hypothesised that:

- H_4: Market forces are positively related to firm performance

Table 1: Summary of sustainable manufacturing drivers by previous literatures

Researchers/SM drivers	PR	SL	RA	MF
Benito and Benito (2006)	x			x
Gunasekaran and Spalanzani (2012)	x		x	x
Gunasekaran and Spalanzani (2012)	x			x
Jayaraman *et al.* (2012)	x			
Schrettle *et al.* (2012)	x	x	x	x
Currin (2012)	x	x		x
Rusinko (2007)	x			x
MSA (2009)	x	x	x	x
Hong *et al.* (2012)	x			x
Kesidou and Demirel (2010)	x		x	x
Jamian *et al.* (2012)	x			
Adebambo *et al.* (2014)			x	
Matsumoto and Umeda (2011)				x
Cleveland (2011)			x	
Seidel *et al.* (2010)				x
Elenkov *et al.* (2005)	x			
Epstein and Buhovac (2009)	x			
Carter and Ellram (1998)				x
Achanga *et al.* (2006)		x	x	x

PR = Policy and Regulation; SL = Strategic Leadership; RA = Resource Availability; MF: Market Forces

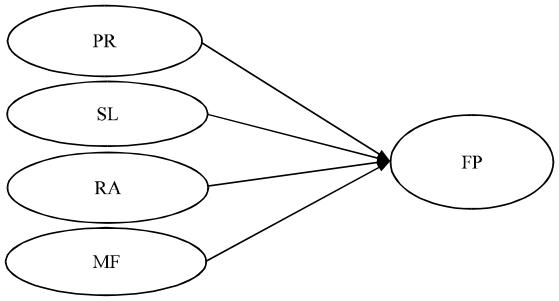

Fig. 1: Research framework for SM drivers of manufacturing firms in Malaysia PR = Policy and regulation, SL = Strategic Leadership, RA = Resource Availability, MF = Market Forces, FP = firm performance

Firm performance: Ensuring a sustainable firm in SM requires systematic approach which is characterised by interlinking connections at various levels, bridging economic, environmental and societal issues. Firm performance examined in this research utilised TBL dimension whereby the variables included firm performance items based on their performance outcome from the SM implementation.

The drivers that are discussed by the previous scholars in sustainability studies are summarised in Table 1 and Fig. 1 which depicts research framework of manufacturing firm's SM drivers in Malaysia.

MATERIALS AND METHODS

The study design: This study opted quantitative research method by using cross-sectional survey approach in data collection (Creswell, 2013). The use of cross-sectional survey instead of longitudinal survey research method was due to the aim for the results to reflect with public opinion and attributes which are difficult to obtain through secondary sources (Babbie, 2013). The target subject in this study was the Malaysia Manufacturing Industry, focusing on three sub-manufacturing industries namely Electric and Electronic (E and E), Machinery and Equipment (M and E) and Engineering Supporting (ES).

The list of Malaysian manufacturing firms was accessed via the Federation of Malaysian Manufacturer directory in which 3,319 companies were selected for the study. The selection of sample size is based on stratified random sampling technique which involved stratification or segregation process, followed by random selection of each industry (Sekaran, 2003). This technique also provides more information within the population frame and variation between the subgroup can be specified (Cooper and Schindler, 2008).

The study instrument: The study questionnaire was divided into six sections. Section A contained items for demographic profile of manufacturing firms and respondents such as age, education level, business nature, position level, business operation, sales turnover and number of employee. Additionally, Section B measured the SM drivers that are represented by four elements; policy and regulation, strategic leadership, resource availability and market forces. Policy and regulation was measured by 9 items, 19 items were developed to measure the strategic leadership, whereas 15 and 14 items were measured for resources availability and market forces respectively. Likewise, Section C measured firm performance variables consisting of environment, economy and social with 15 items. All variables were measured by using 7 Likert-scale ranging from 0-7 in which 0 = strongly disagree and 7 = strongly agree. The respondents were asked to tick the appropriate response from the options provided in the section according to their best knowledge on the particular items.

Data collection: To ensure data robustness and richness in this study, a pilot test was conducted to refine and improve the measurement quality of the constructed questionnaire. Three academics and 10 managers from manufacturing firms were involved in the pilot test, intended to access the content validity in regards to measurement items and constructs. Results from the pilot study revealed few weaknesses and further amendment had been done. The feedbacks from all managers were positive regarding the use of English in the questionnaire, since English is the second language that is commonly

practiced in conducting business nationwide. Upon the pilot test completion, a large scale data collection was conducted in two stages. In the first stage, 500 mail questionnaires were distributed to the selected respondents within two months. In the second stage, 1500 online questionnaires were sent to respondent's e-mail via online web survey, surveymonkey.com. The main respondents in this study were managing directors, managers, executives and engineers from manufacturing firms who have a vast experience and knowledge in SM implementation.

