2012

Information Technology Customization: How is it Defined and How Are Customization Decisions Made?

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ABSTRACT

This study proposes to examine the role of information technology customization in a logistics and supply chain context. As technology continues to be an enabler of collaborative logistics and supply chain relationships, supply chain partners become more dependent upon information technology and the information shared, creating inter-dependence and a shared destiny (Power, 2005). Understanding that many firms today likely develop and deploy disparate information systems, supporting many different business activities and processes (March , Hevner and Ram, 2000), information sharing among supply chain partners calls for some level of information technology customization due to the varying specializations or differences in capabilities across firm boundaries (Charlie and Rebentisch, 2003). But what exactly defines customization and how do firms determine the appropriate level of customization of their information technology resources is necessary to share appropriate information and integrate with their supply chain partners? A grounded-theory approach will be used.

Keywords

Information technology, customization, supply chain, logistics

INTRODUCTION

Supply chain management (SCM) has been described as the integration of business processes that span the spectrum from the raw material extractor to the end user to provide products, information, and services to add value (Cooper, Lambert, and Pagh, 1997; Richey, Roath, Whipple, and Fawcett 2010). Attempts by firms to optimize supply chain processes inevitably lead to a growing interdependence among supply chain partners. The strategic integration of trading partners is the SCM concept (Walton and Miller, 1995). With increased interdependence brings an increase in obligation to supply chain partners (Harrison and van Hoek, 2011). Therefore, supply chain partners must become more integrated.

SCM has emerged as the product of the modern information revolution (Fawcett, Wallin, Allred and Magnan, 2009). Today's collaborative supply chain has been made possible through advances in information technology (Cachon and Fisher, 2000; Lee, So and Tang, 2000). An important binding that often holds supply chain relationships together is capabilities provided by information technology (Walton and Miller, 1995). Information-enabled collaboration reduces costs in the supply chain while enhancing customer service and value (Fawcett, Osterhaus, Magnan, Brau and McCarter, 2007). As technology continues to be an enabler of collaborative logistics and supply chain relationships, supply chain partners become more dependent upon information technology and the information shared, creating inter-dependence and a shared destiny (Power, 2005). Thus, making information systems and the applications within those systems work together is large part of supply chain and logistics integration (Gulledge, 2006). Understanding that many firms today likely develop and deploy disparate information systems, supporting many different business activities and processes (March et al., 2000), information sharing among supply chain partners calls for some level of information technology customization due to the varying specializations or differences in capabilities across firm boundaries (Charlie and Rebentisch, 2003).

Understanding the role of information technology customization as it relates to logistics information systems and how customization decisions are made could help to understand and better identify the gap between the information technology capabilities of a firm and information initiatives required to share information and better integrate with supply chain partners. Further, this understanding may lead to a better process by which firms make technology investment decisions when

customization is required. Using a grounded theory approach, this study proposes to explore the role of information technology customization in a logistics and supply chain context. How is customization defined? According to Haines (2009) the term customization is not used consistently throughout the literature. Also, how do firms determine the appropriate level of customization of their information technology resources that is necessary to share appropriate information and integrate with their supply chain partners? The scope of this research includes providing a consensus definition for information technology customization of inter-organizational systems and / or systems used in the logistics / supply chain context, to include (but not limited to) ERP systems.

UNDERSTANDING INTEGRATION, INFORMATION SHARING, AND THE SUPPLY CHAIN

Supply chain management is based on the integration of activities that add value to customers starting from product design to delivery (Gunasekaran and Ngai, 2004). According to Bowersox and Closs (1996), to be fully effective in today's competitive environment, firms must expand their integrated behavior to incorporate both customers and suppliers (Mentzer DeWitt, Keebler, Soonhoong, Nix, Smith and Zacharia, 2001). For the purposes of this research, integration is defined as a firm's objective to attain operational and strategic efficiencies through collaboration among internal functions and with other firms (Richey et al, 2010; Rodrigues Stank and Lynch 2004; Stank Keller and Closs, 2001). Integration within the context of the supply chain is concerned with coordination: establishing the rules where by material and information flows work in practice (Harrison and van Hoek, 2011). The basis for integration can be characterized by cooperation, collaboration, information sharing, trust, and shared technology (Akkermans, Bogerd and Vos, 1999). Technology-enabled inter-organizational information systems vary in the extent of their integration, providing for different levels of information sharing across firm boundaries (Nicolaou, Sedatole, and Lankton, 2011; Nicolaou, 2008). As Inter-organizational systems act as facilitators of integration and the development of unique processes across the supply chain (Saeed, Malhotra and Grover, 2011), achieving higher levels of integration, it is argued, requires greater customization of information technology resources, which ultimately facilitates the sharing of information between partners (Klein, 2007). According to Power (2005), the three principal elements of an integrated supply chain are described as being information systems and the management of information, inventory management, and the management of supply chain relationships

