Strategic Supply Chain Partnership, Environmental Supply Chain Management Practices, and Performance Outcomes: An Empirical Study

Sunhee Youn
Department of Information, Operations and Technology Management
College of Business Administration
The University of Toledo
Toledo, Ohio, USA 43606
younsh365@gmail.com

Ma Ga (Mark) Yang
Department of Marketing and Supply Chain Management
School of Business
College of Charleston
Charleston, SC, USA 29424
yangm@cofc.edu

Paul Hong
Department of Information, Operations and Technology Management
College of Business Administration
The University of Toledo
Toledo, Ohio, USA 43606
Paul.Hong@Utoledo.Edu

Kihyun Park
Department of Management
School of Business
Robert Morris University
Moon Township, PA 15108
parkk@rmu.edu

Send Correspondence to:

Paul Hong
Department of Information, Operations and Technology Management
College of Business Administration
The University of Toledo
Toledo, Ohio, USA 43606
Paul.Hong@Utoledo.Edu
SHORT BIOGRAPHICAL INFORMATION

**SunHee Youn** is a Lecturer at the Hongik University of Seoul, Korea. As a recipient of Young Scholar Award from Korean government she is currently a post-doctoral researcher at the University of Toledo. She is a recipient of Korea Young Scholar’s Award. Her research interest is in the area of supply chain management. Her articles have been published (accepted) in *International Journal of Logistics and Systems Management*, *International Journal of Services Operations and Management*, *Journal of Korea Production and Operations Management Society* and *Journal of the Korean Society for Quality Management*.

**Ma Ga (Mark) Yang** is currently employed as a Visiting Instructor in the School of Business at the College of Charleston. He is a Ph.D. candidate of Manufacturing and Technology Management at the University of Toledo, USA. He holds an MBA from the University of Toledo and a BA from Hankuk University of Foreign Studies in Seoul, Korea. He is a recipient of 2010 APICS Plossl Doctoral Dissertation Award. His articles have been published in *International Journal of Production Economics* and *International Journal of Service Operations Management* and accepted for *Benchmarking: an International Journal* and *International Journal of Business Excellence*. His research interests are in sustainable supply chain management, environmental management, lean manufacturing, and green supply chain management.

**Paul Hong** is a Professor of Information Operations and Technology Management at the University of Toledo, USA. He holds a Ph.D. in Manufacturing Management and Engineering from the University of Toledo. He also holds an MBA and an MA in Economics degree from Bowling Green State University, USA and a BA from Yonsei University in Seoul, Korea. His articles have been published in numerous journals including *Journal of Operations Management*, *International Journal of Operations and Production Management*, *International Journal of Production Research*, *Journal of Supply Chain Management*, *International Journal of Production Economics*, *Management Decision*, *Journal of Business Research*, *International Journal of Technology Management*, *Benchmarking: An International Journal*, *European Journal of Innovation Management*, and *Strategic Outsourcing: An International Journal*. He is the international research network coordinator for annual Symposium and Workshop in Global Supply Chains. He is also the USA Coordinator of International Manufacturing Strategy Survey (IMSS). His research interests are in technology management, operational strategy, global supply chain management and international comparative studies that involve Asian, North American and European businesses.

**Kihyun Park** is an Assistant Professor of Management at Robert Morris University, USA. He holds a Ph.D. in Manufacturing and Technology Management at the University of Toledo. He holds BA and MA in Economics from Hanyang University in Seoul, Korea. His articles have been published in *Korean Public Economy* and *Benchmarking: an International Journal* and accepted for *International Journal of Service Operations Management*. He won the National Doctoral Dissertation Research Grant Competition from *Institute for Supply Management* in 2011. His research resides in resilient supply chain strategy, practices, and its outcomes in terms of visibility, security, and sustainability.
Strategic Supply Chain Partnership, Environmental Supply Chain Management Practices, and Performance Outcomes: An Empirical Study of Korean Firms

ABSTRACT

Increasingly, firms have recognized the significance of environmental issues in gaining competitive advantage. Many firms have searched for mechanisms that integrate environmental supply chain practices and performance objectives. This paper explores how strategic supply chain partnership (SSCP) contributes to environmental supply chain management (ESCM). This study presents a research model that defines the details of SSCP and ESCM. Based on the responses of 141 Korean manufacturing firms, the research model is empirically tested through a structural equation model. To the best of our knowledge, this study represents the first empirical test conducted on the integration of SSCP and ESCM as a way of examining how these two critical sets of practices are implemented in the context of Korean firms. Managerial implications and future research opportunities are provided.

Keywords: Strategic supply chain partnership (SSCP), Mutual trust, Organizational compatibility, Top management support, Information sharing, Environmental supply chain management (ESCM), Empirical study

1. Introduction

As the Bhopal disaster (1984) and Mattel Toy Recall (2007) cases suggest, even one single failure in terms of critical environmental requirements can create huge implications for a firm’s immediate financial performance and long-term organizational social reputation (Stenson, 2006; Kovács, 2008; Zhang et al., 2011). The primary reasons behind these failures are, in part, derived from the companies’ mismanagement of their partners who failed to meet environmental standards. In response to these and other similar cases, firms increasingly have focused a great deal of attention on environmental supply chain management (ESCM) practices that are deeply
grounded in the idea of partnership. The complexity involved in producing environmentally safe, high-quality, cost-competitive products and services requires trust-based collaborative participation from numerous firms in the supply-and-demand network (Klassen and McLaughlin, 1996; de Bakker et al., 2002; Montabon et al., 2007). Naturally, the scope and extent of collaborative relationships with the suppliers and customers are refined through systematic and organization-wide efforts that involve effective information sharing at both the strategic and operational levels. Achieving this superior level of communication requires considerable support from the highest levels of management.

