Effect of IT-enabled supply chain process integration on firm's operational performance

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Abstract

The past literature on information systems and supply chain management has broadly argued on how information systems could impact indirectly a firm's performance, specifically in terms of process integrations with suppliers and customers. The tendency to deliberate on external process integration has altered the firm's focus from internal process integration which used to be considered as one of most important conditions initially for the firm's operational performance. Hence, drawing on the theory of swift, even flow; the resource-based view, and the relational view, this study aims to find out if enterprise systems integration impacts a firm's operational performance through both internal and external process integrations.

Keywords: Supply chain, Process integration, Enterprise systems

1. Introduction

Many researchers in areas of information systems and supply chain management have discussed extensively on a critical role that information technology plays in managing supply chain activities and partnerships to enhance firm's performance. However, due to uncertain direct affect of information technologies on supply chain performance (Devaraj, Krajewski, & Wei, 2007; Heim & Peng, 2010), previous literature tried to explain how and why information technology can improve firm's performance in a supply chain context focusing on external integration with suppliers and customers (Devaraj *et al.*, 2007; Rai, Patnayakuni, & Seth, 2006). Flynn, Huo, and Zhao (2010) defined supply chain integration (SCI) as "the degree to which a manufacturer strategically

collaborates with its supply chain partners and collaboratively manages intra- and inter-organization processes", which emphasizes dimensions of external (suppliers and customers) and internal integrations that should be considered upon supply chain integration. Thus, *objective* of this study is to find out if enterprise systems integration impacts firm's operational performance through both internal and external process integrations.

The goal of supply chain integration is to achieve effective and efficient flow of materials, information, money and decisions, in order to provide maximum value to the customer at low cost and high speed (Ben Naylor, Naim, & Berry, 1999; Bowersox, Closs, & Stank, 1999; Flynn *et al*., 2010; Frohlich & Westbrook, 2001). Manufacturers employ two interrelated forms of supply chain integration: physical flow integration and information flow integration (Frohlich & Westbrook, 2001). Therefore, we consider *supply chain processes* from perspectives of information flow integration and materials flow integration in this study.

Supply chain integration can be hindered because of fragmented IT applications that constrain information flows and activity coordination (Barua, Konana, Whinston, & Yin, 2004; Sambamurthy, Bharadwaj, & Grover, 2003). On the contrary, enterprise systems, which are defined by common data and infrastructure/platform standards, enable flows of information and coordination of activities across functional units and value chain partners.

Based on this foundation, we address the following questions in our research:

1. Does enterprise systems integration impact operational performance of a firm?
2. Do internal and external (suppliers and customers) process integrations mediate the impact of enterprise systems integration on firm's operational performance?
3. Do data consistency and common infrastructure affect enterprise systems integration?

2. Theoretical backgrounds and hypotheses

Our study of the relationships between enterprise systems integration, internal and external process

integrations and firm's operational performance is grounded on three theories: swift, even flow; resource-based view (RBV); and relational view.

The theory of swift, even flow (Schmenner & Swink, 1998) "holds that the more swift and even the flow of materials through a process, the more productive that process is." Consequently, effectiveness and efficiency for any process increases with the speed and smoothness by which the material and information flow through the process. We assume that enterprise systems integration will lead to better process integration on both internal and external levels. Accordingly, materials and information will flow through the entire supply chain including inside the firm more swiftly and evenly, and yield improved operational performance.

H1a. *Internal process integration positively influences firm's operational performance.*

H1b. *Process integration with suppliers positively influences firm's operational performance.*

H1c. *Process integration with customers positively influences firm's operational performance.*

The resource-based view (RBV) is based on the notion that a firm's performance is founded on its unique resources and capabilities that are difficult to imitate (Barney, Wright, & Ketchen Jr, 2001; Wernerfelt, 2006). From the perspective of RBV, literature suggests that the ability of a firm to develop, utilize new technologies and organizational processes, including IT, will bring to sustainable competitive advantages (Straub & Klein, 2001; Teece, 2009; Zhu & Kraemer, 2002). Developing these unique capabilities is an enduring process that requires firms to make a series of strategic decisions related to IT resources as well as to blend them with organizational processes and knowledge resources (Barua *et al*., 2004; Rai *et al.*, 2006). Therefore, we postulate that enterprise systems integration will lead to better internal process integration.

