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# Supply Chain Integration and Firm Performance: The Moderating Effects of Organizational Culture

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## ABSTRACT

Building on multiple theoretical perspectives, we examine how organizational culture moderates the association of different dimensions of Internet-enabled Supply Chain Integration (i.e., online information sharing and operational coordination) and firm performance (i.e., operational and customer service performance). We test hypotheses using survey data from senior executives in China. Our findings reveal that an internally focused culture negatively moderates the effects of information sharing on both operational and customer service performance. In contrast, an internally focused culture positively moderates the relationships between operational coordination and firm performance. In addition, our findings indicate that an externally focused culture negatively moderates the effects of operational coordination on customer service performance. Theoretical contributions and managerial implications of the study are discussed.

## Keywords

Supply chain integration, firm performance, organizational culture.

## INTRODUCTION

Fostering Supply Chain Integration (SCI) is generating much excitement among researchers and practitioners (Frohlich, 2002; Ke et al. 2009; Lee and Whang, 2004; Liu et al. 2010). It is well touted that the greater SCI, the better firm performance. However, the empirical research findings are mixed (Flynn et al. 2010). While some studies offer support for the significant, positive relationship between SCI and firm performance (e.g., Frohlich, 2002; Rai et al., 2006), others show that the relationship is insignificant (e.g., Flynn et al., 2010). The inconsistent findings across different studies motivate us to investigate potential moderating effects. Specifically, we propose organizational culture as a moderator for the relationship between SCI and firm performance. Organizational culture refers to a collection of assumptions, values, and beliefs that are embedded in a

firm and reinforced by firm practices and goals, and thereby shapes employee behavior (Deshpandé et al., 1993; Liu et al., 2010; Quinn and Rohrbaugh, 1983). In particular, organizational culture may affect how employees embrace an innovation such as SCI and thus influence the innovation implementation process (McDermott and Stock, 1999). Drawing upon organizational culture theory, we thus propose and empirical test that the effects of SCI on firm performance will be contingent on the focal firm's organizational culture.

In the next section, we describe the theoretical background and develop hypotheses on the relationships among SCI, organizational culture, and firm performance. Section three describes the research methodology, data analysis and results; and section four is the discussion and concludes the paper.

## THEORETICAL BACKGROUND AND HYPOTHESES

Scholars in operations management, information systems, and marketing have offered diverging views as to what constitutes SCI. While some researchers introduce the dimensions of demand and supply integration or upstream and downstream integration (e.g., Flynn et al., 2010; Frohlich, 2002; Frohlich and Westbrook, 2001; Narasimhan and Das, 2001), others propose physical, logistic, information, and process integration as SCI dimensions (e.g., Rai et al., 2006). Following Kulp et al. (2004), we conceptualize SCI as a construct of two dimensions, namely online information sharing and operational coordination. These two dimensions reflect different requirements of human participation in SCI (Ba and Johansson, 2008). Specifically, the Internet facilitates system integration to enable the automation of basic business activities including sharing information across the supply chain (Lepak and Snell, 1998). In contrast, online process coordination, for complex supply chain activities such as joint R&D and market development, requires intensive human participation (Kulp et al., 2004).

Online information sharing is defined as the extent to which channel members exchange information across the

supply chain via the Internet (Lee and Whang, 2004; Rai et al., 2006). Lee and Whang (2004) suggest, “the capability for all supply chain partners to have access to shared information on a timely basis is key to improving supply chain performance” (p.126). Indeed, growing empirical evidence lends support for the positive relationship between information sharing and operational performance, such as product delivery, new market exploration, and new product/services promotion (e.g., Devaraj, Krajewski and Wei, 2007; Rai et al., 2006). Integrated technological interface enables automated information update and allows the firm to sense market changes more rapidly (Lee and Whang, 2004).

Online information sharing may also improve customer service performance (Lee and Whang, 2004; Porter, 2001). It enables firms to collect timely information about customer demands, which is critical for customer service quality (Frohlich and Westbrook, 2001; Lee and Whang, 2004; Porter, 2001). On the other hand, customers always prefer to receive information directed toward their special needs anytime, anywhere. With the open technological interface, online information sharing enables customers to access rich information on products, troubleshooting techniques, and services without the constraints of time and space (Ba and Johansson, 2008).

*H1: Online information sharing is positively related to the firm's (a) operational performance and (b) customer service performance.*

Online operational coordination refers to the extent to which firms have highly coordinated and streamlined supply chain operations with channel members via the Internet, with the support of information already shared online (Lee and Whang, 2004; Sanders, 2008). Specifically, online coordination requires human involvement and is about integration of the complicated and creative operations with channel partners, such as joint service planning, R&D, and new product promotion (Schneeweiss and Zimmer, 2004). With the support of the Internet, human participation takes SCI one-step further than automated online information sharing. According to Lee and Whang (2004), online operational coordination would result in cost-effective, speedy, and reliable supply chain operations.

