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Environmental Uncertainty, Performance, and the Mediating Role of Balanced Scorecard Measures Use: Evidence from Malaysia

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This study empirically examines the mediating role of the balanced scorecard (BSC) measures usage on the perceived environmental uncertainty (PEU) and firm performance relationship. The management accounting and control literature has highlighted the importance of environment in the design of management accounting and control systems. Using empirical data from 120 Malaysian manufacturing firms, the results provide ample evidence on the role of multiple performance measures - conceptualized according to the BSC framework - on the relationship between perceived environmental uncertainty and firm performance.

Field of Research: Performance Measures, Balanced Scorecard, Perceived Environmental Uncertainty

1.0 Introduction

Contingency theory suggests that firms perform more effectively if management control systems are designed to match contextual variables such as perceived environmental uncertainty. From the management accounting and control literature, environment is one of the factors that can determine the management accounting and control systems design used by an organization (e.g. Ezzamel, 1990; Fisher, 1998; Gordon & Miller, 1976). In relation to this, the external control model suggests that environment is the dominant influence on organizational actions (Romanelli & Tushman, 1986) and it is multidimensional with multiple and various effects on organizational characteristics (Keats & Hitt, 1988). Environmental uncertainty is also a contingent factor which affects the choice of the performance evaluation style (Govindarajan, 1984).

Meanwhile, Mia and Clarke (1999) argued that managers' use of the information provided by the management accounting system (MAS) can help organizations to implement benchmarking and monitoring information.

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Ward (1993) argued that MAS must add an external focus such as competitors' suppliers' and customers' perceptions of value in addition to the traditional inward emphasis of the accounting analysis, planning and control cycle. In response to this argument, the use of multiple performance measures provided by the Balanced Scorecard (BSC) approach can play a significant role in providing internal and external broad-based information. The BSC "translates an organization's mission and strategy into a comprehensive set of performance measures that provides the framework for a strategic measurement and management system" (Kaplan & Norton, 1996, p. 2). The BSC integrates financial and non-financial measures into four perspectives: financial, customer, internal business process and innovation and learning.

In the management accounting and control literature, financial-based measures are criticized for their short-term orientation and ex post evaluation in nature, for they focus only on efficiency, promote data manipulation and thus are not adequate for ex ante evaluation and for controlling and decision making processes. Started in the late 1980s as a result of changes in the world market, basis of performance measurement has changed from the financial measures such as profit and return on investment towards non-financial measures such as quality, time of delivery, flexibility and innovation (Johnson & Kaplan, 1987). Thus, the importance of non-financial measures in accounting and control systems, performance measurement systems and evaluation of managers has now been discussed extensively in the literature (e.g. Banker *et al*., 2000; Ghalayini & Noble, 1996; Chenhall, 2005; Ittner & Larcker, 1998; Gordon & Miller, 1976; Kaplan & Norton, 1996). Non-financial measures are indicators of intangible assets and key drivers of firm value and may be better predictors of future financial performance than historical accounting measures, and thus should be disclosed (Ittner & Larcker, 1998; Kaplan & Norton, 1996). Also, Banker *et al*. (2000) noted that the primary reasons to use non-financial performance measures are that they provide better indicators of future financial performance than accounting measures and they are valuable in evaluating and motivating managerial performance. In this regard, therefore, it can be concluded that the issue of non-financial performance measures and its measurements is receiving increasing emphasis in the manufacturing and service industry.

The importance of BSC in accounting research has been recognized by several researchers when they initiated to study BSC empirically. Atkinson *et al.* (1997, p. 94) noted that "the balanced scorecard is among the most significant developments in management accounting and thus, deserves intense research attention". However, empirical support for BSC is still limited and not conclusive. Empirical studies by Towers Perrin Consulting firm (Lingle & Schiemann, 1996), Hoque and James (2000), Hoque *et al.* (2001), Sim and Koh (2001), Olson and Slater (2002), Maiga and Jacobs (2003), and Anand et al. (2005) provide some evidence on the use of BSC measures. A number of studies have examined the relationship between contextual variables (such as perceived environmental uncertainty) and management accounting systems (MAS) design and its impact on performance (e.g. Gul, 1991; Mia, 1993; Gul & Chia, 1994; Chong & Chong, 1997; Hussain, 2003; Hussain & Gunasekaran, 2002; and Burney,

