

A Framework for Performance Measurement in Supply Chain Using Balanced Score Card Method: A Case Study

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Abstract: Successful supply chain management (SCM) has become essential for the ultimate success of corporations. Companies today seek an effective performance measurement system to maximize the bottom line. In this paper a proposed framework is presented to help companies to measure and evaluate the performance of their supply chains. In present scenario the companies operate their business in an increasingly, changeable and unpredictable environment, where competition assumes a global scale, they need to look for new ideas, new tools and new methods. The proposed framework grounds on the methodology of performance measuring systems applying to the measurement for tangible and intangible assets and also measuring Supply chain performance internally and externally. The framework developed enhances the use of a group of matrices across all organization these matrices are a fundamental part of a measuring system adopted to strategy, goals, key performance areas, process elements and activities, enabling, evaluating defined goals, leading to decision making and the implementation in improvement areas.

Keywords: Supply chain, Performance Measurement, AHP, Balance Score Card (BSC)

I. INTRODUCTION

The development of economy of any country is supported by growth of its manufacturing industries. Currently the manufacturing industries are passing through a phase of very tough competition. The economic environment is becoming harsh. In order to survive, every industry has to strive to improve productivity in all spheres of activity. What is required is to devise new ways of improving manufacturing performance by optimally utilizing the resources. In this context effective supply chain management is vital to the competitiveness of manufacturing enterprises, as it directly impacts their ability to meet changing market demands in a timely and cost effective manner. Fig. 1 shows the typical supply chain consisting of different levels e.g. Supplier, manufacturer, distributor and consumer, who work together in an effort to acquire raw materials, convert these raw materials into specified final products and deliver these final

products to retailers. Organizations need to capitalize on supply chain capabilities and resources to bring products and services to the market faster, at lower possible cost, with the appropriate product and service features and the best overall value (Gunasekaran et al., 2001). Performance measures are important to the effectiveness of supply chain. Supply chain performance measures serve as an indicator of how well the supply chain system is working. Measuring supply chain performance can facilitate a greater understanding of the supply chain and improves its overall performance (Charan et al., 2008). Companies have understood that for competing in continuously changing environment, it is necessary to monitor and understand firm's performance. Various performance metrics are in place for measuring effectiveness of supply chain. Different perspective of supply chain performance measures are cost and non-cost perspective, strategic, tactical or operational focus, business process perspective and financial perspective. The earlier focus of performance measurement was on financial perspective which is gradually changing to non financial perspective.

Fig.1 SCM Framework

II. BALANCED SCORE CARD CONCEPT

The balance score card was first introduced in early 1990s

Supplier ↔ Organization ↔ Customer

through the work of Robert Kaplan and David Norton of the Harvard business school Shown in fig.2. Since then, the concept has become well known and its various forms widely adopted across the world (Rigby, 2001). By combining financial measures and non financial measures in a single report, the balanced scorecard aims to provide managers with richer and more relevant information about activities they are managing than An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it. is provided by financial measures alone. To aid clarity and utility, Kaplan and Norton proposed that the number of measures on a balanced scorecard should also be constrained in number, and clustered into four groups (Kaplan and Norton, 1992, 1993). Most companies realize the importance of financial and non financial measures; however they failed to represent them in a balanced framework. According to Kaplan and Norton (1992), while some companies and researchers have concentrated on financial performance measures, other has

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concentrated on operational measures. Such an inequality does not lead to metrics that can present a clear picture of organizational performance. For a balanced approach, Maskell (1991) suggests that companies should understand that, why financial performance measurements are important for strategic decisions and external reporting; day to day control of manufacturing and distribution operations is often handled better with non-financial measures. Another area where inequality persists is deciding upon the number of metrics to be used. The metrics that are used in performance measurement and improvement should be those that truly capture the essence of organizational performance. A measurement system should facilitate the assignment of metrics to where they would be most appropriate. For effective performance measurement and improvement, measurement goals must represent organizational goals and metrics selected should reflect a balance between financial and non financial measures that can be related to strategic, tactical and operational levels of decision making and control.

III. PERFORMANCE MEASUREMENTS AND METRICS IN SCM

In this section, the literature on performance measurements and metrics is reviewed. The metrics are discussed in the context of the following perspective: (1) Customer, (2) Internal Business (3) Financial, (4) Innovation and Learning

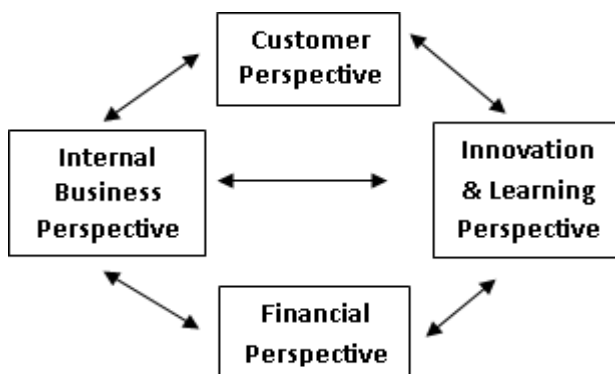


Fig. 2 Balanced Scorecard Framework

Customer Perspective

In this set of metrics we look for the interface with customers, evaluating: Sales/Customer Support and Logistics once these are the activities that directly interact with customer in the sale and delivery processes. The activities of Sales and Customer Support will be measured by product quality and market share. Quality is associated with good condition and good manufacturing that in the final is what customer need and want, market share means the position that the company occupies along with is competition and shows how well the market receive their products. Logistics is associated to product delivery, strongly connected with lead time, service level. Actually beyond cost, service level and quality are the cornerstones of customer satisfaction.

