

Measuring Sustainability Performance Measurement System

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Abstract: This paper presents an effort to suggest a comprehensive measurement for the Sustainability Performance Measurement (SPMS) construct. Absence of a comprehensive instrument has limited the research on SPMS. This study makes a significant contribution on defining SPMS general characteristics. The SPMS construct was empirically tested through confirmatory factor analysis based on data obtained from 147 manufacturing business units. The data suggest that SPMS construct is a manifestation of three dimensions; first, financial orientation, which reflects the financial measures that link with other units and the shareholders. Second is the growth orientation which covers measures such as the customer satisfaction, new product development, effectiveness of information use and supplier performance. Finally, the third dimension is environmental and social orientation, which covers environmental and social measures, and measures that linked to sustainability strategy. Using the suggested instrument, future study could examine the effect of SPMS on performance, or study the factors that could affect the SPMS implementation.

Keywords: Economy; Environment; Social; Malaysia; Manufacturing

JEL Classification: M4

1. Introduction

The concern for corporate sustainability has long been recognized in the literature, yet little is known about the measurement. The study of Sustainability Performance Measurement System (SPMS) can be regarded as still at its infancy stage and its structure has not been defined consistently. In fact, companies still face significant

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challenges such as difficulty in developing the sustainability indicators (Adams & Frost, 2008), and only use the performance measures for reporting purposes, which do not relate to managers' daily operations and decision making (Delai & Takahashi, 2011). The disconnection of sustainability measures with the daily operations will only mislead the decision making process.

In order to tackle this problem, some scholars suggest that the integrated performance measurement system (IPMS), such as Sustainability Balance Scorecard (SBSC) that integrates the sustainability measures, be combined with the traditional PMS (Figge, Hahn, Schaltegger & Wagner, 2002). However, for research purposes, it is difficult to examine the implementation of SBSC among companies, since companies have their own unique performance measurement systems (Speckbacher, Bischof & Pfeiffer, 2003). Nevertheless, with the absence of comprehensive instrument to measure the SPMS, it has limited the research in this area of study. Thus, to fill in the gap and to encourage future studies on SPMS implementation, this study aims to define the scope of comprehensive measure of SPMS.

We consider SPMS a suitable system to be implemented because it is a type of integrated PMS that supports the implementation of company strategy; communicates company's strategic goals throughout the organization; integrates the top down cascade of goals and objectives with the business units and project teams; motivates and monitors employees; as well as informs the stakeholders on the efficiency and effectiveness of actions and the prospect of success for future actions (Bourne, Neely, Mills & Platts, 2003; Fleming, Chow & Chen, 2009; Ittner, Larcker & Meyer, 2003; Kaplan, R.S. & Norton, 1996; Neely, Adams & Kennerley, 2002).

The study of SPMS is relevant to Malaysia because this country is one of the top competitive developing countries in Southeast Asia and sustainability practices are growing among companies in this country (Eltayeb, Zailani & Ramayah, 2011; Schwab & Sala-i-Martin, 2012). In sum, this study will define the characteristics for SPMS and suggest the SPMS construct dimensions. It is expected that this research may well assist managers in strengthening their SPMS structure.

2. Literature Review

2.1. Conceptual Definition and Characteristics of SPMS

As defined by Searcy (2012) SPMS is 'a system of indicators that provides a corporation with information needed to help in the short and long term management, controlling, planning, and performance of the economic, environmental, and social activities undertaken by the corporation'. Specifically, Fiksel, Mcdaniel, and Mendenhall (1999) highlighted the four sustainability

measurement principles; first, indicators should be able to minimize resource consumption and maximize value creation. Second, the indicators should include economic, environmental and social aspects. Third, the indicators measure throughout product life cycle, including the supply, manufacturing, use and disposition of a product. Finally, the indicators should combine both leading and lagging indicators of performance. The definition and principles align with our argument that SPMS is an integrated PMS which is important to assist company's competitive advantage in the long run.