In addition, online operational coordination could improve customer service. In particular, online operational coordination allows customers to request for engineering changes, access services, and file complaint practically anywhere, any time (Ba and Johansson, 2008; Rosenzweig, 2009). On the other hand, the extensive and responsive online interactions among boundary spanning personnel would enable the firm and channel partners to jointly respond to market changes and adjust joint plans in a timely manner (Lepak & Snell 2002; Lepak, Takeuchi, & Snell 2003). The intensive interactions with customers would decrease potential conflicts, and thus enhance the quality of customer service (Batt, 2002).

*H2: Online operational coordination is positively related to the firm's (a) operational performance and (b) customer service performance.*

Organizational culture reflects the basic assumptions, values, and beliefs held by business leaders that act as the foundation of management systems and practices (Deshpandé et al., 1993; Liu et al., 2010; Quinn and Rohrbaugh, 1983; Wei et al., 2008). Through rituals, routines, and managerial values, organizational culture could shape people's behavior and affect investment and resource allocation decisions (Chan et al., 2004). Organizational culture can be categorized by two dimensions: flexibility/control and internal/external (Quinn and Rohrbaugh, 1983). The flexibility orientation values empowerment, flexibility, and spontaneity, and the control orientation emphasizes order, efficiency, and achievement. In contrast, an internal focus emphasizes the development of people and systems within the firm, while an external focus stresses external positioning and interactions with the external environment. Hewett et al. (2002) propose that the dimension of internal/ external focus is particularly germane to the study of supply chain relationships. Following the work of Hewett et al. (2002), we focus on the internal/ external dimension.

According to the contingency theory, to be effective, a firm's operations practices must be consistent with other aspects of the firm, especially factors that are human related (Delery and Doty, 1996; Greening and Gray, 1994). As organizational culture influences employees' behavior and attitude toward innovations, it may affect how employees embrace SCI and thus impact the extent to which the firm derives benefits from SCI implementation (McDermott and Stock, 1999). The extant literature provides consistent support for the significant interaction effects between operations management and human resource management practices (e.g., Ahmad and Schroeder, 2003; Hewett et al., 2002; Liu et al., 2010; Menezes, Wood and Gelade, 2010). Therefore, it is established that organizational culture is an important conditional factor that may affect how operational management practices help improve firm performance (Hewett et al., 2002; Kufidu and Vouzas, 1998; Liu et al., 2010; Menezes et al., 2010). In the same vein, we contend that the effects of SCI on firm performance may be conditional and affected by organizational culture.

An internally focused culture may not value the support afforded by online information sharing and thus impede the firm from benefiting from information sharing. Specifically, with technological interface, online information sharing may have positive effects on firm performance as it allows firms to access proprietary information automatically across the supply chain and therefore are able to be responsive to market changes. However, an internally focused culture emphasizes employees' business involvement, values internally generated information, and prefers managing documents within the confine of the firm (Berthon, Pitt and Ewing,

2001; McDermott and Stock, 1999). As such, the impacts of online information sharing on performance may be limited. In contrast, an internally focused culture might enhance the relationship between online operational coordination and firm performance, because of its emphasis on optimizing existing operational equipment and practices (McDermott and Stock, 1999). Further, this culture values human relationships, such as family-like relations and employee support in personal and work issues, and favors empowerment, participation, and coordination (Khazanchi, Lewis and Boyer, 2007). This would facilitate the firm benefit from online operational coordination.

*H3. An internally focused culture a) negatively moderates the relationship between online information sharing and firm performance and b) positively moderates the relationship between online operational coordination and firm performance.*

Given that an externally focused culture encourages firms to adapt quickly to market conditions (Hewett et al., 2002), it may facilitate SCI to improve firm performance. Specifically, this culture would lead a firm to actively scan the external environment to assess its strengths and weaknesses, and strive to meet customer demands (McDermott and Stock, 1999). In this view, the effects of the timely information provided by online information sharing on firm performance would be strong in a firm with an externally focused culture. In addition, due to the human participation in online operational coordination, an externally focused culture would facilitate firms to benefit from operational coordination as it encourages utilizing employees' ideas, creativity, entrepreneurship, and risk taking (Panayotopoulou, Bourantas and Papalexandris, 2003). Thus, an externally focused culture could allow a firm to enhance agility and responsiveness in online operational coordination, and thus improve operational and customer service performance (Devaraj et al., 2007).

*H4. An externally focused culture positively moderates the relationship between SCI (i.e., online information sharing and operational coordination) and firm performance.*

## METHODOLOGY

The study collected the data through a questionnaire survey of executives in China. Senior executives were chosen as the key informants (Wei et al., 2008). We randomly chose 1,000 firms located in the east of China and sent them invitations for participating in our survey. Questionnaires were sent to 600 firms that agreed to participate in the survey. After discarding incomplete questionnaires, 251 usable questionnaires were obtained, which allowed us to achieve a response rate of approximately 25.1%.

