The significance of the balance scorecard dimensions with respect to the supply chain strategy

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Abstract

The balanced scorecard (BSC) is a prominent approach used to manage performance in supply chain. However, there is a lack of an agreed upon measures to manage the supply chain performance using the BSC. This might be attributed to the fact that the BSC is context specific and is affected by strategies. Accordingly, this research examines the relationship between supply chain strategies and the BSC dimensions. Survey research was conducted and four regression models were developed. The results indicated that the significance of the dimensions of the BSC differ with respect to the supply chain strategy.

Keywords: Supply chain strategy, Balanced scorecard

Introduction

Today, supply chain management is becoming a widely accepted business model by both academics and practitioners to manage inter and intra organizational relationships. Supply chain members aim to collaborate together in order to satisfy the customers and develop their competitive advantage (Busi and Bititci, 2006, Chopra and Meindl, 2001). Accordingly, business organizations started to realize the importance of managing their performance not only at the organizational level but also at the supply chain level to redirect their efforts towards achieving their strategic goals (Busi and Bititci, 2006).

In 1996, Kaplan and Norton proposed the balanced scorecard with four dimensions, financial, customer, internal business process and learning and growth, as the first attempt to recognize the importance of both financial and non-financial measures to manage the organizational performance. In 2007, Bhagwat and Sharma provided the first attempt to extend the balanced scorecard to measure and manage the performance in supply chains. From that time on, several studies examined how the use of the balanced scorecard could be extended to the supply chain level (Bhagwat and Sharma, 2007; Chia et al, 2009; Bigliardi and Bottani, 2010; Callado and Jack, 2015).

Nevertheless, it seems that there is a lack of an agreed upon measures to manage the supply chain performance using the balanced scorecard. This might be attributed to the fact that the balanced scorecard is context specific and that the measures used should be driven from the organization/supply chain's strategy (Taticchi et al, 2012). Each organization/supply chain should develop its own balanced scorecard measures with respect to its goals and strategy (Chavan, 2009 and Taticchi et al, 2012).

Consequently, this research aims to understand how supply chain strategies affect the significance of the four dimensions of the balanced scorecard.

Literature Review

Supply chain management means partnering with suppliers, customers, designers, research institutes, and so on for gaining a competitive advantage (Gunasekaran et al. 2003, Busi and Bititci, 2006). It emphasizes interdependence among organizations and working collaboratively to achieve better performance in supply chain activities. Successful design and implementation of supply chains reduces cost, improves flexibility, enhances quality, and ensures customer satisfaction (Mellat-Parast, 2013).

However, supply chain members should formulate a strategy in order to combine their core competencies and capabilities to create their unique competitive advantage (Bititci et al, 2005 and Birhanau et al, 2014). Through reviewing previous literature, it could be identified that supply chain strategic orientations varies along a continuum that has efficiency at one end and responsiveness at the other end (Selldin and Olhager, 2007 and Qrunfleh and Tarafdar, 2013).

The term efficiency refers to the ability of a supply chain to compete through minimizing the overall cost of operations and thus giving the customers better selling price (Blackman et al, 2013). A typical efficient supply chain is likely to achieve a smooth flow of activities at a minimum cost (Christopher, 2006, Chopra and Meindl, 2001). The efficiency-oriented strategy aims to efficiently utilize the capacity, obtain scale economies, minimize inventory, etc., resulting in significant cost reductions (Nag et al, 2014 and Blackman et al, 2013).

The core thrust of supply chain responsiveness calls for achieving operational goals while operating in a turbulent environment (Reichhart and Holweg, 2007). In designing a responsive supply chain, the emphasis will be on quick and fast deliveries, better flexibility, better service levels and better ability to react to unforeseen events (Reichhart and Holweg, 2007). Responsive supply chains refer to the capability to be highly innovative, respond to a wide range of quantities demanded; have short lead times, meet high service levels and capability of handling supply chain uncertainty (Bruce et al, 2004; Vachon et al, 2009; Birhanau et al, 2014).

