

The financial performance effects of IT-based supply chain management systems in manufacturing firms

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Abstract

This paper examines the financial benefits of information technology investments around newly adopted IT-based supply chain management (SCM) systems by 123 manufacturing firms over the period 1994–2000. We form hypotheses using the value chain to specify the expected financial impact of SCM systems. By examining the change in financial performance pre- and post-adoption controlling for industry median changes in performance, we find that SCM systems increase gross margin, inventory turnover, market share, return on sales, and reduce selling, general, and administrative expenses. We also provide a model showing how process improvements around supply chain initiatives combine to improve overall performance. Finally, we show that contextual effects such as firms in the high-tech industry and the scope of the supply chain implementation have dramatic effects on the overall financial performance resulting from supply chain implementations.

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1. Introduction

Recent evidence suggests that IT investments, such as IT-based SCM systems, are most likely to provide tangible business value when well targeted, well timed, well managed and accompanied with complementary investments and actions (Barua and Mukhopadhyay, 2000). That IT investments are well targeted, i.e., they are

undertaken to attain specific business objectives, is perhaps most important. Thus, assessments of the business value of IT investments should likewise reflect a direct path from the nature of the IT investment being undertaken to specific metrics reflective of the business objectives being sought. Most of the research examining the business value of IT, however, has focused on broad, overarching firm performance metrics, such as Tobin's *q* (Bharadwaj et al., 1999), equity market capitalization (Brynjolfsson and Yang, 1999) or stock price changes around the announcement of IT investments (Dos Santos et al., 1993; Dehning et al., 2003). While these studies do provide insights into the overall business value of IT investment, associated analyses are accompanied by considerable measurement 'noise' attributed to (1) the indirect path between the IT investment and these

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overarching performance metrics and (2) a recognition that these overarching performance metrics are affected by numerous factors other than the focal IT investment (Dehning and Richardson, 2002).

In a similar vein, the firm performance effects associated with SCM systems have tended to be measured with high-level measures of financial performance or with self-reported, survey-based process performance measures. Extant research suggests that large-scale empirical studies of the financial benefits from SCM are as elusive as a consensus definition of SCM (Scannell et al., 2000). The best recent evidence of the value of SCM is Hendricks and Singhal (2003), who demonstrate that production or shipment delays attributed to SCM systems decrease firm value by an average of 10.28%. However, Hendricks and Singhal note that large sample empirical evidence directly linking SCM systems to financial firm performance metrics is quite limited given currently available evidence (e.g., Frohlich and Westbrook, 2001; Krause et al., 2000; Narasimhan and Das, 1999; Narasimhan and Jayaram, 1998; Shin et al., 2000; Tan et al., 1999).

The intent of this study is to explicitly hypothesize the direct impacts of supply chain investments on (supply chain specific) process metrics along with overall financial performance metrics using audited, externally reported financial performance measures. Using audited, externally reported financial performance measures adds an important degree of verifiability, an essential characteristic of a performance metric (Melnyk et al., 2004). It is certainly possible to assess the impact of focused IT investments by considering the impacts of these investments vis-à-vis correspondingly focused financial accounts. Mukhopadhyay et al. (1995), for example, offer a rare glimpse at the specific changes in detailed financial performance measures by considering the effects of EDI on total inventory, obsolete inventory, and premium freight charges; and Barua et al. (1995) identify relations between various IT and non-IT inputs and business processes, and relations between these business processes and overall firm performance finding (a) a positive impact of IT on business processes and (b) that certain business processes relate positively to overall firm performance. We follow a similar approach, guided by Porter's value chain (Porter, 1985). Motivation for using the value chain to guide the selection of targeted performance measures can be found in Vickery et al. (2003, p. 523).

The theoretical foundation for supply chain integration can be traced to the Value Chain Model (Porter, 1980, 1985), and specifically, its notion of linkages.

A “linkage” is the relationship between the way in which one value activity is performed and the cost or performance of another. Porter advocated the identification and strategic exploitation of linkages *within* a firm's value chain (i.e., horizontal linkages) and *between* the firm's value chain and the value chains of its suppliers and customers (i.e., vertical linkages).¹

Specifically, we develop a conceptual model that considers the impact of IT-based SCM systems on discrete components of the value chain and predict changes in specific financial performance measures associated with these components. IT-based SCM systems are of particular interest due to the heightened cross-organizational event visibility enabled through active process monitoring and automatic information routing, thus attaining levels of supply chain integration not previously possible (Benjamin and Wigand, 1995; Gunasekaran et al., 2004). Then, using an industry-adjusted sample, we assess the impact of IT-based SCM systems on financial performance measures – such as raw materials, work-in-process, finished goods inventory, gross margin, and selling, general, and administrative (SG&A) accounts – expected to be directly affected by investments in IT-enabled SCM.

We then develop a model showing how direct process effects and contextual effects of the supply chain implementation and the firms that implement them influence overall financial performance measures. Our results suggest that the direct process effects of supply chain implementations, in turn, have a significant influence on profit margins and overall return on assets (ROA). Finally, we show that contextual effects such as firms in the high-tech industry and the scope of the supply chain implementation have dramatic effects on the overall financial performance resulting from supply chain implementations. In the final section, we discuss the implications of our analyses for both researchers and practitioners.

2. Background

SCM has many definitions, all with a similar underlying theme of integrating the firm's internal processes with suppliers, distributors, and customers (Elmuti, 2002; Tan et al., 1999). Perhaps the most often cited definition comes from the Global Supply Chain Forum:

¹ Emphasis in original.

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