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An Empirical Test of Cause and Effect Relationships among Measures in Balanced Scorecard (BSC): Evidence from Multivariate Granger Causality

¹Zainuridah Yusof, ²Wan Fadzilah Wan Yusoff, ³Faridah Maarof and ⁴Aye Aye Khin

¹Senior Researcher, Analytics & Computation Lab, Telekom Malaysia Research & Development Sdn. Bhd., TM Innovation Centre, Lingkaran Teknokrat Timur, 63000 Cyberjaya, Selangor, Malaysia.

²Professor, Dean of Graduate School of Management (GSM), Multimedia University, Jalan Multimedia, 63100 Cyberjaya, Selangor, Malaysia.

³Executive Director, Institutional Research & Planning, Canadian University of Dubai, P. O. Box 117781, 1st Interchange, Dubai, United Arab Emirates.

⁴Lecturer, Faculty of Management, Multimedia University, Jalan Multimedia, 63100 Cyberjaya, Selangor, Malaysia

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ABSTRACT

Background: Few performance measurement systems (PMS) are in use today such as Balanced Scorecard (BSC), Performance Prism and Performance Pyramid. The most widely adopted PMS is the BSC which is framework that translates the organization's strategy into a set of achievable performance indicators. The uniqueness of BSC that differentiates it from other PMS is strategy map that has a unidirectional causality following the bottom top approach. However, BSC holds shortfalls despite its apparent popularity. The criticisms on the causality in BSC have been widely discussed whether they are based on the statistical tested, logical or assumptions. Well-developed causal models are valuable for improving business performance, predicting and decision making to foresee how action affects future performance. Therefore, the relationship between measures should have notion of causality. **Objective:** To find out whether cause and effect relationship in BSC at the research site exists or not using statistical analysis test of causality. In seeking empirical evidence of causality linkages in BSC, a theoretical framework which consists of ten (10) propositions based on the Service Profit Chain (SPC) theory were developed and tested using the econometric causality analysis; Granger causality test on the 45 time series data point extracted from the Business Performance Review report. Prior conducting Granger causality test, the unit root tests were conducted individually onto performance measures to check the nature of the data in terms of the stationary data level. **Results:** Results of the study show insufficiency of well-established causality models as only 40% of the causal linkages were supported by the data and the study suggests existence of bidirectional causality between employee engagement and revenue which demonstrates a significant dynamic relationship. Unidirectional causality significantly existed from revenue to customer satisfaction and from customer growth to revenue. **Conclusion:** The findings are based on a single case study of telecommunication industry in Malaysia. Therefore, the generalization to others companies demands caution and more data are needed to analyze in foreseeing the long term effects. The study contributes to the extant literature on the areas of PMS by analyzing the cause and effect relationships among measures through Econometrics statistical analysis in the context of BSC environment.

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INTRODUCTION

In the last two decades, performance measurement topic has shown increased interest and recognition in the literature. Performance measurement is often discussed and defined in many different ways but it is generally defined as a process to quantify actions taken in terms of efficiency and effectiveness. It may also be defined as a comparison of results against expectations with the objective of improving performance (Rouse and Putterill, 2003).

Balanced Scorecard (BSC):

Corresponding Author: Zainuridah Yusof, Senior Researcher, Analytics & Computation Lab, Telekom Malaysia Research & Development Sdn. Bhd., TM Innovation Centre, Lingkaran Teknokrat Timur, 63000 Cyberjaya, Selangor, Malaysia.

Ph: +60388838940. E-mail: zainur@tmrnd.com.my

Several performance management systems are in use today such as Balanced Scorecard, BSC (Kaplan and Norton, 1996, 2001), the Cambridge Performance Measurement Process (Neely, 1996) and Performance Prism (Neely *et al.*, 2002). However, the most popular adopted among those mentioned is BSC. It is a framework that translates the organization's strategy into a set of achievable strategic objectives cutting across financial and non-financial perspectives. Each objective is measured by a set of key performance indicators. The unidirectional causality or cause and effect relationship is one of the uniqueness that differentiates BSC from any other Performance Management System (PMS) which are reflected in the strategy map. The measures of BSC are unique to the organization especially under Organizational Learning and Growth (OLG) and Internal Business Process (IBP) perspectives. Measures under these perspectives show how the people inside the organization play their role and job in order to support measures under customer, then to financial perspectives respectively. Due to its popularity, BSC is deemed to be the widely used PMS in most organization.

