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The configuration between supply chain integration and information technology competency: A resource orchestration perspective

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ABSTRACT

Research indicates that deploying appropriate information technology (IT) competency in a manner that fits the supply chain integration (SCI) of a firm induces superior firm performance; however, our understanding of how to empirically conceptualize and assess the performance effect of the fit remains limited. Drawing upon resource orchestration theory and the literature on fit assessment methodologies, our study employs both a contingency and a configuration perspective to conceptualize and operationalize "fit." The results of a survey of 196 firms in China provide the first empirical evidence for the existence and nature of interrelationships between multiple components of SCI and IT competency and their effects on firm performance. In particular, fit as "moderation" approach indicates that IT competency could strengthen the relationship between SCI and both operational and financial performance. Fit as "profile deviation" approach further reveals that the more similar the IT competency configurations are to those of the top performers in the high-level SCI group, the higher their operational and financial performance are. However, in the medium- and low-level SCI groups, the SCI-IT competency fit is significantly positively associated with financial performance and insignificantly associated with operational performance. The theoretical contributions and managerial implications of the study are discussed.

1. Introduction

The disparate outcomes of supply chain integration (SCI) have attracted significant interest among researchers and practitioners (Flynn et al., 2010; Saeed et al., 2011; Srinivasan and Swink, 2015; Vanpoucke et al., 2014). Prior research has primarily focused on how various types of SCI influence firm performance and the boundary conditions for these relationships (Flynn et al., 2010; Wiengarten et al., 2014; Wong et al., 2011). In particular, information technology (IT) competency is widely recognized as playing a critical role in determining the extent to which a firm reaps benefits from SCI (Piccoli and Ives, 2005; Rai and Tang, 2014; Venkatesh, 2013). For example, using its high-level IT competency, IBM has created "Globally Integrated Supported Functions" that allow the company to further leverage its integration with customers to improve its performance (Strikwerda and Stoelhorst, 2009). However, theoretical and empirical research on how IT competency and SCI jointly affect performance remain scarce (Yao and Zhu, 2012). Consequently, normative guidance to predict ex ante the particular IT deployment strategies that are likely to be effective is limited, as evidenced by the various results of SCI implementation among organizations (Saeed et al., 2011).

To address this research gap, the current study intends to investigate how organizations can deploy IT competency in a manner that is conducive to materializing the benefits of SCI. We draw upon resource orchestration theory, an extension of resource-based view theory, to develop our research model. According to resource orchestration theory, an organization can realize the full value of its resources only when the resources are managed effectively (Sirmon et al., 2011). Resource management includes structuring a portfolio of resources, bundling resources to build

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capabilities, and leveraging capabilities (Gruber et al., 2010; Sirmon et al., 2007). The leverage and configuration of the interconnected resources determines whether the organization can achieve superior performance (Chadwick et al., 2015; Sirmon et al., 2011). Extending this notion to our research context, we propose that a firm should deploy IT competency in a manner that fits its degree of SCI to improve operational and financial performance.

Although SCI and IT competency are well documented as multidimensional phenomena consisting of many different but interconnected elements (Flynn et al., 2010; Rai and Tang, 2014; Tippins and Sohi, 2003; Wiengarten et al., 2014; Wong et al., 2011), prior research tends to integrate these two constructs and proposes concepts such as IT-enabled SCI (Saldanha et al., 2013; Wong et al., 2012) and Web-enabled SCI (Devaraj et al., 2007; Frohlich and Westbrook, 2002). Consequently, the interaction between SCI and IT competency components remains a black box. This condition triggers an important unanswered question: *How do the components of IT competency affect the relationship between various SCI dimensions and firm performance*? To answer this question, we adopt the existing well-established typologies of SCI, including information integration, synchronized planning, operational coordination, and strategic partnership (Cai et al., 2010; Cao and Zhang, 2011). We follow the work of Tippins and Sohi (2003) and categorize IT competency into flexible IT infrastructure, IT assimilation, and managerial IT knowledge. We take a contingency approach and apply fit as "moderation" (Flynn et al., 2010) to empirically assess how individual components of IT competency influence the effects of SCI dimensions on firm performance. In addition, considering the interconnected nature of its components and their possible synergistic effects, we assess the interaction effect of the overall constructs of SCI and IT competency on firm performance.