From both stage of large scale data distribution, 112 returned questionnaires has received during first stage and 240 surveys returned from the online surveys. The total number of returned questionnaires are 352, however, only 323 samples completed and usable for further analysis using SPSS Version 21. The section below presents the findings of the study.

RESULTS AND DISCUSSION

Sample characteristics: The study questionnaires were distributed to a random sample of 2000 manufacturing firms in Malaysia from the three selected industries. There were 323 completed and returned surveys to be analysed, yielding 16.2% response rate. Table 2 indicates the demographic information of respondents which includes firm size, year of operation, respondent's position, type of industry population and firm annual sales turnover. Most of the respondents in this study are from medium firms, representing 48.9% whereby the firms have 75-200 employees. Similarly, most of the firms are operating >16 years which indicates that the firms are well experienced in dealing with sustainability practices.

In addition, majority of the respondents are director or owner of the firms which represent 33.4% of the total respondents. The main respondents were selected in order to ensure that they are adequately experienced in industries to contribute by sharing their experience and knowledge through this research. Moreover, these individuals are the major driving forces of their firm and also vital to the SM implementation sustainability.

The study has selected three industries which are M and E, E and E and ES for the investigation of SM driver's. The highest contribution was from E and E industry at 51.07%, followed by M and E at 12.93% and ES at 36% of the total samples. Next, medium-sized firms represent the highest percentage of total respondents at 50.8% that constitutes annual sales turnover between RM350, 000 to RM15 million, followed by large firms which constitutes 26.6%. Large firms present annual sales turnover more than RM50 million and the lowest percentage (22.6%) is comprised of small firms with annual sales turnover between RM 300,000 to 15 million.

Table 2: Demographic information of respondent

Firm characteristics	Percentage
Firm size (No. of employee)	
<75 (small)	16.10
Between 75-200 (medium)	48.90
>200 (large)	35.00
Year of firm operation	
<5 year	10.80
Between 6-10 year	28.80
Between 11-15 year	23.80
>16 year	36.50
Position of respondents	
Senior engineer	19.50
Executive	17.60
Manager	29.40
Director/owner	33.40
Type of industry population	
Machinery and equipment	12.93
Electric and electronic	51.07
Engineering supporting	36.00
Annual sales turnover of firm	
Small (RM300 k-RM15 m)	22.60
Medium (RM15 m-RM50 m)	50.80
Large (>RM 50 m)	26.60

Data analysis: In this study, the data analysis was carried out by using SPSS 21 for the independent t-test, reliability analysis, correlation analysis, Exploratory Factor Analysis (EFA) and multiple regression analysis. Firstly, an independent-sample t-test was conducted between early and late response for both mail and online surveys in order to evaluate the discrepancies among the two groups (Armstrong and Overton, 1977). Early response in this study is defined as response received before the first reminder of e-mail invitation was (15 day from the first mailing) whereas late responses are the surveys received after that. According to this criterion, there were 38 early responses and 69 late responses for mail survey. Meanwhile, for the online survey, there were 97 early responses and 119 responses late responses respectively. The results show that there is no significant difference between early and late response, therefore the t-test provides evidence that nonresponse bias was not a concern in this study.

Next, reliability analysis was computed statistically by using alpha formula coefficient which developed by Cronbach's alpha. Cronbach's alpha is a reliability coefficient that indicates how well the items in a set are positively correlated to one another. The alpha coefficient is combination of split halves. Convergent validity was assessed by using Cronbach's alpha and composite reliability scores (Gerbing and Anderson, 1988). A 0.70 benchmark is used as the minimum acceptable value of the Cronbach's alpha (Cronbach, 1947). An acceptable composite reliability is assessed similarly to the Cronbach's alpha in which the acceptable value is above 0.70 (Farrell and Rudd, 2009). The correlation and reliability analysis between the SM drivers and firm performance are illustrated in Table 3. As outlined by

Table 3: Reliability and correlations analysis result

Construct	δ	1.0	2.0	3.0	4.0	5.0
Policy and regulations	0.92	1				
Strategic leadership	0.93	0.78**	1			
Resource availability	0.96	0.76**	0.82**	1		
Market forces	0.96	0.66**	0.58**	0.70**	1	
Firm performance	0.95	0.59**	0.59**	0.65**	0.65**	1

