

# Balanced Scorecard: A Tool for Measuring Competitive Advantage of Ports with Focus on Container Terminals

Ali Divandri and Homayoun Yousefi

**Abstract**—The Balanced Scorecard (BSC) is a valuable management system which is used for different companies to elucidate and translate their strategies into execution; nevertheless the BSC has not been planned for container terminals and ports users' satisfaction in a great extent. This article addresses the issue of deploying BSC as an accepted management tool for measuring competitive advantage of ports users with a focus on container terminals. Use of balanced scorecard helps port and terminal managers to understand better strategic vision as well as their own contribution to implementation of strategic goals. The BSC can be used by the companies which are responsible for handling container terminals operation in order to achieve value, controlling core competencies, satisfying the terminal's users or customers and offering bonus to the terminal's shareholders.

**Index Terms**—Balanced scorecard, port users, competitive advantage, container terminals.

## I. INTRODUCTION

These days, majority of Container terminals face so many difficulties in measuring performance appraisal and also environmental evaluation, because manager attempts to match organizational performance and strategic goals. For this reason, the Ports authority and Maritime Organizations realized that an acceptable development can be carried out by using BSC for measuring competitive advantage of a port and its container terminal. In general, there are several ways to guide performance monitoring procedure such as the Balanced Scorecard. In this article some definitions, advantages and also introduction about the use of BSC methods, Competitive advantage, Business Performance Measure and techniques in ports Management would be analyzed in a great extend.

## II. WHAT IS BSC?

The balanced scorecard is a strategic planning and management system that is used extensively in business and industry, government, and nonprofit organizations worldwide to align business activities to the vision and strategy of the organization, improve internal and external communications, and monitor organization performance against strategic goals. It was originated by Professors Robert Kaplan and David Norton (Harvard Business School) as a performance measurement framework that added strategic non-financial performance measures to traditional financial metrics to give managers and executives a more 'balanced' view of organizational performance [1]. The

balanced scorecard approach was intended to provide a clear prescription as to what companies should measure in order to 'balance' the financial perspective in implementation and control of strategic plans [1]. While the phrase balanced scorecard was coined in the early 1990s, the roots of the this type of approach are deep, and include the pioneering work of General Electric on performance measurement reporting in the 1950's and the work of French process engineers (who created a "dashboard" of performance measures) in the early part of the 20th century. Now, thanks to the Internet and new Web-based software tools known as dashboards, accessing this type of specific information is as easy as clicking a mouse [1]. The balanced scorecard has evolved from its early use as a simple performance measurement framework to a full strategic planning and management system. The "new" balanced scorecard transforms an organization's strategic plan from an attractive but passive document into the "marching orders" for the organization on a daily basis. It provides a framework that not only provides performance measurements, but helps planners identify what should be done and measured. It enables executives to truly execute their strategies. Kaplan and Norton describe the innovation of the balanced scorecard as follows: [2] based on the research which has been done by Nikolaos S. Marianosi and his group, Balanced Scorecard is an integrated method that is able to incorporate all the important quantitative and qualitative measures, covering all the aspects of an organization.

"The balanced scorecard retains traditional financial measures. But financial measures tell the story of past events, an adequate story for industrial age companies for which investments in long-term capabilities and customer relationships were not critical for success. These financial measures are inadequate, however, for guiding and evaluating the journey that information age companies must make to create future value through investment in customers, suppliers, employees, processes, technology, and innovation." [2]

The balanced scorecard suggests that we view the organization from four perspectives, and to develop metrics, collect data and analyze it relative to each of these perspectives: 1). The Financial Perspective: The box at the top of figure.1 represents the financial perspective and answers the question How are we doing for our shareholders? A financial perspective typically uses measures like cash flow, return on equity, sales, and income growth. 2). The Customer Perspective: The box at the left reflects the customer perspective and responds to the question how satisfied are our customers? A customer satisfaction perspective typically adds measures related to defect levels, on-time delivery, warranty support and product development, among others, that come from direct