According to the previous studies, the characteristics of PMS could be summarized as; (i) a set of operating measurements, (ii) measurements integrate with the strategy and (iii) performances are measured throughout departments, activities and the value chain (Chenhall, 2005; Hall, 2008; Ittner, Larcker & Randall, 2003; Malina & Selto, 2001). Align with the general characteristic; this study suggests the following characteristics for SPMS:

i. A broad set of sustainability measures

According to earlier research, sustainability indicators could be grouped into:

a. Indicators of Environmental performance

Sustainability measures should include the environmental performance indicator because past study had found that environmental performance (EP) able to increase economic performance (Russo & Fouts, 1997). Firms use EP measures to observe compliance, to keep track of ongoing improvement, to assist in decision making, and to produce data for external reporting (Henri & Journeault, 2008).

b. Indicators of New Product Development performance

Indicators of new product development (NPD) is important because it is able to measure the firm's R&D performance to enhance the competitive advantage (Cooper, 1998; Godener & So, 2004). Examples of NPD measures are time-to-market new items, volume of new brand, and number of sales returns (Gadenne, Mia, Sands, Winata & Hooi, 2012).

c. Indicators of Employee value performance

Basically firms measure employee value performance to gather information on employees' satisfaction on training, development, workplace relations and their health and safety (Azapagic, 2004). Employees' satisfaction is important at increasing service quality, satisfaction of the customer, as well as firm earnings (Yee, Yeung & Cheng, 2008).

d. Indicators of customer value performance

Firms need to have information on their customers' satisfaction (Pinheiro de Lima et al., 2008). Basically, customers value the selling price, efficient deliveries, design and quality (Hoque, Mia & Alam, 2001). In order to get the information,

firms should measure customer satisfaction, number of customer retention, volume of new customers, and level of product quality (Hoque & James, 2000).

e. Indicators of financial performance

Financial performance measures are essential for sustainability. Basic financial measures are operating income, return-on-capital-employed, sales growth, and cash flow (Hoque & James, 2000).

f. Indicators of information technology effective performance

Previous study found that information technology is important at enhancing competitive advantage (Dao, Langella & Carbo, 2011). Besides that, business communication via internet is positively related to innovation, as well as profit and sales growth (Andersen, 2001). Therefore, firms could measure the effectiveness of information technology used and the collection rate for sales via internet.

g. Indicators of social responsibility performance

Corporate social responsibility (CSR) performance could enhance the firms' financial performance (Sun, 2012). Therefore, information on CSR performance could be gathered through indicators such as total cash and contribution for community, percentage of anti-corruption training and actions, and rate of sites or branches running CSR actions.

h. Indicators of suppliers' performance

In order to enhance firm's survival and profit, suppliers selection is essential (Kang & Lee, 2010). Therefore, firms should pay more attention to supplier selection and manage their supplier relationships (Leppelt, Foerstl, Reuter & Hartmann, 2011). Examples of supplier performance measures are suppliers' sustainability practices assessment, suppliers' sustainability training, and number of contract non-compliances (Delai & Takahashi, 2011).

ii. Integration of financial and sustainability strategy.

Studies show that companies that implemented competitive strategy most often include financial, customers, internal processes and long-term innovation indicators into their PMS (Chenhall, 2005). However, since sustainability strategy is a hybrid strategy that uses differentiation and cost leadership simultaneously (Baumgartner & Ebner, 2010), the company needs to have broad measurement indicators that link with the strategies. The broad measurement indicators should integrate the financial and sustainability strategies. Firms need to integrate sustainability strategy into their traditional PMS in order to sustain in the long-run (Dyllick & Hockerts, 2002; Figge et al., 2002). Thus, besides the traditional profit oriented measures, firms should integrate the social and environmental indicators.

iii. Integration of measures across activities and value chain.

Value chain is a cycle of activities from the developing stage, to the production, distribution and lastly disposal (Kaplinsky & Morris, 2001). Thus, indicators should cover all the stages. Besides that, firms should develop indicators that measure the achievement of their stakeholders' needs. This is because those stakeholders have an significant influence on the legitimacy of the firms (Bansal, 2005).

In terms of cause-effect relationship between measures and activities, previous studies had shown the causal link between sustainability measures and activities. For example, Hsu and Liu (2010) found significant linkage between sustainability measures. The employees' initiative for environmental information (in learning and growth perspective) was found to be significantly correlated with; the cost of environmental improvement (in the financial perspective); with the customer satisfaction and external relation (in the customer perspective); and with the environmental performance of process and operation (in the internal perspectives). Therefore, it is reasonable to link SPMS with activities.

2.2. SPMS Dimension

The above section discusses the underlying characteristics of SPMS; however, those characteristics could be grouped into several strategic dimensions. This section will discuss on SPMS dimension that could be used for future study.