ESCM addresses environmental concerns as part of a broader supply chain network (Narasimhan and Carter, 1998; Hall, 2000; Shaw et al., 2010). ESCM is regarded as an extended supply chain that incorporates the demands of environmental issues through various integrative business practices, such as life cycle analysis (LCA) (Matos and Hall, 2007), the 3Rs (recycling, reuse, and remanufacturing) (Hervani et al., 2005), environmental technologies (Shrivastava, 2007), and collaborative practices across supply chain participants (i.e., suppliers, manufacturers, distributors, and customers) (Cheng et al., 2008). In the context of supply chains, any supply chain initiatives require strategic supply chain partnerships (Goffin et al., 2006; Nyaga et al., 2009). Thus, firms increasingly seek to improve partnerships among supply chain partners (i.e., suppliers). In this paper, strategic supply chain partnership (SSCP) is conceptualized in a broader sense to include (a) enabling antecedents, such as mutual trust, organizational compatibility, and top management support and (b) implementation of effective partnership interactions, such as information sharing at both the strategic and operational levels (Mentzer et al., 2000).

The aim of this paper is to explore the following research question: In view of increasing global environmental requirements, how can focal companies integrate SSCP with ESCM to gain
sustainable competitive advantages? To explore this question further, we present a research model that examines the complex relationships between SSCP and ESCM, and conducts empirical validation through the survey results of 141 Korean firms. To the best of our knowledge, an empirical examination of such relationships in the context of fast-growing Asian economies, such as that of Korea, has not been undertaken before. This paper is organized as follows: First, a research model is presented based on a review of the literature, followed by the hypotheses, which articulate the nature of the relationships between key variables. Secondly, the research methods, data analysis, and results are presented, showing the details related to the empirical validation of the model. Finally, the findings, implications, and directions for future research are discussed.

2. Literature Review

Figure 1 depicts the research model, which emphasizes the relationship between SSCP and ESCM. SSCP is predicated on antecedents such as mutual trust, organizational compatibility, and top management support. Implementation of SSCP includes strategic information sharing and operational information sharing. In addition, ESCM has two dimensions: ESCM practices and performance outcomes (environmental and business performance).

2.1. Strategic Supply Chain Partnership (SSCP)

A stream of literature supports the value of SSCP. In early studies, Mohr and Speckman (1994) have discussed partnership attributes, communication behaviors, and conflict resolution techniques as important factors for partnership success. Since then, much of the research that has been conducted on this topic has been conceptual (Graham et al., 1994; Ellram and Hendrick, 1995; Mentzer et al., 2000). Recently, several empirical studies have been conducted as well
(Goffin et al., 2006; Nyaga et al., 2009; Sodhi and Son, 2009). Goffin et al. (2006) have examined the specific attributes of close supplier-manufacturer relationships in terms of potential benefits to be attained through such partnerships. Nyaga et al. (2009) empirically examined the mediating role of trust and commitment between inter-organizational collaborative activities, such as information sharing, joint relationship efforts, dedicated investments, and relationship outcomes. Sodhi and Son (2009) scrutinized Korean supplier-retailer partnerships from two different angles, including strategic partner performance and operational partnership performance. Five factors that affect these partnership performance outcomes are information exchange, trust, joint partnership management, relationship-specific assets, and partner asymmetry.

Strategic partnership plays an essential role in increasing long-term benefits for the supply chain based on successful supply chain relationships and reducing risk (Mentzer et al., 2000; Lambert et al., 2004). Strategic partnership also involves trust, cultural compatibility, top management support, and effective information sharing (Chen and Paulraj, 2004; Li and Lin, 2006). Thus, for the purpose of this study, SSCP is defined as successful long-term relationships among trading partners in the supply chain that are enabled by mutual trust, organizational compatibility, top management support, and information sharing.

2.1.1. Antecedents of SSCP

*Mutual trust* is an important antecedent in the SSCP (Johnston et al., 2004). Developing and maintaining a high level of trust is critical for successful relationship building (Cai et al., 2009; Nyaga et al., 2009). Firms with mutual trust perceive partners as reliable and trustworthy in taking effective actions toward achieving desirable performance outcomes (Das and Teng, 1998; Mentzer et al., 2001). *Organizational compatibility* reflects similarity in management style and
goal compatibility with supply chain partners. Compatible corporate culture is also essential for effective long-term inter-firm dyadic relationships (Smith and Barclay, 1997; Li and Lin, 2006; Paulraj et al., 2008). Top management support is critical in communicating shared vision and implementing strategic decisions within an organization (Hambrick and Mason, 1984; Kotter, 1990). Top management’s commitment, as evidenced by deploying necessary resources, facilitates the development of strategic partnership with key suppliers (Mentzer et al., 2000; Li and Lin, 2006).

2.1.2. Implementation of SSCP

In management literature, practices have been defined both in strategic dimensions as well as operational dimensions (Castanias and Helfat, 1991). Strategic practices involve top management, are implemented organization-wide, and are long-term oriented. Operational practices, in contrast, are middle-management initiated, functionally focused, and short-term based. SSCP thrives when firms are willing to share strategic information (e.g., organizational vision, long-term opportunities, and realistic risks) (Monzka et al., 1998; Mentzer et al., 2001). SSCP also requires operational-based information (e.g., production planning, production outcomes, and new product/service developments details) (Zhou and Benton, 2007). Quality inter-organizational decision making requires timely, accurate, and relevant information both at the strategic and operational levels. Thus, in this study, we distinguish these two types of information and show how firms integrate them in their collaborative decision-making processes.

2.2. Environmental Supply Chain Management (ESCM)

A supply chain perspective is useful in addressing complex environmental issues involving focal firms and their suppliers. ESCM includes waste reduction, recycling, reuse, and material
substitution (Narasimhan and Carter, 1998). Hall (2000) has proposed a research model that contains theoretical requirements (i.e., systemic approaches to environmental concerns, strategic buyer-supplier relations, and firm behaviors under environmental regulation pressures). Zhu and Sarkis (2004) have adopted a broader perspective of ESCM by including four ESCM-related practices (internal environmental management; external ESCM; investment recovery; and eco-design, also referred to as design for environmental practices) and environmental performance outcomes in terms of reductions in environmental waste and energy consumption (Beamon, 1999; Sroufe, 2003; Hervani et al., 2005; Montabon et al., 2007). In this study, ESCM is defined as organizational efforts addressing environmental issues through inter-organizational collaboration to achieve performance goals and requirements (e.g., market performance and financial performance) (Narasimhan and Carter, 1998; Hall, 2000; Zhu and Sarkis, 2004).