**Correlation is significant at the 0.01 level (2-tailed)

Table 4: Results of multiple regressions for SM drivers and firm performance

Construct	Direct effect on firm performance
Policy and regulations	0.08
Strategic leadership	0.12
Resource availability	0.25***
Market forces	0.35****
R^2	0.51
Adjusted R^2	0.50
F-change (Sig.)	81.27****

*p<0.10; **p<0.05; ***p <0.01; ****p<0.001 (n = 323)

Eltayeb and Zailani (2009), a correlation of 0.90 and higher among variables signifies substantial collinearity. Thus, the correlation coefficients of all items are below threshold value, signifying that the measurement items and variables have good convergent validity.

Accordingly as the multiple item scales in the study were not drawn in their entirety from previous studies, EFA was conducted to assess the validity of the measurement scales in terms of their convergent and discriminant validity and to confirm the conceptualization of the constructs (Churchill, 1979). Factor analysis was done on the independent and dependent variables utilized Principal Axis Factoring (PAF) method with the initial extraction of factors determined by the latent root criteria. Factors were interpreted from the rotated component matrix following Direct Oblimin rotation. The results confirmed the identification of four independent variables and one dependent variable as conceptualized. An analysis of the loadings and cross loadings of the factor analysis indicates that all scales show adequate levels of convergent validity (Appendix A). Finally, multiple regression analyses were conducted to test the hypothesized causal relationships tested in this study. Table 4 depicted multiple regression analysis for SM driver's variables and firm performance.

The regression equation explains 51% variation in the practice of SM drivers (R^2 = 0.51, F = 81.27, p<0.01). The relationship between policy and regulation with firm performance is not significant (β = 0.08, t = 1.18, Sig. 0.28), so H_1 is not supported. The second variable of the relationship between strategic leadership and firm performance is also not significant (β = 0.12, t = 1.62, Sig. 0.11), thus H_2 is not supported. Out of the four dimensions of SM drivers, resource availability (β = 0.25, t = 3.13, Sig. 0.00) and market forces (β = 0.35, t = 6.06, Sig. 0.00) are both significant at p<0.01. Therefore, H_3 and H_4 are strongly supported. The findings indicate that the greater the SM drivers in terms of resource availability and market forces, the higher the firm performance will be.

The objectives of this paper are to analyse the drivers which influence SM implementation and its impact towards firm performance in the selected industries of manufacturing sector in Malaysia. From the analysed data, it is revealed that resource availability and market forces are the most critical drivers of SM implementation that lead to the firm performance enhancement.

Resource availability is the most important variable in the SM driver's model being developed through the research. Resource availability stems the opportunity to reduce risk and uncertainties in the environment via a persistent performance among firms. Manufacturing firms are regularly adopting SM when there are available resources to engage with the sustainability efforts. The results from this research validate studies conducted by the previous researchers. According to Sheikh *et al.* (2016), the resource availability possessed by firms such as training provision, reward and promotion are important and affect firm performance. Moreover, a well-trained workforce exhibits strong skill and capable to meet expected duties effectively whereas the strategically inspired managers will perform to their full capacity leading firms to achieve the anticipated objectives and performance (Sunday and Somoye, 2011). Additionally, prior to Elsayed (2006), a positive link on the relationship between firm's capability, cost and profit performance was also discovered in the study by Bharadwaj (2000) and this proves that available resources are significant predictor of firm environmental performance. The relationship is further validated via findings from this research in which resource availability which involves skill, training and capability setting as one of the SM drivers that leads to firm performance improvement, thus this driver is perceived as a firm's sustainable competitive advantage.

Market forces also drive SM implementation and are associated with firm performance. Traditionally, gaining business advantage will increase profitability and motivate firm to engage in green efforts. Most firms will consider the economic and financial effect towards their performance thus urging them to practice sustainability programme such as waste minimisation. According to findings by Rehman and Shrivastava (2013), manufacturing firms in a highly competitive industry and market uncertainty need to be attentive and stay reactive to the market forces in a changing environmental challenge. It is found that a competitive market is important to influence cooperative efforts and green practices. The previous study by Schrettle *et al.* (2012) confirmed that the firm involvement with environmentally cautious supplier leads to positive feedback on the firm's

credibility in managing eco-sustainability. Moreover, firm's competition may exert power that the competitor's values and norms are perceived to be superior with regards to eco-sustainability. The results showed that the manufacturing firms experience greater firm performance due to their success in adjusting and responding towards market forces. Environmentally responsible firms can foster a positive corporate image and provide unique selling point to the firm.