Based on the previous studies, there is no consistency in terms of the performance measurement system dimensions. This may due to the differences of the studies. For example, Hall (2008) studied the comprehensive PMS, and suggested PMS as a unidimensional construct. Whereas, Chenhall (2005) found that there are three dimensions of PMS; first, the generic dimension that identifies the extent to which the system provides information linking operations to goals and strategies, and to link activities across sub units. Second, measures that are linked to customers, and third, measures that are linked to suppliers. Homburg, Artz, & Wieseke (2012) suggested there that are three dimensions of comprehensive PMS for marketing; first, the breadth of the PMS, second, the strategy fit, and third the cause-and-effect relationships.

In order to decide whether SPMS consists multiple dimensions or unidimensional, Mackenzie, Podsakoff, & Podsakoff (2011) highlighted that, if the essential characteristics have no unique aspects, and eliminating any one of them would not restrict the conceptual domain of the construct, then the construct is unidimensional from a conceptual perspective. However, if the essential characteristics describe relatively unique aspects of the construct, and eliminating any of them would

restrict the conceptual domain of the construct, then the construct is multidimensional from a conceptual perspective.

For the purpose of this study, we found that SPMS construct provides a way of translating sustainability strategy into a coherent set of performance measures. Thus, this study suggests that SPMS is demonstrated by the following three dimensions: (i) financial orientation dimension, (ii) growth orientation dimension, and (iii) environmental and social orientation dimension. If any of the dimensions is eliminated, it will not be able to describe the construct as conceptualized.

The financial and growth orientation

Based on Porter (1985), in order for a company to be successful in the market, the company should deliver unique products and services (product differentiation) or the company can deliver products and services with the lowest price (cost leadership). However, according to (Baumgartner & Ebner, 2010), corporate sustainability uses the concept of hybrid strategies that consider the differentiation and cost leadership simultaneously. Indicators that usually being used for companies implementing differentiation and cost leadership strategy are financial, customers, internal processes and innovation (Chenhall, 2005; Kaplan & Norton, 2001).

Verbeeten and Boons (2009) suggested that strategic PMS could be separated into two dimensions, which are financial and growth orientation dimensions. The reason for this separation is that the financial perspective is focusing on the profit and financial measures have been used to align internal goals with the maximization of shareholder value. Another dimension is the growth perspective which focuses on the non-financial performance measures that provide information in non-monetary term such as market share, customer satisfaction, innovation, new product development and employee turnover (Verbeeten & Boons, 2009).

As SPMS is a strategy that considers both product differentiation and cost leadership simultaneously; therefore, this study suggests that SPMS will consist of financial orientation dimension, as well as growth orientation dimension. The financial orientation dimension will cover the following characteristics; i) financial indicators, ii) the measurements link with shareholders, iii) data are documented for evaluating performance, iv) the measurement links the current operating performance with the financial strategies and financial goals, and v) the measurement links between unit activities.

This study also proposed that the growth orientation dimension for SPMS will cover the following characteristics; (i) new product development indicators, employee satisfaction indicators, information effectiveness indicators, customer satisfaction indicators, and supplier performance indicators, ii) the measurement links with customer, supplier, and employees.

Environmental and Social Orientation

According to Figge et al. (2002), companies should integrate the environmental and social responsibility measures into the traditional PMS. Measures in this dimension relate to society and government agencies as the major stakeholders for sustainability oriented company (Wood, 1991).

All SPMS dimensions are considered as reflective which demonstrate the SPMS construct. The characteristics or the items are assumed to be covariant and considered to be interchangeable manifestations of the SPMS dimensions; as PMS is an integrated measures which have linkages between each other (Bisbe, Batista-Foguet & Chenhall, 2007; Chenhall, 2005; Rodgers & Guiral, 2011). This is in line with previous studies that suggested most constructs in the Management Control System and PMS survey-based literature are based on reflective models. Therefore, the aim of this study is to further construct the usability questionnaire for measuring SPMS implementation among companies.

3. Methodology

3.1. Research Design

This study used cross-sectional design whereby it allows the researchers to integrate performance measurement system literature, and the actual surveys as a main procedure to gather data from top managements of manufacturing companies in Malaysia.

3.2. Pilot Test

As an initial point for constructing the new scales of SPMS, the questionnaire was validated by four academicians from Malaysian public universities and four managers from manufacturing companies. The academicians are considered as experts in the areas of management accounting, business and statistic, whereas the managers are from food, textile and machinery manufacturers. The experts and practitioners were required to comment on the clarity of the items and their relevance. After analysing the responses and comments, some modifications were made to the wording of the questions as to improve their clarity.