The flow of information is at the heart of the supply chain concept (Thomas, Esper and Stank, 2010). Information sharing is the extent to which critical or proprietary information is communicated to one's supply chain partner (Monczka, Petersen, Handfield and Ragatz, 1998). Of all the resources a company manages, information has received the greatest attention as critical to the implementation of the company's strategic supply chain response (Fawcett et al., 2007). Shared information among trading partners may include things such as inventory levels, product descriptions, pricing, shipment tracking, and promotional calendars (Harrison and Van Hoek, 2011). The benefits of better information linkages and greater information sharing have been outlined in much of the prior research (Madlberger, 2009). These benefits include, but are not limited to, a reduction of inventory levels, shorter product lead times, improved supply chain coordination, improved purchasing, reduced costs, the reduction of the "bullwhip effect", and improved overall firm performance (Cachon and Fisher, 2000; Frohlich, 2002; Lee et al., 2000; Madlberger, 2009; Yao and Dresner, 2008). However, due to the competitive, and in many cases, adversarial, nature of business, managers tend to overestimate the risks without seeing the benefits and can be reluctant to share information with their partners (Huang and Gangapadhyay, 2004). Understanding that information is power, managers have had a difficult time learning to share information. Fear of opportunism by partners in the supply chain promotes the hoarding of information and makes it difficult for managers to want to share. In addition, those who hoard information are able to exploit it, but they cannot leverage it to obtain the cost savings and enhanced service that firms can attain through the sharing of relevant information with supply chain partners (Bowersox, Closs and Stank, 2000).

The value of information sharing within the supply chain has been extensively researched. Cachon and Fisher (2000) studied the value of sharing demand and inventory information. They found supply chain costs were lowered, though not as much as anticipated, with full information sharing among supply chain partners. Li and Zhang (2008) considered information sharing in a decentralized supply chain where one manufacturer supplies to multiple retailers competing in price. They found that when all retailers share their information confidentially, they will be truthful and report the necessary information and the supply chain will achieve its maximum in equilibrium. Li (2002) examined the incentives for firms to share information vertically in a two-level supply chain. Vertical information sharing has two effects: "direct effect" and the "leakage effect". Their findings were not necessarily positive. Information leakage could adversely affect firms. Zhang (2007) investigated the influence of information systems connectivity on performance, finding support for information sharing related to profitability whereas support for information interpretation was negatively associated with profitability. Hsu**,** Chiu**,** Chen and Liu (2009) examined the dimensions of information sharing related to buyer-supplier relationships and demonstrated a positive relationship between an increased information sharing capability and a stronger buyer-supplier relationship, and between stronger buyer-supplier relationships and improved firm performance. Finally, Klein, Rai and Straub (2007) found that firms

achieved greater performance gains when partners share information and customize information technology resources. From the literature, a clear theme emerges. The sharing of the appropriate information with supply chain partners is key to establishing trust, improved relationships with firm partners, achieving greater integration, and gaining a competitive advantage. According to the literature, information sharing among supply chain partners calls for some level of information technology customization due to the varying specializations or differences in capabilities across firm boundaries (Charlie and Rebentisch, 2003; Hsu, Kannan, Tan and Leong, 2008)

INFORMATION TECHNOLOGY CUSTOMIZATION

The literature on the customization of information systems is somewhat limited. Definitions are varied and inconsistent. Rothenberger and Srite (2009) defined customization as building custom features by using standard programming languages or the ERP system's language, changing the ERP system code, and/or including third-party packages that require some degree of programming to implement. Haines et al. (2006) defined customization as the "best-of-breed" module or enterprise system module, with the goal of providing a better match with existing or desired organizational processes and data. Luo and Strong (2004) stated that customization involves the modification of an ERP software package to match the organizations existing processes. Klein (2007) defines customization as an asset specific information technology investment made by clients in the course of a strategic business relationship. Maciaszek (2001) defined customization as an administrative task of tailoring the software to different groups of users.

The majority of literature focuses on enterprise resource planning (ERP). ERP is a business management system made up of a collection of applications that integrates all facets, including marketing, finance, human resources, sales, manufacturing, logistics, etc., of a company into a common database (Hsu and Chen, 2004; Al-Mashari, 2003; Chang, Chou and Yen 2002) The commonly accepted best practice for large, enterprise wide system implementation has been to limit customization. Citing high cost and difficult change management, minimal customization has been preferred. Some past research suggests that high ERP customization contributes to project failure (Rothenburger and Srite, 2009). However, firms seeking benefits of greater integration with supply chain partners may be motivated to undertake such customization projects to achieve those goals. Subramani (2004) provided evidence that relationship-specific investments by suppliers are linked to their patterns of supply chain management system use. The study developed and tested theory relating to supplier firms' use of information technologies in a supply chain. Jayachandran, Sharma, Kaufman and Raman (2005) examined the key drivers and outcome of relational information processes and the role of technology; specifically, the implementation of customer relationship management (CRM). Their study emphasizes the importance of customer relationship management and the contributing role of technology. Fawcett et al., (2007) discussed both and technical and cultural perspectives as enablers of information sharing within a supply chain, establishing connectivity and willingness as antecedents to information sharing within a supply chain.