3. Hypothesis Development

3.1. Mutual Trust and Information Sharing

Mutual trust is both relationally based and performance based. Firms that exhibit a high level of organizational integrity tend to uphold their business reputations through effective information sharing practices among strategic partners both at the strategic and operational levels (Zaheer et al., 1998). Firms make decisions about the level of trust they assign to their partners based on such external evidence. They continue to sustain mutual trust unless or until their experiences with information sharing (e.g., reliability, timeliness, and accuracy of information exchanged) suggest that they should seek an alternative course of action (Currall and Judge, 1995; Liao et al., 2010).

Strategic information sharing, such as emerging R&D plans or details about strategic outsourcing with new suppliers, requires a level of trust in the motives of supply chain partners and the appropriate use of shared information. Furthermore, operational information, such as
requirements to win contracts and secure orders for new products/services, is critical when supporting strategic goals, such as achieving market growth targets. Thus, firms that have developed a high level of mutual trust usually continue such relationships based on highly relevant, accurate, and timely information—relationships that ultimately result in mutual benefit. Based on the research that has been reported on the strategic role of information sharing and mutual trust, we hypothesize the following:

**H1a:** The extent of mutual trust among the partners in the supply chain is positively associated with strategic information sharing.

**H1b:** The extent of mutual trust among the partners in the supply chain is positively associated with operational information sharing.

### 3.2. Organizational Compatibility and Information Sharing

Firms with organizational compatibility across the supply chain members share similar corporate philosophies. Their organizational cultures and business policies also share essential elements of business decision making (Cooper et al., 1997; Paulraj et al., 2008). Thus, firms that are compatible with each other are more likely to share not only strategic but also operational information with partners in the supply chain than they are to share information with firms that operate in different environments because the former tend to share a common “world view” of SCM (Spekman et al., 1998; Li and Lin, 2006).

As more organizations require compatibility in terms of strategic priorities (innovativeness vs. low cost) and interests (global market vs. regional focus), the more they pursue information sharing. Examples of strategic information sharing include market requirements for premium products and changing customer demands in global market. On the other hand, information sharing in operational details may involve cross-functional collaboration and amount of component part delivery needs. Thus, we hypothesize the following:
H2a: The extent of organizational compatibility among the partners in the supply chain is positively associated with strategic information sharing.

H2b: The extent of organizational compatibility among the partners in the supply chain is positively associated with operational information sharing.

3.3. Top Management Support and Information Sharing

Top management support is critical for implementing major supply chain initiatives (Mentzer et al., 2000). Li and Lin (2006) have noted that top management support as a key facilitator of information sharing in supply chains. Top management contributes to the integration of information sharing into an overall organizational business strategy and thus provides vision, guidance, and support for the effective implementation of SCM (Wu et al., 2004; Li and Lin, 2006). For example, top management decisions to deploy adequate budgets for network IT capabilities are vital in facilitating strategic information sharing (timelines for implementing major supplier development programs) and operational information sharing (timely and accurate updates on the delivery status and results). Therefore, we hypothesize the following:

H3a: The extent to which top management supports the supply chain is positively associated with strategic information sharing.

H3b: The extent to which top management supports information technology is positively associated with operational information sharing.

3.4. Information Sharing (from Strategic to Operational)

Mutual trust, organizational compatibility, and top management support are important antecedents in forming strategic supply chain partnerships. Partnering firms share critical and proprietary information to sustain and support their partnership relationships. Such information includes multi-level information that is characterized by strategic and operational data (Cooper and Ellram, 1993; Mentzer et al., 2000). Strategic information enables shop-floor employees to
work on operational details. For instance, top management criteria for selecting new product lines (strategic information) enable cross-functional teams to clarify sets of new product development project targets (operational details). In sum, once strategic information is shared, operational information is also likely to be shared among the partnering firms. Thus, we hypothesize the following:

**H4:** Strategic information sharing is positively associated with operational information sharing.

### 3.5. Information Sharing and Environmental Supply Chain Management (ESCM) Practices

Effective information sharing between supply chain partners positively influences the implementation of firms’ supply chain practices (Zhou and Benton, 2007). Implementing ESCM practices requires vital information regarding strategic and operational plans, detailed records, and development of products and services (Erlandsson and Tillman, 2009).

Strategic information available to senior management, such as long-term environmental trends, motivates manufacturing and engineering managers within the supply chain network to implement practices related to processing environmentally safe component parts across the network. Operational information, such as engineering design capabilities and manufacturing production capacity, becomes essential for the successful implementation of cost- and time-saving practices, such as adopting efficient means of toxic waste disposal. Taken together, the more that both strategic information and operational information are shared, the better able companies will be to effectively address ESCM issues. Thus, we hypothesize the following:

**H5a:** The extent to which strategic information is shared among the partners in the supply chain is positively associated with ESCM practices.

**H5b:** The extent to which operational information is shared among the partners in the supply chain is positively associated with ESCM practices.
3.6. ESCM Practices and Performance Outcomes

Organizations use ESCM practices to assess and mitigate their impact on the environment. For example, environmental management systems allow organizations to coordinate information required to improve environmental performance. Such systems are expected to lead to higher environmental performance, especially in conjunction with ISO 14001 certification requirements (Melnyk et al., 2003; Matos and Hall, 2007). ESCM practices also minimize potentially harmful environmental effects throughout a product’s life cycle—e.g., from initial product design to materials disposal (Hart, 1995; Sroufe, 2003; Montabon et al., 2007). Particular ESCM practices that involve strategic procurement of environmentally friendly raw materials may lead to drastic reductions in waste and ultimate product disposal processes, thus improving environmental performance. As a result, we hypothesize the following:

**H6a:** ESCM practices are positively associated with environmental performance.

Successful implementation of ESCM practices may help organizations face competition with new opportunities and therefore add value to core business programs (Porter and van der Linde, 1995; Zhu and Sarkis, 2004). Proactive ESCM practices, such as environmental risk management and continuous environmental improvement, allow organizations to reap the benefits of superior long-term performance; these benefits include an improved organizational reputation, increased market penetration, and increased profitability. Thus, we hypothesize the following:

