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Antecedents and consequences of electronic supply chain management diffusion:

The moderating effect of knowledge sharing

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Antecedents and consequences of electronic supply chain management diffusion

The moderating effect of knowledge sharing

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Antecedents and
consequences of
e-SCM diffusion

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Abstract

Purpose – Grounded in the resource-based view and social exchange theory, the purpose of this paper is to develop a research model that offers a comprehensive understanding of the antecedents and consequences of electronic supply chain management (e-SCM) diffusion.

Design/methodology/approach – Survey data from 142 managers (in charge of e-SCM projects in their companies) of large Taiwanese firms were collected and used to test the hypotheses using hierarchical moderated regression analysis.

Findings – The results indicate that information technology deployment capability, operational capability, human resource capability, and knowledge sharing are important antecedents of e-SCM diffusion. In turn, higher levels of e-SCM diffusion lead to greater competitive performance. This study also finds that knowledge sharing plays a moderating role by strengthening the relationship between organizational capabilities (e.g. operational capability and human resource capability) and e-SCM diffusion.

Practical implications – Managers should recognize that human resource development activities (recruiting, training, and managing valuable e-SCM personnel) are an important source of e-SCM diffusion. Similarly, managers must establish the connection between human resource capabilities and e-SCM diffusion (i.e. “soft-side” e-SCM) such as hiring and retaining skilled e-SCM personnel, training and development for e-SCM personnel, and measuring e-SCM personnel’s global mindset over time.

Originality/value – Theoretically, this study aims to provide a research model that is capable of understanding the antecedents and consequences of e-SCM diffusion. From the managerial perspective, the findings of this study provide valuable decision guides for practitioners to help them identify and develop firm internal capabilities and social mechanisms that foster e-SCM diffusion.

Keywords Organizational capabilities, Information exchange, Knowledge sharing, Competitive advantage, Electronic supply chain management diffusion, Hierarchical moderated regression

Paper type Research paper

1. Introduction

Many researchers view electronic supply chain management (e-SCM) as an important issue when firms deal with more complex and longer supply chains (Cegielski *et al.*, 2012). e-SCM is an internet-based enterprise system providing information and information processing capability to streamline and integrate business processes both inside and across corporate boundaries (Gimenez and Lourenco, 2008; Liu *et al.*, 2010; Wu and Chuang, 2009; Zhu *et al.*, 2006). This study focused on e-SCM diffusion, which refers to the level of e-SCM implementation by the firms to support major business functions and business processes within and across organizations. e-SCM diffusion becomes a significant research topic because it has the potential to improve organizational and supply chain-wide performance by increasing electronic transaction efficiencies and both intra- and inter-firm coordination effectiveness (Hazen *et al.*, 2012; Yao *et al.*, 2007). Basically, there are three important issues related to e-SCM diffusion over the last decade. First, e-SCM diffusion is a critical enabler of



inter-firm commerce because it provides adopters with several operational and strategic advantages. However, the high uncertainty related to network effects and interdependence is a major dilemma for organizations that develop and implement e-SCM (Ke *et al.*, 2009). Studies by practitioners indicate that the high uncertainty of e-SCM adoption consequences, such as the opportunistic behavior of the supply chain partners and the uneven benefit distribution, may lead to a decline in adoption rates (Liu *et al.*, 2010). Therefore, identifying and understanding the antecedents and consequences of e-SCM diffusion is one of the fundamental requisites for development of e-SCM solutions.

Second, although e-SCM diffusion has information technology (IT) components, management capabilities must be addressed regarding changes in organizational processes and interaction both within a firm and among firms (Lin, 2013). Management capabilities possessed by a firm can be thought of as belonging to one of two sets – those that reflect the internal business processes and those that improve inter-firm collaboration (Rai *et al.*, 2006). Organizational capabilities emphasize exploitation of existing firm-specific resources and capabilities to address rapidly changing environments. According to the resource-based view (Barney, 2001) and its extensions (Ravichandran and Lertwongsatien, 2005), the best approach to understanding IT-enabled business innovation requires the identification of organizational resources and capabilities, i.e., IT deployment capability, operational capability, and human resource capability (Molla and Licker, 2005; Zhu *et al.*, 2003).

In contrast, social mechanisms place an emphasis on using social networks to build tight relationships with their supply chain partners (such as suppliers, customers, and other channel members) (Tsanos *et al.*, 2014). Based on the social exchange theory, knowledge sharing can be viewed as one of the important ways in which the firms can continuously enhance inter-firm collaboration (Sivadas and Dwyer, 2000). Wade and Hulland (2004) also emphasized that IT-enabled business innovation requires the development of both inside-out capabilities (e.g. IT-related organizational capabilities) and outside-in capabilities (e.g. external relationship management) to permit the integration of fragmented, silo-oriented intra- and inter-firm business processes with low cost and rich content. This perspective apparently indicates that knowledge sharing may be critical for developing superior organizational capabilities for successful IT-enabled business innovation. Therefore, this study investigated the moderating effects of knowledge sharing on the relationship between organizational capabilities and e-SCM diffusion. As such, to investigate how the main and interaction effects of these factors in the context of e-SCM diffusion deserves further attention.

Third, literature on innovations describes technological diffusion as a process whereby new technology is communicated through various channels over time among members of a social system (Rogers, 2003). Technological diffusion (post-adoption stage) has been distinguished from adoption decision (pre-adoption stage) (Fichman, 2000). The latter refers to the decision about using or not of the technology, while technological diffusion only occurs when the technology spreads within and across organizations. e-SCM diffusion is complex and dynamic and involves an evolutionary process across time (Hazen *et al.*, 2014; Wu and Chang, 2012). e-SCM diffusion is necessary because of the changes in the business environment such as product diversification strategies, increasingly globalized competition, digital interconnection among supply chain partners, and seeking to balance interests and pressures both internally and externally (Rai and Tang, 2014). Since many e-SCM projects are terminated during the diffusion or post-adoption stage, exploring the challenges of this stage has been an issue of increased importance (Wu and Chuang, 2009). However, much existing research focuses on assessing the linkage between the contextual antecedents and e-SCM pre-adoption stage, such as e-SCM adoption intention (Cao *et al.*, 2013; Teo *et al.*, 2009) and e-SCM adoption or non-adoption (Lin, 2014a). Researchers rarely examine empirically exactly how organizational capabilities and social mechanisms impact e-SCM diffusion and performance.

Motivated by above issues, this study develops a research model based on a synthesis of two theoretical perspectives – resource-based view and social exchange theory – to examine the influence of organizational capabilities (IT deployment capability, operational capability, and human resource capability) and knowledge sharing on e-SCM diffusion, which in turn affects competitive performance. This study also posits that knowledge sharing can moderate (complement) each type of organizational capability, thus facilitating e-SCM diffusion. The constructs derived from the research model will be tested using confirmatory factor analysis (CFA) and the hypotheses using hierarchical moderated regression analysis. Theoretically, this study aims to provide a research model that is capable of understanding the antecedents and consequences of e-SCM diffusion. From the managerial perspective, the findings of this study provide valuable decision guides for practitioners to help them identify and develop organizational capabilities and social mechanisms that foster e-SCM diffusion.

2. Theoretical background and hypotheses development

Since e-SCM is enabled by organizational capabilities and social mechanisms with supply chain partners, resource-based view and social exchange theory may provide a useful theoretical foundation for studying the antecedents of e-SCM diffusion. Furthermore, e-SCM post-adoption stages – diffusion and performance – are important stages in the process of conducting supply chain activities over the internet. Therefore, this study attempts to examine the effects of organizational capabilities and knowledge sharing on e-SCM diffusion and how e-SCM diffusion can influence competitive performance. Specifically, this study also posits that knowledge sharing may moderate the relationship between organizational capabilities and e-SCM diffusion. The research model is illustrated in Figure 1, and a set of related hypotheses are developed in the next section.