The resulting questionnaire has 6 reflective items for environmental and social orientation dimension, 6 items for financial orientation dimension and 8 items for growth orientation dimension. A 7-point Likert-type answering scale ranging from 1 ('not at all') to 7 ('To a great extent') was used.

A pilot-test was conducted prior to the actual data collection by using online survey due to time limitation. The purpose of the pilot-test was to get an overall idea of responses that will be received in actual data collection. Target subjects were

managers from manufacturing companies, randomly selected from e-directory employer 2014 provided by the Ministry of Human Resource. Of the 200 online survey sent, the effective responses were from 28 companies. The number is considered sufficient as 25 participants should be considered the lower threshold of sample size for the purpose of instrumentation (Hertzog, 2008).

3.3. Data Collection

This empirical study gathered the data from a sample of Malaysian manufacturing sector. The manufacturing sector is currently seriously considering the implantation of sustainability in their operations (Zailani, Jeyaraman, Vengadasan & Premkumar, 2012). Besides, performance measures are commonly used by manufacturing companies (Jusoh, Ibrahim & Zainuddin, 2008). A random sample comprising 1,000 Malaysian manufacturing organizations was formed based on the FFM Directory 2014. The sample was consisted of organizations with 100 employees or more. This criteria was adopted as to ensure that the organizations are large enough for organizational and strategic variables to apply and that management control systems are sufficiently developed (Bouwens & Abernethy, 2000; Miller, 1987).

The questionnaires were mailed to the top management of each company and the effective responses were 147¹ companies. It should be noted that low response rate for academic surveys is a common pattern in Malaysia (Amir, Ahmad & Mohamad, 2010).

3.4. Data Analysis

PLS is a commonly used second-generation multivariate technique to test psychometric properties of measurement instrument through structural equation modelling (SEM). PLS is preferred when the model includes large numbers of indicators (Vinzi, W.W.Chin, J. Henseler & H. Wang, 2010). Since our model initially had 20 indicators, and the dimensionality of the SPMS construct was still

¹ Several cases contained missing data: four cases with one item missing and four cases with two items missing. Little's MCAR test revealed that the missing data were missing completely at random (MCAR) (chi-square =129.573, degrees of freedom = 108, p>0.05). As the missing data is MCAR, any imputation method can be used (Hair Jr., Black, Babin, & Anderson, 2010). As such, the data were replaced using the expectation-maximization (EM) method in SPSS. The EM approach is an iterative two-stage process where the E-stage makes the best estimates of the missing data and the M-stage makes parameter estimates assuming the missing data are replaced. This occurs in an iterative process until the changes in the estimated parameters are negligible and the missing values are replaced (Hair Jr. et al., 2010). This process resulted in a complete data set of 147 responses. Non-response bias was tested through independent-samples t-test for all variables between the first and last waves of respondents. This test is to be carried out when the response rate is less than 30% (Armstrong & Overton, 1977). The test indicated that there was no significant difference between early and late respondents in terms of response behaviour suggesting that there was no evidence of non-response bias.

not clear, it seemed practical to choose PLS. Finally, the relatively small size of our sample makes PLS suitable, especially when the number of observation is lower than 250 (Reinartz, Haenlein & Henseler, 2009). In this study, we will evaluate the measurement model of PLS for instrument validation.

4. Results

4.1. Respondent's Characteristics

Respondents for this study encompassed top management (30.6%), middle management (51%) and lower management level (27%). More than 40 percent of the respondents (42.9%) had been working for less than 5 years in their current position, 25.2% between 5 to 10 years, and 28.6% worked for more than 10 years. Table 1 provides the profile of the responding companies that encompasses a broad spectrum of business activities. The majority of the companies were of electrical and electronics product manufacturers (28.6%); followed by Iron, steel and metal product manufacturers (12.2%), rubber and plastic product manufacturers (10.2%) and motor vehicles, trailers and semitrailers and other transport equipment manufacturers (9.5%).