However, the effective implementation of a supply chain strategy requires strategy alignment between supply chain members. Thus, several studies highlighted the importance of performance management systems for successful supply chain management (Beamon, 1999; Gunasekaran et al, 2003; Shepherd and Gunter, 2006; Bhagwat and Sharma, 2007; Chia et al, 2009).

Performance measurement and management

The first step towards measuring performance was first introduced by Globerson (1985) and was primarily concerned with measuring financial indicators at the organizational level. In 1992, Kaplan and Norton proposed the balanced scorecard as the first move from merely measuring performance to a more comprehensive tool to manage performance. Throughout the years, the balanced scorecard emerged as the most influential and the most commonly used approach to measure and manage organizational performance and its success has been reported across many industries (Chavan, 2009).

The balanced scorecard is built on the assumption that using mere financial measures in evaluating the performance of an organization is a bare measure to the consequences of past actions with little reflection to future performance and future value creation (Bhagwat and Sharma, 2007; Chia et al, 2009; Bigliardi and Bottani, 2010). Accordingly, the balanced scorecard enables companies to include measures of performance relating to

customer, internal processes and learning and growth alongside with the financial measures and thus balancing the financial and the non-financial measures in an organization (Callado and Jack, 2015 and Carpinetti et al, 2008).

The balanced scorecard in supply chains

With the emergence of supply chains at the forefront of business strategies, it became critical to success to measure and manage the performance across the whole chain (Bititci et al, 2005, Bigliardi and Bottani, 2010). Supply chain performance management represents a performance model based on mutually agreed upon goals, measures, measurement methods that specify procedures, responsibilities and accountability of supply chain participants (Ramaa et al, 2009).

The first attempt to measure and manage performance across supply chains was introduced by Beamon (1999). Since then, the literature was full of ample attempts to measure performance across the supply chain (Chan and Qi, 2003; Gunasekaran et al, 2003; Shepherd and Günter, 2006; Theeranuphattana and Tang, 2007; Ramaa et al, 2009). However, in 2007, the use of the balanced scorecard to measure the performance was extended to the supply chain level. Nowadays, the balanced scorecard is the most commonly used model in measuring and managing supply chain performance (Chia et al, 2009).

Accordingly, several influential attempts appeared to explicate how the balanced scorecard is implemented in the supply chain context (Bhagwat and Sharma, 2007; Chia et al, 2009; Bigliardi and Bottani, 2010; Callado and Jack, 2015). These attempts converge in defining and acknowledging the role of the four dimensions of the balanced scorecard in better managing supply chain performance. However, they diverge in terms of the significance of each dimension and the elements that underlie each dimension. Each study proposed different measures to capture the performance of the supply chain across the four dimensions of the balanced scorecard.

The main reason behind this might be attributed to the fact that the balanced scorecard is a system that translates strategies into a comprehensive set of performance measures that accordingly provides the appropriate framework for the implementation of the strategy (Punniyamoorthy and Murali, 2008). Hence, it is expected that different organizations/supply chains have quite different needs, market areas, people, products and services. The effective management of supply chains requires careful coordination between supply chain members guided with the strategic orientation of the supply chain (Nag et al, 2014). Thus, each organization/supply chain has significantly different balanced scorecard measures based on their needs and strategy. Each organization/supply chain should develop its own balanced scorecard measures to reflect its goals and strategy (Chavan, 2009). Accordingly, it seems crucial to assess, measure and manage the relationship between supply chain partners with respect to their strategic orientation. It is expected that supply chains with an efficiency strategy will have performance measures that support their efficiency stance while responsive supply chains will have performance measures that help them maintain their responsiveness stance. Accordingly, this research proposes the following hypothesis:

H1: The significance of the four dimensions of the balance scorecard will differ according to the supply chain strategy (efficiency/responsiveness).

Responsive supply chains are concerned with responding quickly to market movements (Vachon et al, 2009). Supply chains with responsive orientations aims to provide customers with a better value in terms of flexibility, quick response, better service levels and better ability to react to unforeseen events. However, customers of a responsive supply chains are ready to accept extra fees to get their value. Thus, responsive supply

chains require decisions from all supply chain members that support their responsiveness orientation. Consequently, it is expected that the significance of the customer perspective in supply chains with a responsive strategy will differ than those of an efficient strategy. Thus the following could be hypothesized:

H1.1 Responsive supply chains will provide higher significance to the customer perspective than efficient supply chains.