1999). However, the findings on the relationship between perceived environmental uncertainty (PEU) and MAS design and information is rather mix and inconclusive. Also, there is no specific study has yet examined the role of performance measures usage on the relationship between PEU and organizational performance, particularly using the BSC framework relating to different dimensions of performance measures. This approach is different from previous studies that typically examine a dichotomy of financial versus non-financial measures (Widener, 2006). Besides, there is little clear empirical evidence of the relationship between PEU and organizational performance, thus more research is certainly warranted. The aim of this study is, therefore, to explicitly examine the mediating role of BSC measures usage on the relationship between PEU and organizational performance as well as the relationship between PEU and BSC measures usage. The remainder of this paper is structured as follows: First, a discussion of the theoretical linkage between PEU, management accounting control systems, and performance as well as the role of BSC measures as a mediating variable, together with the statement of hypothesis will be presented. Second, a discussion of the research methods explaining the sample and variable measurement is provided. This is followed by the discussion of the results. The final section discusses the findings, limitations as well as conclusions.

2.0 Literature Review and Hypothesis Development

2.1 PEU and MACS

Research attempting to study the relationship between perceived environmental uncertainty (PEU) and organizational characteristics (e.g. management accounting and control systems) is now prevalent within the literature of contingency theory of organization and management accounting systems (e.g. Gordon & Miller, 1976, Gordon & Narayanan, 1984; Chenhall & Morris, 1986; Ezzamel, 1990; Mia, 1993). The common conclusion of these studies is that when the environmental uncertainties are considered high, information, in particular performance measures, likely will be external and broader-based, future oriented, non-financial and qualitative in order to manage these uncertainties. For example, according to Gordon and Miller (1976), as the degree of environmental uncertainty (dynamism and hostility) increases, organization needs to incorporate more non-financial data into its accounting information system and adopt a fairly sophisticated control system. Also, studies by Gordon and Narayanan (1984), Chenhall and Morris (1986) and Mia (1993) found that perceived environmental uncertainty is associated with the characteristics of the management accounting information. They indicate that higher PEU is positively associated with higher importance of external, non-financial, and ex ante as well as broad scope type information. Govindarajan (1984), for example, pointed out that financial data alone would not be sufficient to evaluate managerial performance in a situation with high environmental uncertainty. Along the same lines, Chapman (1997) argued that performance evaluation under conditions of uncertainty is inappropriate when accounting information is incomplete because the process of quantification of

accounting information will likely be harder in the more rapidly changing situation. Meanwhile, Brownell (1987) indicated that reliance on accounting performance measures (RAPM) is low under high environment uncertainty but high under low environmental uncertainty. Furthermore, Hoque *et al.* (2001) argued that organizations facing higher competition are likely to use multiple performance measures. In view of the above reported findings, thus, it can be concluded that in high perceived environmental uncertainty, information needed for planning, controlling, decision making and performance evaluation and measures should go beyond the accounting and financial information.

However, different findings were reported by Hussain (2003), Hussain and Gunasekaran (2002) and Burney (1999) where they reveal that greater economic uncertainty increases the pressure on banks/financial institutions to improve financial performance and its measurement, and therefore, non-financial performance and its measurement would be relatively less emphasized. On the contrary, stable economic environment may enhance non-financial performance and its measurement. Also, Gosselin (2005) revealed that firms that are in a more unstable environment tend to use not only financial measures, but also non-financial measures pertaining to customers and employees.

2.2 PEU and Performance

With regards to the relationship between PEU and firm performance, anecdotal evidence of improved organizational performance under increasing competition (one element of PEU) suggests that there is a positive relationship between the intensity of market competition and organizational performance (Mia & Clarke, 1999). Also, a study by Isabela and Waddock (1994) found a positive relationship between firm performance and top management certainty regarding environment assessments and strategic decisions. However, Khandwalla (1972) reported a negative correlation between the firm's profitability and the level of product price and marketing channel competition.