Surprisingly, policy and regulation has no direct impact on firm performance in this study. The result differs from the previous researches (Ashford and Hall, 2011; Eltayeb and Zailani, 2011) whereby Malaysian manufacturing firms need to be more alert and responsive with SM legislation. The opposite results may be attributed by the fact that a stricter regulation hinders firms from adopting SM as indicated in findings of previous study. Study by Walley and Whitehead (1994) indicates that an increased environmental policy and regulation leads to unproductive investment, higher cost and a possible loss due to competitive advantage. Therefore, an appropriate policy and legislation is crucial for firms to ensure competitive environment and firm sustainability.

Additionally, the negative link between strategic leadership and firm performance in this study is contradictory with the previous results (Szekely and Knirsch, 2005; Ireland and Hitt, 2005; Avery and Bergsteiner, 2011). Strategic leadership as discussed in this study refers to the ability of top management in influencing employees to voluntarily make decisions that enhance the firm long-term sustainability while preserving firm's short-term economic stability (Rowe, 2001). For instance, the importance of strategic leadership by the top management in Malaysian manufacturing firm fails to highlight the positive influence on firm performance. Top management strong leadership is shown by reallocating money saved from personnel cost for business improvement rather than allocating it to improve the bottom line (Thomas *et al*., 2012b).

CONCLUSION

This study describes the elements of SM driver that lead to a successful SMP implementation within manufacturing firms in Malaysia. The SM drivers provide a useful insight to enhance critical decision-making process which is needed in the delivery of corporate strategic ambition towards the SM implementation. The drivers identified in this study shows that the top management views the utilization of available resources is strongly important in sustaining SM as well as being alert with market pressure. Hence, these two factors need to be properly addressed to ensure manufacturing sustainability. Firms need to adjust their strategy to align it with the current policy and legislation in order to avoid unnecessary cost. Moreover, firms need to adapt and practise strategic leadership as manufacturing environment keeps changing and evolving.

Manufacturing firm should continue to practise good sustainability initiatives in their daily manufacturing operation and focus on motivation factors to attain development capability, thus, increasing the firm performance. The variables in the study are focused on the factors that are critical to the SM implementation in the manufacturing industry. Therefore, SM achievement is critical to manufacturing industry and can be further researched in other research field such as services industry. In fact, service industry is gaining pace in the today market and factors that are impacting SM capability in this industry are still under-researched.

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APPENDIX

Appendix A: Exploratory factor analysis result

Construct and items	Factors 1	2	3	4	5
Resource availability					
ra1: Our company is aware of the importance of the availability of adequate resources to practice sustainable manufacturing	0.75				
ra2: The current resources available is efficient to practice sustainable manufacturing	0.72				
ra3: Resource availability in company meets current and future needs to practice sustainable manufacturing	0.69				
ra4: The availability of resources enable our company to practice sustainable manufacturing	0.76				
ra18: Our company encourages workforce to self-organize which is important in sustainability practice	0.81				
ra19: Our company put priority to the development of new skills and capabilities in sustainability practice	0.79				
ra10: There are appropriate and modern manufacturing equipment in our company to practice sustainable manufacturing	0.76				

