



## Strategic linkage process and value-driven system: A dynamic analysis of high-tech firms in a newly-industrialized country

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### ARTICLE INFO

#### Keywords:

Balanced scorecard  
Lagging measurement  
Leading measurement  
Time-lag effect

### ABSTRACT

The current balanced scorecard literature suggests that a link should exist between lagging and leading measurements of non-financial performance perspectives and financial performance measures. This work designed a dynamic integrated model for examining the influence of strategic links on the Taiwanese high-tech industry, and to examine the relationships among the strategic perspectives of the balanced scorecard (BSC). This work studied the descriptive validity of the balanced scorecard as a causal model for leading and lagging measurements of non-financial and financial performance in relation to time-lag effects. Structural equation modeling (SEM) and dynamic analysis were used to empirically examine the relations among strategic linkages and value drivers within the model. The analytical results demonstrate the existence of directly positive driver effects between the learning-growth, customer, and financial perspectives; also the internal process (leading measurements) mediates the relationship between learning-growth (leading measurements) and financial perspective (lagging measurements). The results indicated that time lag positively influenced the non-financial and financial perspectives, and that they were strongly correlated with the strategic linkage process.

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### 1. Introduction

The high-tech industry is a fastest growing industry in many newly-industrialized countries (NICs) such as Taiwan, Korea, and India. Taiwanese government has viewed the high-tech industry as a driver of economic growth, and used various resources to support its development, including building the Hsin-chu Science-based Industrial Park and legislating the “Statute for Encouraging Investment” and the “Statute for Upgrading Industry” (Chen & Huang, 2004; Chen, Wu, & Lin, 2006; Shyu & Chiu, 2002; Wu, Hung, & Lin, 2006). Furthermore, the Ministry of Economic Affairs (MOEA) launched technology development programs to accelerate the development of industrial innovation technology and to stimulate domestic economic growth in Taiwan. Since the early 1980s, the active involvement of the government and private enterprises in developing the electronic information and high-tech industries has yielded excellent results. The high-tech industry has grown rapidly and become a significant industrial sector in Taiwan, with a sharply increasing number of firm establishments (Tseng & Goo, 2005). Furthermore, during the past decades, globalization

has enhanced global competition and placed considerable pressures for multinational corporations to lower costs and to increase efficiency as well as profitability. Consequently, many multinational corporations shifted some of their manufacturing and design activities abroad and performed strategic outsourcing in Taiwan. Taiwan was chosen mainly because of its combination of low manufacturing costs, skillful work forces, and tax breaks provided by the local government (Hu & Schive, 1998). Furthermore, high-tech firms that realize economies of location by dispersing each of its value creation activities to the optimal location for that activity should enjoy a competitive advantage over a firm that bases all of its value creation activities at a single location (Hu & Schive, 1998).

The electronics, information and high-tech industries in Taiwan are dominated by OEM/ODM (original equipment manufacturing/original design manufacturing) manufacturers, and firms in these industries face dynamic changes in terms of technological environment and market competition. Given the growing challenges and competition from local and international environments, domestic high-tech firms must adopt appropriate strategies to enhance their competitive advantages and profitability, and the issue of how to drive the performance of high-tech firms has thus become increasingly important in Taiwan.

During the past decade academicians and researchers in strategic management and managerial accounting areas have devoted increasing attention to the influence of non-financial measurements

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on financial performance (Banker, Chang, & Pizzini, 2004; Banker, Potter, & Srinivasan, 2000). The balanced scorecard developed by Kaplan and Norton (1992) uses a sequence of four perspectives that reflects the value creation activities of firms. The sequence begins with the learning and growth perspective, followed by the internal/business process, then the customer perspective in third place, and finally the financial perspective. Core outcome (performance) measures within each perspective are taken as leading indicators of the core outcome measures in the next perspective. Kaplan and Norton argued for the existence of a secondary set of associations besides the links among the four balanced scorecard perspectives (Kaplan & Norton, 1993, 1996a, 1996b, 1996c, 2001a, 2001b, 2001c, 2001d, 2004a, 2004b, 2004c, 2004d, 2006). Within each of the four perspectives of the BSC, performance drivers (performance measures) are expected to be the leading indicators of core outcome measures. The BSC view of the firm indicates that strategic linkages and value drivers provide firms with competitive advantages and improved performance. Since being developed by Kaplan and Norton, the BSC concept has been widely adopted by manufacturing and service companies, nonprofit organizations, government entities, and other industries around the world. A considerable number of research has employed the BSC concept to study the performance of manufacturing firms and manufacturing strategies, for example Blundell, Sayers, and Shanahan (2003); Bryant, Jones, and Widener (2004); Duh, Chow, and Chen (2006); Fernandes, Raja, and Whalley (2006); Hoque and James (2000); Huang, Lee, and Kao (2006); Knotts, Jones, and Udell (2006); Lee, Chen, and Chang (2008); Maltz, Shenhar, and Reilly (2003); Sohn, You, Lee, and Lee (2003).