Supply chains with an efficient strategy provide their customers with a cost advantage value (Blackman et al, 2013). This is achieved through the efficient management of the supply chain operations and the continuous elimination of waste (Blackman et al, 2013). Thus, efficient supply chain strategy, with its core thrust to minimize cost, requires decisions from all supply chain members that support their efficiency orientation. Consequently, it is expected that the significance of the financial perspective in supply chains with an efficiency strategy will differ than those with a responsiveness strategy. Thus the following could be hypothesized:

H1.2 Efficient supply chains will provide higher significance to the financial perspective of the balance scorecard than responsive supply chains.

The learning and growth perspective defines how the organization continues to improve and create value. The intense global market competition requires continual improvements to the existing products, processes and cost structure. The aim is to facilitate the level of information sharing and employee training in order to achieve superior internal processes and cost efficiency with respect to customers and shareholder's expectations. Consequently, it is expected that the significance of the learning and growth perspective of the balance scorecard will not differ according to the supply chain strategy. Thus the following could be hypothesized:

H1.3 The significance of the learning and growth perspective of the balance scorecard will not differ with respect to the supply chain strategy (efficiency/responsiveness).

The internal business processes determine what the organization must do internally to meet its customers' expectations. Thus managers, regardless of the strategy, need to focus on those critical internal operations that enable them to satisfy customer needs. It focuses on the internal operations that include developing and delivering products and services to the customers. Consequently, it is expected that the significance of the internal business perspective of the balance scorecard in supply chains will not differ according to the supply chain strategy. Thus the following could be hypothesized:

H1.4 The significance of the internal business perspective of the balance scorecard will not differ with respect to the supply chain strategy (efficiency/responsiveness).

Research Methodology

This research started with reviewing the literature of performance management at both the organizational and supply chain level. The aim is to explore how supply chain strategies affect the significance of the four dimensions of the balanced scorecard. Specific management databases, such as Emerald Insight and Science Direct, were investigated to identify articles discussing performance management in supply chains. Abstract and citation search was carried out according to some inclusion and exclusion criteria; language and context. Accordingly, articles written in other language rather than English were excluded. Besides, this research develops particular interest in manufacturing context and thus articles focusing on service supply chains were also excluded. The research unit of analysis is the company as it is considered a major indicator to understand the research argument. Survey strategy was used to empirically validate the research argument due to the exploratory nature of this research project.

Sampling and data collection

The survey population of this study is the database of one of the largest consultancy agencies in Alexandria, Egypt. The database contains around 680 manufacturing companies. From which, 402 companies were with complete information regarding the company name, contact person and e-mail address. Each company was sent a questionnaire targeting the Supply Chain Director/Manager. After two weeks, a reminder e-mail was sent again to non-respondents. In total, 69 questionnaires were returned, constituting around 18 percent response rate. After deleting the cases with missing values for the measures used in this study, 61 usable questionnaires were included in the study.

The non-response bias was tested and the results indicated no substantive problem in the data set. This was done through random follow-up phone calls to non-respondents to understand the reasons of why they declined from participating in this study. The commonly mentioned reasons were the lack of resources and time and loss of interest. Besides, the chi-squared test was employed and its results indicated no significant difference between early and late responses (Forza, 2002).

The construction of the questionnaire

The data required for this study was collected through a questionnaire that was divided into three sections. The first section was intended to collect demographic data. The second section was derived from Selldin and Olhager (2007) to assess the extent to which the company deploy a supply chain strategy that is either efficient or responsive using 8 questions. Respondents were asked to indicate the degree of implementing each of the mentioned items using a five-point Likert scale with "1" indicating "not implemented" and "5" indicating "fully implemented". The third part of the questionnaire was adapted from Bhagwat and Sharma (2007), Chia et al (2009), Bigliardi and Bottani (2010) and Callado and Jack (2015) to measure the extent of importance attached to each performance dimension for a manufacturing firm using 28 questions. Respondents were asked to identify the degree of importance they attach to each element of the balanced scorecard using a five-point Likert scale with "1" indicating "extremely not important" and "5" indicating "extremely important".

