



# A contingent view of e-collaboration and performance in manufacturing

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## ABSTRACT

Manufacturers are increasingly utilizing Internet-based tools to more readily conduct collaborative activities with key business customers. While the emerging conventional wisdom suggests that the greater the extent to which manufacturers engage in Internet-enabled commerce with downstream business customers the better the performance, we espouse an alternative view. Consistent with the relational view of competitive advantage and contingency theory, we develop a model and a series of hypotheses that specify how various product and market characteristics may influence the nature of the expected positive relationship between e-collaboration and performance.

To test the model, we collected data from 50 manufacturers using a Web-based survey. Our partial least squares (PLS) analysis results do indeed support the notion that e-collaboration is related to better operational and business performance. However, we go on to show that the strength of the relationship between e-collaboration and operational performance diminishes as the level of environmental munificence increases. Notably, we found no such moderating effect with respect to the level of product complexity or market variability. Our findings contribute to the operations strategy literature on supply chain relationships in the e-business arena and offer managers a framework for understanding the conditions under which investments in e-collaboration may be more appropriate and therefore more beneficial.

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## 1. Introduction

In recent years, the practitioner and academic literatures have generated much excitement about Internet-enabled commerce, or the use of the Internet to conduct or support business activities across the supply chain (Boyer and Olson, 2002; Mullaney et al., 2003; Rosenzweig et al., 2009; Tsikriktsis et al., 2004; Zhu and Kraemer, 2002, 2005). One form of Internet-enabled commerce—e-collaboration, which “facilitates coordination of various decisions and activities beyond transactions among the supply chain partners...over the Internet” (Johnson and Whang, 2002, 414)—has garnered a great deal of attention. Frohlich and Westbrook (2002, 741), for example, conclude that

enhanced competitiveness requires that companies ceaselessly integrate within a network of organizations—[and] manufacturers...ignoring this new challenge are destined to fall hopelessly behind their more Internet-enabled rivals,

while Liker and Choi (2004, 104) assert that “partnerships are the supply chain’s blood” in today’s technology-intensive, global economy. But many manufacturers engaged in e-collaboration, particularly those conducting collaborative activities with business customers, have not reaped the expected performance benefits (Deveraj et al., 2007; Jap and Mohr, 2002; Mukhopadhyay and Kekre, 2002; Rosenzweig and Roth, 2007; Zhu, 2004).

In this study, we first hypothesize that e-collaboration with downstream business customers (hereafter e-collaboration) improves performance based on the emerging, yet fairly pervasive, view in practice and in the literature that the greater the supply chain connectivity, the better.

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However, while the benefits of connectivity are widely touted, this view often fails to fully consider the substantial costs associated with e-collaboration (e.g., in information systems, administrative time, process changes, overhead, and human relationships) as well as the environment in which the firm competes (Barrett and Konsynski, 1982; Bensaou, 1999a,b; Clemons et al., 1993; Kumar and van Dissel, 1996; O’Leary-Kelly and Flores, 2002).

As an alternative to the developing conventional wisdom, we go on to hypothesize that there are likely to be conditions under which the benefits of e-collaboration—even when properly executed—do not exceed the costs. In doing so, we draw upon the notion that *context matters* with regard to the proposed relationship between e-collaboration and performance (Drazin and Van de Ven, 1985; Prescott, 1986; Venkatraman, 1989). That is, in addition to investigating the proposed main effect, we examine how various product (product complexity) and market characteristics (market variability, environmental munificence) moderate the form of the relationship between e-collaboration and performance using partial least squares (PLS) modeling.

The paper is intended to offer several key contributions to the emerging e-business literature. First, in contrast to the majority of empirical papers in this literature stream that adopt transaction cost economics or diffusion of innovation perspectives (Robey, 2006), we draw upon the *relational view* (Dyer and Hatch, 2006; Dyer and Singh, 1998; Jap, 1999; Malhotra et al., 2005)—and upon the operations strategy, information systems, and strategic management literatures and practice—to identify potential sources of advantage emanating from e-collaboration.