**H6b:** ESCM practices are positively associated with business performance.

Improved environmental performance can positively impact business performance by enhancing customer satisfaction and customer loyalty (King and Lenox, 2002; Luo and
Bhattacharya, 2006). Socially responsible environmental accountability improves a firm’s brand image and thus affects market performance (Klassen and McLaughlin, 1996; Luo and Bhattacharya, 2009; Yang et al., 2011). For example, publicity that focuses on firms’ drastic waste reduction followed by subsequent community recognition and environmental awards may lead to a superior reputation among customers and increased market valuation, which can directly result in sales growth. Thus, we hypothesize the following:

**H7:** Environmental performance is positively associated with business performance.

4. Research Methods

From the 1960s to the 2000s, Korea’s economy has displayed double-digit annual growth by focusing on shipbuilding, electronics, semiconductors, and the auto industry. The gross domestic product (GDP) per capita of Korea grew from $67 (1960) to $20,000 (2008) (Shin and Ciccantell, 2009). In the course of attaining such dramatic economic growth, the issue of “going green” has steadily gained attention. Korean firms, with their relatively small domestic markets, vigorously have pursued strategic positioning in an increasingly global market. Leading firms, such as POSCO, Samsung, LG, and Hyundai, have exerted a sustained effort to develop supply chain partnerships with their suppliers in order to deliver highly innovative products and services that meet global standards (Song and Noh, 2006; Hong and Hwang, 2011). In addition, the Korean government has actively promoted environmental partnerships. For instance, the Korean government initiated a five-year environmental partnership-building project for companies from July 2003 to June 2006. With support from governmental budgets (up to 75%), companies began to build and launch ESCM partnerships (Korea MCIE, 2006). Such supply chain partnerships have enabled these Korean firms to conform both to domestic and international environmental regulatory standards and thus achieve their market share goals in these advanced markets (Lee
and Rhee, 2005; Lee et al., 2010). Thus, focusing on Korean firms provides an opportunity to
gain especially rich insights about the relationship between SSCP and ESCM.

To begin collecting data, researchers contacted via telephone either a top management
executive or another relevant informant from each company listed with the Korea Composite
Stock Price Index (KOSPI) and Korean Securities Dealers Automated Quotations (KOSDAQ)
trading board. These initial phone calls resulted in 400 potential respondents, who comprised the
population of this study. Survey questionnaires (n=210) were sent via email, regular mail, and
fax to participants who indicated an interest this study by. An email reminder was sent to
participants who did not complete the survey within one week. A follow-up telephone call was
conducted as a final reminder after an additional week. From June 2007 to September 2007, a
total of 142 completed surveys were returned with a response rate of 35.5% (142/400). Out of the
142 returned surveys, one survey was excluded because of an excessive number of irrelevant
answers. Therefore, for this study, 141 surveys were used.

The typical method for testing non-response bias is to determine whether any significant
differences exist between the responses of participants who returned the survey after the first
mailing and the responses of participants who returned the survey after subsequent contact
(Krause, 1999; Prahinski and Benton, 2004). According to Armstrong and Overton (1977), it is
assumed that the late return of surveys represents the opinion of non-respondents. After dividing
141 surveys into two groups (70 for the early response group and 71 for the late response group),
we randomly selected half of the total items (12 out of 24) and performed a t-test between the
two groups (i.e., the early response group and the late response group). The result showed that
there were no statistically significant differences between the groups based on an analysis using
these 12 items.
The sample descriptions are presented in Table 1. The majority of respondents (111 out of 141) were from manufacturing companies (51.1%) and logistics and services companies (27.7%). Researchers solicited participants not only from small and medium-sized companies (<500) (112: 79.3%) but also from larger companies (>500) (29: 20.7%). Participants from a wide range of companies in the supply chain were included in this study (e.g., suppliers, assemblers, logistics providers, etc.). Participants included primarily upper-level managers or senior personnel who understood the organization structures of their employers as well as their unique market situation in the supply chain context.

Because survey responses were gathered from single respondents, researchers tested for common methods bias. Harman’s single method test was used. Confirmatory factor analysis did not produce a single factor or one general factor that explained the majority of the variance because each factor accounted for more than the cutoff value of 5% variance (Lederer et al., 2000). Also, the model fit indicated that a single-factor model did not represent the dataset well ($\chi^2 = 1377.98$, df = 252, GFI = 0.493, RMSEA = 0.179, SRMR = 0.119). Further, the average variance extracted (AVE) by a single factor was 0.41%, indicating that a very small proportion of the variance in the data was accounted for by a single factor. The results of these analyses indicate that common methods bias was not problematic.

Survey items are based on comprehensive literature reviews. Items for each construct are adopted and revised based on the existing literature to ensure face validity and content validity. After translating the original questionnaires into Korean, minor modifications are made to improve the acceptance and understanding of survey respondents in Korea. All questionnaire items use a seven-point Likert scale. Details of survey items, item means, standard deviation, item loadings, average variances extracted (AVE), and composite reliability (CR) are shown in
Appendix A.

5. Research Results

Structural equation modeling (SEM) is used to analyze the data. The data for our research consist primarily of perceptual measures, and our hypotheses represent a series of simultaneous relationships that include exogenous and endogenous variables. Due to the increased flexibility that represents the interplay between data and theory, SEM techniques offer advantages over discriminant analysis and multiple regressions. SEM is regarded as an appropriate technique since we examined a series of interrelationships between simultaneous endogenous and exogenous variables in defining multi-faceted constructs and studying path-dependent variances (Hair et al., 1998). We followed Anderson and Gerbing’s (1988) recommended two-step approach to test our hypotheses. In step one, we test the measurement model to establish validity and reliability of the scales used in our analysis; next, in step two, we also test the structural relationships. Details regarding the measurement model as well as the reliability and validity of the survey items are discussed in the next section.