Appendix A: Continue

Construct and items	Factors 1	2	3	4	5
ra11: Our company aware of the importance of utilizing better technology which safe to the environment	0.77				
ra12: Our company applies technology that reduced the environmental impact in manufacturing operation	0.74				
ra5: Our company provides training for workers to reduce potential damaging environmental practices	0.77				
ra6: Introducing environmental concern need for additional education and training efforts	0.8				
ra7: Our company encourages the involvement of workers by training, to make the efforts of sustainability more effective	0.83				
ra9: Highly trained workers may lead to better company performance	0.70				
Market forces					
mf1: Customers prefer products that are environmentally friendly		0.66			
mf10: The involvement with environmentally cautious suppliers can have a positive feedback on the firm's credibility in managing sustainability practice		0.75			
mf11: Competition is one of the factors that force our company to practice sustainable manufacturing		0.81			
mf12: My company needs to compete with other competitors with regards to the sustainable product and practice		0.88			
mf13: Competitors attitude toward sustainability is perceived as more credible compared to my own company		0.78			
mf15: The growing trend of producing sustainable product among our competitors lead us to practice the same		0.74			
mf2 Customer power and demand really affect the supply side		0.69			
mf3: Customers are better informed and more aware of the environmental and human health impacts of the products they purchase		0.90			
mf4: Customers are demanding the firms to improve the environmental performance of products and production facilities		0.87			
mf5: Environmentally conscious customer prefers eco-labelled products		0.72			
mf6: Supplier involvement influence adoption of sustainable practice		0.75			
mf8: Buying decision is influenced by the performance of suppliers on environmental issues		0.84			
mf9: Supplier often compete on 'green' promises much compared to price due to changes in consumers' perceptions			0.80		
Policy and regulations					
pr1: Policy and regulation can motivate my company to comply with current and future environmental regulations			0.65		
pr2: Compliance with current and future regulations will make my company more sustainable		0.84			
pr4: Complying to the sustainable manufacturing policy and regulation put my company in a better position compared to my competitors		0.80			
pr7: Competitive firms are flexible enough to make constant strategic adjustments and policy changes considering the dynamic nature of business environments		0.84			
pr9: Businesses adhere to sustainable manufacturing policy and regulations to avoid sanctions, bad publicity, fines and penalties, punitive damages, clean-ups, discontented employees and other risks		0.73			
Strategic leadership					
sl1: Top management is aware of the possible positive effects of sustainable practices on manufacturing costs			0.91		
sl2: Top management encourages collaborative practices with their supply chain partners			0.76		
sl3: Direct involvement and strong commitment of top management is crucial for sustainable manufacturing			0.76		
sl5:Top management use simple and clear management principles to direct operations towards sustainable practice			0.70		
sl6: Top management is concern about the positioning of effective leadership in the management team			0.63		
sl7: Top management treats the need to become sustainable as a corporate social responsibility			0.73		
Firm performance					
Env2 Decrease environmental footprint				0.88	
Soc4 Improve financial analytic skills				0.87	
Env1 Reduce waste level and emission		0.86			
Soc5 Improve job satisfaction rate		0.84			
Eco2 Increase profitability		0.84			
Eco1 Increase in sales		0.84			
Soc2 The ability to think systemically		0.77			
Soc1 Increased worker's knowledge and awareness of sustainability efforts		0.76			
Soc6 Workers can provide great insights on the production process and ideas for additional improvements		0.74			
Soc3 Workers understand complex legislation around sustainability		0.72			
Eco3 Increase in return on investment		072			
Env3 Improve air quality and noise pollution		0.72			
Eco5 Increase current ratio		0.69			

n = 323

REFERENCES

Achanga, P., E. Shehab, R. Roy and G. Nelder, 2006. Critical success factors for lean implementation within SMEs. J. Manufact. Technol. Manage., 17: 460-471.

Adebambo, H.O., H. Ashari and N. Nordin, 2014. Antecedents and outcome of Sustainable environmental manufacturing practices. Int. J. Manage. Sustainability, 3: 147-159.

Adebambo, H.O., R.I. Abdulkadir, N.K.N. Mat and J.A.A. Alkafaagi, 2013. Drivers of sustainable environmental manufacturing practices and financial performance among food and beverages companies in Malaysia. Am. J. Econ., 3: 127-131.

Armstrong, J.S. and T.S. Overton, 1977. Estimating nonresponse bias in mail surveys. J. Market. Res., 14: 396-402.]

Ashford, N.A. and R.P. Hall, 2011. The importance of regulation-induced innovation for sustainable development. Sustainability, 3: 270-292.

Avery, G.C. and H. Bergsteiner, 2011. Sustainable leadership practices for enhancing business resilience and performance.Sustainable leadership practices for enhancing business resilience and performance. Strategy Leadersh., 39: 5-15.

Babbie, E., 2013. The Basics of Social Research. Wadsworth Cencage Learning, California, USA.,.

Bansal, P. and K. Roth, 2000. Why companies go green: A model of ecological responsiveness. Acad. Manage. J., 43: 717-736.

Barney, J.B., 1991. Firm resources and sustained competitive advantage. J. Manage., 17: 99-120.

Benito, G.J. and G.O. Benito, 2006. The role of stakeholder pressure and managerial values in the implementation of environmental logistics practices. Int. J. Prod. Res., 44: 1353-1373.

Bharadwaj, A.S., 2000. A resource-based perspective on information technology capability and firm performance: An empirical investigation. MIS Quart., 24: 169-196.

Bhaskaran, S., M. Polonsky, J. Cary and S. Fernandez, 2006. Environmentally sustainable food production and marketing: Opportunity or hype? Br. Food J., 108: 677-690.

Cai, W.G. and X.L. Zhou, 2014. On the drivers of eco-innovation: Empirical evidence from China. J. Cleaner Prod., 79: 239-248.