customer input and are linked to specific company activities. 3). The Business Process Perspective: The box to the right represents the internal business process perspective and address the question what are our core competencies and areas of operational excellence? Internal business processes and their effective execution as measured by productivity, cycle time, quality measures, downtime, and various cost measures, among others, provide scorecard input here. 4). The Learning & Growth Perspective: The learning and growth box at the bottom of figure.1 answers the question "how well are we continuously improving and creating value"? The scorecard insists on measure related to innovational and organizational learning gauge performance on this dimension-technological leadership, product development cycle times, operational process improvement, and so on [3]. All of the boxes are connected by arrows to illustrate that the objectives and measures of the four perspectives are linked by cause and effect relationships that lead to the successful implementation of the strategy. Achieving one perspective's targets should lead to desired improvements in the next perspective, and so on, until the company's performance increases overall. The balanced scorecard methodology adapts the total quality management (TQM) ideas of customer-defined quality, continuous improvement, employee empowerment, and measurement-based management /feedback into an expanded methodology that includes traditional financial data and results [2]. The balanced scorecard incorporates feedback around internal business process outputs, as in TQM, but also adds a feedback loop around the outcomes of business strategies.

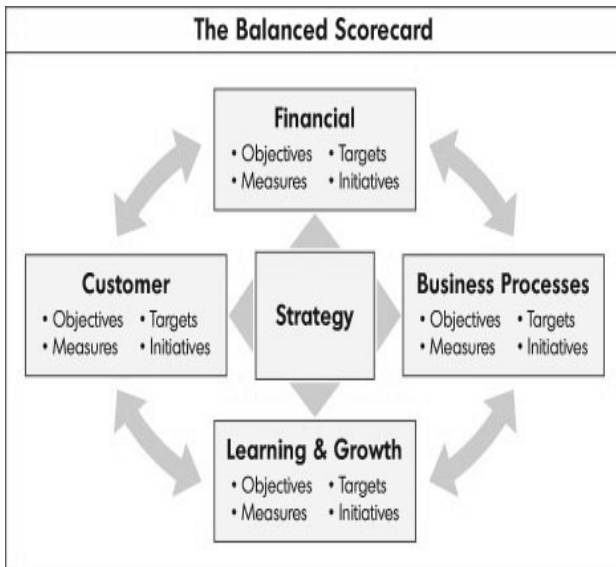


Fig. 1. Adapted from Robert S. Kaplan and David P. Norton, "using the balanced scorecard as a strategic management system," source: harvard business review (january-february 1996): 76.

III. ADVANTAGE OF USING BSC METHOD

Fig. 2 is drawn from an article written by Dr. David Norton. The brief article explained the need for balancing the number of measures in all four perspectives, with greater emphasis on process measures, because the process perspective is the primary domain through which organizational strategy is implemented [4].

Eight years after introducing the BSC, Kaplan and Norton published an article entitled, Having Trouble with Strategy, Then Map It! The article introduced the concept of a "Strategy Map" to the BSC framework. A "Strategy Map" enables organizations to clarify their strategy and assist organizations with creating their BSC framework and measures. A generic corporate strategy map is provided below to illustrate the "Strategy Map" concept.

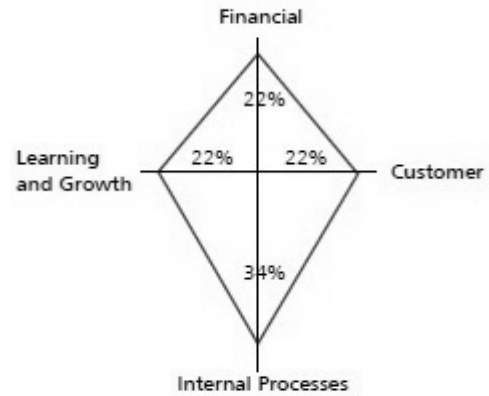


Fig. 2. Example an ideal balanced scorecard source: norton, david, 2000, the unbalanced scorecard.

