The impact of innovativeness on supply chain performance: Is supply chain integration a missing link?

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Purpose: Innovativeness is an accepted driver to leverage firm performance. Supply chain integration (SCI) and supply chain performance (SCP) require innovativeness in the supply chain, but their interrelationships have rarely been researched empirically. This paper investigates the impact of innovativeness on SCI and SCP and the role of SCI in mediating between innovativeness in the supply chain and SCP.

Design/methodology/approach: A questionnaire survey and structural equation modelling were employed in this work. After a structural and measurement model was devised from existing supply chain literature, the main data were collected in a web-based questionnaire survey of South Korean manufacturers. Structural equation modelling was applied to test proposed hypotheses on the associations between variables, following a hierarchical analysis process.

Findings: Innovativeness in the supply chain had a positive impact on both SCI and SCP. However, the direct impact of innovativeness on SCP disappeared when the model included SCI as a mediator. In specific, internal and supplier integration fully mediated innovativeness-SCP relationships, whereas customer integration had no mediating role on those relationships. The findings suggest that innovativeness can influence SCP only when the manufacturer’s level of SCI is sufficiently effective in developing necessary supply chain practices.

Research limitations/implications: In this work innovativeness in the supply chain effectively influenced SCP through the mediation of SCI. However, cross-sectional analysis in one nation using one response per organisation invites validation embracing other geographical areas and longitudinal studies.

Practical implications: Design of an innovative culture within a firm and along a supply chain can enhance SCI practices by stimulating innovativeness. A high level of SCI should be pursued to effectively transform innovativeness into performance.

Originality/value: This work seminally examines the effect of innovativeness in the supply chain on SCI and SCP as well as the mediating role of SCI in the relationships between innovativeness and SCP.

1. Introduction

Increasingly, organisations are realising that their level of innovativeness in supply chains is integral to strategic success and long-term survival. It underpins the achievement of sustainable competitive advantage and an ability to respond effectively to rapidly changing markets as organisations strive to be innovative despite intense technological uncertainty. Innovativeness is seen as a complex process that handles environmental and technological uncertainty to seek and adopt new processes, ideas, products and technologies for satisfying customers.

The salient characteristics of innovativeness which reinvigorate supply chain management appeared in conceptual and empirical studies (Chapman *et al.*, 2003; Roy *et al.*, 2004; Soosay *et al.*, 2008; Panayides and Lun, 2009). Indeed, development of supply chain integration (SCI) and supply chain performance (SCP) requires innovativeness as organisations change. Innovativeness may mature and heighten as organisations initiate and establish inter-relationships with suppliers and customers or become more integrated internally to create effective and efficient supply chains which deploy state-of-the-art systems. Enhanced innovativeness may facilitate more sophisticated management and operations in information and physical flows along the supply chain.

Supply chain management is a key component of competitive advantage whilst striving to improve organisational productivity and profitability through internal, supplier and customer integration (Gunasekaran *et al.*, 2004). Where close relationships among supply chain partners are lacking, organisations no longer compete profitably (Huang *et al.*, 2014). In addition, SCI incorporates core practices required to achieve higher levels of supply chain management. These include activities such as knowledge and information exchange, integrated production systems, the management of accurate supply and demand, inventory and transport management and shared demand forecasts in order to satisfy customer requirements at low costs. To confirm the benefits of SCI, academics investigated the relationships between SCI and performance following conflicting results under environmental, demand and technological uncertainty based on the contingency approach (Flynn *et al.*, 2010; Wong *et al.*, 2011; Huang *et al.*, 2014). However, the antecedents of SCI remain relatively unknown except for some studies regarding information technology implementation and integrated information technology (Vickery *et al.*, 2003; Li *et al.*, 2009).

Notwithstanding the importance of innovativeness in a supply chain context (Roy *et al.*, 2004; Panayides and Lun, 2009), an extensive literature review revealed minimal systematic analysis of the potential impact of innovativeness in the supply chain on SCI and SCP. Few studies have explored a potential linkage between innovativeness and the adoption or level of SCI practices. Rather, most studies have explored the effect of innovativeness on broad and overarching firm performance measures (Damanpour, 1991; Hult *et al.*, 2004; Rhee *et al.*, 2010). These multifarious measures may result in unintended results, because measures might be influenced by numerous other antecedents aside from innovativeness. This study attempts to clarify this confusion and to expand SCI research through empirical examination of these relationships. Even if innovativeness does not have a direct impact on SCP, it may have an indirect impact via its impact on the process developed for SCI. This potential association has remained hidden thus far. This study sheds new light on these inter-relationships and investigates the indirect impact of innovativeness on SCP based on surveys of South Korean manufacturers, since few prior studies have examined those relationships notwithstanding an important role of Korean manufacturers in the world economy due to their modern technologies and process (Nelson and Pack, 1999). In the next section we will review related literature and develop hypotheses by proposing a conceptual model, ahead of describing the methodology and presenting the results of analysis. Finally, we will discuss theoretical and managerial implications of these findings, consider some limitations of the study and suggest avenues for future research.

2. Literature review and hypotheses development

2.1 Innovativeness

The notion of innovativeness plays a pivotal role in augmenting quality and performance (Mone *et al.*, 1998), and is commonly used as a measure of the level of newness of an innovation (Garcia and Calantone, 2002). Hurley and Hult (1998) defined innovativeness as a collective perspective, which is openness to new ideas as a characteristic of an organisation's culture. Innovativeness infers a proactive willingness to give up old habits and to attempt experimental ideas by seeking new opportunities rather than taking advantage of current strengths (Panayides and Lun, 2009). From a micro perspective, Garcia and Calantone (2002, p. 113) defined innovativeness as "the capacity of a new innovation to influence the firm's existing marketing resources, technological resources, skills, knowledge, capabilities, or strategy." Innovativeness often strengthens the competitive positions of organisations in markets where customer demands quickly change, and differentiation is limited (Harvey, 2000), as it facilitates flexibility in building, selecting and adapting various strategies. Innovativeness is an action-based capacity to introduce and execute creative new ideas within a firm (Rhee *et al.*, 2010), and where present it compels organisations to embed a process of turning opportunities into practical use (Tidd *et al.*, 1998). The degree of innovativeness relies on the extent to which managers acquire and act on market intelligence (Hult *et al.*, 2004) or the extent to which the firms have a strong innovative culture that encourages them to adopt innovative behaviour (Škerlavaj *et al.*, 2010). Organisations which lack innovativeness can spend time and resources in investigating markets, but they cannot absorb this knowledge into their practice (Hult *et al.*, 2004). Accordingly modern organisations have attempted to stimulate innovativeness internally by encouraging employees, teams and executives to exploit new behaviours, product, services and practices.