5.1. Measurement Model, Validity, Reliability

First, we tested the measurement model and established the validity and reliability of the items using confirmatory factor analysis. The literature has suggested that multiple fit indices can be used to assess the model fit (Hu and Bentler, 1998; Shah and Goldstein, 2006). Generally, two types of model fit indices are reported: (a) absolute fit and (b) incremental fit measures. Absolute fit indices—i.e., $\chi^2$, goodness-of-fit index (GFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR)—measure how well the hypothesized model fits the sample data. Incremental fit indices—i.e., normed fit index (NFI), comparative fit index (CFI), and
incremental fit index (IFI)—compare the hypothesized model to two alternative baseline models: (a) a null model that assumes there are no correlated constructs, and (b) an ideal model that perfectly matches the hypothesized model (Shah and Goldstein, 2006). These models measure the fit improvement in comparison to the above baseline models.

In this study, absolute fit indices (i.e., $\chi^2$, GFI, RMSEA, and SRMR) are reported only because the measurement items have been designed based on research questions and grounded theories, and thus the baseline models are not considered. The literature has identified appropriate and acceptable cutoff values for model fit indices (Hu and Bentler, 1998; Modi and Mabert, 2006). RMSEA is regarded good fit if under 0.05 and yet acceptable up to 0.08. GFI is good fit ($> 0.9$) and acceptable ($> 0.8$). SRMR is good fit ($< 0.09$). Our results suggest that all model fit indices for the measurement model are acceptable ($\chi^2=340.50$, d.f. =224, GFI= 0.838, RMSEA =0.061, and SRMR= 0.042).

Convergent validity is assessed by checking the value of the loading for an item (Bagozzi and Yi, 1998). The loadings for the measurement model presented in Appendix A indicate that all standardized factor loadings for each item load significantly on their posited constructs ($> 0.70$), suggesting that convergent validity is adequately demonstrated for all eight constructs. Discriminant validity is assessed by examining whether the square roots of average variance extracted from each construct is greater than the correlations of that construct with all other constructs (Fornell and Larcker, 1981). Table 2 indicates that all constructs show an adequate level of discriminant validity except two constructs (ESCM practices and BP). Reliability values over 0.70 are preferable (Cronbach, 1951; Nunnally, 1978). The values of Cronbach’s $\alpha$ and composite reliability (Fornell and Larcker, 1981) are above 0.80 (see Appendix A and Table 2), which indicates good reliability of the measurement items.
5.2. Structural Model Results

Figure 2 illustrates the structural relationships ($\gamma$) between the exogenous variables ($\xi$), i.e., three antecedents of SSCP (e.g., mutual trust, organizational compatibility, and top management support) and the endogenous variables ($\eta$), i.e., strategic and operational information sharing. It also depicts the structural relationships ($\beta$) among information sharing, ESCM practices, and performance outcomes. Figure 2 also shows fit statistics for the structural model. Fit indices for the structural model reflect an acceptable model fit: $\chi^2=396.144$, d.f.=237, GFI= 0.818, RMSEA =0.069, and SRMR=0.086.

Overall, the results indicate that the majority of hypotheses were supported at $p < 0.05$, while two hypotheses (H1b and H2b) were not supported (see Table 3). For H1a, the standardized coefficient from mutual trust to strategic information sharing is marginally significant at $p < 0.1^1$: H1a ($\gamma_{11} = 0.203, t=1.879$). The standardized coefficient from organizational compatibility to strategic information sharing (H2a) is supported at $p < 0.05$ ($\gamma_{12}=0.210, t=2.061$). Both H1b (mutual trust to operational information sharing) and H2b (organizational compatibility to operational information sharing) were not supported: H1b ($\gamma_{21}=0.131, t=1.275$) and H2b ($\gamma_{22}=-0.036, t=-0.372$). Interestingly, the path coefficients from top management support to both strategic information sharing and operational information sharing were significant at $p < 0.01$ and $p < 0.05$, respectively, supporting H3a ($\gamma_{13}=0.331, t=3.163$) and H3b ($\gamma_{23}=0.204, t=2.008$).

The path coefficient between strategic and operational information sharing is significant at $p < 0.01$ ($\beta_{21}=0.564, t=5.063$), indicating strong support for H4. H5a and H5b are all supported at $p$

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1 It is not conventional to report the significance level of 0.1 in social sciences. However, this practice is not unusual in current literature (Schmenner and Vastag, 2006; Eroglu and Hofer, 2011). According to Shah and Goldstein (2006), the significance level of 0.1 is rarely used in practice but recommended for reporting statistical result.
< 0.05 and p < 0.01, respectively: H5a (β_{31}=0.307, t=2.411) and H5b (β_{32}=0.454, t=3.363). Two hypotheses, in regard to the relationship between ESCM practices and performance outcomes, are supported at p < 0.01: H6a (β_{43}=0.706, t=7.267) and H6b (β_{53}=0.488, t=4.807). The hypothesis linking environmental performance and business performance is supported at p < 0.01: H7 (β_{54}=0.483, t=4.885). These findings are discussed next.

These empirical results suggest that mutual trust, organizational compatibility, and top management support have direct effects on strategic information sharing but not on operational information sharing. Sobel’s test (see Table 4), however, suggests that these three antecedents have positive and indirect effects on operational information sharing through strategic information sharing. This shows that firms with SSCP use strategic information first to make macro-decisions and then utilize operational information to make supportive micro-decisions. In addition, the direct impact of top management support on operational information sharing suggests that top management’s awareness of operational details, as well as the strategic big picture, is important for establishing and strengthening SSCPs.

Figure 2 also shows that a strong linkage exists between operational information sharing and ESCM practices. Although information sharing is important for ESCM practices, operational information sharing has greater impact on ESCM practices. Strategic information sharing is critical for planning purposes related to front-end strategic supply chain partnerships while operational information sharing has more impact on back-end ESCM practices and performance outcomes. As supply chain processes exert increasingly direct influence over performance outcomes, operational details and supply chain practices become more critical. Thus, the results of this study illustrate the importance of information integration for both SSCP and ESCM. These results demonstrate that sustainable competitive advantages (i.e., improved environmental
performance and business performance) require an effective integration of SSCP and ESCM.