H2a. *Enterprise systems integration positively influences internal process integration.*

Contrary to the RBV's focus on the resources housed within a firm, thus, neglecting the network of relationships in which the firms are embedded (Dyer & Singh, 1998; Powell, 1996), the relational

view postulates that firm's critical resources may extend over its boundaries and be embedded in inter-firm resources and relationships (Dyer & Singh, 1998). In this research, we suppose that enterprise systems integration with suppliers and customers will lead to better process integration with suppliers and customers respectively.

H2b. *Enterprise systems integration positively influences process integration with suppliers.*

H2c. *Enterprise systems integration positively influences process integration with customers.*

Integrating enterprise systems such as ERP, SCM and CRM requires standards in data and platform (Web-based EDI, Internet), and processes to be consistent and implemented in order to achieve real-time connectivity between distributed applications (Ross, 2003). Thus, we assume that *an integrated and standardized IT platform* and *common and standardized data* enable real-time transfer of information between applications and functions not only within a firm, but also across distributed partners of the supply chain.

H3. *Data consistency positively influences enterprise systems integration.*

H4. *IT infrastructure positively influences enterprise systems integration.*

Based on our discussion and the research framework developed by Rai *et al.* (2006), we propose the research framework shown in Figure 1.

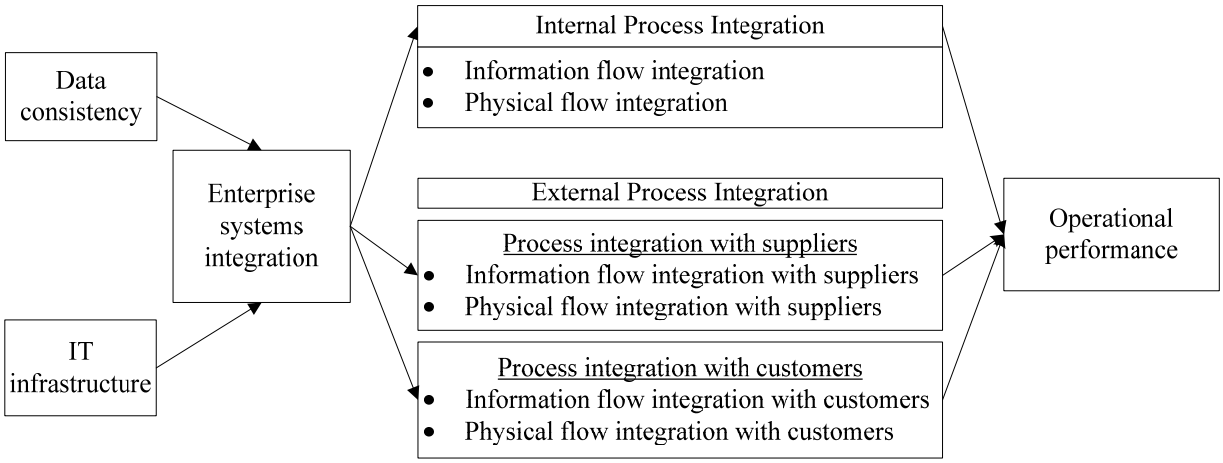

Figure 1. Research framework

3. Research methodology

Research instrument

We will identify valid measures for related constructs and adapt existing scales through literature survey. Preliminary assessments of the questionnaire will be conducted among academicians and supply chain executives for their review.

Data collection

Data is expected to be collected from manufacturing companies in Japan via online-survey between May and July, 2013. We will solicit one respondent from each company who is in charge of supply chain management. Sample size should be large enough to test the research framework.

Once measurement instrument's reliability and validity analyses are conducted principally based on Cronbach's alpha and confirmatory factor analysis, partial least square is to be used for hypothesis testing.

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