2.1 Organizational capabilities and e-SCM diffusion

The resource-based view holds that organizational capabilities are a major source for the generation and development of sustainable competitive advantages (Barney, 2001). Organizational capabilities are particularly relevant to the management of supply chain activities for at least two reasons. First, firms vary in their capabilities to adapt to the rapidly changing supply chain environment (Brandon-Jones *et al.*, 2014; Hsu *et al.*, 2009). Second, organizational capabilities may affect supply chain profitability by increasing sophisticated IT deployment capability, enhancing operational flexibility, and developing human resource strategies (DeGroote and Marx, 2013). Management scholars assert that

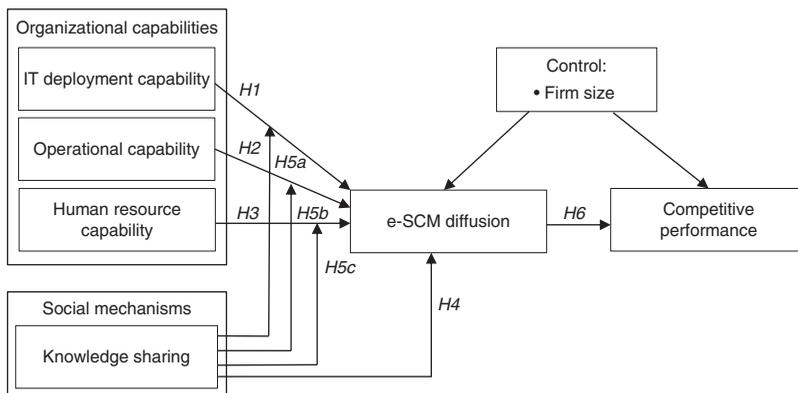


Figure 1.
Research model

organizational capabilities focus on achieving IT-enabled business innovation through IT, operations, and human resource management, thereby matching the demands of (rapidly) changing environments (Molla and Licker, 2005; Ravichandran and Lertwongsatien, 2005).

Research has also emphasized the importance of “hard” (function-oriented) and “soft” (human-oriented) business-related capabilities to achieve supply chain management excellence in the current dynamic and unpredictable business environment (Gomez-Cedeno *et al.*, 2015). Function-oriented capabilities, such as technical excellence in IT and operations management, are defined as the firm’s ability to effectively support day-to-day business activities and have become essential for transforming a firm into a competitive force (Pavlou and El Sawy, 2006). Firms with sophisticated IT deployment capability can ensure that e-SCM is effectively utilized by end users and, thus, achieve a better fit between their business processes and e-SCM features (Lin, 2014a; So and Sun, 2011; Teo *et al.*, 2009). Similarly, firms with high operational capability have high e-SCM efficiency, which facilitates lean manufacturing and continuous quality improvement to streamline business processes across the supply chains (Hsu *et al.*, 2009). Human-oriented capabilities are intangible strategic assets, which emphasize that improve employee knowledge, skills, and abilities are critical to achieving competitive advantage (Huselid, 1995). A highly skilled and motivated workforce is a strategic asset that is difficult for other firms to imitate. It can help a firm identify the most appropriate supply chain strategy, thereby facilitating e-SCM diffusion (Hohenstein *et al.*, 2014). Hence, the research model includes IT development capability, operational capability, and human resource capability and posits that each of these organizational capabilities has a direct positive relationship with e-SCM diffusion.

2.1.1 IT deployment capability. IT deployment capability refers to the firm’s ability to mobilize and deploy IT-based resources (i.e. computers, networks, databases, and technological platforms) (Bharadwaj, 2000). It entails a firm’s IT functional capabilities, such as IT infrastructure, planning, system development, and IT integration (Ravichandran and Lertwongsatien, 2005; Bharadwaj, 2000). IT infrastructure establishes an internet-based platform on which e-SCM can be built (DeGroot and Marx, 2013); a high-quality IT planning and system development helps the firm to develop a streamlined information flow about products, orders, and inventory across the supply chain to increase channel visibility (Zhu *et al.*, 2006). IT deployment capability is critical for e-SCM because e-SCM requires the integration between different IT applications within and across organizational boundaries, and e-SCM should achieve better synchronization and coordination with supply chain partners through an integrated technological platform with open standards (Lee and Whang, 2004). Furthermore, firms with limited IT deployment capabilities might have difficulty initiating and sustaining innovative projects targeted at enhancing supply chain agility and responding to market changes (Liu *et al.*, 2013, 2015). Therefore, firms with greater IT deployment capability are in a better position to facilitate incremental e-SCM diffusion. These considerations lead to the following hypothesis:

H1. The degree of IT deployment capability is positively associated with e-SCM diffusion.

2.1.2 Operational capability. Operational capability refers to firm-specific sets of skills, processes, and routines that facilitate and support organizational activities efficiently and flexibly with minimum wastage of resources (Tan *et al.*, 2007). Firms that have strong operational capabilities are very different from firms with weak operational capabilities. For example, firms with strong operational capabilities continually develop advanced manufacturing procedures, improve new product design and development activities, manage just-in-time inventory, and enhance total quality management capabilities (Yam *et al.*, 2011). A combination of these capabilities promotes operational excellence and positively influences supply chain management practices (Wong *et al.*, 2011). On the other

hand, Hsu *et al.* (2009) also found that some management priorities involved in implementing e-SCM are to reduce manufacturing costs, reduce research and development period, and improve operational flexibility and quality, all of which facilitate e-SCM diffusion. Hence, this study hypothesizes that a higher level of operational capability is likely to integrate e-SCM with business processes and to be linked to a greater proportion of supply chain partners and business transactions:

H2. The degree of operational capability is positively associated with e-SCM diffusion.

2.1.3 Human resource capability. Human resource capability, which can be defined as the routines embedded in the collective knowledge of employees (inimitable), is developed over time (rare) and is a valuable strategic asset that can help a firm create and sustain competitive advantages over competitors (Huselid, 1995). Important aspects of human resource capabilities identified in the literature include employee knowledge, skills, experience, and commitment invested in the organization (Wiklund and Shepherd, 2003). For firms facing increasingly complex supply chain situations, the knowledge and skill of employees is particularly important due to the need to understand the underlying philosophy and principles of e-SCM and adapting to environmental changes (Hohenstein *et al.*, 2014). In order to facilitate successful e-SCM diffusion, firms must ensure that employees are equipped with the skills necessary for the effective establishment of supply chain relationships and the subsequent collaboration between supply chain partners (Gomez-Cedeno *et al.*, 2015). Menon (2012) indicated that e-SCM is increasingly considered an indispensable tool for maintaining competitiveness, especially in the face of excessive global competition; these firms need to invest in appropriate human resource development such as employee development and training programs, motivation initiatives, and others. Hence, it is hypothesized that increased human resource capability will lead to greater e-SCM diffusion:

H3. The degree of human resource capability is positively associated with e-SCM diffusion.

2.2 Knowledge sharing and e-SCM diffusion

As explained by social exchange theory, effective social mechanisms, such as knowledge sharing, are recognized as key means of managing buyer-seller relationships (Sivadas and Dwyer, 2000). Knowledge sharing is defined as social interactions between individuals, groups, organizations, or networks of organizations, involving the exchange of ideas and experiences within and across organizational boundaries to identify market opportunities and capture business value (Argote *et al.*, 2000). Examples of knowledge sharing include knowledge donating and knowledge collecting. Knowledge donating refers to the process of employees communicating their knowledge to others, while knowledge collecting refers to the process of gathering knowledge from inside and outside of the organization. Fatemeh and Leila (2014) stated that knowledge sharing can be considered as an important process in inter-firm networks, because it involves both the creation and the transfer of knowledge through socialization process of knowledge workers. Researchers also suggested that knowledge sharing can be viewed as the activity of how to help communities of people work together to facilitate the exchange of their knowledge, which leads to the building of buyer-seller relationships and improved communication between two or more entities (Chen *et al.*, 2014; Li *et al.*, 2006; Lin, 2014b). Huo *et al.* (2014) emphasized that knowledge sharing concerns managing the flows of information, money, and products across organizational boundaries, which in turn helps firms to facilitate supply chain collaboration and success. These discussions lead us to posit that knowledge sharing results in firms achieving a smooth digital transformation and deep e-SCM diffusion:

H4. The level of knowledge sharing is positively associated with e-SCM diffusion.

