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Corporate strategies, environmental forces, and performance measures: a weighting decision support system using the *k*-nearest neighbor technique

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Abstract

The choice of performance measures is critical to formulating strategies. This paper investigates the relationship among corporate strategies, environmental forces, and the Balanced Scorecard (BSC) performance measures. Corporate strategies are explored within the framework of Miles and Snow's taxonomy, where they are categorized into prospectors, defenders, analyzers, and reactors. The relative weights for each performance measure are calculated by the use of the Analytic Hierarchy Process. A sample of 219 companies can confirm the link between corporate strategies, environmental forces, and the weights of the BSC performance measures. These weights shift depending on the nature of challenges companies face. In the light of this empirical evidence, a decision support system is proposed to help retrieve the BSC weights of the companies with similar characteristics. In order to measure the proximity between companies, a *k*-nearest neighbor technique is employed. This system can help find the weights of the performance measures for particular strategies.

Keywords: Corporate strategy; Environmental forces; Intangible assets; Analytic hierarchy process; *k*-Nearest neighbor

1. Introduction

Companies are shaped by their performance measure. Performance measures play a critical role in formulating corporate strategies, evaluating accomplishments, and compensating organizational members. Traditional performance measures are financial. They tend to be myopic and short-term oriented. The financial aspect is only a part of the whole system of a firm. Companies need to leverage their hidden assets. In particular, knowledge is becoming more important in the new economy. Knowledge is non-financial and intangible. Therefore, non-financial measures have been employed to measure such knowledge assets (Dekker & de Hoog, 2000; Kitts, Edvinsson, & Beding, 2001; Lee, Kwak, & Han, 1995; Liebowitz & Wright, 1999; Wilkins, van Wegen, & de Hoog, 1997).

The need for measuring knowledge components has motivated the need for a variety of performance measurement methods. The Balanced Scorecard (BSC) is one of them. The BSC attempts to integrate all the interests of the key stakeholders—shareholders, customers, and employees, on a scoreboard (Kaplan & Norton, 1996). The beauty of the BSC is that it seeks for a balance between financial and non-financial measures. These diverse interests are categorized into financial, customer, internal business process, and innovation and learning measures.

Companies have to determine the relative importance (i.e. weights) of BSC measures so that they can better identify which measures to focus on and which to ignore. These weights can shift depending on the nature of challenges companies face. However, relatively little is known about how to determine the weights. The weights allotted to particular measures are likely to differ according

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to corporate strategies. For example, prospectors may differ from defenders in determining the weights of performance measures. Furthermore, because companies are thriving in different environments, the weights need to accommodate the potential of environmental variables, such as dynamism, heterogeneity, and hostility (Miller & Friesen, 1983). Recently, several articles admit that, to enhance performance, the strategy pursued by the organization needs to fit into the organizational structure and its evaluation systems (Stathakopoulos, 1998). Olson and Slater (2002), in particular, echo that corporate strategies are linked to the relative importance of the BSC performance measures.

This paper addresses the following research issues: (i) What is the effect of corporate strategic choices on the weighting of the BSC performance measures? (ii) What are the important environmental variables in determining these weights? (iii) What is the potential capability of the k-nearest neighbor technique in measuring the weights of performance measures? (iv) How does our proposed weighting decision support system work?

The rest of this paper is organized as follows: The next section reviews the BSC and the related corporate variables such as strategy, dynamism, and heterogeneity. Section 3 describes measurements including the weighting method. Section 4 analyzes empirical results to explore how the weights of the BSC performance measures vary depending on strategy, dynamism, and heterogeneity. Sections 5 and 6 explore a system for finding the weights among the BSC measures. Section 7 concludes the paper and suggests areas for further research.

2. Balanced scorecard, corporate strategies, and environmental variables

2.1. Balanced scorecard

A great deal of research has investigated on how to remedy weaknesses that underlies most traditional financial performance measurement systems (Bontis, 1998; Edvinsson & Malone, 1997; Kaplan & Norton, 1992; Liebowitz & Suen, 2000; Sveiby, 1997). Examples for new measurement systems include human resource accounting (HRA), economic value added (EVA), BSC, and intellectual capital (IC). Kaplan and Norton (1992) originally proposed the BSC as an integrated performance measurement framework that helps firms articulate, communicate, and translate strategy into action.

According to Kaplan and Norton, the BSC enables managers to look at the business from the four perspectives in a balanced fashion: (i) The financial perspective addresses the question, “To succeed financially, how should we appear to our shareholders?” (ii) The customer perspective addresses the question, “To achieve our vision, how should we appear to our customers?” (iii) The internal process perspective addresses the question, “To satisfy our shareholders and customers, at what business processes must we excel?” (iv) Finally, the learning/growth perspective addresses the question, “To achieve our vision, how will we sustain our ability to change and improve?” The scorecard takes into account key performance measures that go beyond financial matters to consider employees, customers, and internal operations.

2.2. Balanced scorecard and corporate strategies

The usefulness of the BSC can be enhanced by aligning its scorecard with corporate strategies. The taxonomy by Miles and Snow (1978) is widely used for categorizing corporate strategies. This category includes four strategies: defenders, prospectors, analyzers, and reactors.

Defenders tend to maintain a secured niche position in a relatively stable product or service sector. They are likely to provide a relatively more limited product mix than their competitors, while they are seldom pioneers in development and thus less likely to make ambitious efforts at market penetration. They thus emphasize operational efficiency and seldom attempt to make key changes in technology, organizational structure, or operational method. Instead, they invest in a few pivotal technologies.

In contrast, prospectors tend to work in a variety of product and market sectors; they continue to look for market opportunities and carry out regular searches for any new trends. They react quickly to the suggested opportunities and lead to new fields of exploitation. However, they may not be able to maintain their competitive domination in all the fields that they have penetrated; prospectors put their emphasis on flexibility and innovation, but this tendency may cause a lack of control or low efficiency in operation (Mavondo, 2000).

Defenders are likely to put more emphasis on the perspectives of financial and internal process than prospectors (Lukas, 1999; Chan, Burns, & Yung, 2000). Because their businesses are relatively narrow and stable, they are inactive in the exploring of a new market, i.e. their emphasis on the customer and learning/growth perspectives is lower (Ko, Kincade, & Brown, 2000). In contrast, prospectors tend to put more emphasis on the customer and learning/growth perspectives (Woodside, Sullivan, & Trappey, 1999; Conant, Mokwa, & Varadarajan, 1990).

Analyzers are positioned between the two extremes (defenders and prospectors); they tend to employ both strategies, seeking to maximize opportunities for profit and minimize risk. Analyzers observe the first mover cautiously in order to penetrate into the market with high cost efficiency as the second movers. They neither avoid changes as defenders nor lead these changes as prospectors, but they