Increasingly technology-driven and knowledge-based environments which demand the dynamic state of knowledge and faster flows of materials and information compel manufacturers to seek greater integration of technology (Soosay and Hyland, 2004). This may result in innovation capability through knowledge expansion in supply chains to sustain competitiveness. Technologies generate a foundation for sharing knowledge in supply chains in which factors such as technology, knowledge and relationship networks are primarily related to innovation (Chapman *et al.*, 2003). Once new knowledge is generated and expanded from the information obtained from extended networks of relationships such as suppliers and customers, innovation may be likely to facilitate knowledge development and diffusion throughout organisations and supply chains. Innovation capabilities hinge on knowledge base expansion via the effective use of supply chain relationships (Chapman *et al.*, 2003). This knowledge diffusion can be distributed throughout and between organisations (Soosay and Hyland, 2004). It can enhance organisational capabilities in integrating internal operations and collaborating with partners in the supply chain (Soosay, 2005). In addition, technologies drive innovation because they improve communication and collating information as a source and driver of innovation, fostering further collaboration (Soosay and Hyland, 2004). Hyland *et al.* (2003) identified major capabilities that contribute to innovation in the supply chain context: the management of knowledge; the management of information; the abilities to accommodate and manage technologies; and the ability to manage collaborative operations. In this paper, innovativeness is considered in the supply chain context since new processes introduce a tendency towards implementation of integrated information technology systems with supply chain partners in pursuit of more integrated supply chains and supply chain performance.

2.2 Supply chain integration

Managers in manufacturing industries often seek to manage supply chains by adopting new techniques such as total quality management, just-in-time (JIT), enterprise resource planning (ERP) and lean production (Gunasekaran *et al.*, 2004). SCI is the strategic integration of both intra- and inter-organisational processes (Flynn *et al.*, 2010) and gauges the extent to which supply chain partners work collaboratively together to gain reciprocally beneficial outcomes (O'Leary-Kelly and Flores, 2002). SCI has become a major topic amongst organisations which seek to exploit the potential of the supply chain to build sustainable value (Kannan and Tan, 2010). The ultimate aim is to gain effective and efficient movements of products, services, information, cash and decisions through coordinated endeavours and exchange of information in the provision of maximum value to the customer at low cost without delay (Frohlich and Westbrook, 2001; Wong *et al.*, 2011). A lack of SCI causes serious problems such as increased inventory cost, delayed procurement, lowered product quality and inaccurate product forecasts, which may jeopardise both a focal organisation and all of its supply chain partners, by worsening customer satisfaction.

The SCI construct comprises three dimensions including internal, supplier and customer integration, to capture multidimensionality (Flynn *et al.*, 2010; Wong *et al.*, 2011). Internal integration refers to the extent to which a manufacturer re-engineers its own organisational strategies and processes into synchronised processes to satisfy its customers' demands (Kahn and Mentzer, 1996). The expansion of cross-functional teams that tend to focus on their process requires a seamless flow of resources and relevant information in supply chains and removal or minimisation of barriers between functional boundaries to surmount the shortcomings of specialisation (Gunasekaran *et al.*, 2004). Internal integration facilitates cooperation amongst internal functions (Wong *et al.*, 2011). It focuses on functions or departments within the manufacturers via an integrated process across them. An absence of internal integration and heterogeneity of each team's aim may cause redundant work and waste resources, which undermine quality and cost performance (Pagell, 2004). In addition, internal integration fosters relevant knowledge and information sharing (Narasimhan and Kim, 2002). By sharing knowledge pertaining to value adding activities across cross-functional teams, they can facilitate modern supply chains, which in turn promote greater integration of suppliers and customers (Fawcett, 1995).

External integration is comprised of supplier and customer integration. A multitude of activities between a focal firm and suppliers underpin supplier integration including information sharing and collaboration in planning and joint production development in dealing with inter-organisational boundaries (Ragatz *et al.*, 2002). Customer integration enhances market expectations and opportunities, leading to more precise and rapid responses to customer needs (Swink *et al.*, 2007). External integration underlines the importance of building close and interactive relationships with suppliers and customers (Flynn *et al.*, 2010). All three types of integration are essential to ensure enhanced value in supply chains.

2.3 Supply chain performance

To enhance SCP, manufacturers have long strived to set up supply chain goals with well-defined performance indicators (Panayides and Lun, 2009), but the complexity and frequency of supply chains complicates the choice of adequate SCP indicators. Few supply chains are effective and efficient, often overlooking performance measurement in critical supply chain contexts (Gunasekaran *et al.*, 2004). Traditionally, Beamon (1998) identified cost, activity time, customer responsiveness and flexibility as SCP measures either singly or jointly, but concluded that these appear to be incomplete based on criteria such as inclusiveness, universality, measurability and consistency. Gunasekaran *et al.* (2004) proposed a comprehensive framework for SCP measurement broadly divided into strategic, tactical and operational processes. Six categories included: (1) metrics for order planning; (2) evaluation of supply link; (3) measures and metrics at production level; (4) evaluation of delivery link; (5) measuring customer service and satisfaction; and (6) supply chain and logistics. Beamon (1999) argued that operational performance items, such as customer service and flexibility, should be included in SCP measurement. Panayides and Lun (2009) identified delivery reliability, responsiveness, cost reduction, lead times, conformance to specifications and process improvements and time-to-markets as constituents of SCP.

2.4 Hypotheses development

Authors have generally agreed that innovativeness leads firms to higher firm performance (Damanpour, 1991; Calantone *et al.*, 2002; Hult *et al.*, 2004). Damanpour (1991) asserted that the embracing of innovativeness is envisioned to heighten a firm's effectiveness and performance. Armour and Teece (1978) argued that innovation at the organisation level is anticipated to lead to organisational changes that may influence its performance. Panayides and Lun (2009) noted that openness to novel ideas that endorse administrative efficiency and adoption of fresh technologies in the supply chain may cumulate improvements in SCP. Innovativeness empowers managers to solve business problems, offering a foundation for future corporate success (Hult *et al.*, 2004). The capacity to innovate critically affects their performance (Hurley and Hult, 1998; Hult *et al.*, 2004). In general, innovativeness has become a prerequisite for a firm's success and survival (Rhee *et al.*, 2010). Innovativeness can offer a strategic means by which firms deal with internal and external environmental changes (Rhee *et al.*, 2010). Simpson *et al.* (2006) identified positive outcomes of innovativeness on shorter cycle times, product quality, new approaches to distribution and organisational effectiveness and efficiency, which may contribute to SCP.

As businesses attempt to seek more ways to innovate, attention has transferred from the manufacturing functions to other supply chain relationships (Soosay and Hyland, 2004). Improved SCP can be obtained by fostering relational exchange and innovativeness and working closely with partners to detect necessary areas for improvement (Panayides and Lun, 2009). Innovativeness that encompasses innovative changes or adoptions of processes and services may influence interaction between manufacturers and suppliers or manufacturers and customers. In the logistics context, Lin (2008) found that the adoption of technological innovations has a positive impact on SCP. In a supply chain context, Roy *et al.* (2004) pointed out that innovation generation may involve transformation in products, services and processes which decreases costs and enhances efficiency. In turn, customer satisfaction is increased. Therefore, we hypothesise that:

H1. Innovativeness in the supply chain is positively associated with the level of supply chain performance.