The results further show that firms implementing ESCM practices realize tangible performance outcomes, such as improved environmental performance, enhanced brand image, and improved sales growth through facilitating SSCP. Our study indicates that ESCM practices, such as using eco-design principles, basing supplier selection on environmental criteria, and using the 3R model (reduce, reuse, and recycling), positively contribute to firms’ bottom-line performance. The empirical results support the conclusion that environmental performance serves as an important intermediate operational objective that is positively related to business performance (Angell and Klassen, 1999; Jiménez and Lorente, 2001; Pullman et al., 2009). Such environmental performance is assured when supply chains partners, such as important suppliers, successfully meet and exceed the standards for environmental hygiene that impress and attract customers. Successful SSCPs enhance the dynamic relationships among supply chain partners and therefore ensure sustained environmental performance as well as business performance.

6. Discussion and Conclusion

The results of this study offer valuable implications for managers. First, three antecedents (e.g., mutual trust, organizational compatibility and top management support) may be considered as a broad organizational level relationship infrastructure through which effective information sharing (with quality and accuracy) among the partners are achieved. Particularly, this study suggests that a well-established trust facilitates information sharing in strategic level. This result contradicts the notion that active information sharing naturally builds trust among organizations. In typical supply chain context, information sharing itself may not necessarily cultivate trust relationship. In reality, sharing sensitive environmental information may have serious business implications. Thus,
transferring environmental knowledge to other firms requires prior well-established trust relationship.

Second, strategic supply chain partnership (SSCP) facilitates the implementation of environmental supply chain management (ESCM) practices. In rapidly changing market environment, SSCP offers positive impacts on implementing ESCM practices which in turn reap desirable performance outcomes. SSCP in the form of active assistance for rapid recovery of supplier capabilities and real time information sharing among partners is all the more critical in case of major environmental disruptions.

Third, this study considers the Small- and medium-sized enterprises (SMEs) in South Korea. This study shows that it is the large organizations that initiate ESCM; yet, it is the SMEs that improve bottom line performance through implementation of ESCM practices. The results of this study illustrate how Korean firms have integrated SSCPs with ESCM in order to enhance their broad product and service offerings in the global market. Future research may include international comparative studies with firms in Northeast Asia (e.g., China, Japan, Taiwan, and South Korea) and Southeast Asia (e.g., India, Indonesia, Malaysia, Thailand, and Vietnam) as well as firms from Europe and North America.

While this research explains important relationships among SSCPs and enhanced performance outcomes, this study is not free from limitations. First, this study used a single respondent from each company. Future studies may replicate our method using multiple respondents (or multiple methods) from each company. Second, the data analysis procedures used in this study are based on cross-sectional data. While the results of this study are valid, a future longitudinal study with secondary data may lead to more robust research results that examine the complex relationships among other variables that are not included in this study. Third, based on Korean contexts, our study suggests that even in a global market, a broad range
of SSCPs and environmental issues across supply chains may require implementation of supply-chain-level environmental practices. Future studies may explore further how network of supply chains address growing environmental management challenges while wrestle with increasing complexity in global supply chains.
References

Korea Ministry of Commerce, Industry and Energy (Korea MCIE), 2006. Study on industry-wide supply chain environmental management for complying with environmental regulation, GOVP1200621305.


Appendix A: Survey items, item means, standard deviation, item loadings, AVE, and CR (n=141)

<table>
<thead>
<tr>
<th>Description of Items</th>
<th>Mean</th>
<th>S.D.</th>
<th>Loadings&lt;sup&gt;a&lt;/sup&gt;</th>
<th>AVE&lt;sup&gt;b&lt;/sup&gt;</th>
<th>CR&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
</table>

Please indicate the level of mutual trust with your major supply chain partners (1: not at all, 4: moderate, 7: very much).

**Mutual Trust (MT)**

| MT1 | We believe that our partnering firms fulfill their assigned works. | 5.219 | 1.265 | 0.813 |
| MT2 | We believe that our partnering firms provide mutually beneficial decision-making as well as reliable performance outcomes. | 5.042 | 1.319 | 0.821 |
| MT3 | It is our belief that our partnering firms display favorable attitude toward negotiation for reciprocal contentment. | 4.992 | 1.370 | 0.924 |
| MT4 | We trust that our partnering firms dependably respond to our company’s requests. | 4.666 | 1.543 | 0.809 |

Please indicate the level of organizational compatibility with your major supply chain partners (1: not at all, 4: moderate, 7: very much).

**Organizational Compatibility (OC)**

| OC1 | We and our partnering firms are compatible with behavioral characteristics such as behavioral pattern, culture, and language. | 4.347 | 1.444 | 0.933 |
| OC2 | We and our partnering firms are compatible with cognitive characteristics such as value, norm and belief. | 4.283 | 1.430 | 0.916 |
| OC3 | We and our partnering firms are compatible with organizational structure and system. | 3.957 | 1.377 | 0.844 |
| OC4 | We and our partnering firms are compatible with CEO’s leadership pattern. | 3.992 | 1.391 | 0.895 |

Please indicate the level of top management support for supply chain management (1: not at all, 4: moderate, 7: very much).

**Top Management Support (TMS)**

| TMS1 | CEO’s interest and support for information technology | 4.978 | 1.499 | 0.838 |
| TMS2 | CEO’s interest and support for supply chain management (or partners) | 4.978 | 1.499 | 0.914 |

Please indicate the level of information sharing with your supply chain partners (1: not at all, 4: moderate, 7: very much).

**Operational Information Sharing (OIS)**

| OIS1 | Production (or sales, logistics, and procurement) planning for products and services | 4.766 | 1.495 | 0.740 |
| OIS2 | Production (or sales, logistics, and procurement) outcomes for products and services | 4.553 | 1.766 | 0.831 |
| OIS3 | New product and service developments | 4.631 | 1.683 | 0.761 |

**Strategic Information Sharing (SIS)**

| SIS1 | Development plan, strategy and vision | 4.070 | 1.442 | 0.850 |
| SIS2 | Environmental change (equipment, facilities, and increases in number of employees) | 3.874 | 1.627 | 0.825 |
| SIS3 | Opportunities and risks | 4.035 | 1.564 | 0.808 |

Please indicate the level of environmental supply chain management practices (1: not at all, 4: moderate, 7: very much).