TABLE I: IDEAL BSC

Perspective	≠ of Metrics	Weight
Financial	5	22%
Customer	5	22%
Learning & Growth	5	22%
Internal Processes	9	34%
	24 measures	100%

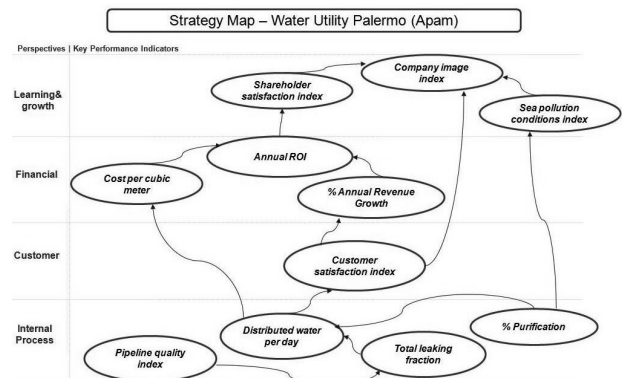


Fig. 3. Example of a strategy map, source: water utility palermo.

IV. COMON CHARACTERISTICS OF BSC

Performance measures framework used in the balanced scorecard approach tend to fall into the five groups illustrated in Exhibit 4: Strategy, Goals, Objectives, Targets, and Measures. Internal business processes are what the company does in an attempt to satisfy customers. For example, in a manufacturing company, assembling a product is an internal business process. In an airline, handling baggage is an internal business process [5]. The basic idea is that learning is necessary to improve internal business processes; improving business processes is necessary to improve customer satisfaction; and improving customer satisfaction is necessary to improve financial results.

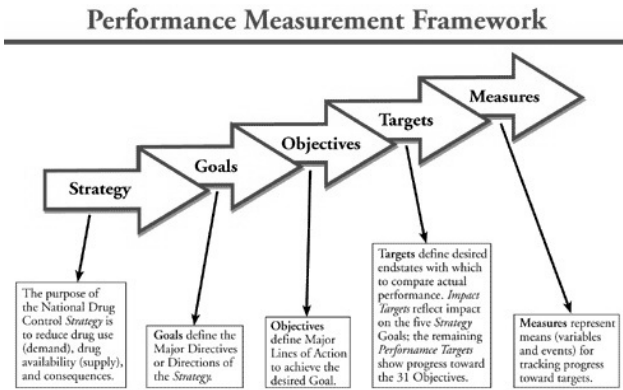


Fig. 4. The BSC: from strategy to performance measures source: american office of national drug control policy.

V. ACTIVITY-BASED MANAGEMENT

Traditional cost accounting permeates most organizations and is characterized by arbitrary allocations of overhead costs to items being produced. Typically, the company’s total overhead is allocated to goods produced based on volume-based measures (labour hours, machine hours, etc.)[5]. The underlying assumption is that there is a relationship between overhead and the volume-based measure. Activity-based costing (ABC) was developed to provide better insight into how overhead costs should be allocated to individual products or customers. Businesses that do not use ABC typically only make simple adjustments to allocate overhead costs that do not accurately fit elsewhere. Businesses that use ABC link expenses related to resources supplied to the company to the activities performed within the company. Through the use of ABC, expenses are allocated from resources to activities and then to products, services, and customers. Activity-Based Management (ABM) is a discipline that focuses on the management of activities to maximize the profit from each activity and to improve the value received by the customer. This discipline includes cost-driver analysis, activity analysis, and performance measurement [5]. ABM draws on ABC as its major source of information. Using the ABC approach, companies get insights into profitable and profitless activities based on a customer or a product viewpoint. ABC then is a way of measuring which of the firm’s activities generate revenues in excess of costs and, as a result, provide keen insight into what is really providing value for customers. ABC is used by many organizations that implement the BSC because ABC enables businesses to more accurately define and measure their metrics [6].

TABLE II: TRADITIONAL AND ABC VIEW

Traditional View		ABC View	
Salaries	\$375,000	Select Suppliers	\$82,000
Benefits	\$92,000	Procure Material	\$175,000
Supplies	\$47,000	Certify Vendors	\$92,000
Phone	\$8,500	Resolve Problems	\$103,500
Travel	\$13,000	Expedite Shortages	\$83,000
<b>Total</b>	<b>\$535,500</b>	<b>Total</b>	<b>\$535,500</b>

Fig. 5. Comparison of traditional and abc accounting.

