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# Impact of eBusiness technologies on operational performance: The role of production information integration in the supply chain

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**Abstract**

While the information technology (IT) literature is mixed regarding the direct benefits of eBusiness technologies on performance, the impact of such technologies on supply chain practices remains largely an unexplored area of research. We hypothesize that while there may be no direct benefit of eBusiness technologies on performance, these technologies might support customer integration and supplier integration in the supply chain, which in turn might impact operating performance.

To examine our hypotheses, we collected data from respondents who focused their responses to a single major product the process that manufactures it, a significant customer, and an important supplier. Our analyses showed that there was no direct benefit of eBusiness technologies on performance; however these technologies supported customer integration and supplier integration. Further, supplier integration was found to positively impact cost, quality, flexibility, and delivery performance; however there was no relationship between customer integration and performance. Consequently, there is a relationship between eBusiness technologies and supplier integration that leads to better performance. Further, there is an interactive effect between customer integration and supplier integration that supports the notion that firms that have both forms of integration, supported by eBusiness technologies, significantly outperform the others.


*Keywords:* eBusiness technologies; Customer integration; Supplier integration; Operational performance; Supply chain management

## 1. Introduction

With the advent of new eBusiness technologies, firms have engaged in initiatives that link supply chain processes across enterprises to create efficiencies and gain a competitive edge. The thrust of investment in eBusiness technologies is to create a seamless integration of entities in a supply chain, which calls for the sharing of accurate and timely information and the coordination of activities between business entities. Distorted information from one end of a supply chain to the other can lead to exaggerated order swings causing tremendous inefficiencies (Lee et al., 1997).

Despite the widespread adoption of eBusiness technologies, it is not clear whether eBusiness technologies have a direct affect on supply chain performance. Certainly, firms invest in eBusiness technologies with the presumption that they will facilitate supply chain integration and that performance will improve. Executives consider "supply chain planning," "linkages with customers," and "linkages with suppliers" to offer the greatest operational improvement opportunities, all of which are the capabilities most often transformed by eBusiness

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technologies in supply chain initiatives (D'Avanzo et al., 2003). Unfortunately, managerial expectations for these technologies have exceeded actual performance (Poirier and Quinn, 2003). Further, while the payoff from investing in information technologies has been a subject of long standing academic research and intense discussion, no clear conclusion has resulted. Payoffs from IT have been and continue to be open to debate in the literature, where it is called the "IT paradox" (Brynjolfsson and Yang, 1996). Largely due to the nature of the research designs employed, this stream of research has not definitively attributed the impact of individual technologies on organizational performance (Lee and Barua, 1999; Devaraj and Kohli, 2003). A direct linkage between eBusiness technologies and supply chain performance still remains an elusive entity. Thus, the first critical research question that this study seeks to address is "Do eBusiness technologies have a significant impact on supply chain performance?"

One possible reason for the dissatisfaction with the performance of eBusiness technologies on the part of supply chain executives is that technology solutions were selected before certain process improvements were made, thereby diluting the paybacks for these investments (Poirier and Quinn, 2003; Zhu and Kraemer, 2002). A potential remedy may be the development of processes to improve integration, which can enhance relationships with distribution channel partners (Johnson, 1999) or cultivate supplier capabilities (Krause et al., 1998). To realize these benefits, firms use eBusiness technologies to engage in information sharing and other forms of collaboration between customers and suppliers that address the issues of production planning and scheduling of their products. We will refer to this specific form of integration as *production information integration*. New eBusiness technologies facilitate quick information sharing between downstream and upstream partners and enable companies like Dell Computer to "trade inventory for information" (Milgrom and Roberts, 1988; Dell, 1999). Capturing and sharing real-time information has become essential to improving supply chain performance. Timely information sharing helps speed up decision making and often results in shorter lead times and smaller batch sizes (Cachon and Fisher, 2000). In addition to information sharing, eBusiness technologies also facilitate the collaboration of supply chain entities. Examples include jointly developing demand forecasting (Koloczyc, 1998; Aviv, 2001) and vendor-managed inventory (VMI), also referred to as direct shipment or automatic replenishment (Buzzell and Ortmeyer, 1995; Cetinkaya and Lee, 2000; Kulp et al., 2004). Conceivably, if eBusiness technologies for production planning and scheduling do not have a direct effect on firm performance, they may have an *indirect* effect on performance via their impact on the processes developed for supplier and customer production information integration. This possibility has not been addressed in the literature. Thus, our second research question is "Does production information integration constitute an important link in the pathway from eBusiness technology to supply chain performance?"

As indicated by Kauffman and Walden (2001), much of the existing eBusiness literature still relies heavily on case studies and anecdotes, with few empirical studies to measure Internet-based initiatives or gauge the scale of their impact on firm performance. Thus, there is a paucity of scientific analysis that clearly establishes the impact of eBusiness technology on strategic measures (Mukhopadhyay and Kekre, 2002). Since the evidence of both the success and failure of eBusiness initiatives has been generally anecdotal, we use a rigorous survey methodology in this paper to answer the two research questions. Specifically, we developed a set of hypotheses based on the literature to empirically test the pathway from eBusiness technology to performance, mediated by information integration. A unique aspect of our data set is that the respondents were asked to focus on their major product, the specific process that manufactures that product, the most important customer for the product, and the most important supplier for parts or components for the product. All data for the production information integration and performance variables were gathered in that context, which allowed the respondents to be specific about the value chain.

## 2. Literature and hypotheses

Our overarching premise is that eBusiness technologies add value to supply chain operations by enhancing production information integration. The focus of this paper is to provide insight into how firms can realize the benefits of those technologies. In this section we develop three constructs and a set of theory-based hypotheses on the role of eBusiness technologies in supply chain performance. These hypotheses are supported by three theories: resource-base view theory, the relational view theory, and the theory of swift and even flow, which will be discussed later. We performed an extensive survey of the literature that spanned the three areas pertinent to this study: eBusiness capabilities, production information integration, and operational performance. Table 1 is a concise summary of the representative references categorized by the three constructs mentioned above.