Furthermore, SCI and IT competency are interrelated rather than independent of each other (Saeed et al., 2011; Venkatesh, 2013), and the deployment of IT competency to reap benefits from SCI must address multiple and often conflicting contingencies (Rai and Tang, 2014; Tafti et al., 2013; Yao and Zhu, 2012). Thus, understanding the exact nature of the link between the fit of IT competency and SCI and firm performance requires a configuration approach (Saeed et al., 2011; Vorhies and Morgan, 2003, 2005). This condition triggers another important unanswered question: *What are the particular patterns of IT competency components that best match the degree of SCI to enhance firm performance?* Although the contingency approach allows operations management researchers to establish the nonlinear relationship between IT competency and SCI (Chakravarty et al., 2013; Chi et al., 2010; Paulraj and Chen, 2007), it does not facilitate the identification of an ideal "gestalt" or configuration of the various interconnected elements of IT competency and SCI (Saeed et al., 2011; Vorhies and Morgan, 2003; Yarbrough et al., 2011). Therefore, we apply fit as "profile deviation" (Vorhies and Morgan, 2003; Yarbrough et al., 2011) to examine how deviation from the ideal IT competency configuration of top performers in groups with different levels of SCI affect the operational and financial performance of the focal firm.

Our study makes at least three major contributions to the literature. First, this study theorizes and empirically examines how multidimensional IT competency and SCI interact with each other to affect firm performance. The findings enrich our understanding of the specific conditions (e.g., IT competency) under which SCI improves performance and help explain the inconsistency of the results of previous studies of SCI (Wiengarten et al., 2014; Wong et al., 2011). In particular, we highlight that both the effects of individual IT competency components and the synergistic effects of these multiple IT competency components are important. Indeed, the whole is larger than the sum of its parts.

Second, we go beyond the bivariate interaction effects and identify specific alignment patterns of IT competency and SCI that are favorable to firm performance. Assuming that SCI and IT competency are interrelated, as suggested by prior research and confirmed by our robustness test, our configuration perspective complements our contingency perspective and shows ideal profiles of IT competency and SCI components. In addition, by adopting a holistic view and synthesizing the myriad bivariate relationships that have previously been identified among elements of SCI, IT competency, and firm performance (e.g., Flynn et al., 2010; Piccoli and Ives, 2005; Rai and Tang, 2014; Saeed et al., 2011; Venkatesh, 2013), our study contributes to the exploration of relationships involving complex, multidimensional, and interrelated phenomena observed in the real world.

Third, we provide a nuanced understanding of how the fit between SCI and IT competency affects operational and financial performance differently. Although we determine that both operational and financial performance can be achieved with a sufficiently high level of SCI, our results also indicate that firms should benchmark against different ideal profiles of IT competency and SCI elements to improve operational and financial performance.

2. Theoretical framework and literature review

2.1. Resource orchestration theory

Resource orchestration theory argues that "managers need to orchestrate their resources to realize any potential advantage" (Chirico et al., 2011, p.310). This theory was developed from the resource-based view, which posits that firm performance can be explained by heterogeneity in possessing valuable, rare, inimitable, and non-substitutable resources (Chadwick et al., 2015; Sirmon et al., 2011). The resource-based view does not indicate how resources can be deployed to generate synergistic effects; thus, it cannot predict ex ante the particular resource combination strategies that are likely to be effective in deriving competitive advantage (Gruber et al., 2010; Sirmon et al., 2007). Resource orchestration theory addresses this limitation of the resource-based view and proposes that "it is the combination of resources, capabilities, and managerial acumen that ultimately results in superior firm performance" (Chadwick et al., 2015, p. 360). In other words, the outcomes of resource deployment are determined by joint effects resulting from the combination of other resources that are interconnected with the focal resource rather than the independent effects of the individual resources (Zaefarian et al., 2013).

Resource orchestration theory is particularly useful for understanding the deployment of resources and capabilities such as SCI and IT competency. According to resource orchestration theory, what matters is not SCI or IT competency but the fit or alignment of these two interdependent variables. Yao and Zhu (2012), for example, argue that "alignment between IT and supply chain processes can help firms improve their operations. Such alignment generates transactional efficiencies, which may further create operational and strategic benefits" (p. 1047). In this view, resource orchestration arguments could be extended by theorizing that the ability of firms to translate SCI into heightened performance is dependent on their ability to leverage critical IT competency that can be effectively utilized in conjunction with SCI (Chakravarty et al., 2013; Chi et al., 2010).

2.2. Supply chain integration

SCI refers to the degree to which a firm collaboratively deploys its resources and capacities with channel partners (Kulp et al., 2004; Lee and Whang, 2004; Rai et al., 2006). Previous studies