The above figure provides a window into the value of

ABC vs. traditional accounting. Firms that implement an ABC methodology are able to Identify the most and least profitable customers, products, and channels; Determine the true contributors to (and detractors from) financial performance; More accurately predict costs, profits, and resource requirements associated with changes in production volumes, organizational structure, and resource costs;[6]

- More easily identify the root causes of poor financial performance;
- Better track costs of activities and work processes; and
- Provide front-line managers with cost intelligence to drive improvements.

While firms will likely benefit from ABC, the system is mainly an accounting and cost-based method of viewing and analyzing an organization and its activities. ABC also lacks the strategic and nonfinancial elements that are captured in the BSC. Thus, most successful firms use ABC to manage costs and gain insight into their internal competitive advantages. ABC is particularly valuable initially as a management accounting and reporting tool, but has also proved valuable as providing metrics for use in the BSC’s internal process perspective [7]. In other words, successful firms use ABC in combination with the BSC to drive the achievement of a firm’s strategy and competitive advantage. BSC and ABC are useful tools of performance management. It should be noted that the integration of BSC with ABC in order to achieve an integrated function in performance management. By integrating the ABC system with the BSC, it will cause to improve the operational efficiency and upgrade the performance of strategy management.

VI. COMPETITIVE ADVANTAGE

A core competence is a capability or skill that a firm emphasizes and excels in doing while in pursuit of its overall mission. Core competencies that differ from those found in competing firms would be considered distinctive competencies. Distinctive competencies that are identified and nurtured throughout the firm, allowing it to execute effectively so as to provide products or services to customers that are superior to competitor’s offering, become the basis for a lasting competitive advantage [8]. Executives, enthusiastic about the notion that their job as strategists was to identify and leverage core competencies into distinctive ones that create sustainable competitive advantage, encountered difficulty applying the concept because of the generality of its level of analysis [8]. The Resource-Based View (RBV) is a method of analyzing and identifying a firm’s strategic advantages based on examining its distinct combination of assets, skills, capabilities, and intangibles as an organization. The RBV emerged as a way to make the core competency notion and thought process more focused and measurable-creating a very important, and more meaningful, tool for internal analysis. The RBV’s ability to create a more focused, measurable approach to internal analysis starts with its delineation of the following three basic types of resources: 1). Tangible assets: The most easily identified assets, often found on a firm’s balance sheet. They include production facilities, raw materials,

financial resources, real estate, and computers. 2).Intangible assets: A firm’s assets that you cannot touch or see but that are very often critical in creating competitive advantage: brand names company reputation, organizational morale, technical knowledge, patents and trademarks, and accumulated experience within an organization. 3).Organizational capabilities: Skills (the ability and ways of combining assets, people, and processes) that a company uses to transform inputs into outputs [9]. Fig. 6 shows Wal-Mart’s cost advantage as a percent of sales. Each percentage point advantage is worth well over \$500 million in net income to Wal-Mart.

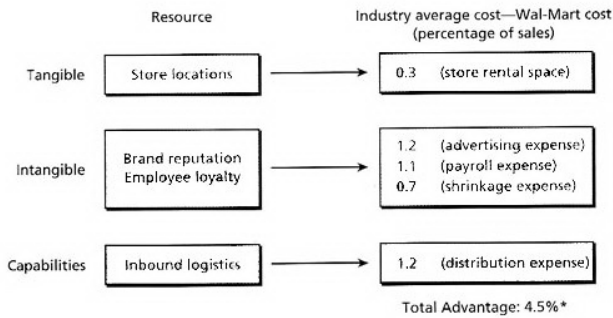


Fig. 6. Wal-Mart resource-based competitive advantage source: Wal-Mart Corporate.

We will now consider a very influential model, the balanced score-card that may be used by firms to develop, implement and control strategy through a balanced use of financial and non-financial indicators [9]. Rather than focus on an individual strategic investment, the balanced score-card is concerned with the maintenance of an outward- and forward-looking stance on a continuous and routine basis through a systematic process of monitoring and reporting on a variety of different performance dimensions.