The developed questionnaire was first pretested by two academics and two supply chain managers prior to its distribution to check the suitability of the questions and the clarity of the wording. Accordingly, some questions were rephrased and others were completely deleted.

Analysis and results

Validity and reliability of the data

The first step of the analysis was principal component factor analysis with varimax rotation to validate the underlying structure of the balanced scorecard. Based on theoretical assumptions, the researchers limited the number of extracted factors of the BSC to four according to the four dimensions of the balanced scorecard (customer, learning and growth, internal business and financial dimensions). Results of the varimax-rotated analysis indicated that the four extracted factors explained 66.594 percent of the variance. The results of the factor analysis are summarized in Table 1.

Then, another principal component factor analysis with varimax rotation was undertaken to validate the underlying structure of the supply chain strategy. Based on theoretical assumptions, the researchers limited the number of extracted factors to two (SC responsiveness and SC efficiency). Results of the varimax-rotated analysis indicated

that the two extracted factors explained 75.667 percent of the variance. The results of the factor analysis are summarized in Table 2.

Table 1 – Factor analysis of the balanced scorecard

Performance dimension		Component			
		1 Customer	2 Learning and Growth	3 Internal business	4 Financial
Rate of return on investment	PM1				.880
Variations against budget	PM2				.896
Cost per operation hour	PM4		.516		
Customer query time	PM6	.720			
Customer perceived value	PM7	.826			
Order lead time	PM8	.925			
Flexibility to meet particular customer need	PM9	.898			
Delivery lead time	PM10	.769			
Delivery reliability	PM11	.709			
Responsiveness to urgent deliveries	PM12	.814			
Quality of delivered goods	PM13	.877			
Market share	PM14	.679			
Loyalty of customers	PM15	.646			
Accuracy of forecasting techniques	PM17		.498		
Total inventory cost	PM20		.716		
New services and products implemented	PM21			.614	
Waste reduction	PM22			.791	
Supplier rejection rate	PM23			.818	
Frequency of delivery	PM24			.769	
Money invested in employee training yearly	PM27		.868		
Employee satisfaction	PM28		.765		
% of Variance Explained		31.232	13.791	11.849	9.722
Reliability Coefficient		.921	.732	.751	.74

The final step in the analysis was regression analysis to examine the research hypotheses. Model 1 was developed to test hypothesis H1.1 which measures the effect of supply chain strategies (efficiency and responsiveness) on the significance of the customer dimension of the balance scorecard. In model 1, the ANOVA test indicates that there is a significant relationship between supply chain strategies and the customer dimension of the balance scorecard ($p < 0.05$). While the t-test indicated that only the responsiveness strategy has a significant effect over the customer dimension ($p < 0.05$). The model indicated that the efficiency strategy has an insignificant effect on the customer dimension of the balance scorecard. This result supports hypothesis H1.1.

Table 2 – Factor analysis of supply chain strategy

Supply chain strategy element		Component	
		1 Responsiveness	2 Efficiency
Generate high turns & minimizes inventory	SC2		.888
Maintain high average utilization rate	SC3		.908
Maintain excess buffer capacity	SC5	.821	
Significant buffer stock	SC6	.740	
Responding quickly to unpredictable demand	SC7	.928	
Investing aggressively in ways to reduce lead-time	SC8	.879	
% of Variance Explained		47.766	27.901
Reliability Coefficient		.711	.708

Model 2 was developed to test hypothesis H1.2. The ANOVA test of model 2 indicates that there is a significant relationship between supply chain strategies and the financial dimension of the balance scorecard ($p < 0.05$). While the t-test indicated that only the efficiency strategy has a significant effect over the financial dimension ($p < 0.05$). However, the model indicated that the responsiveness strategy has an insignificant effect on the financial dimension of the balance scorecard. This result supports hypothesis H1.2. Finally, models 3 and 4 was developed to test hypothesis H1.3 and H1.4. Model 3 indicates that the relationship between supply chain strategies and the learning and growth dimensions is insignificant and model 4 indicated that the relationship between supply chain strategies and the internal business dimension is insignificant. Accordingly, the results partially support the research hypothesis.

