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Effects of inter-organizational compatibility on supply chain capabilities: Exploring the mediating role of inter-organizational information systems (IOIS) integration

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ABSTRACT

Growing globalization and environmental uncertainty have increased the challenges managers face in delivering services or products to the customer. Integration of information systems across partnering organizations has become the backbone of supply chain management, as amalgamation facilitates the sharing of information required to enhance organizational flexibility and responsiveness while minimizing risk and inventory costs. Using data from the Australian retailing sectors, this study investigates the mediating role of inter-organizational information system (IOIS) integration on the relationships between inter-organizational compatibility and supply chain capabilities. The results indicate that inter-organizational compatibility of technical, strategic, and cultural inter-organizational dimensions facilitate IOIS integration and supply chain capabilities. To maximize benefits for all chain members, IOIS integration needs to be embedded in the strategies and goals of partnering organizations. Business-to-business and industrial marketing managers need to be aware that IOIS integration processes require support of top managers of the partnering organizations and should be embedded in the organizations' strategic goals.

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1. Introduction

Growing globalization, market dynamism, and environmental uncertainty have increased the challenges that managers face in delivering the right service or product to the customer, at the right time, in the right quantities and condition, and at lowest delivered cost (Li & Lin, 2006). Dynamic environments require managers to create new value propositions that use relationship-driven customer agreements (Badii & Sharif, 2003), and in managing business-to-business relationships. Information and computer technology has emerged as a crucial tool in managing business-to-business relationships (Pereira, 2009; Thomas & Griffin, 1996), and integration of information systems across partnering organizations has become the backbone of supply chain management as it facilitates information sharing, thereby enhancing organizational flexibility and responsiveness while minimizing risk and inventory costs (Hartono, Li, Na, & Simpson,

2010; Krause, Handfield, & Tyler, 2007; Vickery, Jayaram, Droge, & Calantone, 2003).

Inter-organizational information systems (IOIS) comprise boundary-spanning technologies and value-added networks that link suppliers and buyers (Craighead, Patterson, Roth, & Segars, 2006). IOIS can include value-added network-based electronic data interchange (EDI), Internet-based EDI, extranets, electronic exchange in supply chain management, and other decision support systems that use a common technology under a single ownership (Lyytinen & Damsgaard, 2011). Therefore, an IOIS can comprise two or more autonomous organizations that share information and communication technology built around shared or common IT capabilities that facilitate the creation, storage, transformation, and transmission of information across organizational boundaries (Johnston & Vitale, 1988).

However, because of their boundary-spanning properties, IOIS are inherently complex, as these systems involve multiple partners with diverse interests, cultures, and strategic intentions (Ireland & Webb, 2006), and as a result, their implementation can be problematic, as it requires significant effort to redefine and extend the boundaries of the participating organizations (Kim, Ryoo, & Jung, 2011). Consequently, inter-organizational compatibility is a key ingredient of IOIS integration (Waarts, van Everdingen, & van Hillegersberg, 2002). Within these boundary-spanning networks, effective integration requires business partners to be highly embedded operationally, technically, and strategically (Hult, Ketchen, & Slater, 2004). Prior investigations in business-

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to-business and industrial marketing suggest the need for inter-organizational compatibility and congruency between partnering organizations to ensure the effective flow of financial and physical information across the supply chain (Claycomb, Iyer, & Germain, 2005; Sarkar, Echambadi, Cavusgil, & Aulaks, 2001). Research also highlights the positive effects of IOIS on individual organizations as well as the supply chain (Cachon & Fisher, 2000; Li & Lin, 2006). For example, information-sharing through IOIS enables organizations to identify and communicate consumer requirements across the supply chain (Soliman & Janz, 2004), thereby enhancing responsiveness and delivering products that meet specified customer and buyer configurations (Li & Lin, 2006). Further, effective integration of IOIS across the supply chain facilitates access to timely and accurate information that is necessary for collaborative planning and forecasting, production scheduling, and synchronization of orders (Attaran & Attaran, 2007; Pereira, 2009). Thus, IOIS integration is crucial in managing risk and uncertainty (Glickman & White, 2006) and enables organizations to maintain information integrity across the supply chain (Levy, Bessant, Sang, & Lamming, 1995).

While many organizations invested heavily in information systems in anticipation of significant improvements in information-sharing capabilities, data security, inter-organizational relationships, and supply chain processes (Weber & Kantamneni, 2002), most have failed to reap the anticipated benefits (Li & Williams, 1999; Widdifield & Grover, 1995). Despite the espoused benefits of IOIS integration, recent literature indicates that the adoption rate of IOIS has been low, and in some cases, organizations have even abandoned IOIS integration processes (Rodon, Sese, & Christiaanse, 2011). Additionally, the benefits of IOIS integration may not be equitably distributed throughout the supply chain (Lee, So, & Tang, 2000; Wakolbinger & Cruz, 2011), owing to inequitable allocation of cost and resources (Griffith & Harvey, 2006).