Carter, C.R. and L.M. Ellram, 1998. Reverse logistics: A review of the literature and framework for future investigation. J. Bus. Logistics, 19: 85-102.

Churchill, Jr. G.A., 1979. A paradigm for developing better measures of marketing constructs. J. Market. Res., 16: 64-73.

Cleveland, C., 2011. The sustainable manufacturer: A greenprint for action. Sustainable Facility, 36: 16-18.

Cooper, D.R. and P.S. Schindler, 2008. Business Research Methods. 10th Edn., Mc Graw-Hill Companies, Inc., Singapore, ISBN: 978-007-126333-7.

Creswell, J.W., 2013. Research Design: Qualitative, Quantitative and Mixed Methods Approaches. Sage Publications, California, USA., ISBN:978-1-4522-2609-5, Pages: 274.

Cronbach, L.J., 1947. Test reliability: Its meaning and determination. Psychometrika, 12: 1-16.

Currin, E., 2012. Businesses going green: An analysis of the factors that motivate firms to adopt environmentally friendly practices. Bridges, 6: 35-50.

Dora, M., M. Kumar, D. van Goubergen, A. Molnar and X. Gellynck, 2013. Operational performance and critical success factors of lean manufacturing in European food processing SMEs. Trends Food Sci. Technol., 31: 156-164.

Elenkov, D.S., W. Judge and P. Wright, 2005. Strategic leadership and executive innovation influence: An international multi-cluster comparative study. Strategic Manage. J., 26: 665-682.

Elsayed, K., 2006. Reexamining the expected effect of available resources and firm size on firm environmental orientation: An empirical study of UK firms. J. Bus. Eth., 65: 297-308.

Eltayeb, T.K. and S. Zailani, 2009. Going green through green supply chain initiatives towards environmental sustainability. Operat. Supply Chain Manage., 2: 93-110.

Eltayeb, T.K. and S.H.M. Zailani, 2011. Drivers on the reverse logistics: Evidence from Malaysian certified companies. Int. J. Logistics Syst. Manage., 10: 375-397.

Eltayeb, T.K., S. Zailani and W.L. Filho, 2009. Green business among certified companies in Malaysia towards environmental sustainability: Benchmarking on the drivers, initiatives and outcomes. Int. J. Environ. Technol. Manage., 12: 95-125.

Epstein, M.J. and A.R. Buhovac, 2014. Making sustainability work: Best practices in managing and measuring corporate social, environmental and economic impacts. Berrett-Koehler Publishers, California, USA., ISBN:978-1-60994-994-5, Pages: 305.

Fan, C., J.D. Carrell and H.C. Zhang, 2010. An investigation of indicators for measuring sustainable manufacturing. Proceedings of the 2010 IEEE International Symposium on Sustainable Systems and Technology, May 17-19, 2010, IEEE, Lubbock, Texas, ISBN:978-1-4244-7094-5, pp: 1-5.

Farrel, A.M. and J.M. Rudd, 2009. Factor analysis and discriminant validity: A brief review of some practical issues. Proceedings of the Australia-New Zealand Marketing Academy Conference, 30 November-December 2, 2009, Melbourne, Australia, pp: 1-9.

Galeazzo, A., A. Furlan and A. Vinelli, 2014. Lean and green in action: Interdependencies and performance of pollution prevention projects. J. Clean. Prod., 85: 191-200.

Gaussin, M., G. Hu, S. Abolghasem, S. Basu and M.R. Shankar *et al*., 2013. Assessing the environmental footprint of manufactured products: A survey of current literature. Int. J. Prod. Econ., 146: 515-523.

Gerbing, D.W. and J.C. Anderson, 1988. An updated paradigm for scale development incorporating unidimensionality and its assessment. J. Market. Res., 25: 186-192.

Gunasekaran, A. and A. Spalanzani, 2012. Sustainability of manufacturing and services: Investigations for research and applications. Int. J. Prod. Econ., 140: 35-47.

Habidin, N.F., A.F.M. Zubir, J. Conding, N.A.S.L. Jaya and S. Hashim, 2013. Sustainable manufacturing practices, sustaining lean improvements and sustainable performance in Malaysian automotive industry. World Rev. Entrepreneurship Manage. Sustainable Dev., 9: 444-459.

Hami, N., M.R. Muhammad and Z. Ibrahim, 2015. An empirical study on the impact of sustainable manufacturing practices and innovation performance on environmental sustainability. J. Technol., 77: 57-68.