It was claimed by earlier scholar that the effectiveness of BSC model increase with the development of the strategy maps (Lucianetti, 2010) and the performance of the organizations become better with the causal model (Marr and Schiuma, 2003; Othman, 2006; Lucianetti, 2010). Furthermore, it provides the ability to predict as the role of leading indicator in predicting lagging indicator and acts as an effective strategy communication in identifying the best way to achieve strategic performance. By incorporating the ability to predict, causal relations in PMS helps decision makers to anticipate how their actions affects future performance, thus improve the decision making process.

Limitations of Balanced Scorecard (BSC):

Despite its popularity, however, BSC is not without limitations. Criticisms on the causality in BSC have been widely discussed by previous researchers whether they are based on the statistical test, logic or assumptions (Ittner and Larcker, 1998; Norreklit, 1998; Ittner *et al.*, 2003; Malina and Selto, 2004; Bukh and Malmi, 2005; Malina *et al.*, 2007).

Even though few studies imply that organisations with the causal model tend to perform better than the ones that do not (Marr and Schiuma, 2003; Othman, 2006; Lucianetti, 2010), there is scarce attempt to study the extent to which this concept would benefit organisations. Furthermore, there is a dearth of empirical researches which conduct and document the findings on the causality linkages in the BSC. In view of this, it is very apt for an organization to investigate the existence of causal linkages within the BSC framework as suggested by the BSC's founder concerning the unidirectional causality in a strategy map. Identifying the causal linkages is essential because it provides a platform to identify its predictive capability. Besides, this would enable the organisation to design programmes or initiatives to improve its performance resulting from successful statistical identification of the causal linkages. Therefore, this study undertakes to investigate the existence of any cause and effect relationships in BSC at the research site using statistical analysis test of causality.

Literature Review of Causality in BSC's Measure:

It was found that the assumption of cause and effect in BSC was not based on the statistical causality testing between factors but relied on logic assumption as it has been pointed out that in practice, identification of relationship between measures in BSC merely depends on user's belief instead of testing the actual relationships (Norreklit *et al.*, 2006). It was supported through thorough study on the relationships between customer loyalty to profitability on the Jones and Sasser (1995) model (Norreklit, 1998). Results from previous studies found that the relationships between customer satisfaction and loyalty to revenue in BSC were not represented by causal relationship but based on logical relationships instead (Ittner and Larcker, 1998; Ittner *et al.*, 2003). Customer loyalty was perceived by earlier scholars as the most important driver of long-term financial performance as the high level of customer satisfaction would increase customer loyalty (Reichheld and Sasser, 1990). In support of this, it was found that the relationships between customer satisfaction and loyalty is non-linear in nature; only highly satisfied customers remained loyal to the service provider (Heskett *et al.*, 1994; Silvestro and Low, 2007).

Furthermore, it was empirically found that customer satisfaction was not a driver for revenue in corporate business services but significantly positively correlated for small business services (Silvestro and Low, 2007).

There was no sound theory for a model in which relationships were derived from logic. Empirical evidence can provide some guidance in the effort to build such models of which the validation of those relationships can be conducted statistically. Therefore, earlier researchers proposed that a causality test be conducted on the measures in BSC. This concern is very important as only 23% of firms that had built their causal models maintained them (Ittner *et al.*, 2003). Issues of causation between measures in BSC were seldom addressed in research. It was obtained from earlier researches that the relationships between employee engagement or employee satisfaction to revenue and vice versa showed only correlation relating to both variables and not due to causation (Clark, 2003). Furthermore, this finding was supported empirically that the causation should strongly run both ways. The linkages between employee engagement and financial report (revenue) needed to

determine, in order to test the relationship, whether engaged employee is accountable for the success of a company or do successful company spur employee engagement (Grant, 1998).

The usefulness in predictions of Performance Management Model (PMM) depends on how reliable the cause and effect relationships. Thus, the usefulness of BSC highly depended on how reliable the cause and effect relationships in the strategy maps. The existence of causal model or causal linkages in strategy maps was empirically proven by earlier researchers to be essential to the organization (Ittner and Larcker, 2001; Speckbacher *et al.*, 2003). In support, it was found empirically that organisations that adopt BSC with causal model and utilize it performed better than the one that did not have nor use it (Marr and Schiuma, 2003; Othman, 2006; Lucianetti, 2010). It was also found that the effectiveness of the BSC was reduced due to the lack of development of strategy maps for those organisations that used BSC as PMM (Lucianetti, 2010). The same study also found that only 63% of respondents were visualising causal links of their strategy through the use of cause and effect diagram available in the strategy maps.