Innovativeness assists supply chain managers to foster the development of information and progressive technologies using innovative operations to heighten efficiency and service effectiveness (Bello *et al.*, 2004). Innovativeness is one of the strongest means for transforming an organisation as a response to internal or external environmental changes (Hult *et al.*, 2004). Organisations firstly innovate their business processes to improve SCI, simultaneously considering their supply chain partners' processes. Recently, customers and suppliers have prompted organisations to update by adopting the latest technologies (Soosay and Hyland, 2005), which increases innovativeness in supply chains. In turn, this innovativeness may encourage enhanced SCI. Innovativeness embedded in knowledge development and diffusion may shape knowledge integration via sharing resources and information by stressing collaboration with partners (Hyland *et al.*, 2003).

Inter-organisational relationships may embed acceptance of new ideas and openness to new patterns of behaviour into corporate organisational culture, implying that relational exchange fosters innovativeness (Panayides and Lun, 2009). Collaboration in supply chains can be usefully utilised as capabilities for generating innovation (Soosay *et al.*, 2008). When firms develop relationships between supply chain partners, innovativeness can be created and developed (Panayides and Lun, 2009). Thus, Chapman *et al.* (2003) contended that the emphasis on SCI has changed the way in which firms undertake and benefit from innovation. Indeed, the appropriate level of collaboration with supply chain partners for grasping strategic innovation is imperative. In addition, collaborative adoption of innovativeness creates network externalities where partners in the network can benefit from innovations (Frambach and Schillewaert, 2002).

The extent of innovativeness is largely influenced by supply chain relationships and collaborative practices, but simultaneously enhances the integration within a firm (internal integration) and within a supply chain (external integration). If one supply chain possesses a higher level of innovativeness than another, it is likely to proactively devise and adapt new strategic actions such as the implementation of SCI to manage fluctuations in supply and demand and meet customers' needs. Kline and Rosenburg (1986) proposed that innovativeness may support an interactive process between suppliers and customers. In supply chain management contexts, Rutner *et al.* (2003) pointed out that, when it comes to enhancing SCI, innovativeness is an essential element in stimulating investments in new systems and processes. Desbarats (1999) contended that innovative processes are necessary to acquire greater integration in the supply chain. Innovativeness is also capable of enhancing supply chain processes by refurbishing new ideas through integration and collaboration with partners. Hence, we propose:

H2. Innovativeness in the supply chain is positively associated with the level of supply chain integration.

Traditionally, the literature acknowledged that SCP can be augmented by more integrated chains, but recently diverse studies with different contingency effects argued that this relationship is still controversial. Germain *et al.* (2008) found that the impact of cross-functional integration is valid in the case of high demand variability, whilst when there is low variability, formal control is useful. Similarly, Gimenez *et al.* (2012) noted that integration in buyer-supplier relationships is only related to better performance in the case of high supply complexity, which is referred to as the complexity of the process in which buyers' orders are switched into the suppliers' manufacturing orders. In addition, empirical research which did not adopt a contingency approach showed inconsistent results as for the relationships between SCI and performance. For example, Vickery *et al.'s* (2003) result indicated a negative association, while Das *et al.* (2006) discovered that growing supplier integration above a certain level does not affect performance, and argued that there exists an optimal set of integration practices.

Nonetheless, it cannot be doubted that most studies found a positive correlation between SCI and SCP (Ettlie and Reza, 1992; Lee and Billington, 1992; Frohlich and Westbrook, 2001; Barratt, 2004; Pagell, 2004; Fabbe-Costes and Jahre, 2007; Swink *et al.*, 2007; Li *et al.*, 2009). A high level of SCI empowers manufacturers to enhance flexibility to customers' requirements allowing them to reduce inventories, delivery times and various obstacles to efficient supply chains (Barratt, 2004), but insufficient SCI causes bullwhip effects, which in turn increase inventory by magnifying the effects of uncertain information (Lee and Billington, 1992). Internal integration contributes to enhancing quality performance (Pagell, 2004; Swink *et al.*, 2007) and assisting cross-functional teams to reduce production costs (Ettlie and Reza, 1992). This reduced production may be converted into other necessary activities of firms, tending to reduce opportunity costs. It also allows better collaboration of production capacity to augment delivery performance (Droge *et al.*, 2004) and process efficiency (Swink *et al.*, 2007). The extent to which a focal firm integrates with suppliers and customers determines SCP. External integration reinforces external processes and activities by sharing accurate supply and demand information with suppliers and customers (Stank *et al.*, 1999). Performance can be improved through vendor-managed inventories and production information from the customers (Devaraj *et al.*, 2007). The focal firm may suffer from poor production planning, a high degree of inventory and poor delivery performance owing to distorted supply and demand information if supplier and customer integration is lacking (Lee *et al.*, 1997).

When the fragmented result of the association between SCI and performance is taken into account, it is highly required to test as to whether SCI has a positive impact on SCP. Therefore, we hypothesise that increased SCI positively impacts performance by adopting the view that, as the more SCI increases, the greater performance will be in mainstream logistics and supply chain management (Fabbe-Costes and Jahre, 2007).

H3. The level of supply chain integration is positively associated with the level of supply chain performance.

Innovativeness plays an important role in augmenting performance, but it may not necessarily create outcomes *per se*, even though it appears to be an action-based capacity to introduce and execute creative new ideas within a firm (Rhee *et al.*, 2010). Han *et al.* (1998) pointed out that several types of innovations such as administrative innovations may contribute to enhancing internal operations, which may have no direct impact on performance. Therefore, it is plausible that the relationship between innovativeness and SCP might be mediated by another variable.

A mediator variable accounts for a substantial portion of the association between an independent and a dependent variable (Baron and Kenny 1986). We propose that SCI mediates the association between innovativeness and SCP, which means that SCI acts as a particular alternative approach for proliferation of innovativeness along the supply chain. To examine the possibility of this mediating effect, it is hypothesised that SCI mediates the effect of innovation (independent variable) on SCP (dependent variable). If innovativeness potentially stimulates SCI, it in turn may influence SCP.

H4. The level of supply chain integration mediates the association between innovativeness in the supply chain and the level of supply chain performance.

3. Methodology

To test these hypotheses empirically, we adopted a questionnaire survey as the strategy for collecting data which was analysed using multivariate statistical tests.