Heilala, J., S. Vatanen, H. Tonteri, J. Montonen and S. Lind *et al*., 2008. Simulation-based sustainable manufacturing system design. Proceedings of the 2008 Conference on Winter Simulation Conference, December 7-12, 2008, IEEE, Finland, ISBN:978-1-4244-2707-9, pp: 1922-1930.

Henderson, K. and J. Evans, 2000. Successful implementation of six sigma: Benchmarking general electric company. Benchmarking Int. J., 7: 260-281.

Henriques, I. and P. Sadorsky, 1999. The relationship between environmental commitment and managerial perceptions of stakeholder importance. Acad. Manage. J., 42: 87-99.

Hitt, M.A., K.T. Haynes and R. Serpa, 2010. Strategic leadership for the 21st century. Bus. Hori., 523: 437-444.

Hong, P., R.J. Jungbae and G. Rawski, 2012. Benchmarking sustainability practices: Evidence from manufacturing firms. Benchmarking Int. J., 19: 634-648.

Huang, X., B.L. Tan and X. Ding, 2012. Green supply chain management practices: An investigation of manufacturing SMEs in china. Int. J. Technol. Manage. Sustainable Dev., 11: 139-153.

Ireland, R.D. and M.A. Hitt, 2005. Achieving and maintaining strategic competitiveness in the 21st century: The role of strategic leadership. Acad. Manage. Execut., 19: 63-77.

Jamian, R., M.N. Ab Rahman, B.M. Deros and N.Z.N. Ismail, 2012. A conceptual model towards sustainable management system based upon 5S practice for manufacturing SMEs. Asia Pac. J. Opera. Manage., 1: 19-31.

Jayaraman, V., R. Singh and A. Anandnarayan, 2012. Impact of sustainable manufacturing practices on consumer perception and revenue growth: An emerging economy perspective. Int. J. Prod. Res., 50: 1395-1410.

Karim, M.A., A.J.R. Smith and S. Halgamuge, 2008. Empirical relationships between some manufacturing practices and performance. Int. J. Prod. Res., 46: 3583-3613.

Kesidou, E. and P. Demirel, 2012. On the drivers of eco-innovations: Empirical evidence from the UK. Res. Policy, 41: 862-870.

Kim, S.T. and S.Y. Lee, 2012. Stakeholder pressure and the adoption of environmental logistics practices: Is eco-oriented culture a missing link?. Int. J. Logistics Manage., 23: 238-258.

MSA., 2009. Sustainable manufacturing: Unpacking the issues. Manufacturing Skills Australia, Australia. http://www.mskills.com.au/DownloadManager/Downloads/Sustainable%20Manufacturing%20-%20unpacking%20the%20issues.pdf.

Mahmood, W., W. Hasrulnizzam, M.Z. Yusup, M.R. Salleh and R. Amat, 2014. Exploring the impacts of cleaner production on manufacturing sustainability in Malaysia-an initial study. Sci. Int. Lahore, 26: 1829-1833.

Matopoulos, A. and M. Bourlakis, 2010. Sustainability practices and indicators in food retail logistics: Findings from an exploratory study. J. Chain Network Sci., 10: 207-218.

Matsumoto, M. and Y. Umeda, 2011. An analysis of remanufacturing practices in Japan. J. Remanufacturing, Vol. 1, 10.1186/2210-4690-1-2

Melnyk, S.A., R.P. Sroufe and R. Calantone, 2003. Assessing the impact of environmental management systems on corporate and environmental performance. J. Operat. Manage., 21: 329-351.

Menguc, B., S. Auh and L. Ozanne, 2010. The interactive effect of internal and external factors on a proactive environmental strategy and its influence on a firm's performance. J. Bus. Ethics, 94: 279-298.

Mittal, V.K. and K.S. Sangwan, 2014. Prioritizing barriers to green manufacturing: Environmental, social and economic perspectives. Procedia CIRP., 17: 559-564.

OECD., 2009. Sustainable manufacturing and eco-innovation: Framework, practices and measurement. Organisation for Economic Co-operation and Development, USA. https://www.oecd.org/innovation/inno/43423689.pdf.

Peteraf, M.A. and J.B. Barney, 2003. Unraveling the resource-based tangle. Managerial Decis. Econ., 24: 309-323.

Rachuri, S., R.D. Sriram and P. Sarkar, 2009. Metrics, standards and industry best practices for sustainable manufacturing systems. Proceedings of the 2009 IEEE International Conference on Automation Science and Engineering, August 22-25, 2009, IEEE, Gaithersburg, Maryland, ISBN:978-1-4244-4578-3, pp: 472-477.

