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Why Go Green: The Influence of Green Practices Coordination on Firm Performance

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ABSTRACT

The aims of the research are to present a model of environmental performance by measuring the effects of a firm's green practice in conjunction with inter-functional coordination mechanisms, and in turn, measure how environmental performance influences firms' economic performance. Moreover, this study synthesizes both ecological modernization theory (EMT) and complementarity theory (CT) as a theoretical lens to develop a comprehensive model. The results of this study showed that green practice-manufacturing coordination and green practice-supply chain coordination have positive effect on environmental performance. However, the relationship between green practice-marketing coordination and environmental performance and the relationship between green practice-IS coordination and environmental performance were insignificant. Moreover, environmental performance is confirmed as an important antecedent of economic performance. Discussion and implications are provided.

Keywords

Green Practices-Manufacturing Coordination, Green Practices-Marketing Coordination, Green Practices-IS Coordination, Green Practices-Supply Chain Coordination, Environmental Performance.

INTRODUCTION

Over the last decade, researchers and practitioners concerned the relationship between the environmental sustainability and firms have investigated why firms respond to environmental issues and how firms lead to increased performance by incorporating environmental practices into their business operations and supply chain (SC) processes (Schroeder et al., 2002). This continues to be a fundamental question facing management theories concerned with sustainability and the environment. To further this investigation, several studies have examined various environmental and pollution prevention strategies including supply chain management (SCM), reverse logistics, and end-of-life product management (e.g. Sarkis, 2003).

A review of prior studies reveals that researchers and practitioners tend to consider the relationship between the environment and economy from two divergent perspectives. These two perspectives suggest two counteracting consequences of the firm: (1) a win-lose game; and (2) a win-win relationship. On one hand, some studies suggest that strategic decisions with ambitious environmental goals come with real economic costs. On the other hand, some researchers suggest a win-win relationship where the interests of all stakeholders can be satisfied (Park et al., 2010). That is, green practices for sustainability offer opportunities as well as challenges. Further, green practices itself should be integrated into firm's functions in order to improve firm's performance. In other words, firms only can lead to increased performance when firms incorporate green practice into their primary business operations.

According to Melville (2010), the topic of sustainability has been studied widely. For example, operation researchers have investigated lean production and environmental performance (King and Lenox, 2001) and sustainable supply chains (Klassen and Vachon, 2003); marketing scholars have examined consumer adoption of green products and the marketing of

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sustainable business initiatives (e.g. Collins et al., 2007). However, the integration of those elements into one research study is underdone. Although many studies provides a compelling theoretical explanation as to why investments in environmental practices can lead to increased profits, there are few empirical studies that have investigated the relationship between green practices and other business operations (Sharma et al., 2010).

Specifically, in recent, the issue of green practices has received more attention among sustainability researchers and practitioners. To contribute to this discipline, this research presents a model of environmental performance by measuring the effects of a firm's green practice in conjunction with inter-functional coordination mechanisms. In particular, this study compared the influence of green practice-IS coordination to the other green practices coordination in explaining environmental performance. Moreover, this study synthesizes both ecological modernization theory (EMT) and complementarity theory (CT) as a theoretical lens to develop a comprehensive model. Thus, this research will be one of the few studies that extend "Green Practices Coordination" with other business operations and that conceptualize and empirically test the impact of "Green Practices Coordination" on firm's performance in the supply chain.

This research uses recent developments in theories of an organization's environmental management (Melville, 2010; Park et al., 2010; Sharma et al., 2010), along with methodological procedures to identify the synergistic effects between green practices and other business operations on firm's environmental performance and economic performance (Bharadwaj et al., 2007). The aim of this research is to measure the roles of green practices coordination in the context of organization. Specifically, this study addressed two research questions: (1) how do green practices associated with various functions in a company (i.e. marketing, manufacturing, IS, and supply chain management) effect firm's environmental performance; and (2) how do these green practices establish the relationship between firm's environmental performance and firm's economic performance.

The remainder of this paper proceeds as follows. The next section reviews the relevant theories of green practices and identifies the antecedents that may lead to increased environmental performance. Section 3 describes our research methods. Section 4 presents the results of the analyses used to validate the hypotheses. Finally, the article closes by discussing the results and their implications in section 5.

THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

Recent studies of the impacts of green SCM have attempted to assess the economic or competitive impacts of green SCM itself, at the firm level. Whilst these studies have delivered several important insights, there is a significant gap relates to empirical evaluations of the competitive impact of green practices. However, the emergent roles of green practices in environmental and economic performance, introduces a new dimension of inter-functional coordination that almost has not been considered, namely, between green practices and other business functions such as manufacturing, marketing, and supply chain processes. To develop our tentative conceptual framework, we integrate perspectives from Ecological Modernization Theory (EMT) and Complementarity Theory (CT).

Ecological Modernization Theory (EMT)

Although there is the opposing view on the effect of environmental sustainable strategy on firm performance, some researches focus on the relationship between green strategy and firm performance (Aragon-Correa, 1998; Klassen and Whybark, 1999; Russo and Fouts, 1997). For example, Bansal and Roth (2000) define competitiveness as "*the potential for ecological responsiveness to improve long-term profitability*".

The aim of Ecological Modernization Theory is to analyze how contemporary industrialized societies deal with environmental crises (Mol and Sonnenfeld, 2000). EMT posits that continued industrial development, rather than inevitably continuing to degrade the environment, offers the best option for escaping from the global ecological challenge (York and Rosa, 2003). Central to EMT is the perspective that the era of modernity offers promise that industrialization, technology development, economic growth, and capitalism are not only potentially compatible with ecological sustainability but also may be key drivers of environmental reform (Mol, 1995). EMT also suggests the possibility that inherent in the process of late modernization is self-referential mechanisms (e.g. the need to internalize environmental impacts in order to ensure future production inputs) that have potential to lead to ecological sustainability (York and Rosa, 2003). The core basis of EMT's commitment is a belief that all crucial, fundamental alternatives to the present economic order have proved infeasible according to various criteria such as economic, environmental, and social (York and Rosa, 2003).Ecological modernization theory (EMT) give a theoretical lens to evaluate the relationship between environmental performance and innovation (Jänicke, 2008). It also encourages organizations to use sustainable technology to help reduce the environmental impact of the rest of their business. EMT emphasizes on the possibility of ecological-economic ''win-win'' solutions that can be achieved, above all, through cost reduction and competition for innovation. According to EMT, the firm's task is therefore to change the direction of technological progress and to put the compulsion for innovation at the service of the environment (Jänicke, 2008).

Despite a broad concept of EMT, in this study, we focus on the effect of environmental performance on financial performance. The theoretical insight of EMT is that technological innovation, such as green SCM, will help organizations improve on both environmental and economic performance. To this extent, EMT suggests that firms can overcome environmental problems as barriers by complementing technological change with organizational change (Park et al., 2010).

Complementarity Theory

Complementarity theory (CT) indicates that the value of an organizational resource can increase super-additively in the presence of other complementary resources (Milgrom and Roberts, 1995). The complementarities among assets or activities across various organizations have been an important research theme in explaining sustainable competitive advantages (Stieglitz and Heine, 2007).

The performance advantages provided by resource complementarities are sustainable (Porter, 1996), since imitating such complementarities is difficult due to the challenges entailed in the simultaneous implementation of all elements (Rivkin, 2001). As complementarities among the resources of the firms create economies of scope and super-additive synergies (Harrison et al., 2001), the crucial implication of complementarities is the synergistic effect which means "an enhancement of resource value and arises when a resource produces greater returns in the presence of another resource than by itself" (Zhu, 2004). The synergistic effect can be generated through complex interactions among complementary resources and it takes time to convert potential complementary resources into value synergies.

CT has focused on the interdependence and coordination among activities. It arises from various factors such as shared resources, and relatedness, commonality, and diversity of knowledge or information. Our focus in this research is on firm-level environmental and economic performance in the context of supply chain, and therefore we examined the key inter-functional and cross-functional coordination between green practices and other functions.