2.3 Interaction between organizational capabilities and knowledge sharing

Firms that encourage employees to share their knowledge are quite different from firms that do not. These firms continually learn new ideas, viewpoints, and skills from the external environment; encourage communication within and across organizations; and reward employees for perpetuating the learning cycle (Huo *et al.*, 2014). Because contextual knowledge about the business and IT strategic alignment influence the effective use of IT applications (Lu and Ramamurthy, 2011), greater knowledge sharing would strengthen the relationships between IT deployment capability and e-SCM implementation success, whereas less knowledge sharing would weaken those relationships (Rai and Tang, 2010). Moreover, knowledge sharing complements the value of IT deployment capability in communicating with supply chain partners to better understand their IT needs, informing them about their evolving IT infrastructure, learning about their new IT systems, and discussing with them how IT integration capability can be used in the e-SCM diffusion (Rai *et al.*, 2012). As the intensity of knowledge exchange among supply chain partners increases, firms have better ability to improve the alignment of IT deployment capability with e-SCM diffusion. Hence, it is hypothesized that IT deployment capability and knowledge sharing have a positive joint effect on e-SCM diffusion:

H5a. IT deployment capability and knowledge sharing interact positively (i.e. complement) in their effect on e-SCM diffusion.

To create and refresh operational capabilities over time, where expertise and skills may be distributed across individuals and groups, both internally and externally, the ability to facilitate knowledge sharing is crucial to success (Lawson *et al.*, 2009). Scholars further propose that knowledge sharing can act as a strategic option which enables the firms to improve operational efficiency in the supply chain (Liu *et al.*, 2013). For example, knowledge sharing increases the awareness of the needs of each supply chain partner since they communicate and interact in the inter-firm collaboration context, which enhances operational flexibility and realizes a wide variety of operational benefits, including lower operational costs, improved delivery reliability, fewer quality problems, early insights into new product development, and on-time product launches (Caridi *et al.*, 2014; Zhang and Chen, 2013). Wu *et al.* (2014) also contended that by establishing knowledge-based process linkages with supply chain partners, firms increase their capability to achieve operational excellence and thus improve supply chain sustainability. Increased levels of knowledge sharing provide a firm with important complementary resources to develop superior operational capabilities for successful e-SCM implementation. Therefore, this study proposed the following hypothesis:

H5b. Operational capability and knowledge sharing interact positively (i.e. complement) in their effect on e-SCM diffusion.

Human resource capability, which is embedded in employees, is the sum of the skills and abilities of employees or the stock of knowledge within and across organizations (Campbell *et al.*, 2012; Wang *et al.*, 2014). However, knowledge that is isolated within certain employees or units is difficult to use for developing collaborative relationships with supply chain partners. Through knowledge sharing, firms in a supply chain setting can look toward supply chain partners as a source of manpower (Menon, 2012). Employees recognize that knowledge sharing is a key means of facilitating the knowledge flow from the firm to other supply chain partners (Chung *et al.*, 2000). Therefore, knowledge sharing may improve the effectiveness of inter-firm learning, may lead to the development of well-organized knowledge structures, and may enhance inter-firm collaboration and coordination (Huysman and de Wit, 2004; Martin-Rios, 2014). Lengnick-Hall *et al.* (2013) also emphasized that knowledge sharing can make job easier by the exchange of relevant

information and create opportunities for supply chain partners to learn together. Thus, effective knowledge sharing complements and enhances human resource investments that lead to joint creation of new value-added activities and improved adaptability and resilience across the supply chain. Based on the above discussion, this study proposes that knowledge sharing positively moderates the effect of human resource capability and e-SCM diffusion:

- H5c.* Human resource capability and knowledge sharing interact positively (i.e. complement) in their effect on e-SCM diffusion.

2.4 The link between e-SCM diffusion and competitive performance

Previous research has consistently shown that electronic-enabled performance improvements consist of improvements in operational advantages (performance relating to the efficiency of specific business processes, such as higher productivity and shorter lead time) (Hinkka *et al.*, 2013; Li *et al.*, 2006; Villena *et al.*, 2009) or strategic advantages (performance relating to long-term organizational benefits, such as improved customer service levels and better relationships with supply chain partners) (Zhang and Dhaliwal, 2009). IT-enabled business innovation such as e-SCM diffusion is a core business strategy only when it helps the firm gain competitive performance (Zhu and Kraemer, 2005). Firms that devote high firm-level capabilities and inter-firm relationships to e-SCM diffusion are likely to realize e-SCM benefits. This effect is due to interactive and effective communications through internet-based channels that permit supply chain partners to better synchronize their business processes and better coordinate their supply chain activities, which in turn leads to greater operational and strategic advantages. Therefore, it is reasonable to hypothesize the link from e-SCM diffusion to competitive performance:

- H6.* e-SCM diffusion is positively associated with competitive performance.

Additionally, this study includes firm size as a control variable to account for contextual differences. Firm size may be positively related to strategic renewal and innovation efforts, since large firms are more likely to possess slack resources (Cohen and Levinthal, 1989). The use of this variable in the research model helps to control for firm-level differences that might affect e-SCM diffusion and competitive performance.

3. Research methodology

3.1 Sample and data collection

The firms that qualified for this study must emphasize investments in e-SCM implementation and have considerable experience in e-SCM projects. Thus, this study assumes that larger firms are more likely to have these experiences. A sample frame was assembled from the list of the top 1,600 Taiwanese manufacturing firms published by *CommonWealth Magazine*. To ensure that managers (currently and directly in charge of e-SCM projects) received the questionnaire and maximize the response rate, six research assistants spent one month telephoning these 1,600 firms; they asked the target firms whether they have adopted e-SCM and asked for the name of the managers (currently and directly in charge of e-SCM projects) in their companies. Firms that were not adopters of e-SCM or lacked permission to participate in the survey were removed from the list. As a result, about 812 firms across different industries formed the sampling frame for this study. The final questionnaires were mailed to the 812 managers who are responsible for e-SCM projects in their companies. To encourage response, follow-up letters were sent approximately three weeks after the initial mailing.

This study received 151 questionnaires, nine of which were incomplete and thus discarded. A total of 142 completed questionnaires provided the study with an effective

response rate of approximately 17.5 percent. Although the response rate is not high, it is still acceptable and comparable to other studies in the e-SCM context (Villena *et al.*, 2009; Wu and Chuang, 2009). The respondents came from different industries, including computer and electronics (64), automobile (27), machine and tool (15), health/foods (10), textile (7), and other industries (19). The number in the parenthesis is the sample size in a particular industry. The average number of years that respondents had worked in their organizations (working experience) was 16.3. Overall, 46 percent of respondents were chief information officers and 54 percent were managers (senior IS manager or other manager in IS department).

This study conducted two statistical analyses to test the potential non-response bias (Armstrong and Overton, 1997). First, a comparative analysis of two descriptive variables (total assets and employee numbers) was conducted in order to see if responding firms have significantly different characteristics from non-respondents. The comparisons on total assets and employee numbers of the two groups showed no significant differences based on the results of the *t*-test ($p = 0.104$ and 0.130 , respectively). Second, the respondents were further divided into two halves based on the dates of return, and then χ^2 test was used to compare the early 71 respondents (50 percent) and the late 71 respondent (50 percent) on two demographic characteristics: working experience and job title. The results indicated no significant differences between the two groups in working experience ($p = 0.068$) and job title ($p = 0.091$). Accordingly, non-response bias was not a serious concern in this study.

3.2 Measures

To test the research model, a draft questionnaire was developed on the basis of a comprehensive review of the literature and modified to suit the e-SCM diffusion context. The English questionnaire was first translated into Chinese and then was back-translated into English to ensure translation equivalence. The cover letter consisted of a brief paragraph explaining the purpose of this study and describing the concept of e-SCM diffusion to enhance confidentiality. With establishing the content validity, the questionnaire was refined through rigorous pre-testing. The pre-testing focused on instrument clarity, question wording, and validity. During the pre-testing, three MIS management professionals and three IS managers were invited to comment on the questions and wordings of questionnaire. The comments of these six individuals then provided a basis for revisions to the construct measures. All measures (with the exception of firm size) were assessed with five-point Likert scales, ranging from "strongly disagree" to "strongly agree." The definitions for all measurement items are listed in the Table I and discussed below.