Discussion and conclusions

The research results indicated that the customer dimension of the BSC is significant with the supply chain responsive strategy only. This result support previous studies that indicate that customer needs from a responsive supply chain goes far beyond the costs considerations. Supply chain responsiveness is the ability of the supply chain to deliver customer value in presence of markets with high demand uncertainty (Reichhart and Holweg, 2007). Customers of a responsive supply chains aim to get value in terms of flexibility, innovative products and services, fast deliveries, etc. (Vachon et al, 2009, Reichhart and Holweg, 2007, Birhanau et al, 2014, Bruce et al, 2004).

The findings also reported that the financial dimension is significant with the efficiency strategy only. This result supports previous studies that highlighted that efficient supply chains are mostly concerned with achieving a smooth flow of the supply chain activities while minimizing costs (Qrunfleh and Tarafdar, 2013, Selldin and Olhager, 2007, Blackman et al, 2013, Vachon et al, 2009, Christopher, 2006, Nag et al, 2014).

In addition, the results indicated that there is no relationship between the learning and growth dimension and the internal business dimension of the BSC and the supply chain strategy. This result partially supports the study of Chia et al (2009) who claimed that the internal business processes and the learning and growth dimensions are drivers of strategic future performance for any supply chain, regardless of the supply chain strategy

(Chia et al 2009). Supply chains aims to continuously improve and create value whatsoever its strategic orientation. In that sense, Selldin and Olhager (2007) and Birhanau et al (2014) identified that focusing on internal operations enable supply chains to satisfy customer needs rapidly regardless of the supply chain strategy.

Relevance/contribution

This research provides new insights regarding the use of the balanced scorecard in managing supply chains performance. The research concludes that the significance of the four dimensions of the balance scorecard are affected by the supply chain strategy.

From a theoretical stance, the proposed relationship between supply chain strategy and the four dimensions of the balance scorecard opens new lens to better understand how supply chain performance is managed. The understanding of the significance of each BSC dimension with respect to the supply chain strategy is one of the merits of this research.

From a managerial point of view, this study provides useful insights for firms wishing to better measure and manage their supply chain performance. The research results provide practitioners with the roadmap of what dimensions of the BSC to focus on with respect to their supply chain strategy. Managers should be aware that the customer dimension of the BSC is significantly important when the supply chain strategy stress responsiveness. Besides, managers should provide particular attention to the financial dimension of the BSC when their supply chain strategy is skewed towards efficiency. Finally, managers should be aware that the learning and growth dimension and the internal business dimension are not affected with the supply chain strategy.

Limitations and Future research

Research limitations are always present in any research study. However, the researcher awareness with the limitations improves the value of the research. The first limitation in this research study is the low response rate which might limit the ability to generalize the research findings. Besides, the sample used for the survey was drawn from a database of Egyptian manufacturing companies located in one industrial district in Alexandria, Egypt, which might further limit the ability to generalize the research findings. However, the research design intentionally widened the sample frame to span multiple industries in the manufacturing sector so as to have better insight into the research argument.

A second limitation is the use of single informant from only one member within a supply chain which might introduce some bias and increase the degree of subjectivity in the responses. However, the selection of the manufacturing organization; which are in general the king of the supply chain in addition to the selection of the general managers as target respondents counteracts this potential problem.

Finally, the results from the analysis lead to some potential research opportunities. First, it seems valuable to conduct a confirmatory research to validate the research findings. Another interesting potential research area is to have more than one company informant from the same supply chain. Supply chains involves suppliers, manufacturers, distributors and retailers working together and thus collecting data from more than one supply chain member might provide more detailed picture on how the performance of the supply chain is managed. This will provide multiple perspectives to the significance of the BSC dimensions with respect to the supply chain strategy.

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