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DETERMINATION OF SUPPLY CHAIN PERFORMANCE CRITERIA FOR CHEMICAL INDUSTRY: A CONCEPTUAL FRAMEWORK

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ABSTRACT
A manufacturing supply chain is a network of suppliers, factories, subcontractors, warehouses, distribution centers and retailers, through which raw materials are acquired, transformed, produced and delivered to the end customers. Many methods have been suggested over the years for supply chain evaluation of any organization. This study discusses the supply chain performance criteria for efficient supply chain performance evaluation in chemical industry on the basis of Balanced Scorecard's (BSC) four perspectives: finance, customer, internal business process, and learning and growth. The balanced scorecard developed in this paper provides a useful guidance in evaluation and measuring of SCM in a balanced way.
Keywords: Supply chain management, performance measurement, balanced scorecard,

1. INTRODUCTION
The key to achieve a state of continuous improvement is dependent on the ability to measure consistently and constantly the performance of key processes within an enterprise [1]. Many organizations have realized the importance of constant and consistent measurement and have adopted a variety of performance measurement systems over the last few years [2]. Due to the volatile nature of today's globalized businesses it is becoming imperative that organizations monitor their process performance, the performance of their supply chains and then align their processes to the strategic goal of the company [3]. According to Chan [4], performance measurement describes the feedback or information on activities with respect to meeting customer expectations and strategic objectives. It reflects the need for improvement in areas with unsatisfactory performance. Thus efficiency and quality can be improved [5]. In recent years, both practitioners and researchers have emphasized the need to move beyond financial measures of operations and to incorporate a much wider variety of non-financial metrics in an organization's performance reporting and reward systems [6]. In today's complex competitive environment, firms need to be agile and flexible. As a result, availability of the right information at the right time for both decision making and performance evaluation has become critical [7].
For any business activity, such as supply chain (SC) management, which has strategic implications for any company, identifying the required performance measures on most of the criteria is essential and it should be an integral part of any business strategy. A supply chain is defined as a network of facilities that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and distribution of these products to customers [8,9]. Many methods have been suggested over the years for SC evaluation of any organization. However, a balanced approach to evaluate SCs is a source of increasing cost and concern to management as traditional methods focus only on well-known financial measures, which are best, suited to measure the value of simple SCM applications [5].

In this paper, we use BSC that considers both financial and non-financial measures to determine performance criteria for a supply chain in chemical industry.

2. BALANCED SCORECARD

The need of performance measurement systems at different levels of decision-making, either in the industry or service contexts, is undoubtedly not something new [10]. Kaplan and Norton [11,12,13] have proposed the balanced scorecard (BSC), as a means to evaluate corporate performance from four different perspectives: the financial, the internal business process, the customer, and the learning and growth (Figure 1) [5]. The Balanced Scorecard is a set of measures, which serves to connect the vision and strategy, expressed in form of real aims and serves to the measurement of progress in realization of the strategy. Ratios are integrated in related perspectives (categories), which have both financial and outside financial character, qualifying the results of activities and stimulating the enterprise's development [14].

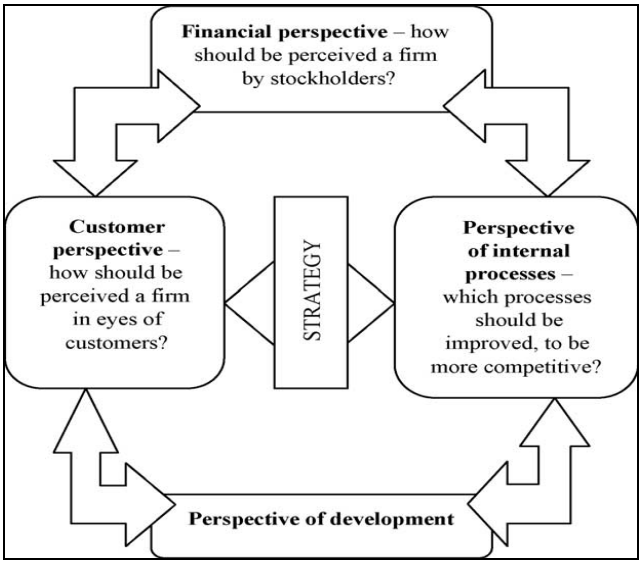

Figure 1. Elements of the BSC

The name of BSC is with the intent to keep score of a set of measures that maintain a balance "between short- and long-term objectives, between financial and non-financial measures, between lagging and leading indicators, and between internal and external performance perspectives" [15]. Since its introduction, BSC has been adopted by many companies as a foundation for strategic management system. It has helped managers to align their businesses to new strategies towards growth opportunities based on more customized, value-adding products and services and away from simply cost reduction [16]. BSC software programs have even been developed to extract data from computer-based information system to obtain required performance indices [17].