The instrument was developed based on previously validated measures in the extant literature. All items were assessed with 5-point Likert scales, ranging from

“strongly disagree” to “strongly agree.” Items measuring online information sharing were adapted from Devaraj et al. (2007). The instrument for online operational coordination was developed based on the work of Kandemir et al. (2006). We measured organizational culture using Mott and Stock (1999). The items measuring operational performance were adapted from Rai et al. (2006) and Ravichandran and Lertwongsatiem (2005). The items for customer service performance were adapted from Chen et al. (2004) and Rai et al. (2006). We also included four control variables, i.e., industry (IND), ownership (OWS), firm size (SIZE), and the size of the firm's IT department (ITQ).

## DATA ANALYSIS AND RESULTS

We tested the construct validity by evaluating convergent validity, and discriminant validity. The results showed that the loadings of all items were higher than 0.60 and t-values were significant at the  $p < 0.01$  level. The values of Cronbach's Alpha ranged from 0.70 to 0.85; and the values of the Average Variance Extracted (AVE) ranged from 0.56 to 0.77. These results indicated that our measurement model had good convergent validity. Also, the results indicated that the square roots of AVE for all constructs were greater than the correlations between constructs. Thus, it confirmed the discriminant validity of the measurement model.

### Hypothesis Testing

We assessed all hypotheses through a hierarchical regression analysis (Kutner, Neter, Nachtsheim and Wasserman, 2004). The results show that the effects of online information sharing ( $\beta = 0.14$ ,  $p < 0.05$ ) and online operational coordination ( $\beta = 0.16$ ,  $p < 0.01$ ) on operational performance were significant, and therefore H1a and H2a were supported. Also, the effects of online information sharing ( $\beta = 0.26$ ,  $p < 0.01$ ) on customer service were significant, which supported H1b. However, the effects of online operational coordination on customer service were non-significant ( $\beta = 0.07$ ), and therefore H2b was not supported.

In addition, the results indicate that the interaction terms between internally focused culture and two dimensions of SCI had significant effects on firm performance. Thus, H3 was supported. Specifically, the interaction terms of internally focused culture and online information sharing were negative and significant ( $\beta = -0.31$ ,  $p < 0.01$  for operational performance and  $\beta = -0.27$ ,  $p < 0.05$  for customer service). Meanwhile, the interaction terms of internally focused culture and online operational coordination were positively and significantly associated with operational performance ( $\beta = 0.35$ ,  $p < 0.01$ ) and customer service ( $\beta = 0.45$ ,  $p < 0.01$ ). Yet, the interaction term of externally focused culture and online operational coordination had negative and significant effects on customer service ( $\beta = -0.32$ ,  $p < 0.05$ ), while it had insignificant effects on operational performance ( $\beta = -$

0.14). Further, the interaction terms of externally focused culture and online information sharing had no significant effects on firm performance, and thus H4 was not supported.

## DISCUSSION AND CONCLUSION

The present study investigates how organizational culture moderates the relationships between different dimensions of SCI and firm performance. Specifically, we conceptualize SCI as a construct of two dimensions, i.e., online information sharing and operation coordination. We assess how these two dimensions of SCI differentially affect the firm's operation performance and customer service. In addition, we examine the moderating effects of internally and externally focused culture on the influences of SCI on firm performance. Our research model is largely supported by the empirical data.

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The present study has conceptual and theoretical implications for SCI research. Conceptually, the research investigates the essential elements of SCI. Different from previous empirical studies that treat SCI as a single-dimensional construct (e.g., Rai et al., 2006), this study explores the differential effects of the two dimensions of SCI on operational and customer service performance, respectively. Our results indicate that integrating supply chain via the Internet, either by automation through system integration or coordination involving human agents, may both enhance operational performance (Frohlich, 2002; Lee, 2000; Lee and Whang, 2004). Yet, it may be difficult to ensure customer service quality by coordinating operations with human involvement in the online context. Compared to online information sharing, operational coordination, with its human involvement, might complicate the online service delivery processes (Miller, Craighead and Karwan, 2000). Thus, our conceptualization of SCI helps to enrich our understanding of the differential effects of different dimensions of SCI on different aspects of firm performance.

Theoretically, this research extends the SCI research by proposing and empirically examining that the effects of SCI are conditional. Specifically, we examine the moderating effects of organizational culture in the value realizing process of SCI. Our results show that an internally focused culture positively moderates the relationships between online operational coordination and

firm performance, while it negatively moderates the association of online information sharing and firm performance. In contrast, an externally focused culture negatively moderates the association of online operational coordination and customer service, while it does not affect the relationships between online operational coordination and operational performance and between online information sharing and firm performance. The investigation of the moderating effects of organizational culture makes our study distinct from previous research that assumes unconditional effects of SCI on firm performance (e.g., Kaufmann and Carter, 2006). With the extension of exploring conditional factor's effects, this study helps to explain why the existing findings on SCI-performance relationship are mixed.

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