**Environmental Supply Chain Management (ESCM) Practices**

| ESCM Practices1 | Our purchasing department selects suppliers who are environmentally committed. | 4.269 | 1.698 | 0.825 |
| ESCM Practices2 | We implement environment-friendly practices such as recycling, reuse, and use of alternative, non-hazardous substances in producing products. | 4.574 | 1.777 | 0.823 |
| ESCM Practices3 | We implement environment-friendly practices such as in design, construction, and packaging in selling products. | 4.539 | 1.658 | 0.915 |
| ESCM Practices4 | We consider client companies’ legitimate demands for environmental issues. | 3.872 | 1.792 | 0.708 |

Please indicate the level of performance outcomes (1: Strongly disagree, 4: neutral, 7: strongly agree).

**Environmental Performance (EP)**

| EP1 | Pollution reduction (i.e. pollutants, CO₂ emission). | 4.418 | 1.678 | 0.922 |
| EP2 | Energy consumption reduction (i.e. water and electronic power). | 4.879 | 1.632 | 0.818 |

**Business Performance (BP)**

| BP1 | Improved company brand image. | 3.695 | 1.398 | 0.871 |
| BP2 | Improved sales growth. | 4.255 | 1.600 | 0.864 |

<sup>a</sup> Standardized coefficients; all loadings are significant at p < 0.01.

<sup>b</sup> Average variance extracted: Calculated according to Fornell and Larcker (1981)

<sup>c</sup> Composite reliability: Calculated according to Fornell and Larcker (1981)
### Appendix B: A Notation List

<table>
<thead>
<tr>
<th>Acronym</th>
<th>What stands for</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSCP(s)</td>
<td>Strategic Supply Chain Partnership(s)</td>
</tr>
<tr>
<td>ESCM</td>
<td>Environmental Supply Chain Management</td>
</tr>
<tr>
<td>MT</td>
<td>Mutual Trust</td>
</tr>
<tr>
<td>OC</td>
<td>Organizational Compatibility</td>
</tr>
<tr>
<td>TMS</td>
<td>Top Management Support</td>
</tr>
<tr>
<td>OIS</td>
<td>Operational Information Sharing</td>
</tr>
<tr>
<td>SIS</td>
<td>Strategic Information Sharing</td>
</tr>
<tr>
<td>EP</td>
<td>Environmental Performance</td>
</tr>
<tr>
<td>BP</td>
<td>Business Performance</td>
</tr>
</tbody>
</table>
Table 1. Sample descriptions by industry, size, and position

<table>
<thead>
<tr>
<th>Classification</th>
<th># of respondents</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>72</td>
<td>51.1</td>
</tr>
<tr>
<td>Electronics and Communication</td>
<td>19</td>
<td>13.5</td>
</tr>
<tr>
<td>Logistic and Services</td>
<td>39</td>
<td>27.7</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>11</td>
<td>7.8</td>
</tr>
<tr>
<td>Total</td>
<td>141</td>
<td>100.0</td>
</tr>
<tr>
<td>Number of Employees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less Than 50</td>
<td>64</td>
<td>45.3</td>
</tr>
<tr>
<td>50-100</td>
<td>27</td>
<td>19.1</td>
</tr>
<tr>
<td>100-500</td>
<td>21</td>
<td>14.9</td>
</tr>
<tr>
<td>500-1000</td>
<td>7</td>
<td>5.0</td>
</tr>
<tr>
<td>More than 1000</td>
<td>22</td>
<td>15.7</td>
</tr>
<tr>
<td>Total</td>
<td>141</td>
<td>100.0</td>
</tr>
<tr>
<td>Actor in the Supply Chain Stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Materials Suppliers</td>
<td>15</td>
<td>10.6</td>
</tr>
<tr>
<td>Component Parts Suppliers</td>
<td>22</td>
<td>15.6</td>
</tr>
<tr>
<td>Component Parts Assemblers</td>
<td>11</td>
<td>7.8</td>
</tr>
<tr>
<td>Finished Products Assemblers</td>
<td>44</td>
<td>31.2</td>
</tr>
<tr>
<td>Logistic Services Providers</td>
<td>25</td>
<td>17.7</td>
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<tr>
<td>Other Service Providers</td>
<td>24</td>
<td>17.1</td>
</tr>
<tr>
<td>Total</td>
<td>141</td>
<td>100.0</td>
</tr>
<tr>
<td>Position and Title of Respondents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply Chain Specialist</td>
<td>17</td>
<td>12.1</td>
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<tr>
<td>Assistant Manager</td>
<td>29</td>
<td>20.5</td>
</tr>
<tr>
<td>Manager</td>
<td>28</td>
<td>19.9</td>
</tr>
<tr>
<td>Director</td>
<td>39</td>
<td>27.6</td>
</tr>
<tr>
<td>Senior Executives</td>
<td>18</td>
<td>12.8</td>
</tr>
<tr>
<td>CEO</td>
<td>10</td>
<td>7.1</td>
</tr>
<tr>
<td>Total</td>
<td>141</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 2: Inter-construct Correlations, Reliability, and Discriminant validity (n=141)