Even though a causal model is one of the main characteristics of the BSC approach, inexplicably, a study revealed that only half of the companies that used BSC were able to develop causal models (Speckbacher *et al.*, 2003). In support of this, it was reported by Davis and Albright (2004) that 77% of the companies adopting BSC are not able to develop a causal model of their strategy. The previous findings seem to be in line with the concerns given by earlier researchers as stated below. Studies revealed that companies that adopt BSC without having strategy map models reasoned that they faced problems in describing the cause and effect relationships (Malmi, 2001). This was due to inadequate empirical evidence on how the construction of the cause and effect relationships were done in the strategy map of BSC (Ittner and Larcker, 2001). From the identified evidences with respect to the cause and effect relationships, it was really important to identify the existence of causal model in strategy map, as suggested by earlier researches (Grant, 1998; Ittner and Larcker, 1998; Norreklit, 1998; Harter *et al.*, 2002; Clark, 2003; Ittner *et al.*, 2003; Marr and Schiuma, 2003; Othman, 2006; Lucianetti, 2010). Hence, the cause and effect relationships between internal processes and the desired outcomes has to be identified from the beginning (Othman, 2008).

Due to the need of causality study in order to explore the relationships between measures in PMM, two previous researchers investigated whether the assumption of linkages in PMM was derived by logical, finality or cause and effect relations, using statistical causality tests (Malina and Selto, 2004). The statistical causality test used in their research was econometric analysis called Granger causality tests (Granger, 1969). The study revealed no statistical evidence of causal relations but there was statistical evidence to support that linkages in PMM were based on logical and finality. However, as their study was limited to only 17 quarters data point, further research was proposed to cater for a larger data which may reveal that the cause and effect relationship among performance measures could be statistically significant. Due to that, another study with the same objective and methodology was conducted using the Granger causality tests on the historical data of PMM with 31 quarterly data points from 1997 to 2005 (Malina *et al.*, 2007). However the findings were still as previously, i.e. no evidence of statistical causality linkages among performance measures in the PMM.

Granger Causality Test:

Recent studies on validating the cause and effect relationships in the BSC were conducted by Bento *et al.* (2012) who employed stepwise regression analysis to obtain empirical support in testing the cause and effect model in the BSC using survey data from 332 companies. From this study, it was found that the learning and growth, internal and customer perspectives gave a significant direct impact on the financial perspective. However, even though this study claimed to concentrate on testing the cause and effect relationships in BSC, in some way, it was more on studying the relationships and not the causality between performance measures. Therefore, it was suggested that other features of the BSC also be tested using longitudinal test to identify the time lag needed for leading indicators to translate into lagging indicators. The suggested method is supported by studies previously conducted by Malina and Selto (2004) and Malina *et al.* (2007). Taking this into consideration, therefore, the data used in this study was longitudinal data or time series data. Thus, the Granger causality test was chosen for identifying the evidence of causal relations among measures in BSC.

Granger causality test from econometrics analysis is widely used by previous researchers to establish the causality between economic factors (Foresti, 2006; Omachonu *et al.*, 2008; Chimobi and Uche, 2010; Kundan and Gu, 2010; Tang, 2010; Salman and Jinnah, 2011; Rossini and Kupke, 2012) with many more studies from around the world. In Malaysia, the Granger causality test was employed to study the relationship between health spending, income and health price. The study indicated that the unidirectional causality existed from health spending and health price while bidirectional causality is between income and health price (Tang, 2010).

The study whether the relationships among performance measures are based on causality or not is not exclusive to PMS, including the BSC, as causal relationships in a strategy map are the key features that differentiate the BSC from other PMSs. In a strategy map, unidirectional relationship is clearly known for its bottom-up approach. However, the cause and effect relation performance measures in BSC was found to be empirically refutable by earlier researchers (Ittner and Larcker, 1998; Norreklit, 1998, 2000). Therefore this

study was conducted as an extension of the research by Malina and Selto (2004) and Malina *et al.* (2007) to extend and contribute to the literature on empirical findings in works related to cause and effect relationships in PMM, by employing the Granger causality test (Granger, 1969) using 45 time series historical data points from the Business Performance Review (BPR) report at the research site.

