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The impact of information technology on supply chain capabilities and firm performance: A resource-based view

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Abstract

Organizations increasingly rely on information technology (IT) to improve the supply chain process. Yet, past evidence suggests that the investment in IT per se does not guarantee enhanced organizational performance. Drawing from the resource-based view, this study proposes that IT-enabled supply chain capabilities are firm-specific, and hard-to-copy across organizations. These capabilities can serve as a catalyst in transforming IT-related resources into higher value for a firm. Based on data collected from surveying supply chain and logistics managers in various industries, the present study sheds light on these issues. The findings provide a new perspective in evaluating IT investment in the supply chain process.

Keywords: Information technology; Supply chain capabilities; Resource-based view

1. Introduction

The use of information technology (IT) in managing the supply chain process has drawn increasing attention in the corporate world. Indeed, a recent study conducted by Forrester Research indicates that U.S. manufacturers are increasingly dependent on the benefits brought about by IT to: improve supply chain agility, reduce cycle time, achieve higher efficiency, and deliver products to customers in a timely manner (Radjou, 2003). However, IT investment in the supply chain process does not guarantee a stronger organizational performance. The debate on the "IT-productivity" paradox and other anecdotal evidence suggests that the impact of IT on firm performance remains unclear (e.g., Brynjolfsson, 1993; Lucas & Spitler, 1999). In fact, the adoption of a particular technology is easily duplicated by other firms, and it often does not provide a sustained competitive advantage for the adopting firms (e.g., Powell & Dent-Micallef, 1997). Not surprisingly, determining how IT as a resource can create a sustained competitive advantage for a firm remains to be an unresolved issue (Barney, Wright, & Ketchen, 2001).

The primary objective of this paper is to provide some new perspectives in explaining how IT can create a sustained competitive advantage for the firm. In particular, drawing from the resource-based view and supply chain management literature, we propose that IT-enabled supply chain capabilities can serve as a catalyst in transforming IT-related resources into higher value for a firm. The value of IT can be enhanced when it is embedded throughout the supply chain process (Powell & Dent-Micallef, 1997). The implementation of IT in the supply chain can enable a firm to develop and accumulate knowledge stores about its

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customers, suppliers, and market demands, which in turn influences firm performance (Tippins & Sohi, 2003).

Second, we explore two IT-related resources-IT advancement and IT alignment-and their roles in creating higher value for the firm. Past literature tends to examine IT as a stand-alone resource without considering the interrelationship between IT, a firm's strategic emphasis, and the overall business processes (Clemons & Row, 1991; Tippins & Sohi, 2003). In this study, IT advancement measures the extent to which a firm applies the state-of-the-art technology to augment its supply chain capabilities while IT alignment reflects a firm's strategic emphasis in coordinating and integrating its own IT with that of its supply chain partners. By investigating these two specific IT-related resources that are organizationally embedded, we avoid the trap of treating IT as a stand-alone resource, leading to a sounder evaluation of the potential of IT in influencing firm performance.

Third, we develop a new conceptualization of supply chain capabilities as a higher-order construct, consisting of four dimensions: information exchange, coordination, activity integration and supply chain responsiveness. Past literature has discussed one or a few specific aspects of the above capabilities individually (e.g., Frohlich, 2002; Leek, Turnbull, & Naude, 2003; Sahin & Robinson, 2002; Stump & Sriram, 1997). No previous study provides a conceptualization of supply chain capabilities as a higher-order construct that encompasses all of the above dimensions. Our measurement provides a composite index in measuring supply chain capabilities across organizations.

Since IT in the supply chain process has various forms, we limit the context of this study to supply chain communication system (SCCS)—a subset of supply chain management system (SCMS). An SCCS is defined here as an information system shared by channel partners in order to facilitate electronic transactions, quality and cost calibration, and collaborative forecasting and planning (Bowersox, Closs, & Stank, 1999). A typical SCCS incorporates electronic interface systems such as electronic data interchange (EDI) and the Internet, to link the various parts of supply chain management system together including enterprise resource planning, customer relationship management, advanced planning, transportation management, and warehouse management systems (Angeles & Nath, 2003; Bowersox, Closs, & Cooper, 2002; Edwards & Peters, 2001; Sanders & Premus, 2002; Shah, Goldstein, & Ward, 2002; Subramani, 2004). Radio frequency exchange and satellite technology have emerged recently as key elements in SCCS to meet the increasing demand for information in the supply chain process (Bowersox et al., 2002). By limiting the scope to SCCS, we are able to control the respondents' evaluations to a specific type of supply chain system.

The rest of this article is organized as follows. We begin with a brief review of the resource-based view related to IT and supply chain management. Then, a four-dimensional conceptualization of supply chain capabilities is proposed and discussed. Next, a framework that links the IT-related resources to supply chain capabilities and the performance outcomes is presented. This is followed by a discussion of the survey methodology, empirical findings, managerial implications, and limitations.

2. Resource-based view and supply chain capabilities

According to the resource-based view, sources of competitive advantage begin with the notion that firm resources may be heterogeneous and immobile (Barney, 1991). Differences in market performance are fundamentally due to the distinctive resources and capabilities that are valuable, rare, inimitable and non-substitutable (e.g., Barney, 1991; Wernerfelt, 1984). In addition, a firm's competitive advantage can be sustained when it implements a strategy that is not easily duplicated by its competitors (Barney, 1991). How to leverage resources in creating and sustaining competitive advantage for a firm has become the central focus for marketing scholars that link various types of market-based assets (Srivastava, Shervani, & Fahey, 1998; Srivastava, Shervani, & Fahey, 1999) and capabilities (e.g., Day, 1994) with the ultimate financial performance of a firm (e.g., Hunt & Morgan, 1995; Srivastava, Fahey, & Christensen, 2001).

IT, as part of a firm's resource portfolio, may not meet the resource-based view criteria when acting alone. Due to the relatively low barriers to imitation and acquisition by other firms, IT-based advantage tends to diminish fairly quickly (Clemons & Row, 1991). As a result, how IT as a resource can provide a sustained competitive advantage for a firm has become one of the key research topics in recent years. For example, Powell and Dent-Micallef (1997) have shown that the value of IT can be augmented only when it is embedded in an organization through resource complementarity and co-specialization. In the present study, we examine the implementation of IT in the supply chain communication system (SCCS). We propose that through embedding IT in a firm's supply chain process, IT can facilitate the development of higher-order organizational capabilities, namely supply chain capabilities, which are firm specific and hard to duplicate across organizations. The information advantage achieved through the adoption of sophisticated technologies and the synergistic benefits achieved through an integrated system provide the sources of sustained competitive advantage for a firm (Bharadwaj, 2000).

2.1. Supply chain capabilities

In this study, we focus on examining one unique set of organizational capabilities–supply chain capabilities, and their mediating role between IT-related resource and firm performance. Supply chain capabilities refer to the ability of an organization to identify, utilize, and assimilate both