An Empirical Investigation of the Effect of Supply Chain Adaptivity on Combinative Competitive Capabilities and Business Performance

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1. Introduction

In this study, we define the Supply Chain Base (SCB) as the set of suppliers and customers whose strategies, products, technologies, and systems can be influenced by the manufacturer, and SCB adaptivity as the ability of the manufacturer to reconfigure and adjust its SCB operations in the face of changing competitive environments. We investigate the underlying structure of SCB adaptivity by using a grounded-theory approach, and define it as a portfolio of exploration and exploitation supply chain activities. Using survey-based data from 294 supply chain managers, we subject to rigorous empirical scrutiny how SCB adaptivity influences combinative competitive capabilities and firms’ performance.

Research on “adaptation in supply chain management” is still in its infancy. Based on his observations, Lee (2004) discusses why supply chains should be adaptive and how they can achieve this. Choi, et al. (2001) provide a conceptual overview of supply chain networks that are characterized as examples of complex adaptive systems. They propose that a supply network can be managed successfully through the autonomous action of its members rather than by a tight control of the supply chain. Based on the developments in systems theory and other fields such as evolutionary biology (Kauffman, 1995), the notion of adaptation has been investigated for over three decades in the business strategy and organization learning literatures. Following organizational learning theory, this research specifically links SCB adaptivity to combinative
competitive capabilities. We operationalize the construct of SCB adaptivity by employing March’s (1991) notions of exploitation, which reflects the improvement of existing skills and resources in order to raise efficiency within an organization, and exploration, which captures the development of new capabilities by the acquisition of new knowledge and resources from external resources.

This paper contributes to supply chain management in three ways. First, we provide a grounded-theory based definition of SCB adaptivity and its measurement. Second, we provide empirical evidence that supply chains need to focus not only on efficiency but also at the same time on seeking out new capabilities and opportunities that exist among them. Third, in this research we examine the mediation of combinative competitive capabilities between supply chain adaptivity and business performance. Except for recent works (Rosenzweig et al. 2003), prior research on competitive capabilities has usually focused on manufacturing function (Flynn & Flynn, 2004). Our research also contributes to the supply chain management literature by studying the relationship between combinative competitive capabilities and business performance from a supply chain management perspective.

2. Theoretical Framework

In this section, we present our theoretical model and fundamental hypotheses (see figure 1). Kauffman (1995) argues that an adaptive process can be seen as a search process of sequential sampling, which is based on two types of activities: exploration and exploitation. March (1991) links exploration activities with complex searches, innovation, variation, risk taking, loose discipline, and flexibility. On the other hand, exploitation is associated with efficiency. It involves improving existing capabilities, processes, and technologies, as well as rationalizing and reducing costs (Lewin, et al., 1999).

Although there is a certain trade-off between exploration and exploitation in practice, March (1991) suggests that maintaining a balance between exploration and exploitation is critical for firm survival and adaptivity. As Levinthal and March (1993:105) state, “The basic problem confronting an organization is to engage in sufficient exploitation to ensure its current viability and, at the same time, to devote enough energy to exploration to ensure its future viability.” Here the crucial point is this: it is the duality of exploitation and exploration activities that an organization must simultaneously pursue that leads to SCB adaptivity. More formally,

**Hypothesis 1a.** *SCB adaptivity is positively reflected by exploitation adaptivity.*

**Hypothesis 1b.** *SCB adaptivity is positively reflected by exploration adaptivity.*
2.1 Linking SCB Adaptivity and Combinative Competitive Capabilities

The operations management literature perceives competitive capabilities as the ability of the organization to achieve low cost, high flexibility, dependability and quality (Schroeder et al., 2002; Rosenzweig et al., 2003). Following this research stream, we apply the definition given by Roth and Jackson (1995) that competitive capabilities are the manufacturers’ ‘actual’, or ‘realized,’ competitive strength relative to primary competitors in its target markets. The list of generic operations competitive capabilities includes quality, cost/efficiency, delivery/responsiveness, and flexibility.