2.3 BSC Measures Use as Mediating Variable

Furthermore, in examining the role of BSC measures usage as a mediating variable, studies by Mia (1993), Gul (1991), Gul and Chia (1994), Chong and Chong (1997), Mia and Clarke (1999), and Widener (2006) provide evidence that the relationship between PEU and performance could be due, in part, to the indirect effect of the extent to which firm uses multiple performance measures, such as BSC measures, in evaluating its performance. Mia (1993) indicated that the use of broad scope MAS information acted as a mediator in the relationship between PEU and performance. Similarly, Gul (1991) found that under high levels of PEU, sophisticated MAS information had a positive effect on performance, but under low levels of PEU, it had a negative effect. Meanwhile, Chong and Chong (1997) provided evidence that a positive and significant indirect effect was found between PEU and SBU performance through the extent to which managers use broad scope MSA information. They also concluded that PEU is an

important antecedent of MAS design, while broad scope MAS information is an important antecedent of SBU performance. Mia and Clarke (1999) examined the relationship between market competition and business unit performance and found that the use of management accounting information mediates the relationship. This means that market competition, being one element of perceived environmental uncertainty, impacts performance through the use of information which is needed by a firm to position itself properly in the marketplace and counteract competitive threats. More recently, Widener (2006) found that the importance of use of performance measures mediates the association between the importance of strategic resources and performance, and thus, that performance measures matter. Drawing from this notion, the following hypothesis is proposed (the theoretical model for this study is illustrated in Figure 1):

> *The extent to which firms use BSC measures mediates the relationship between PEU and firm performance.*

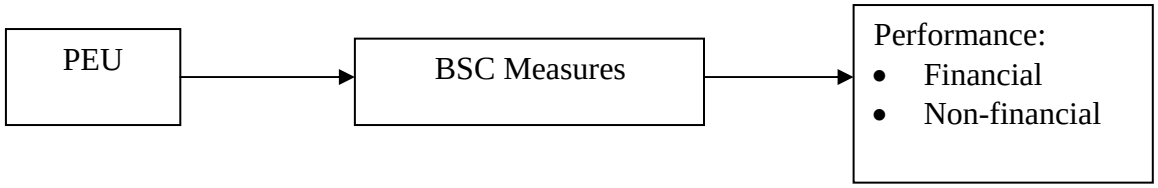

Figure 1: Theoretical Model

3.0 Methodology and Research Design

3.1 Population and Sample

This study used directory of Federation of Malaysian Manufacturers year 2003 as the population frame where a total of about 2,400 companies were listed. Because of the recent emerging impact of several factors on manufacturing industries such as the use of new and advanced manufacturing environment and recent trends of measuring manufacturing performance, the manufacturing industry is viewed as a relevant area of study. Besides, manufacturing firms are considered highly competitive and vulnerable to environmental changes. Moreover, manufacturing industry is an important engine of growth to Malaysia's GDP (Gross Domestic Products) where it contributes more than 30% annually.

This study was based on data collected using mail questionnaires sent to the top managers of the firms. Only firms with at least 25 employees and annual sales turnover of at least RM10 million were selected as to have enough firms representing small and large firms. A total of 133 questionnaires were returned and 13 of these were excluded from the study for incomplete responses. The remaining 120 responses were used in

the data analysis, making a usable response rate of 12.3%. The responding firms constitute a broad spectrum of manufacturers. Majority of the respondents are in the electrical and electronics product manufacturing (25); followed by iron, steel, and metal product manufacturing (18); food and beverage manufacturing (13); rubber and plastic product manufacturing (11); paper, printing, packaging, labeling product manufacturing (7); chemicals and chemical product manufacturing (7); pharmaceutical, medical equipment, cosmetics, toiletries, and household product manufacturing (7); furniture and wood related product manufacturing (5); textile, clothing, footwear, and leather product manufacturing (4); machinery and equipment product manufacturing (4); and other product manufacturing (19). Non-response bias was investigated by comparing early to late respondents on performance, perceived environmental uncertainty, and all dimensions of BSC measures. There were no statistically significant differences noted between early and late respondents.

