

# An empirical study of the impact of e-business technologies on organizational collaboration and performance

Nada R. Sanders

*Information Systems and Operations Management, Raj Soin College of Business, 271 Rike Hall, Wright State University, Dayton, OH 45435, United States*

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## Abstract

The use of e-business technologies between supply chain organizations has been thematic in recent literature. Organizational collaboration, the foundation of supply chain management, has been enabled by the development and use of e-business technologies. Organizational collaboration and information sharing, in turn, are expected to improve organizational performance. We propose and test a model of the relationship between organizational use of e-business technologies, organizational collaboration, and performance, using empirical data. Our model differs from past studies in that collaboration is viewed as two unique constructs, differentiating between intra- and inter-organizational collaboration. Our findings show that use of e-business technologies impacts performance both directly and indirectly by promoting both measures of collaboration. Intra-firm collaboration is also found to have a direct impact on organizational performance. However, the impact of inter-organizational collaboration on performance is found to be only indirect, through the impact of intra-organizational collaboration. These findings reveal the complexity of organizational collaboration, underscore the importance for companies to promote internal collaboration, and invest in information technologies that facilitate it.

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## 1. Introduction

The growth of information technology (IT) has rapidly changed the face of business over the past decade. Supply chain management (SCM), founded on collaboration between supply chain partners (Narasimhan and Jayaram, 1998; Prahinski and Benton, 2004; Vakharia, 2002), has been especially impacted. IT has made possible the sharing of large amounts of information along the supply chain, including operations, logistics, and strategic planning data. This has

enabled real-time collaboration and integration between supply chain partners, providing organizations with forward visibility, improving production planning, inventory management, and distribution. IT, which allows for the transmission and processing of information necessary for synchronous decision making, can be viewed as the backbone of the supply chain business structure (Kearns and Lederer, 2003; Grover and Malhotra, 1997). For this reason the literature often refers to IT as an essential enabler of SCM activities (Mabert and Venkataramanan, 1998).

Of all the information technologies, the Internet and the Web may have had the most profound impact on business integration and collaboration (Rabinovich et al.,

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*E-mail address:* [nadia.sanders@wright.edu](mailto:nadia.sanders@wright.edu).

2003). The Internet, Web, and web-based applications, termed here e-business technologies, have had a particularly significant impact on managerial practices due to their interoperability and open-standard settings for the transfer of data among organizations (Bailey and Rabinovich, 2001; Rabinovich et al., 2003). In fact, the Internet has surpassed information technologies such as electronic data interchange (EDI), a technology available for more than 20 years, in its information sharing capabilities and cost (Chopra et al., 2001).

Today almost all organizations are in the process of adopting some type of e-business technology to streamline SCM activities. For example, e-procurement has automated and streamlined many corporate purchasing processes (Sengupta, 2001); the Web is being used for collaborative processes such as CPFR (Steerman, 2003); and, in the auto industry, supplier firms are using Internet features such as e-mail and discussion forums to understand details of the automaker's requirements not completely conveyed in formal documentation (Takeishi, 2002).

Studies have found overall IT capability to be positively linked to organizational performance (Bharadwaj, 2000; Kearns and Lederer, 2003) and shown to have the potential of providing a significant competitive advantage to firms (Earl, 1993; Ives and Jarvenpaa, 1991; Kathuria et al., 1999). Similarly, organizational integration has been shown to have a positive impact on performance (Vickery et al., 2003; Stank et al., 2001). Less attention has been paid to the direct impact e-business technology use has on facilitating integration and impacting organizational performance.

The goal of this research is to extend knowledge on how use of e-business technologies impacts organizational collaboration, a form of integration (Stank et al., 2001), and organizational performance. Specifically, we propose and test a model of the relationship between organizational use of e-business technologies, organizational collaboration, and organizational performance. We focus on collaboration as the mediating variable between e-business technology use and performance given that it is considered a critical element of SCM and, as such, has received a great deal of attention in the literature (Frohlich and Westbrook, 2001; Narasimhan and Jayaram, 1998; Prahinski and Benton, 2004; Vakharia, 2002). Further, collaboration is directly enabled by IT use (Stank et al., 2001; Vickery et al., 2003), and understanding details of this mechanism is of high importance. Our model extends knowledge in this area by differentiating between intra- and inter-organizational collaboration, unlike past studies that look at collaboration as a composite of interactions and

collaborative behaviors (Kahn and Mentzer, 1996; Stank et al., 2001; Vickery et al., 2003). This enables us to provide a finer grain perspective of collaboration and its relationship to e-business technology use and performance. The model and constructs used in our study are directly derived from the literature.

Our findings show that use of e-business technologies impacts performance both directly and indirectly, mediated by inter and intra-organizational collaboration. Most interestingly, inter-organizational collaboration is found to impact performance only indirectly, by impacting intra-organizational collaboration. These results have important implications for both managers and researchers as they provide insights into the mechanism of how e-business technology use impacts performance and the inherent complexity of collaboration.

## 2. Background

### 2.1. Integration, collaboration, and organizational performance

Supply chain management takes a systems view regarding all activities and functions that are needed to bring a product or service to market. The theoretical foundation for SCM can be traced back to Forrester's work on system dynamics (1961). This view recognizes that the value creation process extends beyond the boundaries of the organization, and involves integrated business processes among entities of the chain, such as suppliers, manufacturers, and customers (Stevens, 1989; Tan et al., 1998). The value creation process of the chain was further developed by Porter (1980, 1985) who advocates exploitation of "linkages" within a firm's value chain and between the value chains of its suppliers and customers. Exploitation of these "linkages" is expected to lead to superior performance (e.g. Tan et al., 1998; Frohlich and Westbrook, 2001) and promulgates the idea that individual organizations that comprise the supply chain must ultimately be managed as a single entity or one complete system. This requires integration, collaboration, and coordination across individual firm functions and throughout the supply chain.

Research consistently supports the idea that integration between firms improves firm performance (Stevens, 1989; Lee et al., 1997; Metters, 1997; Narasimhan and Jayaram, 1998; Lummus et al., 1998; Anderson and Katz, 1998; Hines et al., 1998; Johnson, 1999; Frohlich and Westbrook, 2001). Problems of nonintegration between firms have been well documented beginning with Forrester's (1961) seminal work (Lee and Billington, 1992; Hammel and Kopczak, 1993; Frohlich

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