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# Enhancing hospital supply chain performance: A relational view and empirical test

Daniel Q. Chen[a,1], David S. Preston[a,2], Weidong Xia[b,*]

[a] Department of Information Systems and Supply Chain Management, M.J. Neeley School of Business, Texas Christian University, Fort Worth, TX 76109, United States

[b] Department of Decision Sciences and Information Systems, College of Business Administration, Florida International University, Miami, FL 33199, United States

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ABSTRACT

Improving hospital supply chain performance has become increasingly important as healthcare organizations strive to improve operational efficiency and to reduce cost. In this study, we propose a research model based on a relational view, delineating the factors that influence hospital supply chain performance: trust, knowledge exchange, IT integration between the hospital and its suppliers, and hospital–supplier integration. Testing results of the research model based on data from a sample of 117 supply chain executives from U.S. hospitals show positive direct effects: (1) from trust and from IT integration to knowledge exchange respectively; (2) from knowledge exchange and from IT integration to hospital–supplier integration respectively; and (3) from hospital–supplier integration to hospital supply chain performance. The results also show the following indirect effects: (1) the influences of knowledge exchange and IT integration on hospital supply chain performance are partially and fully mediated by hospital–supplier integration, respectively and (2) the influences of trust and IT integration on hospital–supplier integration are fully and partially mediated by knowledge exchange, respectively. In addition, the results show the following moderating effects: (1) hospital system membership moderates the relationships between IT integration and knowledge exchange and between trust and knowledge exchange; (2) hospital environmental uncertainty moderates the relationship between trust and knowledge exchange; and (3) trust moderates the relationship between knowledge exchange and hospital–supplier integration. Implications of the study findings and directions for future research are discussed.



## 1. Introduction

The recent U.S. government healthcare reform initiatives and public demand are putting pressure on healthcare organizations, which accounted for 17.9% of the U.S. gross domestic product in 2011[3] (Wayne, 2012), to look for ways to improve operational efficiency and to reduce soaring costs. The need for hospitals to operate effectively to address financial challenges have become more crucial due to the recent economic downturn (Kowalski, 2009). Historically, expenses for hospital supplies and materials have constituted up to 45% of a hospital's operating budget (Kowalski, 2009). With the projected growth trend, hospitals and health systems may soon spend more on their supply chains than on labor (DeJohn, 2009). As such, supply chain management has become one of the most important areas for the CEOs and executive leadership of hospitals (Barlow, 2010c).

The literature on supply chain management has historically focused on product-based industries such as manufacturing and retail. There have been calls for researchers to develop supply chain theories with specific considerations of industry and operating environments, especially service sectors (Baltacioglu et al., 2007; Beckman and Sinha, 2005; Johnston, 2005). Hospital supply chains are unique and different from the typical industrial supply chains in many aspects. First, since clinical operations require adequate and accurate supplies according to the diverse needs of patients, hospital supplies are mission critical to the health of the public (Beier, 1995). For contemporary hospitals, supply chain management extends its reach and influence to just about every clinical and operational area (Barlow, 2010b). Second, an average hospital

* Corresponding author. Tel.: +1 305 348 1160.
*E-mail addresses:* d.chen@tcu.edu (D.Q. Chen), d.preston@tcu.edu (D.S. Preston), Weidong.Xia@fiu.edu (W. Xia).
[1] Tel.: +1 817 257 6288.
[2] Tel.: +1 817 257 6154.

[3] The U.S. government has projected that healthcare spending will reach 20% of U.S. GDP by 2021.

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uses thousands of different types of supplies and equipment, much of these materials are of high value and require special handling to combat spoilage or obsolescence. Third, unlike other industries, healthcare has yet to establish a specific universal product number classification system that helps identify functionally equivalent products, resulting in a lack of data standards and synchronization in hospital supply chain management practices (Garvin, 2006; Sargent, 2010; VanVactor, 2008). Fourth, hospital supply selections are often driven by physician preference, which is largely based on medical training, experience with specific brands, and context-specific demands. This is in contrast to manufacturing and retail industries where supply selections are largely driven by production/sales forecasts and cost considerations. There is often a disconnect between those who make the buying decisions (i.e., physicians) and those who actually do the buying (Roark, 2005; Stark and Mangione, 2004). Fifth, the diverse types of healthcare supplies often change as a result of rapid technology and medical innovations, which makes the management of the healthcare supply chain information and knowledge intensive. Hospitals must deal with a large number of suppliers with different specializations and knowledge. As such, hospital supply chain management is uniquely more complex and knowledge-intensive than traditional industry supply chain practices.

Industry experts have estimated that supply chain management practices of the healthcare industry are 10 years behind such industries as retail and manufacturing (Burt, 2006). Rather than viewing the management of the supply chain as an obligatory cost, hospitals would benefit by focusing on supply chain management as an intrinsic part of organizational strategy (Darling and Wise, 2010). Hospitals are challenged to derive impact on organizational performance from the supply chain. Hospitals with a well-managed supply chain can appreciably obtain substantial organizational benefits from both financial and clinical perspectives.