Based on the existing literature, this work has three aims: (a) to examine the relationships between non-financial measurements and financial performance; (b) to examine the relationships between lagging and leading measurements; and (c) to present a conceptual framework for linking non-financial measurements and financial performance regarding time-lag effects (that is, the dynamic BSC framework). By using the structural equation model (SEM) as the analytical tool, this work attempted to answer the following questions: (a) How do learning/growth and internal/business process drive the customer and financial perspectives in the high-tech industry? (b) What are the relationships between lagging and leading measurements? (c) How do time-lag effects influence value creation and organizational performance (that is, customer and financial performance)? (d) How do high-tech firms translate their learning/growth perspective into increased financial performance, whether in terms of productivity, increased growth sales, product acceptance rate, or other organizational performance indicators? This research thus attempts to enhance understandings of how and to what extent the time-lag effect influences the dynamic BSC framework.

The structure of this paper is organized as follows. Section 2 briefly reviews the BSC theory and summarizes the theoretical foundations of the research, with two sets of hypotheses developed. The conceptual framework of the research is then presented in Section 3, along with the research methodology, including the instrument, samples, variables and analytic models. Section 4 then described the empirical analysis methods, including correlation and SEM analyses, followed by the empirical results; a framework of dynamic BSC framework was then developed. Finally, summary, practical implications and suggestions for future research conclude this paper.

## 2. Literature and hypotheses

### 2.1. The balanced scorecard and hypotheses development

First described by Kaplan and Norton in 1992, the balanced scorecard approach comprises four perspectives: the learning and

growth perspective, internal process perspective, customer perspective, and financial perspective. BSC is a strategic approach and performance management system which organizations can use to implement their vision and strategy. The BSC model comprises four new management processes that, separately and in combination, contribute to linking long-term strategic objectives with short-term actions (Kaplan & Norton, 1996a). Numerous companies and industries have adopted the balanced scorecard, which appears to meet several management needs. The BSC model is more than a collection of financial and non-financial measurements; it is a translation of business unit strategy into a linked set of measures that define both long-term strategic objectives and the mechanisms for achieving and obtaining feedback regarding those objectives (Kaplan & Norton, 1996a). Kaplan and Norton (2004a) created a powerful new tool, the strategy map, with which companies can describe the links between intangible assets and value creation with a previously impossible degree of clarity and precision. The strategy map can be used to link processes with desired outcomes; to evaluate, measure, and improve the processes most critical to success; and to target investments in human, informational, and organizational capital (Kaplan & Norton, 2004a, 2004b).

The BSC model identifies four related perspectives on activities that may be critical to almost all organizations and all levels within organizations: (a) Investing in learning and growth capabilities, (b) Improving internal process efficiencies, (c) Providing customer value, and (d) Increasing financial success (Kaplan & Norton, 1992, 1993, 1996a, 1996b, 1996c, 2001a, 2004b).

According to Kaplan and Norton (1992, 1996b), a strategy is a set of hypotheses regarding cause and effect, and three issues need to be considered: (1) cause-and-effect relationships; (2) result measurements and performance-driven factors; and (3) combination with finance.

- (1) *Cause-and-effect relationships*. An identifiable causal relation is important to the balanced scorecard approach in selecting appropriate indicators because it enables the translation of financial objectives. By assessing the relevant factors in each segment of the balanced scorecard that may impact a financial target, appropriate measures can be identified and actions can be aligned to the strategic goals.
- (2) *Result measurement and performance-driven factors*. During the design of the BSC model, the combination of leading indicators as performance-driven factors and lagging indicators as result measurements is used to monitor firm short-term operations and long-term growth.
- (3) *Combination with finance*. The cause-and-effect relationships of the BSC indicators should be clearly linked to the financial targets of firms.

The BSC model assumes a causal relationship among four perspectives: measures of learning and growth, measures of internal processes, measures of customer perspectives, and financial measures. The assumption of a causal relationship and strategic linkage process is essential because it permits firms to use non-financial performance measurements to forecast future financial performance. Based on the related theory and research, five hypotheses are thus developed. These hypotheses are testable given the development of appropriate lagging (outcome) measures and leading measures. Consequently, the following hypotheses are developed:

- H1a. There exists a positive relation between the learning-growth and the internal process perspectives.
- H1b. There exists a positive relation between the learning-growth and financial perspectives.
- H1c. There exists a positive relation between the learning-growth and customer perspectives.

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