3.2 Variable Measurement

3.2.1 Perceived environmental uncertainty (PEU).

For the purpose of this study, PEU was primarily focused on the uncertainty arising out of the external environment of the organization. External environment is viewed as the degree of predictability where the changes in the environment are difficult to predict. The predictability of the environment could be due to the condition of instability and turbulence (Duncan, 1972; Miles & Snow, 1978). Perceived environmental uncertainty occurs when administrators perceive an organization's environment to be unpredictable. As such, by environmental uncertainty, it means the unpredictability in the actions of the task environment comprising customers, suppliers, competitors, labor unions, and regulatory groups (Duncan, 1972; Bourgeois, 1985).

PEU was measured using a 28-item instrument. Of the 28 items, 22 items were adapted from Miles and Snow (1978) and the remaining 6 items adapted from Gordon and Narayanan (1984). Different items from different authors were chosen in order to provide comprehensive and precise questions related to environmental uncertainty. Some of the items in the questionnaire were modified into a new format and were not taken as they are in the original instruments. The 28 items were supposed to measure the respondents' perceptions on the predictability of various aspects of their organisation's suppliers, competitors, customers, financial/capital markets, government regulatories, labour unions, and economics, politics, and technology. However, in the data analysis, labour unions section was excluded as not many Malaysian manufacturing firms have labor unions. All of the items were measured on a seven-point Likert-type scale (varying from "highly predictable" to "highly unpredictable"). The aggregate mean of the seven components served as the overall perceived environmental uncertainty score for a firm. The Cronbach alpha coefficient was .88, exceeding the lower limit of acceptability which is usually considered to be .70 (Nunnaly, 1978). Reliability measures and descriptive statistics are shown in Table 3.

3.2.2 BSC Measures Usage.

The BSC measures were assessed using the 29 items comprising four dimensions: financial, customer, internal business process, and innovation and learning. Twenty items were taken from Hoque *et al*. (2001), which is originally adopted from Kaplan and Norton (1992). The remaining nine items were self-constructed. The respondents were asked to indicate the extent of their use of each indicator across the four dimensions using a seven-point Likert-type scale ranging from one (not at all) to seven (to a greater extent). It is worth to mention that this is the extent of usage of each measure, not the actual performance for that measure. Table 1 presents the 29 performance measures that were originally included in the questionnaire.

A principal components analysis (PCA) with varimax rotation was performed for BSC measures to determine their groups according to the BSC's four perspectives. Prior to performing PCA, the suitability of data for factor analysis was assessed. An inspection of the correlation matrix revealed the presence of many coefficients of .30 and above, suggesting that factor analysis is considered appropriate (Pallant, 2001). The Barlett Test of Sphericity and Kaiser-Meyer-Olkin (KMO) were also used to assess the factorability of the data. The results indicate that the Barlett Test of Sphericity (Bartlett, 1954) reached statistical significance (Chi-Square = 929.65, $p < .01$) and the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was .76, exceeding the recommended value of .60 (Kaiser, 1974). These results suggest that the factorability of the data is considered appropriate. After several runs of factor analysis, a total of 12 items were deleted from the analysis. These items were: customer loyalty, rate of material scrap loss, EVA, ROI, cash flows, manufacturing costs, employee training, employee satisfaction, materials efficiency, setup and changeover time, defect rate, and market share. As a result, five component factors were extracted with eigenvalues exceeding one, explaining a total of 71.9% of the variance, with Component 1 contributing 17.95%, Component 2 contributing 14.53%, Component 3 contributing 14.44%, Component 4 contributing 12.77%, and Component 5 contributing 12.20% (see Table 2 for the results of factor analysis).