A primary task, as well as a challenge, in supply chain management practice is the integration of the business functions and activities throughout the supply chain (Vickery et al., 2003). In particular, synchronous information access and process integration between the company and its suppliers is regarded as a key strategic issue (Droge et al., 2004; Klein, 2007). As such, information technology (IT), which allows for seamless transmission and processing of information critical for real-time decision making (Setia et al., 2013), has become the backbone for companies to achieve integration with their supply chain partners (Kearns and Lederer, 2003; Sanders, 2007). Because of the interrelated nature of IT and supply chain management, the topic of supply chain integration has drawn growing attention from researchers in both the operations management (OM) and information systems (IS) areas.

This study examines the consequences and antecedents (including IT and other relevant and complementary organizational factors) of hospital–supplier integration. The choice of the hospital context is purposeful. First, the majority of prior supply chain studies focus on the manufacturing environment. Given the complex and different nature of the healthcare environment, there is an immediate need to study hospital supply chain integration and performance to extend the body of supply chain management research. Second, health sectors are, at the international level, traditionally 10–15 years behind other industries in IT adoption (Gibb and Haar, 2009). However, the fierce rate of growth of healthcare costs has caused a substantial increase of healthcare IT expenditures and there is an increasing need to understand the payoff of hospital IT investments (Agarwal et al., 2010; Menon et al., 2009). In fact, extant studies focusing on the direct effects of IT investment on firm performance have produced mixed and often contradictory results (Drnevich and Croson, 2013; Melville et al., 2004). Instead of focusing on how much value is added, researchers have called for studies to use frameworks based on business processes by focusing on the intermediate business processes through which IT investment is converted into added value (Barua et al., 1995; Dehning and Richardson, 2002; Mittal and Nault, 2009; Mooney et al., 1996; Soh and Markus, 1995). An examination of the intermediate factors through which IT and other complementary organizational assets contribute to hospital supply chain performance will also enrich the literature on the business value of IT. Third, improving hospital supply management is critical for enhancing healthcare efficiency and reducing costs. Recent developments in the literature have revealed that the findings regarding the relationship between supply chain integration and firm performance are inconsistent (Flynn et al., 2010) and there remain many barriers for companies to achieve supply chain integration (Harland et al., 2007). As noted by Flynn et al. (2010), a possible reason of the mixed findings is the inconsistent and incomplete conceptualization of supply chain integration. For example, some researchers focus on internal or external integration, while other researchers examine both. Regarding the role of IT, some prior studies have conceptualized IT as a component of supply chain integration (Harland et al., 2007) and linked the use of supply chain technologies directly to firm performance (Johnson et al., 2007), while other studies have examined IT as an antecedent of supply chain integration (Sanders, 2007). Accordingly, there have been calls for a systematic approach to examine supply chain integration (Flynn et al., 2010). In addition, researchers have suggested that supply chain research can benefit from the adoption of both organizational and strategic management theories (Hitt, 2011; Ketchen and Hult, 2007; Miles and Snow, 2007).

In this study, we define hospital–supplier integration as the extent to which the business processes between a hospital and its key suppliers (e.g., interorganizational logistical activities) are strategically coupled and unified as a whole (Barki and Pinsonneault, 2005; Flynn et al., 2010; Vickery et al., 2003). Using survey data collected from 117 U.S. hospital supply chain executives, we test a research model that places the antecedents and consequences of hospital–supplier integration in a nomological network. Drawing on cross-disciplinary literature from IS, OM, and organizational studies, we propose that both intangible organizational assets (i.e., the routine knowledge exchange between the hospital and its key suppliers and the hospital's trust to its key suppliers) as well as tangible assets such as the level of IT integration between a hospital and its key suppliers are important forces that directly explain the level of hospital–supplier integration. We posit IT integration and trust as complementary relational resources, both of which are predecessors of intermediary process capabilities (e.g., knowledge exchange and hospital–supplier integration), which in turn influence overall hospital supply chain performance. IT integration, as a strategic necessity, exerts both indirect impact on hospital–supplier integration through its influence on knowledge exchange and direct impact on hospital–supplier integration. In addition, a set of healthcare specific variables play important moderating roles: (1) hospital systems membership moderates the relationships between IT integration and knowledge exchange and between trust and knowledge exchange; (2) environmental uncertainty moderates the relationship between trust and knowledge exchange; and (3) trust moderates the relationship between knowledge exchange and hospital–supplier integration.

Our study makes several contributions that are specifically important to the intersections between the OM, IS, and organizational theory literature. First, using the relational view of competitive advantage as a theoretical lens to study supply chain integration, we go beyond previous studies by identifying the dynamic relationships across different antecedents to supply chain integration and emphasizing the critical role of knowledge exchange (Hora and Klassen, 2013) in shaping hospital–supplier integration. Second, we differentiate between the concepts of