Green Practices Coordination

Coordination is defined as managing the dependencies among activities (Bharadwaj et al., 2007). Polonsky and Rosenberger III (2001) assert that green strategy is affected by external or internal triggers. The former includes *satisfying consumer demand, reacting to a competitor's greening actions, and channel/supplier requests to modify inputs*. Despite the important role of green practices in firm performance, however, the coordination of green practices and the focal firm's primary functions such as manufacturing, marketing, and supply chain has never been formally investigated in both environment management (Sharma et al., 2010). Thus, based on two theories, specifically, we identified four major coordination-related antecedents to both environmental and economic performance: (a) green practice coordination with manufacturing; (b) green practice coordination with marketing; (c) green practice coordination with IS; and (d) green practice coordination with SC.

Green Practice-Manufacturing Coordination

Green manufacturing is related to green supply-chain management (Srivastava, 2007). Dowell et al. (2000) assert that innovations in the manufacturing or production process can reduce or eliminate pollution. Firm's conscious effort to heighten resource efficiency leads to increased environmental performance such as the reduction of pollution and waste. In recent years, many manufacturing firms have adopted green practices that not only promote internal coordination with manufacturing, but also facilitate external coordination with other operations (Seuring and Müler, 2008). Green practices in this area include the techniques for minimizing energy and resource consumption (Srivastava, 2007). In the context of this study, ***Green Practice-Manufacturing Coordination*** refers to "*the extent to which the green practice is associated with manufacturing functions in order to develop and strengthen manufacturing respective goals and activities based on sustainability perspective.*" One of the firm's most important green strategy is to manufacturing sustainable products. It refers all kinds of products that have or aim at an improved environmental and social quality (Rao and Holt, 2005). Greater coordination between green practices with manufacturing facilitates not only the development of sustainable products, but also the development of environmental performance. Hence, we hypothesized:

*H1: **Green Practice-Manufacturing Coordination** has a positive effect on **Environmental Performance**.*

Green Practice-Marketing Coordination

Marketing activities are involved with both production and consumption: they influence product portfolio and the communication efforts of the producer (Rex and Baumann, 2007). Thus, marketing plays a key role in the incipience of a product or service development process as well as at its "end". Green marketing has an important role of "*integrating approach that continually reevaluates how firms can achieve their objectives and meet consumer needs*" in the era of green paradigm (Polonsky and Rosenberger III, 2001). The aim of green marketing is to include environmental issues in the marketing efforts. In other words, if we provide consumers with better information about the green properties of the product offered, they are likely to include this information in their purchasing decisions (Rex and Baumann, 2007). With this aim,

this green marketing requires the coordination among various information and/or activities such as targeting, positioning, promotion based on sustainable paradigm in order to improve environmental performance (Sharma et al., 2010). In the context of this study, ***Green Practice- Marketing Coordination*** refers to "*the extent to which the green practice is associated with marketing functions in order to develop and strengthen marketing respective goals and activities based on sustainability perspective.*" Hence, we argued that:

*H2: **Green Practice- Marketing Coordination** has a positive effect on **Environmental Performance**.*

Green Practice-IS Coordination

IS plays a crucial part in environmental practice of a company. Green Information System refers to an integrated and cooperating set of people, processes, software, and information technologies to support sustainable business process (Watson et al., 2010). The interaction between IS and eco-sustainability performance has received a special attention from few IS scholars (e.g. Molla et al., 2009; Melville, 2010; Watson et al., 2010). A business's capability to comply with the mounting demands of different environmental groups and government regulations and take actions to reduce its environmental impacts might affect its competitiveness (Molla et al., 2009). In this study, we defined ***Green Practice-IS coordination*** as "*the extent to which the green practice is associated with IS functions in order to develop and strengthen IS respective goals and activities based on sustainability perspective.*" In production process, technologies enable the company to design complex production systems and to review cost, material use, and environmental emissions of design options (Berkhout and Hertin, 2004). Moreover, the improvement of coordination mediated by information technology has helped to make supply chains better organized and more efficient (Berkhout and Hertin, 2004). Therefore, by integrating green IS, a company can improve the resource efficiency through greater process control and less polluting.