The BSC for supply chain management framework presented here in this article is structurally similar to the BSC framework proposed by Kaplan and Norton.

3. THE USAGE OF BSC FOR PERFORMANCE CRITERIA DETERMINATION IN CHEMICAL INDUSTRY

The company, that we need to determine the supply chain performance criteria, produces soap and detergent in chemical industry. It distributes the products to 103 foreign countries, chain stores at 81 cities of Turkey and several retailers. The raw materials are bought from 9 countries that are European mostly. The four elements of the BSC can be analysed for the supply chain of the firm as below:

A. Customer Perspective : The customer portfolio of the company consists of city and regional retailers, national chain stores and factories. The customer satisfaction is measured by the data gained via cost-free phone lines and customer interviews. It is tried to answer the customer complaints,

critiques or thanks as soon as possible. Also, the procurement department is responsible from supplier selection. The supplier must deliver the order on time. The firm's suppliers are mostly abroad and hence information technologies are very important. Furthermore, major suppliers are visited yearly.

B. Financial Perspective : The yearly budgets are prepared at the company. The accession level of the financial goals can be analysed by the evaluation of the budget deviations. The budget has a flexible structure and it is implied that there is no liquidity problem in the firm.

C. Perspective of Internal Processes :

Planning : AS400 program is used for planning. The monthly programs and weekly plans are prepared. If there is a trouble about the production plan, then the problem is eliminated by increasing the capacity usage. But, in summer the demand increases and so the second labour shift can be used.

Production : In spite of the company is adopted make-to-stock policy, for several specific products it uses make-to-order policy. The machine breakdowns are the most encountered problem. The inventory of the production is calculated as 75% of average annual sales. The most important performance measures for production are to fit in with the production plan and to reach the target production quantity.

Marketing : The product promotion and marketing are realized via visiting the customers and/or inviting them to the company. The fill rate of the company is almost 100%. To measure the marketing strategies' performance the market research results, the developments in market shares and the customer satisfaction are considered.

D. Perspective of Development : In recent years, the company is focused on new production methods and new investments. R&D studies are mostly not expensive because of making only several modifications on product. The employer trainings are performed internally or externally. The employers are implicated in appropriate trainings.

According to this analyze, the company proposed several criteria for BSC to its supply chain performance measurement. The BSC can be seen from Table 1.

Table 1. The BSC and performance criteria for the chemical supply chain considered here

Customer Perspective: *Mission:* To meet the expectations of customers and have high satisfaction levels. *Key Questions:* • If customers are satisfied or not? • If market share is increased or not? • If product quality and brand image levels are reasonable or not? • If supply costs are reasonable or not? *Criteria:* • Customer expectations, consumer needs • Zet Nielsen data • The planned and actual supply costs	**Financial Perspective:** *Mission:* To ensure the firm to have powerful financial infrastructure, to use institutional methods and have a strong IT infrastructure. *Key Questions:* • How much value is added while reaching company goals. • If the budget outlines and company activities are harmonious with actual budget. *Criteria:* • EBIDA reports • Production-sales-inventory analysis • Price/Cost comparison • Monthly net working capital change • Investments analysis
Perspective of Internal Processes: *Mission:* To implement the internal processes effectively and successfully, and to reach the target goals. ***1. Planning*** *Key Questions:* • If the requirements of sales department are responded or not? • If the planning activities are productive or not? *Criteria:* • Monthly material demand • The response rate to the monthly sales forecasts • Product inventory level • The rate of material waste ***2. Production*** *Key Questions:* • If the production system is effective and productive or not?	**Perspective of Development:** *Mission:* To adapt the changing processes, develop and renovate continuously, and develop the firm vision. *Key Questions:* • If the company would adapt the future transformations in its production and sales and also if it would develop the work processes, or not? *Criteria:* • R&D investments • Fair and symposium participation • The number of trainings for an employer • The investments on new production technologies

Criteria: • Lost hours and waste • Workforce optimization • The consistency to quality circumstances ***3. Marketing*** *Key Questions:* • If the customers are motivated to buy or not? *Criteria:* • Surveys and queries • Disposal-display reports	

4. CONCLUSION

Today the most important problems of management systems are that they cannot be managed as an expanded business concerns and, the companies and their external environment are not integrated. Supply chain management provides this integration, and can answer the changeable customer requirements more quickly and resiliently. Hence, it is very important to measure these chains' performances. This study discusses the supply chain performance criteria for efficient supply chain performance evaluation in chemical industry on the basis of balanced scorecard that is an integrated and large-scale method.

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