Razak, N.A., A.Z. Rahman and H. Borhan, 2016. Modeling firm resources-enterprise risk management relationships: An empirical finding using PLS-SEM. World J. Entrepreneurship Manage. Sustainable Dev., 12: 35-49.

Rehman, M.A. and R.L. Shrivastava, 2013. Green manufacturing (GM): Past, present and future (a state of art review). World Rev. Sci. Technol. Sustainable Dev., 10: 17-55.

Roberts, S.J.F. and P.D. Ball, 2014. Developing a library of sustainable manufacturing practices. Procedia CIRP., 15: 159-164.

Rowe, W.G., 2001. Creating wealth in organizations: The role of strategic leadership. Acad. Manage. Executive, 15: 81-94.

Rusinko, C., 2007. Green manufacturing: An evaluation of environmentally sustainable manufacturing practices and their impact on competitive outcomes. IEEE. Trans. Eng. Manage., 54: 445-454.

Sambasivan, M. and N.Y. Fei, 2008. Evaluation of critical success factors of implementation of ISO 14001 using analytic hierarchy process (AHP): A case study from Malaysia. J. Clean. Prod., 16: 1424-1433.

Schrettle, S., A. Hinz, R.M. Scherrer and T. Friedli, 2012. The impact of sustainability drivers on a firms' strategic decisions regarding manufacturing technologies, new product development and supplychain initiatives. Proceedings of the ICPR 21st International Conference on Production Research, July 31, 2011, Fraunhofer Verlag Publisher, Switzerland, ISBN:978-3-8396-0293-5, pp: 1-8.

Seidel, S., J.C. Recker, C. Pimmer and V.J. Brocke, 2010. Enablers and barriers to the organizational adoption of sustainable business practices. Proceeding of the 16th Americas Conference on Information Systems: Sustainable IT Collaboration Around the Globe, May 19, 2010, Association for Information Systems, Lima, pp: 1-10.

Sekaran, U., 2003. Research Methods for Business: A Skill Building Approach. John Wiley & Sons, New York, USA.,.

Sheikh, M., S. Hasnu and I. Khan, 2016. Link between HR practices and organizational performance in small firms: A case for manufacturing sector of Pakistan. Manage. Sci. Lett., 6: 71-86.

Smith, E.E. and S. Perks, 2010. A perceptual study of the impact of green practice implementation on the business functions. S. Afr. Bus. Rev., 14: 1-29.

Sunday, K.J. and R.O.C. Somoye, 2011. Organization performance: The roles and the duties of managers. J. Afr. Macroeconomic Rev., 1: 33-54.

Szekely, F. and M. Knirsch, 2005. Responsible leadership and corporate social responsibility: Metrics for sustainable performance. Eur. Manage. J., 23: 628-647.

Thomas, A.J., P. Byard and R. Evans, 2012a. Identifying the UK?s manufacturing challenges as a benchmark for future growth. J. Manuf. Technol. Manage., 23: 142-156.

Thomas, A., M. Francis, E. John and A. Davies, 2012b. Identifying the characteristics for achieving sustainable manufacturing companies. J. Manuf. Technol. Manage., 23: 426-440.

Walley, N. and B. Whitehead, 1994. It?s not easy being green. Harvard Bus. Rev., 72: 46-52.

Westkamper, E., L. Alting and G. Arndt, 2000. Life cycle management and assessment: Approaches and visions towards sustainable manufacturing. CIRP. Ann. Manuf. Technol., 49: 501-526.

Zailani, S.H.M., T.K. Eltayeb, C.C.C. Hsu and K.C. Tan, 2012. The impact of external institutional drivers and internal strategy on environmental performance. Int. J. Operat. Prod. Manage., 32: 721-745.

Zhu, Q., J. Cordeiro and J. Sarkis, 2013. Institutional pressures, dynamic capabilities and environmental management systems: Investigating the ISO 9000 ? Environmental management system implementation linkage. J. Environ. Manage., 114: 232-242.

Zhu, Q., Y. Geng, T. Fujita and S. Hashimoto, 2010. Green supply chain management in leading manufacturers: Case studies in Japanese large companies. Manage. Res. Rev., 33: 380-392.

Zubir, A.F.M., N.F. Habidin, J. Conding, N.A.S.L. Jaya and S. Hashim, 2012. The development of sustainable manufacturing practices and sustainable performance in Malaysian automotive industry. J. Econ. Sustain Dev., 3: 130-139.