Table 1: BSC Measures

Dimensions	**Performance Measures**
Financial	Sales Revenue Operating income Sales growth Manufacturing costs Cash flows Return on investment (ROI) Economic value added (EVA)
Customer	On-time delivery Customer response time Number of customer complaints Survey of customer satisfaction Market share Customer loyalty Number of overdue deliveries % of shipments returned Number of warranty claims
Internal Business Process	Manufacturing lead time/cycle time Defect rate Ratio of good output to total output Materials efficiency variance Labour efficiency variance Rate of material scrap loss Setup and changeover time Flexibility
Innovation and Learning	Employee training Employee satisfaction Number of new product launches Time-to-market new products Number of new patents

The interpretation of the five-factor solution was accomplished by relating them to the theoretical concepts of BSC. The first and fifth factors seem to fit well with the performance measures relating to customer. Theoretically, all the performance measures such as percentage of shipments returned, number of overdue deliveries, number of warranty claims, number of customer complaints, on-time delivery, customer response time, and survey of customer satisfaction suggest a strong tie with customers. Thus, Factor 1 and Factor 5 were combined together and were referred to as

Table 2: Results of the Principal Component Factor Analysis for the BSC Measures

Component	Items	Factor Loadings	Eigenvalue	Percentage of Variance Explained
1	% of shipments returned	.840	5.58	17.95
	Number of overdue deliveries	.839		
	Number of warranty claims	.817		
	Number of customer complaints	.777		
2	Manufacturing lead time/cycle time	.836	2.24	14.53
	Ratio of good output to total output	.830		
	Labour efficiency variance	.659		
	Flexibility	.540		
3	Time-to-market new products	.875	1.84	14.44
	Number of new product launches	.849		
	Number of new patents	.815		
4	Sales revenue	.910	1.42	12.77
	Sales growth	.840		
	Operating income	.640		
5	On-time delivery	.840	1.15	12.20
	Customer response time	.811		
	Survey of customer satisfaction	.654		

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 6 iterations.

"Customer". Factor 2 reveals the performance measures that are highly related to enabling the internal business processes and operations. Under this factor, performance measures like manufacturing lead time, ratio of good output to total output, labour efficiency variance, and flexibility were combined together and named as "Internal Business Process". Factor 3 shows that time-to-market new products, number of new product launches and number of new patents stood out to be related to one another in a way that can be termed "Innovation and Learning". Factor 4, with the combination of sales revenue, sales growth and operating income, captures the essential elements of financial measures. Thus, Factor 4 was referred to as "Financial". Four dimensions were identified as financial, customer, internal business process, and innovation and learning. A reliability check for the four dimensions of BSC measures produced Cronbach alpha values all above the lower limits of normal acceptability (financial = .75, customer = .84, internal business process = .80, and learning and

growth = .85, overall BSC = .86). Reliability measures and descriptive statistics are shown in Table 3. A mean score was calculated for each of the four perspectives, and an aggregate mean was calculated to represent an overall BSC usage. Overall rather than individual dimension was used in the analysis as to reflect the multiple performance measures of a scorecard.

3.2.3 Firm Performance.

The measurement of firm performance was captured by using both financial and non-financial indicators. As obtaining the actual and objective financial and non-financial data was rather difficult and in some cases were impossible when firms surveyed were not necessarily public listed firms, thus, actual performance was measured using the perception of the respondents. Firm performance was measured by a self-rating scale using 12 indicators taken from Mia and Clarke (1999) and Govindarajan (1984). Five indicators taken from Mia and Clarke (1999) were: productivity, costs, quality, delivery schedule, and market share. While those taken from Govindarajan (1984) were: sales growth rate, operating profits, cash flow from operation, return on investment, new product development, R&D activities, and personnel development. An advantage of this multiple indicators approach is that it incorporates all aspects of quantitative and qualitative, financial and non-financial performance in the assessment (Mia & Clarke, 1999). Respondents were asked to identify the changes in the performance indicators in the last three years using the scale of 1 to 7 (decreased tremendously = 1, no change = 4, and increased tremendously = 7). Recent improvements in *actual* firm performance as perceived by the respondents were measured. The 12 items were later reduced to two performance indexes called financial and non-financial performance by taking mean scores of each. Cronbach alpha values for financial and non-financial performance are .81 and .79 respectively, indicating high internal reliability for the scale (Nunnally, 1978). Reliability measures and descriptive statistics are shown in Table 3.