Results of the study show insufficiency of well-established causality models as only 40% of the causal linkages were supported by the data and the study suggests existence of bidirectional causality between employee engagement and revenue which demonstrates a significant dynamic relationship. Unidirectional causality significantly existed from revenue to customer satisfaction and from customer growth to revenue. Briefly, in this study, the Granger causality test was conducted on the 45 time series secondary data points extracted from BPR report from April 2008 to December 2011 with 10 propositions tested. Prior to conducting Granger causality test, the unit root tests were conducted individually onto performance measures to check the nature of the data in terms of the stationary data level.

MATERIALS AND METHODS

In this study, a widely accepted service management model known as The Service Profit Chain (SPC) model by Haskett *et al.* (1994) is adopted to explain the phenomenon underlying the causality or cause and effect relationships in BSC. Originally, the SPC is a theory and business model developed by researchers from Harvard University in the mid-nineties (Haskett *et al.*, 1994). It provides a framework to link internal portion (employee) and external portion (customer assessment) to the profitability of the firms. In particular, relationships between firm's profitability, customer and customer satisfaction, engagement or satisfaction and productivity of employees have been established through the SPC framework. It provides an integrative framework for understanding how the investments made by the company into service operations are related to employee satisfaction, customer perceptions and behaviours which in turn drives profit. The framework emphasised that employees who are satisfied and motivated would bring out satisfied customers with a tendency to purchase more, thus in turn increases the revenue and profit of the organisation. In this study, only the portion that links employee engagement to employee productivity or customer service charter, customer satisfaction, customer and revenue or profitability were matched with the research site's 2011 scorecard and were selected as a scope of the study.

A theoretical framework consisting of ten (10) propositions was developed and tested to provide evidence for the cause and effect relationships among measures in BSC. The framework is mainly based on The SPC theory (Haskett *et al.*, 1994) and others empirical findings. Without the theory, the econometrics analysis cannot be conducted to establish the statistical evidence from the cause and effect relationships. Most discussion on the relationships in the SPC model focuses on the correlation analysis instead of causation. There were plenty of arguments on the existence of causality in the said model and modest study on the causation conducted previously. In order to find out whether cause and effect relationships in BSC at the research site exists or not, a statistical analysis test of causality was conducted on the archival data using statistical causality analysis. Based on the research framework, as illustrated in Figure 1 below, the propositions were developed mostly based on the correlation relationships that were found from previous studies but with very little to causation.

Propositions Development:

Admittedly, employee engagement is an important variable in order to ensure the survival of the organisation in terms of the profitability. Organisations with disengaged employees seem to have lower productivity, inefficient and experience high employee turnover. The relationship between employee engagements with other variables is thoroughly discussed and ascertained empirically in terms of correlation and not much to causation. The relationships between employee engagement to customer satisfaction, productivity, profit, employee retention and employee safety were studied using Meta analysis approach (Harter *et al.*, 2002). The study reveals that the relationship of employee engagement to productivity and profit are positively correlated with low magnitude whilst relation of employee engagement to customer satisfaction, employee retention and employee safety are positively correlated with high magnitude.

Findings from studies on service management showed that, as employees become engaged with their work, it increases their commitment, thus improve productivity. As productivity increases, it leads to the improvement in service quality which in turns drive customer satisfaction (Haskett *et al.*, 1994). The same study on this relationship suggests that employee engagement is directly related to financial performance (Pfau and Kay, 2002). Indeed, a study from Tower Perrin Global Workforce Group (2009) indicated that companies with high employee engagement had a 19% increase in operating income and almost a 28% growth in earnings per share. However, issues of causation were not often addressed in research. Clark (2003) found the relationship between employee engagement and satisfaction to revenue and vice versa showed the correlation relates only to both variables and not due to causation. This was supported by Grant (1998) that the causation should strongly run both ways, the linkages between employee engagement to financial report (revenue), in order to test the

relationship of whether engaged employees is the cause of a company's success or, does a successful company encourages employee engagement. Another study on the same issue showed that employee satisfaction affects the financial results and a company with higher financial metrics affects employee satisfaction result as well. However, the model only showed the correlation and not causation between variables. Harter *et al.* (2002) also suggested that a causal model should be developed to explore the relationship of employee engagement to those variables; customer satisfaction, productivity, profit, employee retention and employee safety, that later impacting financial outcome.