Second, using a sample of 50 U.S. manufacturers, we provide empirical evidence that e-collaboration is positively and significantly related to both operational and business performance. According to Zhu and Kraemer (2002, 276), “There has been much speculation but very little empirical data to gauge the scale and characteristics of the Internet-based initiatives and their impact on firm performance, especially of large manufacturing companies.” At the same time, much of the operations management (OM) literature on e-business focuses on supply-side, Internet-enabled commerce (Rosenzweig and Roth, 2007; Sanders, 2008), whereas we examine the performance effects of downstream supply chain operations with business customers.

And third, we show that while e-collaboration does matter, the strength of the effect is contingent upon the perceived level of environmental munificence. Ward and Duray (2000) conclude that the environment has long been identified as an important contingency in studies of manufacturing strategy. Yet empirical research in OM linking Internet-enabled commerce and environmental factors to performance is sparse, and as a result, a fruitful area of study (Saeed et al., 2005; Sanders, 2008). This study is one of the first in the manufacturing strategy literature to empirically investigate the ways in which various contextual factors moderate the relationship between e-collaboration and performance, thereby contributing important theoretical and managerial insights into the nature of supply chain relationships in the e-business arena.

In the next section, we elaborate upon our conceptualization of e-collaboration and provide theoretical arguments regarding its contingent linkages to performance. Section 3 describes the research sample, the reliability and validity of our measures, and the PLS analysis approach. We present and discuss the results in Sections 4 and 5, respectively, and in Section 6 we provide our concluding thoughts, the study limitations, and several opportunities for future research.

## 2. Theoretical development

The concept of e-collaboration is grounded in the literature that distinguishes business-to-business (B2B) marketplace-based competition from more traditional marketplace-based competition (Boyer and Olson, 2002; Frohlich and Westbrook, 2002; Johnson and Whang, 2002; Rayport and Sviokla, 1994; Rosenzweig and Roth, 2007; Tatsiopoulos et al., 2002; Zhu and Kraemer, 2002). Rayport and Sviokla (1994, 141–142) conclude,

When buyer-seller transactions occur in an information-defined arena, information is accessed and absorbed more easily, and arranged and priced in different ways. Most important, the information about a product or service can be separated from the product or service itself. . . . The traditional *marketplace* interaction between physical seller and physical buyer has been eliminated. In fact, everything about this new kind of transaction—what we call a *marketplace* transaction—is different than what happens in the marketplace. . . [I]n an information-defined transaction space, customers learn about their products differently, buy them differently, and have them delivered differently.

Building on these studies, Rosenzweig and Roth (2007) use the term *B2B marketplace* to capture the new ways of doing business and corresponding business models made possible by the open standards, connectivity, and interactivity via the Internet. B2B marketplaces cover a wide spectrum, ranging from transaction-oriented Internet sites (e.g., ChemConnect) to more collaboratively oriented private trading networks (e.g., Cisco) (Jap and Mohr, 2002; Rosenzweig and Roth, 2007; Rosenzweig et al., 2009; Zhu and Kraemer, 2005). The context of this research, however, is on those marketplaces that facilitate e-collaboration.

Early work on interorganizational systems (IOS) highlights the important enabling role that technology—over and above more traditional, yet still effective, modes of collaboration (e.g., face-to-face meetings)—plays in creating and facilitating tightly coupled processes among supply chain partners (Barrett and Konsynski, 1982; Cash and Konsynski, 1985; Giffi et al., 1990; Johnston and Vitale, 1988; Malone et al., 1987; Srinivasan et al., 1994; Roth, 1996). Malone et al. (1987, 488) refer to this phenomena as the *electronic integration effect*, in which

. . . a supplier and a procurer use information technology to create joint, interpenetrating processes at the interface between value-added stages. . . This effect occurs when information technology is used not just to speed

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