Independent variables. IT deployment capability was based on Bharadwaj (2000), with four items, which assessed the extent of the firm's ability to exploit IT deployment capability (IT infrastructure, IT plan, IT development, and IT integration) to facilitate e-SCM implementation. Operational capability was measured by four important items: manufacturing capability, new product design and development capability, just-in-time capability, and total quality management capability (Hsu *et al.*, 2009; Yam *et al.*, 2011). Human resource capability was measured by four items adapted from Wiklund and Shepherd (2003), which assessed the extent to which employees had excellent business knowledge, productivity, efficiency, and commitment to the organization. Knowledge sharing was measured using four items that assessed that the extent to which firms share knowledge with supply chain partners. Measurement items were adapted from the instrument developed by Li *et al.* (2006) and Hernandez-Espallardo *et al.* (2010).

Dependent variables. e-SCM diffusion measures the degree to which the firm implements e-SCM to support major business functions and business processes within and across organizations. The six items, including internal and external supply chain transaction

| Constructs/measures | Factor loading |
|--|----------------|
| <i>IT deployment capability (composite reliability = 0.85)</i> | |
| Your firm currently has ... | |
| 1. Adequate IT infrastructure to facilitate e-SCM implementation | 0.74*** |
| 2. Robust IT plan to facilitate e-SCM implementation | 0.68*** |
| 3. Strong IT development capability to facilitate e-SCM implementation | 0.83*** |
| 4. The skills to integrate the various IT components to facilitate e-SCM implementation | 0.79*** |
| <i>Operational capability (composite reliability = 0.91)</i> | |
| 1. Your firm effectively applies advanced manufacturing procedures | 0.88*** |
| 2. Your firm has good mechanisms for transferring technology from research to product development | 0.87*** |
| 3. Your firm has high capability in increasing delivery frequencies | 0.83*** |
| 4. Your firm emphasizes on quality instead of price | 0.78*** |
| <i>Human resource capability (composite reliability = 0.84)</i> | |
| 1. In your firm, employees have a deep understanding of the business priorities and goals | 0.72*** |
| 2. Your firm has highly productive employees | 0.75*** |
| 3. In your firm, employees are willing to contribute with ideas for new products and services | 0.79*** |
| 4. In your firm, employees have a positive commitment to the company's development | 0.76*** |
| <i>Knowledge sharing (composite reliability = 0.91)</i> | |
| 1. Your firm prefers to share know-how and innovations with supply chain partners | 0.77*** |
| 2. Your firm prefers to share relevant market knowledge with supply chain partners | 0.90*** |
| 3. Your firm openly shares knowledge with your supply chain partners | 0.88*** |
| 4. Your firm and supply chain partners share knowledge that helps establishment of business planning | 0.83*** |
| <i>E-SCM diffusion (composite reliability = 0.85)</i> | |
| Your firm implements the e-SCM in ... | |
| 1. Supporting accounting management | 0.67*** |
| 2. Supporting product and service delivery management | 0.75*** |
| 3. Supporting warehousing and inventory management | 0.63*** |
| 4. Supporting productions and operations management | 0.82*** |
| 5. Facilitating purchase ordering and fulfillment management among supply chain partners | 0.58*** |
| 6. Facilitating electronic data interchange among supply chain partners | 0.74*** |
| <i>Competitive performance (composite reliability = 0.84)</i> | |
| After the implementation of e-SCM, your firm can improve its ability to achieve ... | |
| 1. Higher productivity | 0.62*** |
| 2. Shorter lead time | 0.83*** |
| 3. Improved customer service levels | 0.80*** |
| 4. Better relationships with supply chain partners | 0.76*** |
| <i>Firm size (composite reliability = 1.00)</i> | |
| Number of employees in the firm (logarithm transformed) | 1.00 |
| Notes: Significance test is not applicable to single-item constructs. *** $p < 0.001$ | |

Table I.
Summary of
measurement scales

processes, were adapted from the works of Ranganathan *et al.* (2004). Competitive performance was measured using four items asking respondents to indicate the extent to which they believe that their firms' competitiveness improves as they engage in e-SCM in terms of higher productivity, shorter lead time, improved customer service levels, and better relationships with supply chain partners. These items were adapted from Zhang and Dhaliwal (2009) and Villena *et al.* (2009).

Control variable. Firm size was measured by the number of employees in the entire organization, which was log-transformed to reduce data variance.

4. Data analysis and results

4.1 Validity and reliability assessment

This study conducted a CFA using PLS-Graph Version 3.0 (Chin and Frye, 1994) to assess reliability and validity of the theoretical constructs. As shown in Table I, the composite reliabilities of the constructs ranged between 0.83 and 1.00, which exceed the recommended cut-off level of 0.70 (Nunnally and Bernstein, 1994). Moreover, all constructs in the research model satisfied the requirements for convergent validity (standardized path loadings greater than 0.5 and significant at $p < 0.001$) (Hair *et al.*, 2006). Table II shows that average variance extracted (AVE) of the individual constructs was greater than any squared correlation among constructs, confirming discriminant validity (Fornell and Larcker, 1981). In summary, the research model demonstrated adequate reliability, convergent validity, and discriminant validity.

To test for common method bias, this study first conducted Harman's single-factor test (Podsakoff *et al.*, 2003). According to this approach, significant common method bias becomes evident if a single factor emerges from principal component analysis, or if one factor overwhelmingly accounts for the majority of covariance among the variables in an unrotated factor analysis. Because more than one factor emerged to explain the variance our analysis, the common method bias in this study is not high. Second, following Podsakoff *et al.* (2003) and Vance *et al.* (2008), this study included a method factor in the research model to evaluate the variance explained by substantive factor and the method factor. The average substantively explained variance of the indicators (0.71) is far larger than the average method-based variance (0.021). Additionally, most method factor loadings are not significant. Therefore, the common method bias is unlikely to be a serious concern in this study.

4.2 Hypotheses testing

This study employed hierarchical moderated regression (using SPSS Version 20) to test the hypotheses. To avoid problems with multicollinearity, the variance inflation factor (VIF) was computed. For the regression model, the VIFs are well below 3.0, which are significantly below the cut-off value of 10 (Hair *et al.*, 2006), and therefore suggested that the multicollinearity is not problematic in this study.

The results are reported in Table III. Model 1 includes only one control variable (firm size). The result indicates that firm size has a significant and positive effect on e-SCM diffusion ($\beta = 0.106$, $p < 0.05$). Larger firms possess greater resources and knowledge available to invest in and implement technology effectively as well as economies of scale to facilitate e-SCM diffusion. Model 2 includes the main effects in addition to the control variable. The overall model is significant, and all the main effects coefficients are significant, as is the change in R^2 compared to the base model (F -statistic change = 23.535; $p < 0.001$).

| Constructs | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|----------------------------------|------|------|------|------|------|------|------|
| (1) IT deployment capability | 0.58 | | | | | | |
| (2) Operational capability | 0.05 | 0.70 | | | | | |
| (3) Human resource capability | 0.03 | 0.03 | 0.57 | | | | |
| (4) Inter-firm knowledge sharing | 0.07 | 0.02 | 0.08 | 0.72 | | | |
| (5) e-SCM diffusion | 0.10 | 0.07 | 0.21 | 0.29 | 0.50 | | |
| (6) Competitive performance | 0.08 | 0.09 | 0.20 | 0.39 | 0.47 | 0.57 | |
| (7) Firm size | 0.01 | 0.02 | 0.03 | 0.01 | 0.01 | 0.01 | 1.00 |

Table II.
Correlations and average variance extracted (AVE)