<table>
<thead>
<tr>
<th>Construct</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. MT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.903</td>
</tr>
<tr>
<td>2. OC</td>
<td>0.583</td>
<td>[0.897]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.943</td>
</tr>
<tr>
<td>3. TMS</td>
<td>0.523</td>
<td>0.471</td>
<td>[0.876]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.899</td>
</tr>
<tr>
<td>4. OIS</td>
<td>0.467</td>
<td>0.371</td>
<td>0.502</td>
<td>[0.777]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.816</td>
</tr>
<tr>
<td>5. SIS</td>
<td>0.482</td>
<td>0.463</td>
<td>0.515</td>
<td>0.717</td>
<td>[0.775]</td>
<td></td>
<td></td>
<td></td>
<td>0.864</td>
</tr>
<tr>
<td>6. ESCM Practices</td>
<td>0.524</td>
<td>0.534</td>
<td>0.729</td>
<td>0.634</td>
<td>0.590</td>
<td>[0.821]</td>
<td></td>
<td></td>
<td>0.891</td>
</tr>
<tr>
<td>7. EP</td>
<td>0.375</td>
<td>0.471</td>
<td>0.487</td>
<td>0.437</td>
<td>0.406</td>
<td>0.703</td>
<td>[0.871]</td>
<td></td>
<td>0.860</td>
</tr>
<tr>
<td>8. BP</td>
<td>0.367</td>
<td>0.445</td>
<td>0.580</td>
<td>0.555</td>
<td>0.598</td>
<td>0.822</td>
<td>0.820</td>
<td>[0.867]</td>
<td>0.854</td>
</tr>
</tbody>
</table>

All correlation coefficients are significant at p <0.01.

*Squared root of average variances extracted (AVEs) are on the diagonal in brackets.

Note: MT (Mutual Trust), OC (Organizational Compatibility), TMS (Top Management Support), OIS (Operational Information Sharing), SIS (Strategic Information Sharing), ESCM (Environmental Supply Chain Management) Practices, EP (Environmental Performance), and BP (Business Performance)
### Table 3: Hypotheses tests (Direct effects)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
<th>Path coefficient (t-statistics)</th>
<th>Sig.</th>
<th>Supp.?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a (+)</td>
<td>MT</td>
<td>SIS</td>
<td>0.203 (1.879)</td>
<td>p &lt; 0.1</td>
<td>Yes</td>
</tr>
<tr>
<td>H1b (+)</td>
<td>MT</td>
<td>OIS</td>
<td>0.131 (1.275)</td>
<td>p &gt; 0.1</td>
<td>No</td>
</tr>
<tr>
<td>H2a (+)</td>
<td>OC</td>
<td>SIS</td>
<td>0.210 (2.061)</td>
<td>p &lt; 0.05</td>
<td>Yes</td>
</tr>
<tr>
<td>H2b (-)</td>
<td>OC</td>
<td>OIS</td>
<td>-0.036 (-0.372)</td>
<td>p &gt; 0.1</td>
<td>No</td>
</tr>
<tr>
<td>H3a (+)</td>
<td>TMS</td>
<td>SIS</td>
<td>0.331 (3.163)</td>
<td>p &lt; 0.01</td>
<td>Yes</td>
</tr>
<tr>
<td>H3b (+)</td>
<td>TMS</td>
<td>OIS</td>
<td>0.204 (2.008)</td>
<td>p &lt; 0.05</td>
<td>Yes</td>
</tr>
<tr>
<td>H4 (+)</td>
<td>SIS</td>
<td>ESCM Practices</td>
<td>0.307 (2.411)</td>
<td>p &lt; 0.05</td>
<td>Yes</td>
</tr>
<tr>
<td>H5a (+)</td>
<td>SIS</td>
<td>OIS</td>
<td>0.564 (5.063)</td>
<td>p &lt; 0.01</td>
<td>Yes</td>
</tr>
<tr>
<td>H5b (+)</td>
<td>OIS</td>
<td>ESCM Practices</td>
<td>0.454 (3.363)</td>
<td>p &lt; 0.01</td>
<td>Yes</td>
</tr>
<tr>
<td>H6a (+)</td>
<td>ESCM Practices</td>
<td>EP</td>
<td>0.706 (7.267)</td>
<td>p &lt; 0.01</td>
<td>Yes</td>
</tr>
<tr>
<td>H6b (+)</td>
<td>ESCM Practices</td>
<td>BP</td>
<td>0.488 (4.807)</td>
<td>p &lt; 0.01</td>
<td>Yes</td>
</tr>
<tr>
<td>H7 (+)</td>
<td>EP</td>
<td>BP</td>
<td>0.483 (4.885)</td>
<td>p &lt; 0.01</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: MT (Mutual Trust), OC (Organizational Compatibility), TMS (Top Management Support), OIS (Operational Information Sharing), SIS (Strategic Information Sharing), ESCM (Environmental Supply Chain Management) Practices, EP (Environmental Performance), and BP (Business Performance)

### Table 4: Indirect effects and t-statistics (Sobel’s test†)

<table>
<thead>
<tr>
<th>Latent Variable</th>
<th>Linkages</th>
<th>Path to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OIS</td>
<td>ESCM Practices</td>
</tr>
<tr>
<td>MT</td>
<td>SIS</td>
<td>1.71 (0.066)*</td>
</tr>
<tr>
<td>OC</td>
<td>SIS</td>
<td>1.948 (0.060)*</td>
</tr>
<tr>
<td>TMS</td>
<td>SIS</td>
<td>2.731 (0.068)***</td>
</tr>
<tr>
<td>SIS</td>
<td>OIS</td>
<td>2.932 (0.087)***</td>
</tr>
<tr>
<td>OIS</td>
<td>ESCM Practices</td>
<td>-</td>
</tr>
<tr>
<td>ESCM Practices</td>
<td>EP</td>
<td>-</td>
</tr>
</tbody>
</table>

†: Sobel’s test is used in testing the statistical significance of indirect relationship between an independent and a dependent variable through a mediator (Preacher and Leonardelli, 2001). The test generates t-statistics (standard errors) and p-values for the indirect paths. *, **, *** Significant at the 10%, 5%, and 1% one-tailed level, respectively.
Figure 1. Research framework

Strategic Supply Chain Partnership

Antecedents
- Mutual Trust
- Organizational Compatibility
- Top management Support

Implementation
- Strategic Information Sharing
- Operational Information Sharing

Environmental Supply Chain Management

ESCM Practices

Performance Outcome
- Environmental Performance
- Business Performance
Figure 2. Structural model results

Coefficients are significant at * p < 0.1, ** p < 0.05, *** p < 0.01
Solid thick line represents the main storyline of this study.

Model fit: $\chi^2 = 396.144$, d.f. = 237, GFI= 0.818, RMSEA =0.069, and SRMR= 0.086