A balanced scorecard consists of an integrated set of performance measures that are derived from the company’s strategy and that support the company’s strategy throughout the organization [10]. A strategy is essentially a theory about how to achieve the organization’s goals. For example, low-cost European carriers such as easyjet have copied South Western Airline’s strategy of offering passengers low prices and fun on short-haul jet service. The low prices result from the absence of costly frills such as meals, assigned seating and interline baggage checking. Southwest Airlines consciously hires people who have a sense of humour and who enjoy their work [11].

The theory is that low prices and fun will lead to loyal customers, which, in combination with low costs, will lead to high profits. So far, this theory has worked. Under the balanced scorecard approach, top management translates its strategy into performance measures that employees can understand and can do something about. This performance measure is easily understood by the supervisor, and can be improved by the supervisor’s actions.

VII. TOWARDS THE MEASUREMENT OF PORT USERS

Business Performance Measurement (BPM) has triggered scholars’ interest; with this interest resulting in multiple

new approaches during the latest years. The most widely acknowledged framework is the balanced scorecard by Kaplan and Norton in 1992. BPM has in recent years witnessed a radical change, moving from the strongly criticized pure financial performance measures towards more balanced approaches [12]. In fact, the collection of externally generated information and the access of users’/customers’ perspectives about any business are important even when it is not incorporated into a BPM system. Most businesses are now competing in an environment where value, not price, is the key driver. Given these circumstances, then ensuring that value is delivered to customers becomes key, which is one of the main reasons why the use of customer opinion surveys has become so widespread [13]. In the case of ports, performance measurements are heavily relied upon operational efficiency measures. This is taking place both when performance is measured in practice and when scholars deal with performance issues. In the latter case though some recent studies attempt for an overall assessment of a balanced BPM. Users perceptions are part of studies examining port selection criteria, or port attractiveness. Thinking in terms of performance components, with the latter being efficiency and effectiveness, in the measurement of performance is a concept increasingly shared by the industry [14]. This is exemplified by the launching, in 2008, of the Germanischer Lloyd “Container Terminal Quality Indicator,” a certification process for quality standards in container terminals.

In the last two decades, users/customers satisfaction (hereafter referred as ‘users satisfaction’) measurements have been a popular way to access user perceptions. These measurements are acknowledged to be among the ‘customer core measurement group’, along with market share, customer retention, customer acquisition, and customer profitability [15]. This is because they help business understanding their users’ views on the services offered and hereupon take accordant actions, when differences in perceptions of importance and performance do exist between a company’s management team and the users of their services. Achieving higher users’ satisfaction has been associated with greater loyalty, reduction of transactions costs, decreased price elasticities, minimization of users’ defection when quality falters, and lowering of the cost for attracting 5 new users [16]. Despite its critics, its advantages and value remain important for every business. Yet there is not any tool developed for measuring port users’ satisfaction, though port peculiarities are evident. Such a tool should be looking into the specific of the port as a system of interacting functionally and spatially regionalized units that are embedded in supply chains, rather than focusing on individual terminals, warehouses, rail, trucks etc only [16]. Each interaction between these units stands as a part of the overall setting that creates satisfaction for the ports’ users. For example, even if a specific terminal is the most efficient and effective, vessels have still to use additional port services to reach it, and cargoes have to use additional services to be forwarded in the hinterland. When the last two parts of the chain are underperforming, the effectiveness of the port decreases, at least from a port users’ perspective. As in any satisfaction

measurement a port measurement tool needs to take into account any element that is important for the user and not just a part of the 'port product' only; besides it is the user who has to determine what creates his own satisfaction [17].

Relations developed in the port sector fall in essence within the business-to-business framework, as they are frequently long-term, close, and involve complex patterns of interactions between and within each company [18]. For such relations, satisfaction is also an output of the relations that the two involved parties develop (relationship specific), rather than just a single discrete transaction (transactional specific) as is typical in the consumer goods area. This implies that in the case of industrial satisfaction measurements the emphasis should not be only on the transaction episode between the involving parties but on the entire relation that is maintained between them (i.e. via communications, processes, coordination activities etc.), which can create differentiations and extra value for both [19].