4.0 Results

4.1 Pearson-Moment Correlations

Table 4 displays a correlation matrix using the Pearson product-moment coefficient for all variables. From Table 4, many variables were able to show significant bivariate relationship with each other. Perceived environmental uncertainty (PEU) shows a significant negative correlation with internal business process ($r = -.23$, $p < .05$) and financial performance ($r = -.25$, $p < .01$). Several BSC dimensions are significantly correlated with each other, suggesting that multicollinearity is likely to exist. However, according to Pallant (2001), $r = .90$ and above indicating that variables are highly correlated. From Table 4, none of the correlation coefficients is greater than .90. Also,

Table 3: Reliability Measures and *Descriptive Statistics (n = 120)*

	Minimum	Maximum	Mean	Std. Deviation	Cronbach Alpha
PEU	1.76	5.24	3.51	.66	.88
BSC measures:					
Financial	3.67	7.00	5.98	.78	.75
Customer	2.57	7.00	5.33	1.08	.84
Internal business process	2.00	7.00	5.30	1.10	.80
Innovation and Learning	1.00	7.00	3.99	1.57	.85
Overall BSC Performance:	3.17	7.00	5.20	.82	.86
Financial	2.00	7.00	4.49	.94	.81
Non-financial	3.14	7.00	5.08	.74	.79

Table 4: *Correlation Matrix.*

Variables	1	2	3	4	5	6	7	8
1.PEU	1.00							
BSC Measures:								
2.Financial	-.15	1.00						
3.Customer	-.14	.30**	1.00					
4. Internal business	-.23*	.28**	.54**	1.00				
process	.01	.05	.26**	.38**	1.00			
5. Innovation and	-.16	.44**	.85**	.79**	.62**	1.00		
Learning								
6. Overall BSC								
Performance:								
7. Financial	-.25**	.04	.18	.31**	.39**	.34**	1.00	
8. Non-financial	-.16	.18	.36**	.47**	.53**	.56**	.70**	1.00

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

* Correlation is significant at the 0.05 level (2-tailed)

after performing tolerance and variation inflation factor (VIF) tests, none of these tests detected multicollinearity among the variables (VIF< 10, Hair *et al,* 1998). Thus, it can be reasonably concluded that there is no potential major problem for regression analysis. Findings from Sim and Koh's study (1999) show that there are correlations among the four perspectives of the BSC as well as the inter-correlation within the perspectives themselves. The correlations between the four perspectives are expected as these perspectives are linked by the cause-and-effect relationships. Although the cause-and-effect is difficult to prove, but the strong association between the four perspectives suggests the existence of such relationship. The results show that innovation and learning perspective is significantly correlated with internal business process perspective (r = .38), internal business process perspective is significantly

correlated with customer perspective(r = .54), and customer perspective is significantly correlated with financial perspective (r = .30).

4.2 Hypothesis Testing

Baron and Kenny (1986, pg. 1176) argued that "In general, a given variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion. While moderator variables specify when certain effects will hold, mediators speak to how or why such effects occur". To test for mediation, a series of regression analyses was performed as recommended by Baron and Kenny (1986) and Judd and Kenny (1981). The following regression equations were used:

$$Z = \alpha_0 + \beta_1 X + e$$
$$Y = \alpha_0 + \beta_2 X + e$$
$$Z = \alpha_0 + \beta_3 X + \beta_4 Y + e$$

X = Perceived environmental uncertainty (PEU) (independent variable)
Y = Overall BSC measures usage (mediator)
Z = Performance (financial and non-financial) (dependent variable)

To establish mediation, three conditions must hold. First, the independent or predictor variable (PEU) must significantly affect the dependent or criterion variable (performance) in the first equation. Second, the independent variable must significantly affect the mediator (BSC measures usage) in the second equation. Third, the mediator must significantly affect the dependent variable in the third equation. The mediator must be controlled in establishing the effect of the mediator on the dependent variable. Perfect or full mediator effect holds if the independent variable has no significant effect on dependent variable when the mediator is controlled. Partial mediator effect holds if the effect of the independent variable on the dependent variable is lesser in the third equation than in the first equation when the mediator is controlled.