These findings have sparked interest in how industrial managers can successfully and effectively integrate IOIS to enhance organizational performance and maximize benefits for all chain members. Some researchers suggest that organizations can only attain significant benefits from IOIS integration if the information technology is embedded in the partnering organizations through resource complementarity and co-specialization (Poon & Swatman, 1999; Wu, Yeniyurt, Kim, & Cavusgil, 2006).

This study addresses several gaps in prior work. First, despite the increased attention from managers, researchers, and policy makers, few studies have attempted to identify how managers can position IOIS within and across organizations to fully maximize the benefits of integration for all chain members (Batt & Purchase, 2004). While some researchers have found integration to benefit all supply chain partners (Lau & Huang, 2002), others maintain that manufacturers gain more from such investments than other channel members (Lee et al., 2000; Simchi-Levi & Zhao, 2003; Wakolbinger & Cruz, 2011). Still others argue that channel-leading power has actually shifted from manufacturers to retailers (Huang, Li, & Mahajan, 2002). Further, the benefits of IOIS integration to different channel members can be influenced by the distribution of negotiated profit across the supply chain, the negotiation power of the participants, and risk-sharing contracts (Wakolbinger & Cruz, 2011). For example, retailers such as Wal-Mart use channel power to obtain price reductions from suppliers or manufacturers (Yue, Austin, Wang, & Huang, 2006). Thus, how IOIS integration can be managed to benefit most supply chain members is an important question.

Second, while investigations have led to some consensus on the positive effects of IOIS integration on the performance of some supply chain members, which specific issues managers need to focus on remains unclear. Given that compatibility and congruency in operational, technical and strategic goals between business partners are the keys to IOIS integration, investigating the role that different compatibility dimensions play in the integration process is important.

The goal of this study is to expand the understanding of how managers can effectively develop and manage IOIS integration to enhance

organizational performance and supply chain capabilities. Drawing on the resource-based view and the theories of dynamic capability and congruence, we develop and test a theoretical framework to explain how inter-organizational compatibility dimensions facilitate IOIS integration and supply chain capabilities. The remainder of the article is organized as follows. We begin with an overview of the theoretical underpinning and literature on inter-organizational compatibility, IOIS integration, and supply chain performance and capabilities. Subsequently, we present the methodology and data analysis, and we conclude with a discussion of results, research implications, and areas for future research.

2. Theoretical framework

Prior supply chain research has adopted inter-disciplinary theories, such as diffusion of innovation, network theory, the resource-based view, and the technology acceptance model to explain information system implementation and adoption within supply chains. However, a vacuum persists in theories explaining the role of inter-organizational factors in information systems integration within the supply chain. An in-depth understanding of the relationship between inter-organizational compatibility, IOIS integration, and supply chain capabilities may require the development of a conceptual framework based on a combination of congruence theory, the resource-based view (RBV), and dynamic capability theory (DCT).

Prior business-to-business research has espoused the importance of resources and capabilities in enhancing competitive advantage (Danneels, 2008; Helfat & Peteraf, 2003; Möller & Svahn, 2006; Teece, Pisano, & Shuen, 1997). According to the RBV, an organization's sustainable competitive advantage depends on its control of valuable, rare, heterogeneous, and inimitable resources and capabilities (Amit & Schoemaker, 1993; Barney, 1991; Bharadwaj, Varadarajan, & Fahy, 1993). Resources can be assets, processes, information and knowledge, and technological and customer knowhow (Barney, 1991), and capabilities include organizational processes and routines rooted in knowledge (Cepeda & Vera, 2007). An IOIS constitutes a substantive capability that facilitates operational functioning of an organization to produce the desired output (Cepeda & Vera, 2007; Winter, 2003; Zollo & Winter, 2002).

Other researchers argue that the RBV does not fully explain why some organizations that have substantial resources and capabilities have failed to refresh and change them in turbulent and volatile environments (Ambrosini & Bowman, 2009; Teece et al., 1997; Zahra, Sapienza, & Davidsson, 2006). As a result, the dynamic capability theory (DCT), an extension of the RBV, has emerged to explain how organizations can integrate, build, and reconfigure their internal resource stocks and external competencies in changing environments (Teece et al., 1997). Dynamic capabilities are a learned pattern of collective activity and strategic routines through which an organization can generate and modify operating practices to achieve new resource configuration (Eisenhardt & Martin, 2000; Teece, 2007; Zollo & Winter, 2002). Dynamic capabilities include factors such as strategic decision-making and alliance management that ensure that substantive capabilities can change to provide a sustainable competitive advantage (Rindova & Kotha, 2001; Zahra et al., 2006). Dynamic capabilities facilitate the understanding of how supply chain partners can acquire, deploy, and reconfigure resources within the organization and the supply chain (Newbert, 2007), and they are critical for performance in technology-based environments as they determine the speed of change (Teece, 2007). Attaining competitive advantages requires efficient and effective sharing and deployment of resources between partnering organizations and supply chain partners (Das & Teng, 2000; Dhanaraj & Beamish, 2003). In this study, the DCT helps to explain how IOIS integration can act as a strategic asset that individual organizations can leverage to create competitive advantages for individual organizations (Dyer, Kale, & Singh, 2001; Jap, 2001; Lambe, Jay, Robert, & Hunt, 2002) and the supply chain.

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