Can intrafirm IT skills benefit interfirm integration and performance?

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ABSTRACT

This study develops a model to examine whether intrafirm, hard and soft IT skills have cross-boundary effects on interfirm collaboration and integration, thus leading to better supply-chain performance. A model with eight hypotheses was developed and tested using data collected from 250 Taiwanese manufacturing firms. Seven hypotheses find empirical support. The results show that intrafirm IT skills indeed can benefit interfirm collaboration and integration and thus, supply-chain performance. Our findings suggest that the value of skilled IT professionals for interfirm integration, supply-chain performance and collaborative relationships between firms is critical for realizing that value.

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1. Introduction

Over the last decade, firms have sought integration with their supply-chain partners to cope with uncertainty and to obtain better supply-chain performance [27,79,98]. Skilled business personnel certainly lie at the heart of interfirm collaboration for the integration. These business personnel from different departments, such as purchasing, play a boundary-spanner role by contributing their skills and knowledge across firms to help interfirm collaboration and integration [42]. Recently, advanced interorganizational systems (IOS) have profoundly changed the nature of interfirm operations in the supply chain [68,69,75]. Firms have recognized the importance of IOS and begun to use IOS to integrate their processes with those of their supply-chain partners to improve their supply-chain operations [68,69,75]. Prior studies also recognize that IOS integration can provide information visibility to mitigate the bullwhip effect [50], reduce the complexity of supply-chain activities [66], and promote flexibility to meet varying business demands [7]. However, it is not simple to integrate supply-chain partners using IOS. It requires the alignment of both processes and technology standards across firms [34] and demands that firms overcome the various difficulties caused by conflicting processes and standards [50].

To resolve these difficulties, skilled personnel from the cooperating firms must work together to address the conflicts.

In the past, business personnel from core departments, such as purchasing, manufacturing, and selling, typically served as the boundary-spanners, and their intense collaboration helped firms to achieve better interfirm integration [88], to improve goal alignment [66], to enable effective information flows, and to streamline logistics [66], thereby improving supply-chain performance. However, in the context of rapidly advancing IT, the role of IT personnel in enabling interfirm integration has become increasingly critical [68,69,75]. In interfirm operations, technology issues inevitably intertwine with business processes. Without skilled IT personnel and their involvement, firms have limited ability to tackle conflicting processes and technology standards [50], likely resulting in low levels of integration and mutual benefits. However, it remains unclear whether firms' internal IT skills can truly have a boundary-spanning effect when supply-chain partners attempt to integrate their information systems and processes. Consequently, whether and how intrafirm IT human capital, and IT skills in particular, can help interfirm collaboration and integration are issues of both academic and practical significance.

In supply chains, fulfilling collaborative objectives requires not only the participation of relevant personnel but also the application of their skills [73]. Although IT personnel tend to be more familiar with structured approaches and IT knowledge [72], recognized as hard skills, firms have increasingly search for business-literate IT personnel who can add value at a strategic level [44]. Although prior studies have recognized the importance

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of the skills of IT personnel [26,28,35,40,54,82,100], there remains a lack of studies examining the impact of IT personnel on interfirm collaboration and integration. Furthermore, many studies have demonstrated a positive—either direct or indirect—effect of interfirm integration on supply-chain performance [48,68,69,75], but such a positive effect may not materialize without initial help from IT personnel's skills in achieving a high level of IT-enabled interfirm integration.

As Youndt et al. [96] and Kirsch [47] argue, hard skills alone are insufficient to address real-world difficulties because soft skills, such as managerial and interpersonal skills, are often needed to address such difficulties. Soft skills allow IT personnel to work more effectively with business personnel and to better translate IT solutions into business solutions. Of course, the hard and soft skills possessed by IT personnel may produce different boundary-spanning effects on overcoming the difficulties that reside in interfirm activities such as IOS integration. By taking an inside-out perspective [71,90] on IT skills, we argue that internal IT skills should have cross-boundary effects when working with other firms' personnel to develop interfirm mechanisms and processes. By focusing on dyadic relationships in the supply chain, this study examines whether a focal firm's (buyers) internal IT (hard and soft) skills can affect its supply-chain performance through improved interfirm collaboration and integration. Overall, this study attempts to answer the following questions: (1) why and how interfirm integration, including IOS integration and process integration, contributes to supply-chain performance; (2) why

and how interfirm collaboration facilitates interfirm integration; and (3) why and how firms' internal IT skills facilitate interfirm collaboration and IOS integration. Table 1 highlights the lack of clear conceptualization and empirical examination of IT skills and their effects, especially in the interfirm setting. The literature is also fragmented by the notion of skills and has largely operationalized skills with proxies such as organization size and cost or with a broader construct such as IT resources. Thus, it remains unclear whether disparate IT skills truly facilitate interfirm collaboration and IOS integration, and whether they do so differently. By distinguishing soft from hard skills, this study provides a better understanding of the importance and contribution of different IT skills in the supply-chain context.

The remainder of this paper is arranged as follows. First, we discuss the theoretical foundations of our research and develop the research model and associated hypotheses. Next, we introduce our methods for collecting and analyzing the data. After discussing our results and their implications, we conclude with the limitations of our research and directions for future research.

2. The research framework

The central goals of supply-chain operations are to address uncertainty and to enhance performance. To achieve those goals, firms must overcome three problems. The first problem involves a lack of visibility and efficient interfirm operations in the supply chain, causing the bullwhip effect and operational inefficiency.

Table 1
Literature on disparate IT skills related to IOS or interfirm collaboration.

Author	Research topic	Research approach	Related argument or implicit claim involved with skills	Investigation of disparate skills
Fawcett et al. [26]	The influence of interfirm collaboration on supply-chain performance	In-depth interview for concept development	• Investments in people's skills and emotional safety are needed to establish a collaborative culture. • Companies need to build the unique skills and structures for continuous collaborative improvement.	The concept of IT skills is not empirically examined.
Folinas et al. [28]	Analyzing dimensions and key elements within stages of supply chain evolution	Concept development	• A number of stages in the evolution of the supply chain, ranging from logistics to collaboration, require soft skills, management skills, or hard skills.	The concept of IT skills is not empirically examined.
Gunasekaran & Ngai [35]	The influence of IT integration on SCM performance	Concept development	• IT skills with EDI are the building blocks of infrastructure for SCM.	The concept of IT skills is not empirically examined.
Hoegl & Wagner [40]	The influence of supply-chain collaboration on product-development projects	Empirical survey	• Social and project-management skills are important for ensuring that supplier involvement yields the desired collaborative benefits.	The influences of skills on collaboration and performance are not examined. The notions of skills are only discussed in research implications.
de Leeuw & Fransoo [54]	The antecedents of interfirm collaboration	Case study	• The more that suppliers recognize skills and capabilities, possess proprietary technology, and are very active in research, the more strategic partnerships are desired.	The concept of IT skills is not empirically examined.
Soosay et al. [82]	The influence of interfirm collaboration on innovation performance	Case study	• Competencies formed by partners' skills and expertise are the antecedents of interfirm collaboration.	The concept of IT skills is not empirically examined.
Zhu et al. [100]	The influence of network effect and adoption cost on IOS adoption	Empirical survey	• The use of EDI requires special technical skills. • The implementation of EDI requires firms to develop special technical skills. • Experienced firms have developed certain IOS, technical, and managerial skills.	Skills are acknowledged as adoption costs and switching cost without referring specifically to skills.