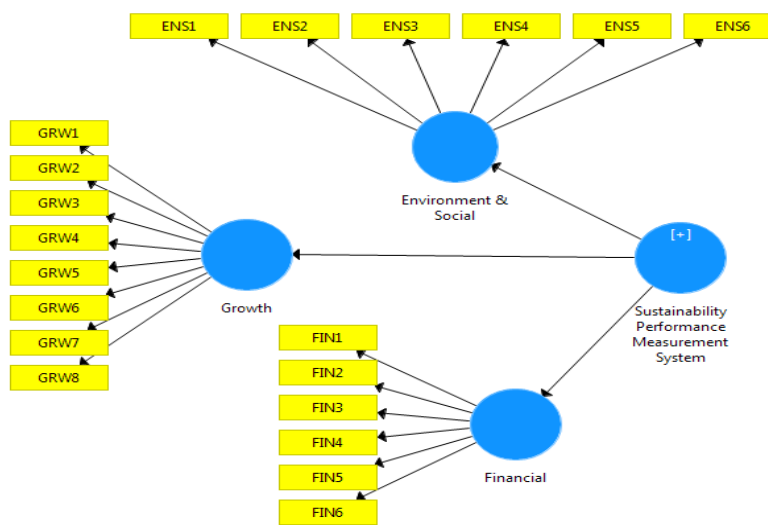
Table 1. Number of respondents based on the primary business activity

Primary business activity	Frequency	%
Electrical and electronics product	42	28.6
Iron, steel and metal product	18	12.2
Food and beverage	5	3.4
Rubber and plastic product	15	10.2
Paper, printing, packaging and labelling product	5	3.4
Chemicals and chemical product	8	5.4
Pharmaceutical, medical equipment, cosmetics, toiletries and household products	3	2.0
Furniture and wood related product	6	4.1
Textile, clothing, footwear and leather	3	2.0
Machinery and equipment	9	6.1
Coke and refined petroleum products	9	6.1
Motor vehicles, trailers and semitrailers and other transport equipment	14	9.5
Other non-metallic mineral products	4	2.7
Other manufacturing	6	4.1
Total	147	100.0

4.2. Measuring SPMS

Diagram 1 shows the model of SPMS construct and its three dimensions. The first dimension is the environmental and social orientation which is measured by six items. The second dimension is the financial orientation which is measured by six items and the third dimension is the growth dimension, measured by eight items. All the three dimensions have been suggested to explain the SPMS construct.

Diagram 1. SPMS construct and the dimensions



4.3. Validity and Reliability of the Instrument

Confirmatory factor analysis (CFA) was conducted to assess convergent validity and the discriminant validity of the measurement model. Composite reliability (CR) and average variance extracted (AVE) were used to assess the internal consistency reliability and convergent validity of the dimensions, and they are reported in Table 2. The findings show that all the CRs of the three dimensions are higher than 0.7 and AVE higher than 0.5, above the threshold suggested by Hair Jr., Hult, Ringle and Sarstedt (2014); thus, showing a high degree of internal consistency.

The validity of the measurement model was then assessed by examining the loading. The loadings threshold is 0.7 (Hair Jr. et al., 2014). It was found that all the loadings are above 0.7, except for ‘Environmental indicators’ item (0.684). However, according to (Chin, 2010) the rule of thumb should not be as rigid at the early stages of scale development, loadings of 0.5 or 0.6 may still be acceptable if there are additional indicators in the block for comparison basis. Since the criteria

for reliability and convergent validity were met, therefore the item is considered acceptable, and thus retained.

Table 2. Result of the Measurement Model

Dimensions	SPMS Characteristics	Loadings	SPMS	AVE	CR
Environmental and social orientation dimension	Link to sustainability strategies (ENS1)	0.885	0.898	0.640	0.914
	Link to sustainability goals (ENS2)	0.834			
	Environmental indicators (ENS3)	0.684			
	Link to society (ENS4)	0.817			
	Link to government agency (ENS5)	0.757			
	Social responsibility indicators (ENS6)	0.805			
Financial orientation dimension	Documented for evaluating performance (FIN1)	0.717	0.877	0.599	0.899
	Link to financial strategies (FIN2)	0.863			
	Link to financial goals (FIN3)	0.866			
	Measurements link between unit activities (FIN4)	0.743			
	Shareholders indicators (FIN5)	0.700			
	Financial indicators (FIN6)	0.736			
Growth orientation	Measures link to Supplier (GRW1)	0.814	0.944	0.633	0.932
	Measures link to Employees (GRW2)	0.866			
	New Product Development indicators (GRW3)	0.705			
	Employee satisfaction indicators (GRW4)	0.836			
	Information effectiveness indicators (GRW5)	0.757			
	Customer satisfaction indicators (GRW6)	0.804			
	Supplier performance indicators (GRW7)	0.752			
	Measures link to customer (GRW8)	0.820			

The discriminant validity of the measures (the degree to which items differentiate among constructs or measure distinct concepts) was examined by following the (Fornell & Larcker, 1981) criterion of comparing the correlations between constructs and the square root of the average variance extracted for that construct (see Table 3). All the values on the diagonals were greater than the corresponding row and column values, indicating that the measures were discriminant.