Integrity Healthcare Services (2009) reported that customer satisfaction has a direct correlation to customer growth through word of mouth among customers. It is supported that better customer satisfaction leads to the positive verbal communication, thus in turn leads to customer growth (Luo and Homburg, 2007). This directly supports the study that high customer satisfaction leads to growth in customer-base. Deep insight into customer behaviour is very important and the company should study where and how customers perceive the product or services value given by the service provider. Therefore, the corporate programmes should be designed carefully by the company to suit the customers to ensure that these programmes are able to attract new customers while retaining existing customers, ultimately leading to the increase in revenue (Lev *et al.*, 2010). This directly supports the notion that customer growth leads to better financial performance. However, the reverse is not true, where increase revenue does not necessarily bring in new customers (Icebridge-Strategic-Sales-Consulting, 2007).

A few studies were conducted to identify the relationship between customer satisfaction and financial performance which drew the conclusion that customer satisfaction theoretically, is a driving measure of financial performance, revenue growth (Ittner and Larcker, 1998; Luo and Homburg, 2007; Yoo and Park, 2007; Lev *et al.*, 2010). In addition to that, satisfied customers do tend to recommend services or product to others, which in turn increase the financial gains. However, service quality and customer satisfaction do not always lead to better financial performance (Ittner *et al.*, 2003). There is no relationship observed between customer satisfaction and revenue in corporate business service, but significant positive correlation in small business service sector (Silvestro and Low, 2007). Their study also showed that there is non-linearity relationship between customer satisfaction and loyalty, i.e. only highly satisfied customer will remain loyal to the service provider. Even though the study carried out by Ittner and Larcker, (1998) demonstrate that improving service quality and customer satisfaction is associated strongly with financial performance as revenue grow resulting from improved customer satisfaction however, the relationship does not represent a causal relationships (Ittner and Larcker, 1998; Ittner *et al.*, 2003). It has been suggested by previous researchers that the causal model should be developed to explore the generalisation of how employee engagement affect the short terms outcomes, and how customer satisfaction result in financial performance (Harter *et al.*, 2002). This directly supports the usefulness of causality linkages identification from customer satisfaction to revenue and vice versa.

Data and Tests:

For testing the causality linkages among measures, the data or information related to this study was collected from April 2008 to December 2011 and monthly time series for employee engagement, customer service charter (CSC) or productivity, customer satisfaction, customer growth and revenue were extracted from BPR report at the research site. The Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) methods were employed to ascertain existence of the stationary in the series followed by the Granger causality test to identify the cause and effect relationships among the variables. For this study, E-Views 7.0 Microsoft package was employed to conduct such tests.

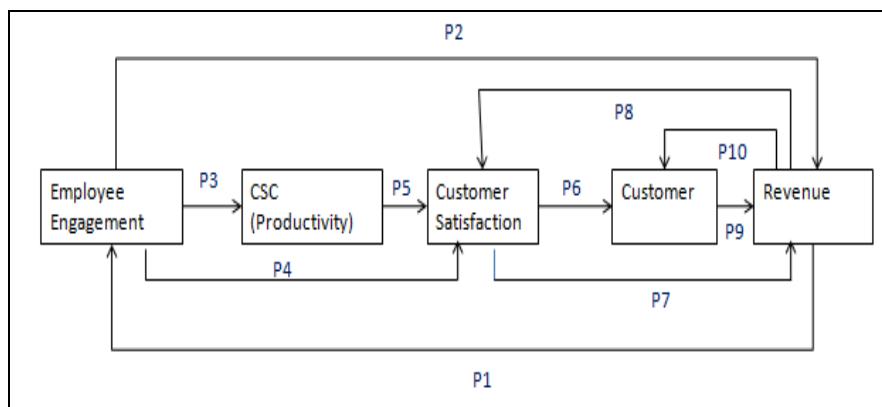


Fig. 1: The Theoretical Framework of the Cause and Effect Relationship between BSC Measures.

Figure 1 above illustrates a research framework that analyses the cause and effect relationship between outcomes measures in BSC. The cause and effect is adapted from a conceptual framework in the service management, the SPC (Haskett *et al.*, 1994) model and the empirical study done by previous researchers (Grant, 1998; Ittner and Larcker, 1998; Harter *et al.*, 2002; Pfau and Kay, 2002; Clark, 2003; Harter *et al.*, 2003; Ittner *et al.*, 2003; Vance, 2006; Icebridge Strategic Sales Consulting, 2007; Luo and Homburg, 2007; Silvestro and Low, 2007; Yoo and Park, 2007; Integrity Healthcare Services, 2009; Tower Perrin Global Workforce Group, 2009; Lev *et al.*, 2010). The methods used in this study are briefly explained in the subsequent sections together with their findings.