Notes: Diagonal elements are average variance extracted (AVE), while off-diagonal elements represent the squared correlations. For adequate discriminant validity, diagonal elements should be greater than corresponding off-diagonal elements

| Dependence variables | E-SCM diffusion | | | Competitive performance |
|--|---------------------------|-----------------------|---------------------|-------------------------|
| | Model 1: control variable | Model 2: main effects | Model 3: full model | Model 4: main effects |
| Firm size | 0.106* | 0.122* | 0.116* | 0.008 |
| IT deployment capability (<i>H1</i>) | | 0.205** | 0.201** | |
| Operational capability (<i>H2</i>) | | 0.222** | 0.186** | |
| Human resource capability (<i>H3</i>) | | 0.284** | 0.296** | |
| Knowledge-sharing culture (<i>H4</i>) | | 0.363*** | 0.347*** | |
| IT deployment capability × knowledge-sharing culture (<i>H5a</i>) | | | 0.092 | |
| Operational capability × knowledge-sharing culture (<i>H5b</i>) | | | 0.403*** | |
| Human resource capability × knowledge-sharing culture (<i>H5c</i>) | | | 0.308** | |
| e-SCM diffusion (<i>H6</i>) | | | | 0.673*** |
| R^2 | 0.011 | 0.416 | 0.523 | 0.454 |
| Adjusted R^2 | 0.004 | 0.394 | 0.488 | 0.446 |
| F -statistic | 1.596 | 19.352*** | 22.166*** | 57.769*** |
| ΔR^2 | | 0.405 | 0.107 | |
| F -statistic for ΔR^2 | | 23.535*** | 11.526*** | |

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table III.
Regression results

The results lend support to *H1-H3*. The three organizational capabilities – IT deployment capability ($\beta = 0.205$, $p < 0.01$), operational capability ($\beta = 0.222$, $p < 0.01$) and human resource capability ($\beta = 0.284$, $p < 0.01$) – have significant and positive effects on e-SCM diffusion. With respect to *H4*, as expected, knowledge sharing is found to have a significant positive effect on e-SCM diffusion ($\beta = 0.363$, $p < 0.01$).

Model 3 includes the moderating effects, in addition to the main effects and control variable. The change in R^2 between the main effect model and the moderated effects model is significant (F -statistic change = 11.526; $p < 0.001$), with two out of the three interaction effects having significant coefficients. Contrary to expectations, the interaction effect of IT deployment capability and knowledge sharing on e-SCM diffusion was insignificant; therefore, *H5a* is not supported by the data. The interaction term involving operational capability and knowledge sharing is positive and significant ($\beta = 0.403$, $p < 0.001$), suggesting a complementary (enhancing) relationship. Therefore, *H5b* is supported by the data. The interaction term involving human resource capability and knowledge sharing also is positive and significant ($\beta = 0.308$, $p < 0.01$), suggesting an enhancing relationship, that is, knowledge sharing complements the positive effect of human resource capability on e-SCM diffusion. Therefore, *H5c* is supported by the data.

Finally, Model 4 of Table III shows that e-SCM diffusion is positively associated with competitive performance ($\beta = 0.673$, $p < 0.001$), providing support for *H6*. However, firm size has no significant positive effect on competitive performance. A possible explanation is that larger firms may have highly bureaucratic and highly complex organizational structures, which can prevent them from realizing the full benefits of e-SCM diffusion (Zhu *et al.*, 2006). Thus, the effect of firm size was not apparent.

5. Discussion and implications

5.1 Discussion

Grounded in the resource-based view and social exchange theory, this study seeks to provide a better understanding of the antecedents of e-SCM diffusion and its impact on

competitive performance, thus offer some useful and practical guidelines for firms wishing to successfully implement e-SCM and realize performance gains. The results provide empirical support for the research model and suggest that organizational capabilities and knowledge sharing lead to superior e-SCM diffusion, which, in turn, facilitate greater competitive performance. The results also support the proposition that knowledge sharing moderates the link between different organizational capabilities (except for IT deployment capability) and e-SCM diffusion.

e-SCM diffusion differs from many previously studied areas of IT adoption, because they integrate intra- and inter-firm operational and strategic planning processes. So far, however, few studies have investigated how e-SCM diffusion is related to inside-out capabilities (internal focus on organizational capabilities) and outside-in capabilities (external relationship management). The results support the resource-based view literature (Ravichandran and Lertwongsatien, 2005; Molla and Licker, 2005), so that organizational capabilities such as IT deployment capability, operational capability, and human resource capability are pivotal in the evolution of e-SCM activities (*H1-H3*). Organizational capabilities serve as a key leverage point within the e-SCM context. These three capabilities have positive and roughly equal effects on e-SCM diffusion ($\beta = 0.205, 0.222, \text{ and } 0.284$, respectively). This result is also consistent with studies in the IT-enabled business innovation literature indicating that well-balanced function-oriented capabilities (i.e. a rapid IT deployment capability and effective operational capability) and human-oriented capabilities (skilled personnel) are more likely to realize more IT business value (Molla and Licker, 2005; Ravichandran and Lertwongsatien, 2005; Zhu *et al.*, 2003).

Consistent with the social exchange theory, this study provides evidence that knowledge sharing was found to be positively and significantly related with e-SCM diffusion (*H4*). This result implies that knowledge sharing facilitates interaction and collaboration among supply chain partners, resulting in a positive influence on the extension of e-SCM into deeper levels of organizations. Huo *et al.* (2014) also reported that knowledge sharing is an essential antecedent to enhance buyer-supplier relationships and collaboration. When knowledge (e.g. best practices in inter-firm collaboration, supply chain partners suggestions, latest information regards to supply chain and logistics operations) is shared within and across organizations, it increases a firm's ability to coordinate supply chain activities, enabling the firm to develop better and more successful e-SCM implementation.

Although this study predicted that the direct impact of IT deployment capability on e-SCM diffusion is positive, this relationship is not moderated by knowledge sharing (*H5a*). One possible explanation for this finding is that e-SCM diffusion is mainly built based on internet-related technologies to conduct or support business activities along the supply chain (Wu and Chuang, 2009). In this study, all of the respondents whose companies have implemented e-SCM projects noted that their organizations have a mature internet-related infrastructure and a lot of built-in help information to ensure appropriate IT planning, systems development, and project management skills. Firms that have a mature internet-related infrastructure are more likely to create well-managed IT deployment capabilities to promote e-SCM diffusion, so employees may not need many external facilitating conditions. The sharing of IT knowledge and skills through interconnected databases and informal (personal) networks may be insufficient to moderate the relationship between IT deployment capability and e-SCM diffusion. Therefore, the interaction between IT deployment capability and knowledge sharing shows no significant effect on e-SCM diffusion.

Two of the proposed moderating relationships are supported by the data; the findings confirm the positive moderating effects between knowledge sharing and two organizational capabilities: operational capability (*H5b*) and human resource capability (*H5c*). The findings suggest that the significant interaction between operation capability and knowledge

sharing displays a positive effect on e-SCM diffusion. e-SCM diffusion requires effective knowledge sharing among supply chain partners and the ability to cultivate innovative operational solutions. The findings also suggest that human resource capability and knowledge sharing can behave as complementary capabilities to facilitate e-SCM diffusion. When firms have a knowledge-sharing culture, employees have knowledge, excellent problem-solving skills, and the ability to participate in e-SCM activities that facilitate the success of e-SCM diffusion.

Finally, as hypothesized (*H6*), e-SCM diffusion had a significant positive association with competitive performance. This study provides empirical evidence that e-SCM diffusion is a critical stage leading to securing competitive advantage and improving organizational performance, that is, high diffusion of e-SCM activities is likely to sustain and improve competitive performance at organizational and inter-organizational levels.

5.2 Theoretical implications

This study makes important theoretical contributions to the emerging knowledge on e-SCM diffusion. First, although prior research has emphasized the importance of internal (organizational) capabilities and external (social) networks for successful diffusion of e-SCM (Bala, 2013; Rai and Tang, 2014), this study is one of the first to investigate the antecedents and consequences of e-SCM diffusion based on the resource-based view and social exchange theory. This study develops a research model to examine the influence of organizational capabilities and knowledge sharing on e-SCM diffusion, which in turn affects firm competitiveness. Without this evidence, developing a resource-based model is unlikely to unearth new insights into how core knowledge, skills, and abilities in organizations are important to create value in the e-SCM diffusion context.