3.1 Instrument development

A survey instrument was designed after the domains of key constructs had been established based on rigorous literature reviews and exploratory interviews with practising Korean manufacturers. Six invited senior managers based in the supply chain or operations departments of organisations engaged in automotive, electronic, food, chemical and apparel industries were interviewed. All the measures deployed were drawn from prior literature pertaining to innovativeness, SCI and SCP as depicted in Table I. Innovativeness in the supply chain was measured using instruments developed and validated by Panayides and Lun (2009) based on UK manufacturers' perception, which were appropriate from the stance of supply chain management and modified from Calantone *et al.* (2002). We used five items to evaluate elements of innovativeness which measure the degree of efforts to seek new ideas; new ways; creative methods; new process of supply chain operations; and introduction of operations in the supply chain context.

SCI is measured using 14 items adapted from previous studies, which are composed of three sub-dimensions: internal integration with four items (Stank *et al.*, 2001; Narasimhan and Kim, 2002; Flynn *et al.*, 2010; Wong *et al.*, 2011), supplier integration with five items (Narasimhan and Kim, 2002; Flynn *et al.*, 2010; Wong *et al.*, 2011) and customer integration with five items (Narasimhan and Kim, 2002; Flynn *et al.*, 2010; Wong *et al.*, 2011). Our results from confirmatory factor analysis (CFA) confirm the measurement model comprising three sub-dimensions.

The measurements for SCP were devised to capture comprehensive dimensions of supply chain operations by adopting instruments conceptualised and validated by Li *et al*. (2009) using six items. They are measured by respondents' perception. Our measurements encompass just-in-time (Beamon, 1999; Stank *et al.*, 2001; Li *et al.*, 2009), inventory turnover and cash-to-cash cycle time (Beamon, 1999; Stank *et al.*, 2001; Devaraj *et al.*, 2007; Li *et al.*, 2009), customer lead time and load efficiency (Beamon, 1999; Gunasekaran *et al.*, 2004; Devaraj *et al.*, 2007; Panayides and Lun, 2009), delivery performance and quality (Beamon, 1999; Gunasekaran *et al.*, 2004; Devaraj *et al.*, 2007; Panayides and Lun, 2009), supply chain inventory visibility and opportunity costs (Stank *et al.*, 2001; Li *et al.*, 2009), and total logistics cost (Beamon, 1999; Stank *et al.*, 2001; Gunasekaran *et al.*, 2004).

<insert Table I around here>

We employed a pilot test to examine the extent of applicability of the constructs amongst 23 practicing Korean manufacturers who were asked to feedback their comments on the initial instruments in order to certify content validity. The target respondents were practitioners who hold a senior position in their organisation and possess sufficient knowledge about the overall organisation's process, activities and performance. For this purpose, the authors prepared the Korean version of the questionnaire, which was translated from English to Korean by two bilingual experts who are academics in Korea. To ensure conceptual equivalence, they also conducted a back-translation process (Wong *et al.*, 2011). The questionnaire used five-point Likert scales, anchored from 1 (strongly disagree) to 5 (strongly agree) to measure respondents' perception. In addition, five academics in the field of operations management and supply chain management were invited to review initial instruments in order to ensure content validity. The authors modified the wording of several questions based on the feedback from practitioners and academics.

3.2 Data collection

The main data were collected in a questionnaire survey of South Korean manufacturers, in various sectors and locations, who perform value chain activities in supply chains. South Korea was selected as a rapidly developing modern economy which epitomises recent success in manufacturing industries, which have benefitted from adopting modern technologies and processes (Nelson and Pack, 1999). We chose a web-based survey method since it is regarded as the most efficient way to collect a large number of questionnaires. The sampling frame was collated from multiple directory lists, officially acknowledged by the Korea Integrated Logistics Association and The Korea Chamber of Commerce & Industry, since no single comprehensive manufacturers directory exists in Korea. These directories provide contact information such as email addresses and telephone numbers, and our frame identified 1,293 separate firms whose supply chain echelons varied. The target respondents were upper level managers or supply chain managers who possessed sufficient knowledge of their organisations' processes, operations, supply chain and performance. The survey was conducted from September to December 2013. After three follow-up reminders by email, of 1,293 questionnaires distributed, 102 useable responses were received. This response rate of 7.88% is comparable with other relevant studies (e.g. Devaraj *et al.*, 2007, 8.4%; Qrunfleh and Tarafdar, 2013, 6.5%; Cao and Zhang, 2011, 6.0%). Our response rate appears to be acceptable although it is predictably low being targeted at senior level managers (Devaraj *et al.*, 2007). In addition, the sample is well distributed to represent the population without bias. No missing data were detected because logic checks in the dedicated web-based surveys had been systematically designed to avoid missing data.

The profile of respondents in accordance with a variety of manufacturer sectors and positions is shown in Table II. We assume that respondents possess sufficient information to evaluate innovativeness, SCI and SCP.

<insert Table II around here>

To assess non-response bias, we adopted the method suggested by Armstrong and Overton (1977). This test investigates significant differences between early and late respondents with the assumption that the responses of late respondents may mimic those of non-respondents. We compared the mean responses of the quartile of earliest respondents with the quartile of final respondents using t-tests. The results indicated no significant difference between the groups at the 5% significance level, offering no evidence of any non-response bias.

Because we collected one response per one organisation based on self-reporting, common method variance should be scrutinised. First, we assessed this issue using Harman's one-factor test on all instruments (Podsakoff *et al.*, 2003). The principal component analysis with no rotation extracted 5 factors with eigenvalues exceeding 1.0 which accounted for 66.9% of the total variance, and a first factor explaining 31.7%. Second, CFA was applied to Harman's single factor model where results show that this model does not fit the data well. The model's fit indices of χ^2=957.850, df=275, normed χ^2=3.483, Root Mean Square Error of Approximation (RMSEA)=0.157, Comparative Fit Index (CFI=0.474), Tucker-Lewis Index (TLI=0.426) were not satisfactory compared to the measurement model. Third, the measurement model with the theoretically derived factor structures for measurement instruments that contained five latent variables were compared (Huang *et al.*, 2014). The chi-square difference between the null model (single-factor model) and the five-factor model was statistically significant at the $p<0.001$ level ($\Delta\chi^2$=655.008). These three results indicate that common method variance is unlikely.

3.3 Factor and reliability analyses

Assessing unidimensionality is important prior to the model test. Unidimensionality refers to the existence of a single concept underlying a group of measures (Anderson *et al.*, 1987). Overall fit indices (χ^2=368.445; df=265; normed χ^2=1.390; RMSEA=0.062; CFI=0.920; TLI=0.910) provide strong evidence of unidimensionality. The normed chi-square estimate of 1.390, was within the critical threshold of 3.0 suggested by Bollen (1989), and RMSEA was within the recommended value of 0.08 (Garver and Mentzer, 1999). Further, CFI and TLI exceeded the suggested critical value of 0.9 (Garver and Mentzer, 1999). The proposed measurement model fits well.