Results:

A unit root test is a statistical method to test whether a time series variable contains unit root and thus making the series is non-stationary if it does (Gujarati and Porter, 2009). Otherwise, the series will be categorised as stationary. In this study, the ADF and PP tests were conducted for each series of measures or variables involved; revenue (R), customer growth (CG), customer satisfaction (CS), customer service charter (CSC) or productivity and employee engagement (EE). If H_0 was rejected, that means the series were stationary, otherwise, it is non-stationary instead. Empirical evidence shows that most of the macroeconomics time series are non-stationary at level and most of them are stationary after first differencing (Nelson and Plosser, 1982; Chimobi and Uche, 2010; Tang, 2010). In brief, Unit Root tests are needed to determine which level of variables are stationary or the order of integration of the variables, either at first order, second or more. It may provide spurious regression results if the variables are non-stationary (Granger and Newbold, 1974; Philips, 1985). To avoid this, the order of integration for each series of variables needs to be determined. Below is the equation of the unit root test:

$$\Delta Y_t = \alpha + \delta Y_{t-1} + e_t \quad (1)$$

Where α is a constant and e is error term (white noise error term), the Null and alternative hypotheses for each variable involved for unit root test are:

H_0 : Series contains a unit root (Non-Stationary), $\delta = 0$

H_a : Series does not contain a unit root (Stationary), $\delta \neq 0$

Table 1: The Results of Unit Root Tests Using ADF and PP.

Variable	Level		First Difference		Second Difference	
	ADF	PP	ADF	PP	ADF	PP
CS t-value (p-value)	-2.73* (0.078)	-4.163** (0.0021)	-6.67*** (0.0000)	-10.7*** (0.0000)		
R t-value (p-value)	-5.243*** (0.0001)	-5.243*** (0.0001)				
CSC t-value (p-value)	-2.195 (0.2110)	-2.189 (0.2130)	-7.280*** (0.0000)	-7.42*** (0.0000)		
EE t-value (p-value)	-4.830*** (0.0003)	-4.86*** (0.0003)				
CG t-value (p-value)	-1.337 (0.6036)	-2.811 (0.0649)	-1.051 (0.7261)	-0.922 (0.772)	-7.90*** (0.0000)	-7.943*** (0.0000)

Note: The asterisks *, ** and *** represent the significant level at 10%, 5% and 1% respectively. ADF and PP refer to Augmented Dickey-Fuller and Philips-Peron unit root tests. Source: Researcher's Estimation using Eviews 7.0.

According to the unit root test results in Table 1 above, the ADF test statistics at significant level of 1% and 5% did not reject the null hypothesis of a unit root at levels for all the variables, except for revenue and employee engagement. While PP unit root test at significant level of 1% and 5% did reject the null hypothesis of a unit root at level for all variables except CSC and customer growth. When the first difference was calculated, both ADF and PP unit root tests consistently rejected the null hypothesis of a unit root strongly at significant level of 1% for customer satisfaction and CSC. Whilst only customer growth variable significantly rejected the null hypothesis of a unit root at second difference. In brief, great significant level of 1%, revenue and employee engagement were stationary at level variables, customer satisfaction and CSC were stationary at first difference variables whilst the customer growth was stationary at second difference variable. Therefore, the Granger causality test was conducted up to the lag of 2.

The Granger causality test, founded by Professor Clive Granger, is a statistical test that is based on prediction and is widely used in economics since 1960s (Granger, 1969). X is said to Granger cause Y if Y can

be better predicted using the historical data of both X and Y. Granger causality test is needed to identify the direction of causality or to test the causal connection between two or more variables. In other words, it is widely used to determine whether the current and lagged value of one variable affects another or in the simplest way, to determine if one time series is useful in forecasting another. The equation of Granger causality test for two variables involve are as below:

$$Y_t = \delta + \sum_{i=1}^k \alpha_{1i} Y_{t-i} + \sum_{i=1}^k \alpha_{2i} X_{t-i} + \varepsilon_{1t} \quad (2)$$

$$X_t = \theta + \sum_{i=1}^k \beta_{1i} X_{t-i} + \sum_{i=1}^k \beta_{2i} Y_{t-i} + \varepsilon_{2t} \quad (3)$$