Table 3. Discriminant Validity

SPMS Dimension	ENS	FIN	GRW
Environmental and social orientation (ENS)	0.800		
Financial orientation (FIN)	0.686	0.774	
Growth orientation (GRW)	0.773	0.747	0.796

Note: Values on the diagonal (bolded) are square root of the AVE while the off-diagonals are correlations.

Table 4 shows that SPMS construct is well explained by the environmental and social dimension (0.898), growth dimension (0.944) and financial dimension (0.877). The structural model results showed that the relationships are significant ($p < 0.01$); hence, indicating that the measurement items significantly explained the SPMS construct.

Table 4. Path Coefficients

Path	Path Coefficients	Std Error	t-values
SPMS -> Environment & Social	0.898	0.023	39.621
SPMS -> Financial	0.877	0.038	23.379
SPMS -> Growth	0.944	0.010	92.967

5. Discussion and Implication

This study suggested instruments to measure SPMS construct that can be used for future study especially in management accounting area of research. It is an effort suggesting how to measure the PMS that integrates sustainability aspects instead of using Sustainability Balanced Scorecard construct. Firstly, this study defined SPMS characteristics. Secondly this study suggested the strategic dimension of SPMS. Lastly, the measurements and dimensions were empirically tested in manufacturing companies operating in Malaysia.

This study shows that the economic measures are important in SPMS. Thus, the financial dimension provides strategic focus as to ensure that the systems monitor the company profitability for the business survival and stock market returns.

Previous studies had also found that the Malaysian businesses rely heavily on financial measures (Amir et al., 2010; Burgess, Ong & Shaw, 2007; Hassan, Amir & Maelah, 2012).

This study found that the dimension of growth orientation is significant for SPMS construct. The findings are in line with previous studies, as the green supply chain indicators and supplier performance indicators are also found to be important for corporate sustainability (Eltayeb et al., 2011; Zhu, Sarkis & Lai, 2008). Also, the innovation measures are useful at ensuring the development of new products and the customer satisfaction measures could assist in increasing profitability and the survival of the company (Azapagic, 2003; Delai & Takahashi, 2011; Gadenne et al., 2012; Perera & Harrison, 1997).

Additionally, past studies showed that measures such as customer satisfaction, customer loyalty, employee training, and employee satisfaction are important to Malaysian manufacturing companies (Jusoh & Parnell, 2008). Moreover, according to previous study, the Malaysian business culture is value risk taking and highly innovative (Rashid, Sambasivan & Johari, 2003); thus, these measurements might be useful at providing information for decision making. Thus, this dimension is considered reliable for SPMS.

Social and environmental information is useful for managers in decision-making processes (Riccaboni & Leone, 2010). Many studies have suggested to the integration of environmental and social aspect into a company's performance measurement system (Dias-Sardinha & Reijnders, 2005; Figge et al., 2002; Staniškis & Arba, 2009). Consistently, this study found that dimension of environmental and social orientation is significant to the SPMS construct.

Measuring the performance towards government agency and societal needs is important because previous studies had also highlighted on the influence of regulators and public authorities in encouraging the environmental and social responsibility action by management (Bansal & Roth, 2000; Burke & Logsdon, 1996; Lämsiluoto & Järvenpää, 2008). Examples of performance measures regarding this aspect are pollution control and pollution prevention (Dias-Sardinha & Reijnders, 2005). To conclude, the combination of the three dimensions is viewed as manifestation of SPMS in achieving the economic, environmental and social performances.

5.1 Research Implication

These results are consistent with the arguments that performance measures can be a strategic management tool (Chenhall, 2005; Kaplan & Norton, 2001). Hence, the measurement of SPMS construct developed in this study can be used as a guideline in future study on the SPMS implementation.

5.2. Policy Implication

Businesses are under pressure from customers, competitors, regulators and society to implement sustainable business practices (Gholami, Binti, Ramayah & Molla, 2013). The findings of this study may be used as guidelines by the management to balance economic and environmental performances in their PMS structure.

6. Limitation and Conclusion

This study focused on the SPMS implementation among manufacturing companies operating in Malaysia. Although our comprehensive instrument may be applicable to companies in other regions, we cannot emphasize that the results would be similar. The study collected data at one point in time, thus the possibility of endogeneity cannot be ignored. Nonetheless, despite these limitations, the study makes important contribution to the PMS literature.

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