Content validity indicates that the measurement items in an instrument include the major content of a construct (Churchill, 1979). However, it is assessed subjectively. To ensure content validity, we rigorously and comprehensively reviewed literature based on previously validated instruments, and our instruments were designed and revised following discussions with practising Korean manufacturers.

Convergent validity assesses how well the item measures are related to each other with respect to a common concept and is apparent where factor loadings of measures on hypothesised constructs are significant (Anderson and Gerbing, 1988). Convergent validity is certified by significant factor loadings (Bollen, 1989). All t-values for factor loadings to the corresponding constructs ranged from 6.137 to 9.919, significant at the $p<0.001$ level. In addition, the standardised estimates for each item exceeded twice of its standard error, ranging from 0.090 to 0.148 (Anderson and Gerbing, 1988). The average variance extracted (AVE) of all constructs exceeded the minimum threshold of 0.5, which indicates strong convergent validity (Fornell and Larcker, 1981). All the composite reliabilities (CR) exceeded 0.7, satisfying the criterion for reliability (Fornell and Larcker, 1981). In addition, Cronbach's alpha (α) measures were calculated to test for reliability. Each exceeded 0.7 indicating evidence of reliability (Nunnally, 1978). Taken together, they confirm the reliability of this study.

Table IV shows descriptive statistics and a correlation matrix. The means of all measures were below 4.0 with standard deviations ranged from 0.94 to 1.20 showing considerable variation in the responses. Interestingly, the mean value of customer integration (3.06) was much less than internal (3.58) and supplier integration (3.31), which indicates that Korean manufacturers have cultivated customer integration relatively less than internal and supplier integration. Further, the mean value of innovativeness was 3.01, the lowest amongst all constructs. The correlations between the constructs were all significant at the 0.05 level except for the correlation between customer integration and SCP, which overall indicates acceptable criterion validity (Nunnally, 1978).

<insert Table III around here>

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Each pairwise correlation between constructs was less than the square root of the corresponding AVEs (Table IV), which indicates a satisfactory level for discriminant validity (Fornell and Larcker, 1981). To further assess discriminant validity, we used a χ^2 difference test between a solution which fixes the correlation between two constructs at 1.0 and a free solution in which both constructs vary freely, between nested CFA models for all pairs of constructs (Table V; Bagozzi and Phillips, 1982). The χ^2 differences between the fixed and free models were all significant at 0.001 levels, which provide strong evidence of discriminant validity.

<insert Table V around here>

4. Results

4.1 Structural model

Structural equation modelling with maximum likelihood estimation was adopted to test both the direct impact of innovativeness on SCP (Figure 1) and the mediating impact of SCI on the association of innovativeness and SCP (Figure 2). As for the direct model, since model fit indices were satisfactory with normed χ^2=1.593; RMSEA=0.077; CFI=0.951; TLI=0.937 (Bollen, 1989; Garver and Mentzer, 1999), we have a basis for assessing our hypotheses. The standardised regression weight from innovativeness to SCP was 0.356, significant at $p<0.01$. Therefore, H1 was accepted, implying that innovativeness positively influences SCP in Korean manufacturers.

To test the mediating role of SCI, a hierarchical method was conducted according to the following three conditions by Baron and Kenny (1986). First, an independent variable should affect the mediating variable. Second, the independent variable should influence the dependent variable. Third, if the mediating variable exists, the association between the independent and dependent variable should be reduced or disappear. Consequently, the effect of mediation was assessed by inserting SCI into the above direct model (Figure 2). The overall goodness-of-fit shows that the hypothesised structural model is deemed to be acceptable (normed χ^2=1.396; RMSEA=0.063; CFI=0.918; TLI=0.908). The structural path from innovativeness to SCI was significant at the 0.01 level (γ=0.616), which satisfied the first condition. In addition, the earlier H1 test demonstrated support for the second condition. To identify the third condition, Table VI effectively shows the comparisons between the direct and the mediation model. After introduction of the SCI variable, the significant direct impact of innovativeness to SCP vanished from $\gamma=0.356$ to -0.097. Hence, it is apparent that SCI fully mediates the relationship between innovativeness and SCP, with suggested methods by Baron and Kenny (1986), implying that H4 is accepted. It is inferred that innovativeness contributes to the improvement of SCP only via the implementation of SCI. In other words, Korean manufacturers may achieve SCP under the circumstance that they implement an adequate level of SCI. In summary, the relationship between innovativeness and SCI (H2) was supported by a parameter estimate of 0.616 ($p<0.01$), while the association of innovativeness on SCP was rejected in this mediation model, which is contradictory to the direct model results. Finally, the effect of SCI on SCP (H3) was supported by a parameter estimate of 0.733 significant at the 0.01 level.

<*insert Figure 1 around here*>

<*insert Figure 2 around here*>

<*insert Table VI around here*>

4.2 Further structural models

For confirmatory purposes, we tested two alternative models. Figure 3 shows a structural model by dividing SCI into internal, suppliers and customer integrations in order to accurately and simultaneously identify which sub-dimensions of SCI do not have positive relationships with innovativeness and SCI. The fitness indices (normed $\chi^2=1.456$; TLI=0.895; CFI=0.906; RMSEA=0.067) suggest that the structural model appears to be acceptable. TLI (0.895) is only marginally less than the suggested threshold of 0.9 (Garver and Mentzer, 1999). All relationships were statistically significant except for the relationships between innovativeness and SCP, and between customer integration and SCP. Interestingly, the non-significant impact of customer integration on SCI appears to defy intuition.

<*insert Figure 3 around here*>

Finally, we individually tested the mediating role of each sub-dimension of SCI on the relationship between innovativeness and SCP in order to examine which sub-dimensions of SCI do not have a mediating role. We conducted three individual mediation tests in which for example after removing the supplier and customer integration variables, we evaluated the mediation effect of internal integration on the relationship between innovativeness and SCP. We tested 2000 bootstrapped samples at a 90 percent confidence level as Qrunfleh and Tarafdar (2013) suggested. First, we focus on the direct effect of innovativeness on SCP with mediator internal integration, supplier and customer integration respectively. Then, the indirect impact of innovativeness on SCI through each mediating variable, namely internal, supplier and customer integration respectively, was sought. To find the direct impact of innovativeness on SCP for each mediator (internal, supplier and customer integration), we computed standardised direct effects' coefficient of 0.096, 0.197 and 0.335 respectively. Consequently, we computed bootstrap confidence estimates to assess the significance of values. The standardised effects were not significant for models that include internal and supplier integration, while models with customer integration were significant at the 0.05 level. Thus, the indirect effects of innovativeness on SCP with the existence of each mediator were 0.259 ($p<0.001$) for the model with internal integration, 0.159 ($p<0.001$) with supplier integration, and 0.022 (not significant) with customer integration. Therefore, it is concluded that internal and supplier integration fully mediates the relationships between innovativeness and SCP respectively, while customer integration has no mediating role on those relationships (Qrunfleh and Tarafdar, 2013).