ERP software has been marketed as a tool designed to make information system connectivity easier, without "customization". Called configuration, software modules for different processes and business organizations, both inside and outside the firm, could be integrated in a seamless manner. Initial research by Davenport (1998) sought to detail whether or not enterprise systems were living up to companies expectations. Davenport found a growing number of horror stories about failed or out-of-control ERP projects. Even though packaged ERP applications are designed to work within different applications or organizations, they generally do not provide all of the functionality necessary. Thus, all ERP installations were found to need some degree of system customization (Rothenburger and Srite, 2009). One of the most intriguing items in the literature was authored by Rothenburger and Srite, (2009). Using exploratory case analysis, the authors attempted to analyze why certain system adopters pursued higher levels of customization. Using data from ERP adoption projects and consultants, the authors identified specific drivers of customization. These drivers were determined to be unnecessary development of functionality already available as an ERP system standard, resistance to change based on cultural issues, low project acceptance, and lack of opposition to customization requests.

PROPOSED RESEARCH DESIGN

For the research described, a grounded theory approach is an appropriate qualitative methodology (Eisenhardt, 1989; Graebner, 2004; Straus and Corbin, 1990). Grounded theory is designed to move beyond description to systematically explain a process, action, or interaction on a topic (Creswell, 2007). Twenty to thirty semi-structured interviews will eventually be conducted. The interviews will be aimed at discovering and gaining a detailed understanding of the definition of customization, the factors affecting customization decisions, and how firms determine the appropriate level of customization of their information technology resources. Initial research will focus on the question of providing a consensus definition of information technology customization. Some open-ended questions will be utilized. The analysis of the data will be completed according to the coding method developed by Srauss and Corbin (1990). Theoretical sampling, which

allows the researcher to gain greater insight of the phenomena under study (Stuart McCutcheon, Handfield, McLachlin and Samson, 2002) will be utilized.

The relational view of the firm provides the theoretical foundation for the research proposed here. According to Dyer and Singh (1998) within the context of an exchange, specialized, relationship-specific assets create more value for the firm than non-specialized, generic assets. Though the tangible parts of information technology itself have become ubiquitous, in that firms have the opportunity to acquire the technology necessary to connect, collaborate, and create value within the supply chain, the way in which technology is customized to suit the needs of supply chain partners could help to improve information sharing. Information technology customization creates specialized, relationship-specific assets and processes for partnering firms. This research will be directed at the stakeholders involved in information technology customization initiatives.

As this research is in its formative stages, a broad range of participants will be included. Industry professionals involved in different customization efforts would likely have valuable insight. The main goal for the project is to get a good sense of how customization is defined and how firms determine the appropriate level of customization of their information technology resources necessary to share appropriate information and integrate with their supply chain partners. Some initial interviews have already been conducted. As this is research in progress, coding of the data has not yet been completed. The interviews included open ended questions that let possible new insights emerge. Initial responses to the question "What is your definition of customization?" are included below. An early emergent theme appears to be concerns about requirements.

"The first word that comes to my mind is proprietary. If I'm going to customize something, it's going to be proprietary to the needs or the decisions of the organization or who I'm customizing it for. "

"I would say taking a specific requirement or a unique requirement and adapting that to multiple uses versus one unique purpose."

"To me, customization is the ability and practice of providing our clients with solutions that meet the needs of their requirements. IT customization is the result of detailed information gathering, process definition and implementation of best practices.

CONCLUSION

As stated previously, the term customization is not used consistently throughout the literature (Haines, 2009). To describe the nature of changes made to a system, practitioners and academics alike use a variety of terms. Most commonly used, according to the literature are "customization", "configuration" and "modification" (Haines, 2003). Information technology is an important firm resource. Companies are intently focused on upgrading their information sharing capabilities (Fawcett et al., 2007). It is possible that customizing information technology resources could allow firms to improve the sharing of information, enhance their relationship quality, lead to greater integration, and provide for better firm performance. Given the costs associated with technology investment, understanding the process by which firms make technology investment decisions; specifically, understanding the gap between capabilities and initiatives and the need for the firm to adapt. It should be noted this is a work in progress. Additional interviews will be conducted to reach theoretical saturation and further our understanding of information technology customization in a supply chain context.

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