Second, three distinct types of firm-specific skills and resources stemming from an organizational capabilities concept were identified. The three antecedent variables – IT deployment capability, operational capability, and human resource capability – reflect the importance of “hard” (function-oriented) and “soft” (human-oriented) business-related capabilities to facilitate scope and success of e-SCM diffusion and achieve competitive performance. Firms build core capabilities by combining various individual and organizational competencies that work together to promote e-SCM diffusion, highlighting that IT management skills, operational processes, and human resources are critical in the e-SCM diffusion context. These antecedent variables provide a more nuanced understanding of the determinants of e-SCM diffusion and performance.

Third, considering the nature of social interactions in the e-SCM diffusion context and drawing on social exchange theory, the findings of this study show that knowledge sharing directly affects e-SCM diffusion. To facilitate e-SCM diffusion, companies must first exploit internal capabilities and then enhance social mechanisms across supply chain partners; however, no empirical evidence has been provided to show how organizational capabilities and social mechanisms interact with each other. This study extends the e-SCM literature to identify the complementarities between organizational capabilities (such as operational capability and human resource capability) and knowledge sharing which are positively related to e-SCM diffusion. This result has not been emphasized by the e-SCM literature, which focuses on the direct effects of IT attributes and supply chain partnerships on e-SCM adoption (Cao *et al.*, 2013; Ke *et al.*, 2009; Wu and Chuang, 2009). The current study provides more granularity than previous research in assessing the antecedents of e-SCM diffusion. Researchers should consider complementarities between firm internal capabilities and social mechanisms, and if complementarities exist, the analysis can provide new insights into e-SCM diffusion and performance.

Finally, focusing on antecedents and consequences of e-SCM diffusion, this study is different from previous studies that explored the determinants of e-SCM adoption decision

(intent to adopt or adoption vs non-adoption) (Cao *et al.*, 2013; Lin, 2014a; Teo *et al.*, 2009). Seeking to further our understanding on the e-SCM diffusion, this study proposes a more comprehensive model that features firm-level capabilities and inter-firm relationships as antecedents relating to e-SCM diffusion and performance. The research model can be used as a theoretical framework for studying other types of IT-enabled business innovation such as ubiquitous commerce and Internet of Things applications.

5.3 Managerial implications

For managers and practitioners who are concerned about e-SCM practices, this study presents several managerial implications. In the fast-paced business environment of today, the ability to integrate, build, and reconfigure firm internal capabilities and social mechanisms in response to environmental uncertainty is critical to the success and nature of e-SCM deployment. While concepts such as organizational capabilities (Molla and Licker, 2005) and knowledge sharing (Sivadas and Dwyer, 2000) have been advocated as viable means to attend this end, little empirical research has been conducted in the e-SCM diffusion context. This study found that when firms successfully implemented e-SCM to support internal and external supply chain transaction processes, substantial benefits were realized ranging from higher productivity to improved competitive performance. Also, managers should be cautious when increasing the scope and magnitude of e-SCM, it is necessary to focus on the creation and continuous development of firm-specific organizational capabilities and knowledge-sharing environment that enable firms to adapt to a rapidly changing supply chain environment.

This study found that all three organizational capabilities (IT deployment, operational, and human resource capabilities) are equally important to facilitate the success of e-SCM diffusion. Managers must carefully consider these organizational capabilities when transforming their physical supply chains into those based on the internet-based supply chain network. Although the e-SCM is built on IT-based applications, the role of IT deployment capability is not limited to the physical IT infrastructure and its connections. The physical IT infrastructure must be balanced with managerial IT skills (e.g. IT transformation planning, IT analysis and development, IT integration strategy) for effective linking of information flows across organizational boundaries, thereby sensing and responding to changes in the e-SCM diffusion context.

Moreover, managers should devote time and attention to embracing operational capabilities as a vital component to diffuse and routinize e-SCM in business processes. In other words, firms must boost productivity, refine product-development approaches, and tame supply chain complexity to facilitate e-SCM diffusion, and to obtain a sustainable competitive advantage over competitors. Meanwhile, managers should recognize that human resource development activities such as recruiting, training, and managing valuable e-SCM personnel are an important source of e-SCM diffusion. Similarly, managers must establish the connection between human resource capabilities and e-SCM diffusion (i.e. "soft-side" e-SCM) such as hiring and retaining skilled e-SCM personnel, training and development for e-SCM personnel, and measuring e-SCM personnel's global mindset over time.

Managers should be aware of the importance of social mechanisms, such as effective knowledge sharing, for development and diffusion of e-SCM. Before embarking on e-SCM diffusion, managers should encourage employees to share knowledge both within and outside organizations and ultimately make organizational knowledge more productive. Creating a knowledge-sharing culture can integrate and synchronize the isolated functions into streamlined business processes between supply chain partners, and thus promote e-SCM adoption and migration. Additionally, this study suggests that, although both organizational capabilities and knowledge sharing individually are related to e-SCM diffusion, managers need to consider their joint impacts. The analysis of moderating effects shows that operational

capability and human resource capability can facilitate greater e-SCM diffusion under higher level of knowledge sharing. Managers should develop their organizational capabilities (e.g. operational capability and human resource capability) and work to promote knowledge sharing across organizational boundaries so that operational capabilities, training programs, and social networks can be synthesized into a holistic process of e-SCM diffusion. These complementary capabilities are especially valuable because they enable firms to effectively leverage tangible and intangible resources in pursuit of e-SCM diffusion.

5.4 Limitations and future research

Although this study provides some meaningful results for research and practice, it has several limitations that offer fertile avenues for further research. First, this study uses only survey data to support the hypothesized relationships. Future research might employ different research methods (such as structured interviews, case studies, or longitudinal data collection methods) to determine the causal links more explicitly. Also, this study selects specific factors in the two domains (organizational capabilities and knowledge sharing) based on their relevance to e-SCM diffusion. Although the results demonstrate that e-SCM diffusion is indeed influenced by the factors in these two domains, it does not exclude the possibility that there are other factors that could influence e-SCM diffusion. For example, the fit between task and technology characteristics (such as information quality, ease of use, system reliability, authorization, and compatibility) has been identified as potential antecedents of the level of participation of SCM system adoption (Cao *et al.*, 2013). Future research can integrate additional relevant factors to achieve a comprehensive model of e-SCM diffusion. Furthermore, the findings indicate that there is no significant relationship between firm size (control variable) and competitive performance. Future research could include additional control variables (such as firm age and industry type) that we expect to have impact on e-SCM diffusion and competitive performance.

In addition, this study focused on the interaction effects of knowledge sharing (only one moderator) with IT deployment, operational, and human resource capabilities, but did not include consideration of interactions between main effects factors. Future research should examine the relationship between these variables. Another interesting direction for future research would be to explore other potential moderators such as competitive intensity (Dong *et al.*, 2009) and environmental turbulence (Wang *et al.*, 2012). Moreover, survey data based on self-reports may be subject to social desirability bias. Future research should attempt to use objective information (preferably financial) to impartially measure the performance of e-SCM diffusion in order to reduce the problems of social desirability bias. Finally, the context of this study, Taiwan, may limit the extent to which the results apply to firms in other countries and in other cultural contexts. Thus, the research model should be tested further using samples from other countries, and further testing may provide a more robust estimation of the hypotheses. However, this study may provide a fundamental reference for firms located in other areas or countries with similar environments to Taiwan.

References

- Argote, L., Ingram, P., Levine, J.M. and Moreland, R.L. (2000), "Knowledge transfer in organizations", *Organizational Behavior and Human Decision Processes*, Vol. 82 No. 1, pp. 1-8.
- Armstrong, J.S. and Overton, T.S. (1997), "Estimating non-response bias in mail surveys", *Journal of Marketing Research*, Vol. 14 No. 3, pp. 396-402.
- Bala, H. (2013), "The effects of IT-enabled supply chain process change on job and process outcomes: a longitudinal investigation", *Journal of Operations Management*, Vol. 31 No. 6, pp. 450-473.