<insert Table VII around here>

5. Discussion

5.1 Theoretical contributions

This study empirically investigates the impact of innovativeness in the supply chain on SCI and SCP by explicitly focusing on a mediation effect of SCI on the link between innovativeness and SCP in the supply chain context. Despite the importance of innovativeness, scant research has considered this in supply chain contexts. In this vein, our work attempts to extend the effect of innovativeness, forming a concrete basis for supply chains. A number of crucial findings emerge. We empirically tested proposed theoretical hypotheses on the impact of innovativeness on SCI and SCP. Since the concept of innovativeness is relatively new and not familiar in the supply chain context, manufacturers who are interested in enhancing SCI and SCP should pay more attention to it. Although previous research has assessed the relationship between innovativeness and SCP (Lin, 2008; Panayides and Lun, 2009), it appears rare that SCP is directly improved by innovativeness. Because innovativeness is an action-based capacity that cannot enhance performance *per se*, it may have no direct influence on performance (Rhee *et al.*, 2010). Logically, in augmenting SCP, the practical activities and operations such as SCI must precede it. To the authors' best knowledge, this is the first exploration of these relationships in an integrated fashion and sheds lights on more realistic supply chain management contexts than prior studies of the relationships between innovativeness and SCP (Panayides and Lun, 2009), or between innovativeness and business performance (Calantone *et al.*, 2002). Despite extensive corporate attempts to link SCI and SCP, the antecedents remain vague. Prior research has addressed the impact of innovativeness on performance, but excessively broad measures of performance (Damanpour, 1991; Hult *et al.*, 2004) denied the identification of specific impacts of innovativeness on more specific measures such as SCP. Soosay *et al.* (2008) clarified how supply chain collaboration fortifies continuous innovation by using multiple qualitative case studies which engaged ten logistics firms in Australia and Singapore. Our results revealed the positive impact of innovativeness on SCI through empirical large-scale research in Korea which adopted a slightly different perspective with Soosay *et al.* (2008).

This study has contributed to a new model which expands SCI contexts, whereby SCI acts as a bridge between innovativeness in the supply chain and SCP. In terms of a mediating model, the results demonstrated that SCI fully mediates the association of innovativeness to SCP. In other words, innovativeness has no direct impact on SCP, implying that it has a positive indirect impact through SCI. Those results are consistent with arguments that innovativeness directly affects internal operations but does not directly affect performance, because the nature of innovativeness is an action-based capacity to start and implement new ideas within a firm (Rhee *et al.*, 2010). Further, those results uphold Soosay and Hyland's (2004) findings that firms in the supply chain compete with each other by using innovative technologies such as web-based orders and integrated communication systems for knowledge and network formation based on repeated collaboration. Without collaboration or strategic partnerships in implementing integrated systems, joint planning and forecasting and information sharing, innovativeness no longer acts as a driving force of better performance. Therefore, the appropriate degree of integration and collaboration is a core catalyst for better performance in the supply chain context.

Finally SCI was positively related to SCP, which supports earlier findings (Barratt, 2004; Droge *et al.*, 2004). However, the impact of innovativeness on SCP vanished after introducing SCI as a mediating variable which fully mediates a relationship between innovativeness and SCP, which implies that innovativeness has an indirect impact on SCP only through SCI. The finding underscores the role of SCI in shaping SCP. The result shows that innovativeness directly influences SCI and SCI positively affects SCP. The former result may be reasonable, as Kline and Rosenburg (1986) argued that innovativeness assists an interactive process in which organisations interact with suppliers and customers. In addition, since innovativeness may allow the organisation to pre-empt rivals with an expanded scope of activities such as SCI practices (Hult *et al.*, 2004), how they are developed for SCI varies with the level of innovativeness. Furthermore, firms with high innovative capacity might be likely to exchange more knowledge as a springboard for SCI by adopting integrated information systems so that other supply chain partners are satisfied, which may in turn enhance interdependence. Since information sharing and interdependence are major representative traits of SCI (Huang *et al.*, 2014), the aforementioned actions may reinforce SCI levels. Thus, the adoption of such systems is viewed as a synonym of innovation (Panayides and Lun, 2009). The finding suggests that innovativeness in the supply chain supports better understanding that is required for initiating and implanting SCI practices. It is likely that innovativeness is fundamental to including precedent factors which have a significant impact on SCI. This is consistent with Rutner *et al.*'s (2003) argument that innovativeness acts as an important component in improving SCI in the supply chain context.

Besides, amongst questionable links between SCI and SCP based on various contingencies and contexts (Fabbe-Costes and Jahre, 2007; Gimenez *et al.*, 2012; Germain *et al.*, 2008), the results confirm the purported impacts of internal, supplier and customer integration on various SCP outcomes. This implies that SCI itself is an important driver and antecedent of SCP, although the proposed model does not consider the contingency approach. Our result empirically supports Chapman *et al.*'s (2003) claim that developing effective internal and external relationship networks can lead to better performance. Manufacturers are seeking a way to fulfil customers' requirements by improving SCP. As an essential source of SCP, SCI may enrich manufacturers' capability to meet the customers' needs.

Our empirical evidence that innovativeness in the supply chain can influence SCP only if a manufacturer's level of SCI with supply chain partners is effective, however, is inconsistent with marketing literature that verified an important determinant role of business performance (Mone *et al.*, 1998; Calantone *et al.*, 2002). Specifically, this result is not in line with Panayides and Lun (2009), which argued that innovativeness in the supply chain directly affect SCP. Development of necessary supply chain practices is required to respond to innovativeness or even high innovativeness may remain unheeded without SCI. SCI is a core element in the explanation of how an organisation elicits action-based capacity from innovativeness in enhancing SCP.

The alternative model in Figure 3 may provide more insights into whether "our knowledge is relatively weak concerning which forms of integration manufacturers use to link up with suppliers and customers" (Frohlich and Westbrook, 2001, p. 185). Our results indicate that customer integration is not positively related to SCP. This finding is not surprising since several empirical studies reported similar results (Frohlich and Westbrook, 2001; Devaraj *et al.*, 2007; Danase and Romano, 2011). Swink *et al.* (2007) suggested that operational performance could be improved by an indirect impact of customer integration. In addition, Frohlich and Westbrook (2001) argued that firms tend to have a stronger level of integration with suppliers than customers by stressing integrative processes with suppliers: production plans, planning systems and inventory mix knowledge. Devaraj *et al.* (2007) found that the firm with high customer integration and low supplier integration has poor performance. A viable reason may be that the expected advantage of an integrated system is used as a catalyst for SCI (Frohlich and Westbrook, 2001). Once the integrated system becomes established with customers, they may demand tougher requirements, which become absorbed into the focal firm's operations and create pressures to raise its performance. However, if performance is restricted because the firm has not also implemented sufficient supplier and customer integration without first developing supplier integration should be avoided. Customer integration has no impact on SCP *per se*, thus both customer and supplier integration should be developed harmoniously. This argument is in line with Lee and Billington's (1992) comment on the pitfalls of fragmented supply chains. Lastly, we tested the mediation effect of each sub-dimensions of SCI as shown in Table VII. Only customer integration does not mediate the relationship between innovativeness and SCP. This result resides in Hult *et al*'s (2004) suggestion that the benefits of innovativeness on performance may be indirect, and that customer orientation was a viable variable to investigate. Whilst establishing customer integration, it would be better for firms to listen to what they really want, resulting in greater customer orientation and integration.