In general, satisfaction is conceptualized as an affective construct whereas perceived value is conceptualized as a cognitive variable. Although perceived value is estimated to have a strongly positive and highly significant impact on satisfaction these two should be used supplementary [20], [21]. Business to business customers perceive at least two different categories of value; functional and relationship value respectively [22]. Functional value lies in customer hierarchies centred on product availability and quality, delivery service quality, and pricing. Relationship value stems from the quality of the interactions going on between the customer and the supplier of the product or service. This setting seems to fit in well in ports, as both relationship and functional values exist. Port users, services providers, and port authorities relationships are rather complex, incorporating special characteristics not common in other industries [22]. There is also a setting of relevant hybrid forms of developed relations that demands attention. Therefore, the value construct seems adequate towards the creation of a port users' satisfaction tool. Applying the value construct concept in ports implies that port users desire specific attributes during their interactions with other relevant actors, with these desires being consequential for their demands. In turn a (port service and/or infrastructure) supplier makes choices aiming to the provision of the service attributes that fulfil such desires. This means a departure from the commonly used in ports groups of metrics (especially operational performance measurement) towards a relevant 'Business to Business customer value hierarchy' [23]. Value, or at least user-perceived value, is achieved by tangible and operational aspects, as well as by intangible and managerial/entrepreneurial aspects of the total user value chain [24]. This value chain is a series of user-oriented actions taken in specific contexts within the aim of producing value for that user [24]. In practice, bearing in mind that the user perceived value is situation specific, any supplier attempting to provide value to its users needs to gain a thorough understanding of these needs and undertake activities which will add to the customer's value chain or hierarchy. Another important implication is that any involved service supplier should expect that the demanded value by its immediate user is likely to be

influenced by the needs of the downstream users. Port services users and providers, are part of a context "which includes only a limited number of identifiable organizational entities. These entities are involved in continuous exchange relationships with the organization. In such cases each individual party exerts considerable influence on the organization." [25]

A number of crucial questions need to be answered towards an overall assessment of port users' satisfaction. These questions are the result of the complex structures of contemporary ports, like the presence of several different port governance models that are not standardized but tailor-made [26]. In addition, traditional port users are constantly transforming their operational patterns, scope, and strategies, even change their core businesses (i.e. from shipping to multimodal operators, or even terminal operators). At the same time, a number of private companies with limited or indirect involvement in port services are expanding their services portfolio related with ports. Thus, traditional relationships between services providers, users and port authorities transformed into new complex ones on the emerging inter-industry partnerships between shipping lines and stevedores), with the distinction between competitors, clients, and partners being frequently blurred [27]. Therefore, one of the most demanding parts towards a port user's satisfaction assessment relates to the understanding of the nature of the interactions between the users and other actors. Port users do not interact as a single body, as happens in other Business to Business relations. Rather than that, they are involved in interactions that take place within the relevant port community involving multiple actors (Port Authority, ship agents, customs agents, freight-forwarders, road haulers, suppliers, logistics operators, stevedoring firms, etc.) [28], [29]. Over time, container terminals are confronted with changing process requirements, higher stack and equipment occupancies, increasing traffic and rising performance expectations from end-users. To improve the productivities of an automated container terminal, it is important to schedule different types of handling equipment in an integrated way. A mixed-integer programming model, which considers various constraints related to the integrated operations between different types of handling equipment, is formulated.

## VIII. CONCLUSION

As far as the significance of BSC is concerned, the BSC is used for more than thousand companies; therefore the port users and services providers may develop their relations fall into a bilateral business. It should be noted that the Competitive advantage of a container terminal in port is achieved by the integrated scheduling of various types of handling equipment at an automated container terminal. It can be seen that use of BSC as a helpful tool may cause efficient scheduling of the equipment reduces the time vessels spent in the port and increases the productivity of the terminal.

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