The equations above show that Y_t depends upon lags of itself and X_t and X_t depends upon lags of itself and Y_t . The hypotheses for the Granger causality test for equations above are:

$$H_0: \alpha_{21} = \alpha_{22} = \dots = \alpha_{2k} = 0 \quad (4)$$

$$H_a: \alpha_{21}, \alpha_{22}, \dots, \alpha_{2k} \neq 0 \quad (5)$$

$$H_0: \beta_{21} = \beta_{22} = \dots = \beta_{2k} = 0 \quad (6)$$

$$H_a: \beta_{21}, \beta_{22}, \dots, \beta_{2k} \neq 0 \quad (7)$$

If H_0 for equation (4) is rejected, then the X_t Granger cause to Y_t . Similarly, the rejection of H_0 for equation (6) indicates that Y_t Granger cause to X_t . If the rejection of H_0 for both equation (4) and (6), then the feedback or bilateral or bidirectional causality between X and Y exist.

Based on the previous study, the number of lags up to four quarters were considered conservative in econometrics analysis since most of the data was in quarterly basis (Malina and Selto, 2004; Malina *et al.*, 2007; Chimobi and Uche, 2010). It is unlikely to take longer than one year for a BSC measure to influence any other measures as the performance measurement is always measured on yearly basis. In addition, the identification of stationary data of variables is part of the criteria to identify the number of lag when conducting Granger causality test. In this study, the Granger causality test was conducted up to lags two since the highest level for variables to become stationary was at second differences. Results for the Granger causality test based on the propositions were illustrated in Table 2 below.

Table 2: The Results of Granger Causality Test.

Proposition of Causality Relationship	F-Statistic	Probability
P1: R does not Granger cause EE ($R \rightarrow EE$)	4.84218	0.0336**
P2: EE does not Granger cause R ($EE \rightarrow R$)	6.51446	0.0146***
P3: EE does not Granger cause CSC ($EE \rightarrow CSC$)	0.31527	0.7315
P4: EE does not Granger cause CS ($EE \rightarrow CS$)	1.15069	0.3272
P5: CSC does not Granger cause CS ($CSC \rightarrow CS$)	1.14994	0.3274
P6: CS does not Granger cause CG ($CS \rightarrow CG$)	0.03846	0.9623
P7: CS does not Granger cause R ($CS \rightarrow R$)	0.08261	0.9209
P8: R does not Granger cause CS ($R \rightarrow CS$)	2.67434	0.0819 *
P9: CG does not Granger cause R ($CG \rightarrow R$)	3.90459	0.0287**
P10: R does not Granger cause CG ($R \rightarrow CG$)	0.08248	0.921
Additional Causal Linkage Identified: EE does not Granger cause CG ($EE \rightarrow CG$)	8.92612	0.0007***

Note: The asterisks ***, ** and * denote statistical significance at the 1%, 5% and 10% level respectively. Source: Researcher's estimation using Eviews 7.0.

Table 2 above presents the results of the Granger causality test based on the propositions as illustrated in Figure 1. It was found that only four propositions were supported significantly by the archival data at the research site; P1, P2, P8 and P9. In details, the study implied that there was bidirectional causality between employee engagement (EE) and revenue (R) and vice versa at significant level of 1% and 5% respectively. Obviously, this was consistent with the suggestion by Grant (1998) that the causation between employee satisfaction and revenue should strongly run both ways. Unidirectional causality significantly existed from revenue (R) to customer satisfaction (CS) and from customer growth (CG) to revenue (R) at 10% and 5% significant levels respectively. However, there was new unidirectional causality discovered in this statistical causality test which was not highlighted in the propositions; employee engagement was a Granger cause to customer growth.

Discussion and Conclusion:

It is essential to establish the causality among BSC performance measures as it is well known to follow the unidirectional cause and effect relationships. Cause and effect relations are important features of BSC depicted in its financial prediction ability and an organizational communication and learning tool. It also acts as a motivation and incentives channel to be given to employees. Furthermore, the causal model is important to PMS for improving business performance as it is empirically proven that a company with causality model performs better than a company without one.