This study empirically breaks new ground showing how innovativeness in the supply chain influences the level of SCI and how SCI exerts a significant impact on SCP by providing evidence of the full mediation role of SCI on the relationship between innovativeness and SCP.

5.2 Managerial implications

Our findings contribute to insights designing effective approaches for innovativeness and SCI so as to augment SCP in Korean manufacturers. A notable finding is that SCI is influenced by the level of innovativeness in supply chains, and SCI fully mediates the relationship between innovativeness and SCP. In addition, SCP is affected by the level of SCI.

This work clearly demonstrates the essential role of innovativeness in aligning supply chains. Manufacturers are more likely to become effective in SCI when making incessant efforts to grasp new ideas by seeking new opportunities. Firms that are seeking effective SCI should take innovativeness into greater consideration. As for components of innovativeness in the supply chain context, new ideas and ways to deal with supply chain practices, creative methods of supply chain operations, introduction of new ways of servicing the supply chain and new process introduction in the supply chain lead firms to higher SCI. By stimulating innovativeness in supply chains as a self-diagnostic improvement tool managers are empowered to upgrade their SCI practice. In addition, managers should encourage employees and organisations to build an innovative culture and learning behaviours that foster new ideas and openness to new technology in order to capture new knowledge and opportunities, as a core component of innovativeness (Hyland *et al.*, 2003; Škerlavaj *et al.*, 2010). Thus, high level executives who design supply chains require an innovative culture within both firms and along supply chains (Hult *et al.*, 2004). When radical innovation is applied to IT systems, organisations may struggle to find skilled employees and their customers or suppliers may suffer increased complexity, resulting in ineffective operations (Soosay and Hyland, 2005). Because such innovation may impact performance negatively, better training of employees impacts supply chain innovativeness positively.

When supply chain managers devise plans to improve SCP they should recognise the mediating role of SCI activities and practices. As a critical factor which affects SCP, supply chain visibility can be improved through close integration with supply chain partners particularly through using state-of-the-art information systems to provide partners with guidelines on how to augment supply chain inventory visibility. Besides, firms with less developed SCI may not sufficiently develop SCP, even though they possess a high level of innovativeness in supply chains. An increased ability to effectively conduct integrated activities may assist in eliminating barriers to SCP. The capability to integrate with supply chain partners may hinge on the basic factors of innovativeness, as SCI entails diverse technology information systems which may depend on how innovative a supply chain is.

Although prior research typically investigated a positive relationship between SCI and SCP, our findings also confirmed a crucial role of SCI in designing SCP. This result implies that managers should seek to strategically facilitate intra- and inter-organisational integration by collaboratively working together with a strong emphasis on supply chain practices to improve SCP.

5.3 Limitations and future research

This study unavoidably has several limitations. First, we proposed SCI as the only mediator between innovativeness in the supply chain and SCP, but other variables such as an integrated information system might help to explain causal variance in SCP, which innovativeness and SCI fail to explain. Second, because we collected data only from manufacturers in Korea, generalisation of results may be limited. Future work could usefully compare several national samples for example including Korea, China and Japan to identify heterogeneity of cultures, business environments, managers' attitudes and relationships with supply chain partners. Third, in terms of survey process, we collected one single response per organisation, but multiple answers may be appropriate in future work to improve the validity of the findings. Fourth, we employed cross-sectional research, which is static. A longitudinal research design may provide richer implications, since the causal relationships of constructs may mature or change over time. Fifth, future studies particularly in other countries may reveal specialist sampling frames which permit more restricted selection criteria. Sixth, this study measured SCP by capturing the perceptions of respondents. Although perception-based performance is highly related with objective performance (Murphy and Callaway, 2004), it may be appropriate to employ objective secondary data to measure SCP. Finally, notwithstanding the extensive SCI-performance literature using a contingencies approach, we did not incorporate contingency factors. Future research might consider a contingency variable such as technological uncertainty to clarify how this variable moderates the association between innovativeness, SCI and SCP in South Korea, a world leader in adopting state-of-the-art technology.

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Figure 1 Innovativeness-Supply Chain Performance Model

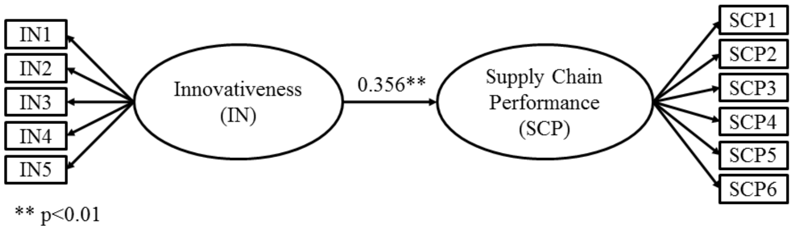
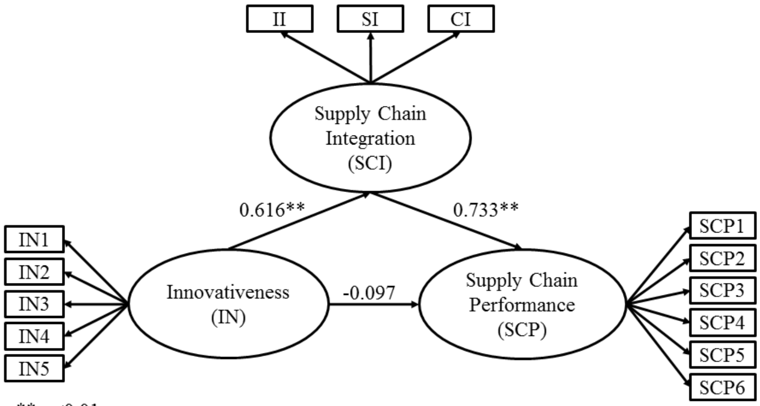
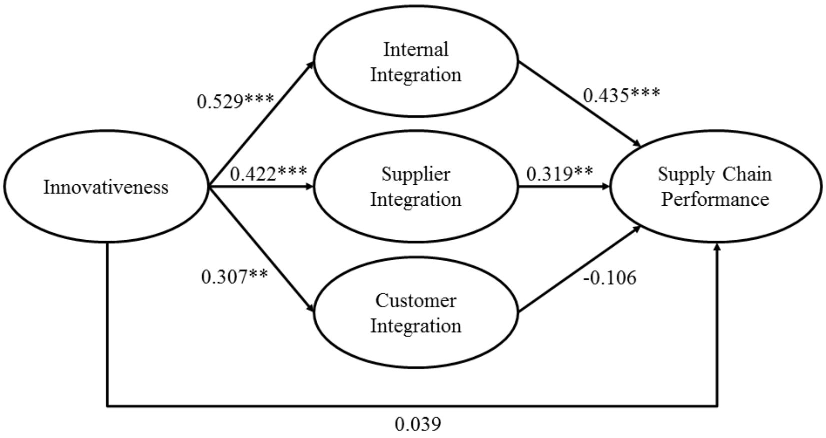