- Barney, J.B. (2001), "Is the resource-based 'view' a useful perspective for strategic management research? Yes", *Academy of Management Review*, Vol. 26 No. 1, pp. 41-56.
- Bharadwaj, A. (2000), "A resource-based perspective on information technology capability and firm performance", *MIS Quarterly*, Vol. 24 No. 1, pp. 169-196.
- Brandon-Jones, E., Squire, B., Autry, C.W. and Petersen, K.J. (2014), "A contingent resource-based perspective of supply chain resilience and robustness", *Journal of Supply Chain Management*, Vol. 50 No. 3, pp. 55-73.
- Campbell, B.A., Coff, R. and Krzyscynski, D. (2012), "Rethinking sustained competitive advantage from human capital", *Academy of Management Review*, Vol. 37 No. 3, pp. 376-395.
- Cao, Q., Gan, Q. and Thompson, M.A. (2013), "Organizational adoption of supply chain management system: a multi-theoretic investigation", *Decision Support Systems*, Vol. 55 No. 3, pp. 720-727.
- Caridi, M., Moretto, A., Perego, A. and Tumino, A. (2014), "The benefits of supply chain visibility: a value assessment model", *International Journal of Production Economics*, Vol. 151 No. 1, pp. 1-19.
- Cegielski, C.G., Jones-Farmer, L.A., Wu, Y. and Hazen, B.T. (2012), "Adoption of cloud computing technologies in supply chains: an organizational information processing theory approach", *The International Journal of Logistics Management*, Vol. 23 No. 2, pp. 184-211.
- Chen, Y.H., Lin, T.P. and Yen, D.C. (2014), "How to facilitate inter-organizational knowledge sharing: the impact of trust", *Information & Management*, Vol. 51 No. 5, pp. 568-578.
- Chin, W.W. and Frye, T.A. (1994), *PLS-Graph User's Manual*, Faculty of Management, University of Calgary, Alberta.
- Chung, S.A., Singh, H. and Lee, G.M. (2000), "Complementarity, status similarity and social capital as drivers of alliance formation", *Strategic Management Journal*, Vol. 21 No. 1, pp. 1-22.
- Cohen, W.M. and Levinthal, D.A. (1989), "Innovation and learning: the two faces of R&D", *The Economic Journal*, Vol. 99 No. 397, pp. 569-596.
- DeGroot, S. and Marx, T.G. (2013), "The impact of IT on supply chain agility and firm performance: an empirical investigation", *International Journal of Information Management*, Vol. 33 No. 6, pp. 909-916.
- Dong, S., Xu, S.X. and Zhu, K.X. (2009), "Information technology in supply chains: the value of IT-enabled resources under competition", *Information Systems Research*, Vol. 20 No. 1, pp. 18-32.
- Fatemeh, N. and Leila, N.A. (2014), "Success factors of inter-organizational knowledge sharing: a proposed framework", *The Electronic Library*, Vol. 32 No. 2, pp. 239-261.
- Fichman, R.G. (2000), "The diffusion and assimilation of information technology innovations", in Zmud, R.W. (Ed.), *Framing the Domains of IT Management: Projecting the Future through the Past*, Pinnaflex Publishing, Cleveland, OH, pp. 105-127.
- Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.
- Gimenez, C. and Lourenco, H.R. (2008), "e-SCM: internet's impact on supply chain processes", *The International Journal of Logistics Management*, Vol. 19 No. 3, pp. 309-343.
- Gomez-Cedeno, M., Castan-Ferrero, J.M. and Guitart-Tarres, L. (2015), "Impact of human resources on supply chain management and performance", *Industrial Management & Data Systems*, Vol. 115 No. 1, pp. 129-157.
- Hair, J.F., Anderson, R.L. and Tatham, W.C. (2006), *Multivariate Data Analysis with Reading*, Prentice-Hall, Upper Saddle River, NJ.
- Hazen, B.T., Hanna, J.B. and Hall, D.J. (2014), "Incorporating logistics enterprise architecture: a diffusion of innovation perspective", *International Journal of Logistics Research and Applications*, Vol. 17 No. 3, pp. 179-199.

- Hazen, B.T., Overstreet, R.E. and Cegielski, C.G. (2012), "Supply chain innovation diffusion: going beyond adoption", *The International Journal of Logistics Management*, Vol. 23 No. 1, pp. 119-134.
- Hernandez-Espallardo, M., Rodriguez-Orejuela, A. and Sanchez-Perez, M. (2010), "Inter-organizational governance, learning and performance in supply chains", *Supply Chain Management: An International Journal*, Vol. 15 No. 2, pp. 101-114.
- Hinkka, V., Framling, K. and Tatila, J. (2013), "Supply chain tracking: aligning buyer and supplier incentives", *Industrial Management & Data Systems*, Vol. 113 No. 8, pp. 1133-1148.
- Hohenstein, N.O., Feisel, E. and Hartmann, E. (2014), "Human resource management issues in supply chain management research: a systematic literature review from 1998 to 2014", *International Journal of Physical Distribution & Logistics Management*, Vol. 44 No. 6, pp. 434-463.
- Hsu, C.C., Tan, K.C., Kannan, V.R. and Leong, G.K. (2009), "Supply chain management practices as a mediator of the relationship between operations capability and firm performance", *International Journal of Production Research*, Vol. 47 No. 3, pp. 835-855.
- Huo, B., Zhao, X. and Zhou, H. (2014), "The effects of competitive environment on supply chain information sharing and performance: an empirical study in China", *Production and Operations Management*, Vol. 23 No. 4, pp. 552-569.
- Huselid, M.A. (1995), "The impact of human resource management practices on turnover, productivity, and corporate financial performance", *Academy of Management Journal*, Vol. 38 No. 3, pp. 604-623.
- Huysman, M. and de Wit, D. (2004), "Practices of managing knowledge sharing: towards a second wave of knowledge management", *Knowledge and Process Management*, Vol. 11 No. 2, pp. 81-92.
- Ke, W., Liu, H., Wei, K.K., Gu, J. and Chen, H. (2009), "How do mediated and non-mediated power affect electronic supply chain management system adoption? The mediating effects of trust and institutional pressures", *Decision Support Systems*, Vol. 46 No. 4, pp. 839-851.
- Lawson, B., Petersen, K.J., Cousins, P.D. and Handfield, R.B. (2009), "Knowledge sharing in interorganizational product development teams: the effect of formal and informal socialization mechanisms", *The Journal of Product Innovation Management*, Vol. 26 No. 2, pp. 156-172.
- Lee, H.L. and Whang, S. (2004), *E-business and Supply Chain Integration*, Springer, New York, NY.
- Lengnick-Hall, M.L., Lengnick-Hall, C.A. and Rigsbee, C.M. (2013), "Strategic human resource management and supply chain integration", *Human Resource Management Review*, Vol. 23 No. 4, pp. 366-377.
- Li, J., Rikora, R., Shaw, M.J. and Tan, G.W. (2006), "A strategic analysis of inter organizational information sharing", *Decision Support Systems*, Vol. 42 No. 1, pp. 251-266.
- Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S. and Rao, S.S. (2006), "The impact of supply chain management practices on competitive advantage and organizational performance", *OMEGA International Journal of Management Science*, Vol. 34 No. 2, pp. 107-124.
- Lin, H.F. (2013), "The effects of knowledge management capabilities and partnership attributes on the stage-based e-business diffusion", *Internet Research*, Vol. 23 No. 4, pp. 439-464.
- Lin, H.F. (2014a), "Understanding the determinants of electronic supply chain management system adoption: using the technology-organization-environment framework", *Technological Forecasting & Social Change*, Vol. 86 No. 1, pp. 80-92.
- Lin, H.F. (2014b), "The impact of socialization mechanisms and technological innovation capabilities on partnership quality and supply chain integration", *Information Systems and e-Business Management*, Vol. 12 No. 2, pp. 285-306.
- Liu, H., Huang, Q., Wei, S. and Huang, L. (2015), "The impacts of IT capability on internet-enabled supply and demand process integration, and firm performance in manufacturing and services", *The International Journal of Logistics Management*, Vol. 26 No. 1, pp. 172-194.