Results from this study show that four propositions were supported at the 1%, 5% and 10% significant levels. The proposition that customer growth is a Granger cause to revenue as denoted by P9 was tested and supported by the results, at the significant level of 5%. This implied the existence of causal linkages between customer growth and revenue. The finding is in line with previous studies on correlation indicating that there is a positive correlation with low magnitude between those two variables (Harter *et al.*, 2002, 2003). Since customer growth was a significant cause to revenue, the organization should develop better marketing strategy to increase the customer growth as this factor would definitely contribute to increases in revenue generated. More studies should be conducted by market research group in identifying factors that might boost the marketing strategy to attract more customers. However, the organisation should not limit itself to only getting new customers since there are costs associated with acquisition of new customers that the service provider has to bear. Retaining existing customers is another important factor that the organisation should be focusing on in order to increase business performance as the cost of retention is much cheaper than getting new ones. Therefore, the organisation should come out with better strategic initiative to make existing customer remain loyal to them.

It was significantly shown that the employee engagement is a Granger cause to revenue and vice versa at significant level of 5% and 1% respectively and as denoted by proposition P1 and P2. This implied that bidirectional causality linkages existed between employee engagement to revenue and vice versa. This indicates that engaged employee accountable to company success and successful company contributed to employee engaged to their work. These findings are consistent with the suggestion by Grant (1998) that any causation between employee satisfaction and revenue should run strongly both ways. Further, from the correlation study, it was found that there is positive correlation with low magnitude between employee engagement and revenue (Harter *et al.*, 2002). In addition, results from the relationship between employee engagement and financial performance also supported by Patterson *et al.* (1997) who used regression analysis instead. Their study discovered that about 12% variation in the profitability between companies is explained by job satisfaction of the employees and where employees' job satisfaction is a component of employee engagement. Thus, the relationship between employee engagement and revenue was consistent with this finding. Another empirical report suggests that there is a 19% increase in operating income from high employee engagement level and declining pattern of more than 32% in operating income with low levels of employee engagement (Towers-Perrin, 2009). In support, it was also found that lowly engagement employees are four times more likely to leave their job than the highly engaged (Ellehuus, 2004). The organization would benefit if it is able to keep employee engagement at high level as has been discovered by Gallup (2013) on the American workplace study using meta analysis research from 2010 through 2012.

It was identified significantly that revenue is a Granger cause to customer satisfaction at level 10% as denoted by P8, thus there was a causal linkage between revenue to customer satisfaction in data of the research site. As the revenue increases, the organisation has the ability to increase the budget allocation for improving the current services, thus, improve customer satisfaction. The organization should decide wisely the appropriate allocation for improving customer satisfaction. However, the cost allocated for improvement customer satisfaction would definitely contribute to the decrease of profit level.

One additional causal relationship was discovered while conducting Granger causality that the employee engagement is a granger cause to customer growth test at 1% significant level. This finding is in line with the empirical research on the relationship between employee engagement and customer growth. The more engaged employees are to their work, the more productive they would be, and the better is customer satisfaction, which

in turn contribute to customer growth (Vance, 2006). This is in support of the results using Meta analysis study by Gallup (2013) that increases in employee engagement level would lead to an increase in the customer level. Although this causal linkage was not included in the proposition testing, this result was still used in establishing the causality linkages among performance measures in BSC.

Overall, findings of this study able to extend the previous research work by Malina and Selto (2004) and Malina *et al*. (2007). Their research investigated the linkages in PMM derived either by logical, finality and cause and effect using 17 and 31 data points respectively. Their studies employed the statistical method, Granger Causality test. Both results remain the same, i.e. no statistical evidence of causal relationships was found in PMM. However, from this study, it was found about 40% of the causality linkages were proven to be statistically significant and exists at the research site using Granger Causality test on the 45 time series data points. In other words, this study identified a greater number of apparent causal relationships than Malina and Selto (2004) and Malina *et al*. (2007) observed. In addition, this study is able to contribute to the SPC theory by narrowing the research gap when studying and identifying the dynamic relationship between measures involved. Dynamic here refers to the relationship that is not only unidirectional but bidirectional as well, where there is a feedback reinforcing mechanism in certain variables involved. As highlighted by Heskett *et al*. (1994) that the relationship between employee engagement and revenue should be in both directions and with a reinforcing feedback. Indeed, this relationship has not been highlighted and tested thoroughly by previous researchers.

Again, it is essential to establish the causality among the performance measure in BSC since it provide a platform for the organisation to identify variables that need to be taken into consideration for prediction. To complement this study in establishing the causality linkages among measures in BSC, therefore, further qualitative research was required to shed light on these issues. Perhaps discover more non-significant cause and effect relationships in future research.

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