Figure 2 Innovativeness-SCI-SCP Model



** $p<0.01$

Figure 3 Model with sub-dimensions of SCI



*** p<0.001; ** p<0.01; * p<0.05

Table I Measurement Items

Item No.	Item Descriptions (References)
	Innovativeness *(Panayides and Lun, 2009)*
1-1	We frequently try out new ideas in the supply chain context.
1-2	We seek out new ways to do things in our supply chain.
1-3	We are creative in the methods of operation in the supply chain.
1-4	We often introduce new ways of servicing the supply chain.
1-5	We have increasingly introduced new processes in the supply chain in the last 5 years.
	Internal integration *(Stank et al., 2001; Narasimhan and Kim, 2002; Flynn et al., 2010; Wong et al., 2011)*
2-1	We have a high level of responsiveness within our plant to meet other departments' needs.
2-2	We have an integrated system across functional areas of plant control.
2-3	Within our plant, we emphasize information flows amongst purchasing, inventory management, sales, and distribution departments.
2-4	Within our plant, we emphasize physical flows amongst production, packing, warehousing, and transportation departments.
	Supplier integration *(Narasimhan and Kim, 2002; Flynn et al., 2010; Wong et al., 2011)*
3-1	We share information with our major suppliers through information technologies.
3-2	We have a high degree of strategic partnership with suppliers.
3-3	We have a high degree of joint planning to obtain rapid response ordering processes (inbound) with suppliers.
3-4	Our suppliers provide information to us about production and procurement processes.
3-5	Our suppliers are involved in our product development processes
	Customer integration *(Narasimhan and Kim, 2002; Flynn et al., 2010; Wong et al., 2011)*
4-1	We have a high level of information sharing with major customers about market information.
4-2	We share information to major customers through information technologies.
4-3	We have a high degree of joint planning and forecasting with major customers to anticipate demand visibility.
4-4	Our customers provide information to us in the procurement and production processes.
4-5	Our customers are involved in our product development processes.
	Supply chain performance *(Li et al., 2009)*
5-1	Just-in-time
5-2	Inventory turnover and cash-to-cash cycle time.
5-3	Customer lead time and load efficiency.
5-4	Delivery performance and quality.
5-5	Supply chain inventory visibility and opportunity costs.
5-6	Total logistics cost.

Table II The profile of respondents (N=102)

The profile of respondents	**Frequency**
Industry	
Food manufacturer	9
Electronic manufacturer	16
Chemicals manufacturer	8
Apparel manufacturer	6
Machinery manufacturer	5
Automotive manufacturer	22
Mineral manufacturer	12
Furniture manufacturer	2
Computer equipment manufacturer	19
Others	3
Position	
Staff	4
Assistant manager	9
Manager	16
Deputy general manager	21
Department manager	14
Managing director	22
CEO	16

Table III Factor loadings, reliability and validity of the measurement model

Construct	Item No.	Loading	Reliability & Validity
Innovativeness	1-1	0.868	α=0.879 CR=0.880 AVE=0.597
	1-2	0.694	
	1-3	0.737	
	1-4	0.762	
	1-5	0.790	
Internal Integration	2-1	0.767	α=0.855 CR=0.856 AVE=0.599
	2-2	0.744	
	2-3	0.770	
	2-4	0.813	
Supplier Integration	3-1	0.770	α=0.882 CR=0.887 AVE=0.613
	3-2	0.672	
	3-3	0.814	
	3-4	0.778	
	3-5	0.868	
Customer Integration	4-1	0.847	α=0.841 CR=0.841 AVE=0.521
	4-2	0.558	
	4-3	0.738	
	4-4	0.607	
	4-5	0.814	
Supply Chain Performance	5-1	0.748	α=0.864 CR=0.856 AVE=0.519
	5-2	0.680	
	5-3	0.706	
	5-4	0.826	
	5-5	0.719	
	5-6	0.627	

Table IV Mean, Standard Deviation (S.D.) and correlations of constructs

	Mean	**S.D.**	**IN**	**II**	**SI**	**CI**	**SCP**
IN	3.01	1.20	**0.773**				
II	3.58	1.02	0.506***	**0.774**			
SI	3.31	1.07	0.391**	0.487***	**0.783**		
CI	3.06	1.02	0.274*	0.356**	0.438***	**0.722**	
SCP	3.80	0.94	0.355**	0.558***	0.478***	0.170	**0.720**

***p<0.001 **p<0.01; *p<0.05; Square root of AVE is on the diagonal; IN: innovativeness; II: internal integration; SI: supplier integration; CI: customer integration; SCP: supply chain performance.

Table V Discriminant validity tests

	IN	II	SI	CI	SCP
IN	-				
II	17.97***	-			
SI	16.59***	27.51***	-		
CI	20.56***	31.97***	20.54***	-	
SCP	26.17***	34.33***	29.07***	44.84***	-

***p<0.001; Chi-square differences between fixed and free models; IN: innovativeness; II: internal integration; SI: supplier integration; CI: customer integration; SCP: supply chain performance.

Table VI Model estimation results

Model Element	Direct Model	Mediation Model
Model fit		
χ^2/df	1.593	1.396
CFI	0.951	0.918
TLI	0.937	0.908
RMSEA	0.077	0.063
RMR	0.062	0.076
Standardised regression weight		
Innovativeness → SCP	0.356**	-0.097
Innovativeness → SCI	Not estimated	0.616**
SCI → SCP	Not estimated	0.733**

Note: ** $p<0.01$

Table VII Mediation effect of each sub-dimensions of SCI

Hypothesis	Direct Beta w/o Med.	Direct Beta w/Med	Indirect Beta	Mediation type observed
II mediates IN-SCP	0.356**	0.096 (NS)	0.259**	Full
SI mediates IN-SCP	0.356**	0.197 (NS)	0.159**	Full
CI mediates IN-SCP	0.356**	0.335 *	0.022 (NS)	No

Note: ** $p<0.01$; * $p<0.05$; NS: not significant; IN: innovativeness; II: internal integration; SI: supplier integration; CI: customer integration; SCP: supply chain performance.

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