Table 5 through Table 7B show the summary results of the regression analyses. As shown in Table 5, PEU was found to have a significant effect on both financial ($\beta = -.25$, $p < .01$) and non-financial performance ($\beta = -.16$, $p < .10$), indicating that there is a significant relationship to be mediated. Thus, the first condition for mediation was met. When BSC measures usage (mediator) was regressed on PEU, the results in Table 4 reveal that the effect of PEU on BSC measures usage was also significant ($\beta = -.16$, $p < .10$). Thus, the second condition was met as well. Table 7A and Table 7B show the results of regression when both BSC measures usage and PEU are regressed together. In this regression model, the mediator was controlled to establish the effect of the mediator on the outcome.

Table 5: Performance Regressed on PEU

	Financial Performance			Non-financial Performance		
	R^2	F	β	R^2	F	β
	.06	7.69		.02	2.96	
PEU			-.25**			-.16*

* p < .10, ** p < .01

Table 6: BSC Measures Usage (Mediator) Regressed on PEU

	R^2	F	β
	.02	2.91	
PEU			-.16*

* p < .10

Table 7A: Performance Regressed on BSC Measures Usage (Mediator) and PEU

Financial Performance						
	R^2	R^2 Change	Sig. F Change	F	β	Sig.
Step 1	.11	.11	.00	14.93		.00
BSC Measures Usage					.34	.00
Step 2	.15	.04	.02	10.44		.00
Control Variable: BSC Measures Usage					.30	.00
PEU					-.20	.02

Table 7B: Performance Regressed on BSC Measures Usage (Mediator) and PEU

Non-financial Performance						
	R^2	R^2 Change	Sig. F Change	F	β	Sig.
Step 1	.32	.32	.00	54.98		.00
Control Variable: BSC Measures Usage					.56	.00
Step 2	.32	.01	.36	27.87		.00
BSC Measures Usage					.55	.00
PEU					-.07	.36

Results in step 1 in Table 7A and Table 7B show that BSC measures usage significantly affects both financial and non-financial performance, thus meet the third condition for mediation. As shown in Table 7A, when BSC measures usage was controlled, the effect of PEU on financial performance is significant but beta coefficient (-.20) is lower than that shown in Table 5 (-.25). Thus, there is evidence for partial mediation effect.

Meanwhile, results in Table 7B indicate that when BSC measures usage was controlled, the effect of PEU on non-financial performance is not significant and its beta coefficient (-.07) is almost zero, indicating that the relationship between PEU and non-financial performance is fully mediated by the BSC measures usage. These results provide support for the hypothesis.

5.0 Discussion of Findings and Limitations

The results provide ample evidence on the role of multiple performance measures usage, such as BSC measures, on the relationship between perceived environmental uncertainty and firm performance. When the relationship between perceived environmental uncertainty and firm performance exists, at least partly through the use of BSC measures, then the use of BSC measures plays the mediating role between perceived environmental uncertainty and firm performance. The results also indicate that the degree of PEU and the extent to which firms use BSC measures are important in determining firm performance. There is a negative and significant relationship between PEU and performance, indicating the lower the degree of PEU, the higher the performance is. This outcome seems to be consistent with Khandwalla's (1972) findings where he reported a negative correlation between the firm's profitability and the level of product price and marketing channel competition which is considered as one element of PEU.