Internal Business Process Perspective

Internal business process perspective relies on primary activities of value chain, like: Sourcing, Planning and delivery. Sourcing activity must evaluate supplier's quality and responsiveness, the metrics related to planning should quantify the downstream and upstream operations of productive process. Process operations are quantified in metrics of produced quantities, production ratios, cycle times and usage. Warehousing uses space and storing capacities associated with time and product rotation. The metrics associated with manufacturing process we found a strong relation quality/time; quality has a high impact on customer satisfaction, time is a measure of efficiency and effectiveness of resources.

Financial Perspective

The financial perspective was developed to evaluate costs and profits of organizations. Once that this framework was developed under a cost leadership strategy supported on tight costs and severe cost control of financial indicators, the performance measures should go through all organization activities. These measures due to its importance upon strategic goals must be accessible to all organization, at different levels of hierarchy, allowing constant monitoring and control. The activities to measure should be: Supplies; manufacturing/ operations; storing; logistics and accounting processes. For Supplying activity is crucial to measure costs of acquisition once that it permits to evaluate fluctuations, deviations from suppliers. Production and quality costs are associated to manufacturing and operations. Associated with operations, logistics and inventory cost represents a considerable part of the final product cost so it monitoring and follow up can represent a competitive advantage. Finally measuring accounting processes allows a rigorous tracking of the financial evolution of the company, this measures are associated to the top management of organizations.

Innovation And Learning Perspective

The perspective of innovation and learning represents the human side of organizations and shows the integration of organizations in society. Organizations should measure the health of organizational culture installed. Kotter,(1992), exposed that culture represents a set of interdependent values of behaviour of a community that tends to perpetuate for long periods of time, this continuity is the product of a large variety of social forces, frequently invisible, a group of rules and values that people learn, being reward when follow it and ostracized when reject it. This phenomenon is recognized as organizational culture. To measure Innovation and learning perspective we will define metrics to evaluate Innovation, social responsibility and human resources. Innovation and social responsibility are related with interactions between organizations and society. Human resources metrics are introduced to identify the employee satisfaction in their working environment. Human capital is actually a sustainable competitive advantage, once that it affects performance, so organizational culture must be aligned with business goals.

IV. SELECTION OF PERFORMANCE INDICATORS & AHP

The selection of Performance Indicators or sometimes called as Key Performance Indicators i.e. KPI is very important. In this paper we have used AHP analysis for the selection of key performance indicators. Firstly by Intense Literature review and interviews with senior executives of industries we have got a number performance indicator under each perspective of BSC but still it is not possible to use all these for measuring the performance of supply chain. for selecting the performance indicators we have prepared a questionnaire which is based on the pair wise comparison between the performance indicators. This questionnaire is sent to the industries where it is being examined by group of people for giving their scores to the pair wise comparison between the performances indicators. After that some personal interviews were also conducted for getting more accurate comparison scores. After getting this questionnaire, matrix is being prepared based on the scores obtained from the questionnaire which is shown in figure.

	SRM	ISCM	CRM
SRM	1	1/6	1/4
ISCM	6	1	3
CRM	4	1/3	1



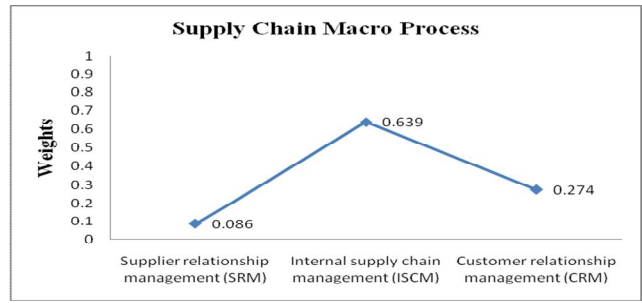
	SRM	ISCM	CRM	Weights
SRM	.091	.111	.058	.086
ISCM	.545	.667	.706	.639
CRM	.363	.222	.235	.274
				1.000

Figure 3: Comparison matrix

Maximum Eigen value = 3.0536
 Consistency index = 0.0268
 Consistency ratio = 4.62%

Table 1: Priority comparison

Graph 1: Variation of priority weights



For the case study company, clearly from the table, internal supply chain management (0.639) is perceived to be the most important criterion followed by customer relationship management (0.274) and supplier relationship management (0.086). It reveals that performance at the internal supply chain management process is the most important whereas the measurement at supplier relationship management rated least important. It also suggests that performance measurement factors that reflect the internal supply chain management process are preferred. Moreover, it is interesting to note that performance measurement at the customer relationship management process has been preferred over performance measurement at the supplier relationship management process. It shows that performance measurement factors that reflect the customer relationship management play more significantly than performance measurement factors for the supplier relationship management.

By using the same procedure for all set of performance measurement factors a set of key performance indicators were selected. The key performance indicators are those performance measurement factors which are given more priority than the other factors. In our study we have selected only those factors whose priority weights are above 0.2 and a set of 28 key performance indicators are taken out from 74 performance measurement factors. Out of these 28 KPI's a set of KPI were selected for each performance measurement perspective in accordance with BSC and a framework with suitable KPI's is being formed for performance measurement of case study companies supply chain.

V CONCLUSION

The above results showed a good effect in selecting key performance indicators out of a number of performance indicators. Further if more precise interviews were taken there is possibility of more optimized results. This process also gives a precise balanced scorecard framework, further there is not any rule for selecting the key performance indicators. but by using above methodology this shortcoming

Supply chain macro processes	Priority for case study company
Supplier relationship management (SRM)	.086
Internal supply chain management (ISCM)	.639
Customer relationship management (CRM)	.274

can be overcome.

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