- Liu, H., Ke, W., Wei, K.K. and Hua, Z. (2013), "The impact of IT capabilities on firm performance: the mediating roles of absorptive capacity and supply chain agility", *Decision Support Systems*, Vol. 54 No. 3, pp. 1452-1462.
- Liu, H., Ke, W., We, K.K., Gu, J. and Chen, H.H. (2010), "The role of institutional pressures and organizational culture in the firm's intention to adopt internet-enabled supply chain management systems", *Journal of Operations Management*, Vol. 28 No. 5, pp. 372-384.
- Lu, Y. and Ramamurthy, K. (2011), "Understanding the link between information technology capability and organizational agility: an empirical examination", *MIS Quarterly*, Vol. 35 No. 4, pp. 931-954.
- Martin-Rios, C. (2014), "Why do firms seek to share human resource management knowledge? The importance of inter-firm networks", *Journal of Business Research*, Vol. 67 No. 2, pp. 190-199.
- Menon, S.T. (2012), "Human resource practices, supply chain performance, and wellbeing", *International Journal of Manpower*, Vol. 33 No. 7, pp. 769-785.
- Molla, A. and Licker, P.S. (2005), "Perceived e-readiness factors in e-commerce adoption: an empirical investigation in a developing country", *International Journal of Electronic Commerce*, Vol. 10 No. 1, pp. 83-110.
- Nunnally, J.C. and Bernstein, I.H. (1994), *Psychometric Theory*, McGraw-Hill, New York, NY.
- Pavlou, P.A. and El Sawy, O.A. (2006), "From IT leveraging competence to competitive advantage in turbulent environments: the case of new product development", *Information Systems Research*, Vol. 17 No. 3, pp. 198-277.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. and Podsakoff, N.P. (2003), "Common method biases in behavioral research: a critical review of the literature and recommended remedies", *Journal of Applied Psychology*, Vol. 88 No. 5, pp. 879-903.
- Rai, A. and Tang, X. (2010), "Leveraging IT capabilities and competitive process capabilities for the management of interorganizational relationship portfolios", *Information Systems Research*, Vol. 21 No. 3, pp. 516-542.
- Rai, A. and Tang, X. (2014), "Research commentary-information technology-enabled business models: a conceptual framework and a coevolution perspective for future research", *Information Systems Research*, Vol. 25 No. 1, pp. 1-14.
- Rai, A., Patnayakuni, R. and Seth, N. (2006), "Firm performance impacts of digitally enabled supply chain integration capabilities", *MIS Quarterly*, Vol. 30 No. 2, pp. 225-246.
- Rai, A., Pavlou, P.A., Im, G. and Du, S. (2012), "Inter-firm IT capability profiles and communications for cocreating relational value: evidence from the logistics industry", *MIS Quarterly*, Vol. 36 No. 1, pp. 233-262.
- Ranganathan, C., Dhaliwal, J.S. and Teo, T.S.H. (2004), "Assimilation and diffusion of web technologies in supply-chain management: an examination of key drivers and performance impacts", *International Journal of Electronic Commerce*, Vol. 9 No. 1, pp. 127-161.
- Ravichandran, T. and Lertwongsatien, C. (2005), "Effect of information systems resources and capabilities on firm performance: a resource-based perspective", *Journal of Management Information Systems*, Vol. 21 No. 4, pp. 237-276.
- Rogers, E.M. (2003), *Diffusion of Innovations*, Free Press, New York, NY.
- Sivadas, E. and Dwyer, F. (2000), "An examination of organizational factors influencing new product success in internal and alliance-based processes", *Journal of Marketing*, Vol. 64 No. 1, pp. 31-49.
- So, S. and Sun, H. (2011), "An extension of IDT in examining the relationship between electronic-enabled supply chain integration and the adoption of lean production", *International Journal of Production Research*, Vol. 49 No. 2, pp. 447-466.

- Tan, K.C., Kannan, V.R. and Narasimhan, R. (2007), "The impact of operations capability on firm performance", *International Journal of Production Research*, Vol. 45 No. 2, pp. 5135-5156.
- Teo, T.S.H., Lin, S. and Lai, K.H. (2009), "Adopters and non-adopters of e-procurement in Singapore: an empirical study", *OMEGA International Journal of Management Science*, Vol. 37 No. 5, pp. 972-987.
- Tsanos, C., Zografos, K.G. and Harrison, A. (2014), "Developing a conceptual model for examining the supply chain relationships between behavioural antecedents of collaboration, integration and performance", *The International Journal of Logistics Management*, Vol. 25 No. 3, pp. 418-462.
- Vance, A., Elie-dit-Cosaque, C. and Straub, D. (2008), "Examining trust in information technology artifacts: the effects of system quality and culture", *Journal of Management Information Systems*, Vol. 24 No. 4, pp. 73-100.
- Villena, V.H., Gomez-Mejia, L.R. and Revilla, E. (2009), "The decision of the supply chain executive to support or impede supply chain integration: a multidisciplinary behavioral agency perspective", *Decision Sciences*, Vol. 40 No. 4, pp. 635-665.
- Wade, M. and Hulland, J. (2004), "The resource-based view and information systems research: review, extension, and suggestions for future research", *MIS Quarterly*, Vol. 28 No. 1, pp. 107-142.
- Wang, N., Liang, H., Zhong, W., Xue, Y. and Xiao, J. (2012), "Resource structuring or capability building? An empirical study of the business value of information technology", *Journal of Management Information Systems*, Vol. 29 No. 2, pp. 325-367.
- Wang, Z., Wang, N. and Liang, H. (2014), "Knowledge sharing, intellectual capital and firm performance", *Management Decision*, Vol. 52 No. 2, pp. 230-258.
- Wiklund, J. and Shepherd, D. (2003), "Knowledge-based resources, entrepreneurial orientation, and the performance of small and medium sized businesses", *Strategic Management Journal*, Vol. 24 No. 13, pp. 1307-1314.
- Wong, C.Y., Boon-itt, S. and Wong, C.W.Y. (2011), "The contingency effects of environmental uncertainty on the relationship between supply chain integration and operational performance", *Journal of Operations Management*, Vol. 29 No. 6, pp. 604-615.
- Wu, I.L. and Chang, C.H. (2012), "Using the balanced scorecard in assessing the performance of e-SCM diffusion: a multi-stage perspective", *Decision Support Systems*, Vol. 52 No. 2, pp. 474-485.
- Wu, I.L. and Chuang, C.H. (2009), "Analyzing contextual antecedents for the stage-based diffusion of electronic supply chain management", *Electronic Commerce Research and Applications*, Vol. 8 No. 6, pp. 302-314.
- Wu, I.L., Chuang, C.H. and Hsu, C.H. (2014), "Information sharing and collaborative behaviors in enabling supply chain performance", *International Journal of Production Economics*, Vol. 148 No. 1, pp. 122-132.
- Yam, R.C.M., Lo, W. and Tang, E.P. (2011), "Analysis of sources of innovation, technological innovation capabilities, and performance: an empirical study of Hong Kong manufacturing industries", *Research Policy*, Vol. 40 No. 3, pp. 391-402.
- Yao, Y., Palmer, J. and Dresner, M. (2007), "An interorganizational perspective on the use of electronically-enabled supply chains", *Decision Support Systems*, Vol. 43 No. 3, pp. 884-896.
- Zhang, C. and Dhaliwal, J. (2009), "An investigation of resource-based and institutional theoretic factors in technology adoption for operations and supply chain management", *International Journal of Production Economics*, Vol. 120 No. 1, pp. 252-269.
- Zhang, J. and Chen, J. (2013), "Coordination of information sharing in a supply chain", *International Journal of Production Economics*, Vol. 143 No. 1, pp. 178-187.
- Zhu, K. and Kraemer, K.L. (2005), "Post-adoption variations in usage and value of e-business by organizations: cross-country evidence from the retail industry", *Information Systems Research*, Vol. 16 No. 1, pp. 61-84.

Zhu, K., Kraemer, K.L. and Xu, S. (2003), "Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors", *European Journal of Information Systems*, Vol. 12 No. 4, pp. 251-268.

Zhu, K., Kraemer, K.L., Gurbaxani, V. and Xu, S. (2006), "Migration to open-standard interorganizational systems: network effects, switching costs, and path dependency", *MIS Quarterly*, Vol. 30, Special Issue, pp. 515-539.

Further reading

Ding, M.J., Jie, F., Parton, K.A. and Matanda, M.J. (2014), "Relationships between quality of information sharing and supply chain food quality in the Australian beef processing industry", *The International Journal of Logistics Management*, Vol. 25 No. 1, pp. 85-108.

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