There is a positive and significant relationship between BSC measures usage and performance, suggesting that the greater use of BSC measures is associated with improved firm performance. Besides, support was also found for PEU to be an important predictor of the BSC measures usage. However, the results suggest that higher degree of PEU is associated with lower usage of BSC measures which is rather contrast with the literature on MAS information. The results suggest that firms which face lower environmental uncertainty tend to use more multiple performance measures covering both financial and non-financial measures. In this light, even though the use of BSC measures plays the mediating role between perceived environmental uncertainty and firm performance, the results are not consistent with previous studies that relate PEU to the use of broad scope management accounting system (MAS) and performance (e.g. Mia, 1993; Gul and Chia, 1994; Gordon & Miller, 1976, Gordon & Narayanan, 1984; Chenhall & Morris, 1986; Govindarajan, 1984). However, the findings on the negative relationship between PEU and the usage of BSC measures seem to be rather consistent with those findings reported by Hussain and Gunasekaran (2002) and Burney (1999) when considering that BSC is predominantly non-financial in nature. Burney (1999) reported that negative or hostile economic conditions (one element of PEU) apparently create higher pressure on management to increase profitability by using more financial performance measures, thus make it more difficult to focus on improving and measuring non-financial performance. Likewise, Hussain and Gunasekaran (2002) argued that the uncertainty of economic conditions diverts the improvement and measurement of non-financial performance, and on the contrary, stability increases the possibilities for management to improve and measures non-

financial performance. According to them, greater economic uncertainty increases the pressure on banks and financial institutions to improve financial performance, and thus non-financial performance would be relatively less emphasized.

It is also worth to note that Malaysian environment seems to be not as uncertain as the western environment highlighted in the literature. In relation to this, Kuruvilla (1996) noted that Malaysian firms faced with a stable economic environment given the rapidly growing economy and the domestic competition is not so threatening. Perceived environmental uncertainty is rather low, (indicated by low mean score and standard deviation) reflecting that Malaysian environment is somewhat stable which could be due to the small market of Malaysia. Perhaps the pegging of the ringgit (Malaysian currency), no major technological break-through, political stability as well as no major changes in government policies and regulations make managers feel the business environment is more stable and predictable. Such condition could result in managers having more access to information needed to make decisions (as reflected by the greater use of BSC measures) and confidently assign probabilities to the outcomes of the decisions. Given the low uncertainty in the Malaysian environment, managers are able to predict external environment accurately because of the information given by the greater use of BSC measures which in turn lead to increase in performance. The findings suggest that under stable conditions and given the availability and greater use of multiple performance measures, the easier it is to prepare targets (e. g. budgets) for the evaluation of firm performance as well as managerial performance and efficiency.

The findings of this study reveal at least three implications. First, firms should use multiple performance measures that emphasize on non-financial measures. However, the use of financial measures should not be disregarded as they are matter to firm performance. Second, it is important for firms to become adaptive and responsive to their environments and understand of the needs of managers for financial and non-financial information that can be communicated through the use of appropriate performance measures. Third, the findings might be useful to the designers of management accounting control systems in understanding how the degree of PEU is indirectly associated with firm performance through the use of multiple performance measures.

There are at least four limitations to the study that are worth noting. First, the instrument for measuring BSC measures usage is rather novel. Only selected BSC measures were used. Thus, other performance measures within the dimensions of financial, customers, internal business processes, and innovation and learning as well as other dimensions of performance measures could be identified in future research. Second, the study focused on PEU only. Besides PEU, other circumstances or contextual variables may be used that require the use of BSC measures. For example, the use of multiple performance measures such as BSC measures may be important in the new manufacturing environment using advanced manufacturing technologies (AMTs) and also useful in executive compensation systems. Third, the study covers only manufacturing industries. Therefore, any generalization of the results to other industries

requires caution. Future studies could be conducted within service industries or public sector organizations so that more understanding on the use of multiple performance measures in different settings could be gathered.

6.0 Conclusion

The purpose of this paper is to contribute to the limited body of knowledge concerning the uses of multiple performance measures and how it mediates the relationship between PEU and performance. The overall conclusion to be drawn from this data is that perceived environmental uncertainty exhibits a negative influence on the usage of BSC measures in the Malaysian context and setting. Although the results are less consistent with the previous studies, the study offers additional empirical evidence on the mediating role of BSC measures in the relationship between PEU and firm performance. The results suggest that there is a negative and significant indirect effect between PEU and performance through the extent to which BSC measures is used. This suggests that as PEU is low, the firms make greater use of BSC measures in order to improve firm performance.

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