One of the important aspects of the notion of competitive capabilities is the discussion about the concept of traded-off versus combinative capabilities. Classical thinking in manufacturing strategy posits that in order to achieve high performance in one of the competitive capabilities, firms need to trade off for low performance in others (Skinner, 1978). On the other hand, new findings suggest that due to global competition (with the concomitant development and dissemination of advanced manufacturing technologies) firms can achieve high levels in more than one capability (Flynn & Flynn, 2004). Roth’s (1996) competitive progression theory posits that cumulative competitive capabilities are due to organizational learning, and that manufacturers can achieve high performance in more than one capability simultaneously (Rosenzwieg & Roth, 2004).

In summary, the notion of combinative competitive capabilities can be viewed as the holistic combination of individual capabilities that build on each other and are mutually reinforcing (Boyer & Lewis, 2002). More formally we hypothesize that:

**Hypothesis 2.** Combinative competitive capabilities is positively reflected by product quality, delivery speed, process flexibility, and price leadership.

Porter (1991:97) states that, “Strategy is the act of aligning a company and its environment. That environment, as well as the firm’s own capabilities, is subject to change. Thus, the task of strategy is to maintain a dynamic, not a static, balance.” The dynamic balance that Porter discusses can be maintained only by the firm’s ability to integrate its current competencies while simultaneously developing fundamentally new capabilities. Thus, capabilities can be built upon the dynamic balance between the exploration and exploitation activities in which a firm engages (Benner & Tushman, 2002). Therefore, by analogy manufacturers should constantly seek out supply chains that enable combinative capabilities, which will provide them temporary advantage over their competitors. Our theory posits that this search process can be conducted in two ways. Either firms can exploit high-payoff actions that have been undertaken several times and are therefore well understood, leading to supply chain efficiency;
and they can explore seldom-tried actions that may have a higher average payoff (Levinthal, 1997). As a result, we posit that the oscillations between exploitation and exploration activities will lead to constant regeneration of combinative competitive capabilities. Since supply chain base adaptivity is the combination of exploitative and exploratory activities, we hypothesize that:

**Hypothesis 3.** Supply chain base adaptivity directly and positively affects combinative competitive capabilities.

### 2.2 Linking Combinative Competitive Capabilities and Firm Performance

In this study, we measure firms’ economic performance in terms of two categories: financial performance and market growth performance. For financial performance, we apply a widely used measure in management literature, profit level and for growth performance, we use a self-reported measure of market share (Rosenzweig et al., 2003). Many studies link competitive capabilities to business performance (Ferdows & DeMeyer, 1990). Conventional wisdom holds that competitive capabilities improve an organization’s chances for survival (Porter, 1996). Thus, we propose

**Hypothesis 4.** Combinative competitive capabilities positively affect market share.

Since the mid-seventies, many studies have documented the positive relationship between market share and profit level (Buzzell et al., 1975). One of the rationales behind this significant effect is scale economies. In other words, high-market-share businesses can achieve lower costs when higher production rates lead to reduced variable costs (Levinthal & Myatt, 1994). Also, as
in the Wal-Mart case, for example, firms with high market share can exert power on their suppliers in order to lower their material costs as well. Therefore we propose that

**Hypothesis 5. Market share positively affects profit level.**

### 3. Discussion & Implications

Our first contribution in this study is to define SCB adaptivity and measure it by using survey data. To our knowledge, except for the work of Isobe et al. (2004), previous studies on exploitation and exploration either have been mostly conceptual or have used publicly available data such as R&D spending or number of patents as proxy variables. By contrast, our study operationalizes new metrics for exploitation and exploration using rigorous psychometric methods. Second, we empirically show that adaptation has two facets, exploitation and exploration, which are not independent activities and which are both necessary for supply chain adaptivity. Third, we investigate the relationships among SCB adaptivity, combinative competitive capabilities, and firm performance. The significant finding regarding the relationship between SCB adaptivity and combinative competitive capabilities constitutes a significant contribution to supply chain management in terms of identifying the ways that combinative competitive capabilities can be acquired by firms with supply chain adaptivity. Parallel to the findings in the evolutionary economics and dynamic capabilities literatures, our results suggest that combined competitive capabilities mediate the effect of SCB adaptivity on firm performance.

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**References**