*H3: **Green Practice-IS Coordination** has a positive effect on **Environmental Performance**.*

Green Practice-SC Coordination

In recent, green SCM is drastically focused by firms. There is a growing need for integrating green initiatives into supply-chain management research and practice (Srivastava, 2007). The integration of green practice into supply chain can be defined as integrating environmental thinking into supply-chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of life management of the product after its useful life (Srivastava, 2007, p. 55). In the context of this study, ***Green Practice-SC Coordination*** refers to "*the extent to which the green practice is associated with Supply Chain functions in order to develop and strengthen SC respective goals and activities based on sustainability perspective.*" The coordination between green practices with SC such as a product's life cycle will eliminate a supply chain's environmental burden and improve their environmental performance (Zhu et al., 2007). Similarly, Srivastava (2007) suggests that adding the green component to supply-chain management involves addressing the influence and relationships between supply-chain management and the natural environment, which, in turn, increase firms' environmental performance. Therefore, we hypothesized:

*H4: **Green Practice-SC Coordination** has a positive effect on **Environmental Performance**.*

Environmental Performance and Economic Performance

Currently, many organizations have an opportunity to deal with sustainable development while improving productivity, reducing costs, and enhancing profitability (Watson et al., 2010). The outcomes of organizational practices and processes are likely to improve the natural environmental may be assessed at the organizational and environmental level such as the economic impacts of pollution reduction and the economic costs and environmental benefits such as reducing the energy costs (Melville, 2010). Most research in the sustainability literatures have shown many empirical evidences that there is a positive relationship between environmental and economic performance (Seuring and Müler, 2008). From EMT perspective, technological innovation, such as environmental management systems (EMS), will facilitate firms improve on both environmental and economic performance. Furthermore, EMT posits that environmental performance increase economic performance by increasing resource efficiency and improving sustainability (Park et al., 2010). Consistent with those previous

*H5: **Environmental Performance** has a positive effect on **Economic Performance**.*

In this research, we developed an integrative model of environmental performance that considers the effects of green practice-manufacturing coordination, green practice-marketing coordination, green practice-IS coordination, and green practice-SC process coordination. Because green practices are increasingly enabled through the coordination with other operations, we posit that there are positive effects of green practice-manufacturing coordination, green practice-marketing coordination, green practice-IS coordination, and green practice-supply chain process coordination on environmental

performance (Bharadwaj et al., 2007). In turn, environmental performance influences economic performance which refers to the decrease of cost for materials purchasing and energy consumption, fee for waste treatment and waste discharge, and fine for environmental accidents (see figure 1).

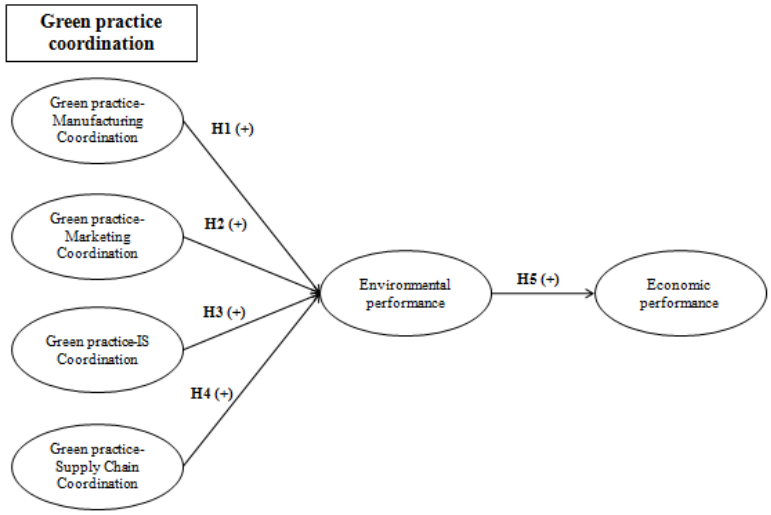

Figure 1. Research Model

RESEARCH METHODS

Sample and Data Collection

We used the survey methodology to collect data for testing the hypotheses. The questionnaire was administered to employees of manufacturing firms in South Korea. Each respondent is responsible for the environmental management practices of his firm. The respondents in our samples are ‘‘key informants’’ who are knowledgeable on the topic of green practices in each firms. By collecting data from them, it can help to assure the validity of sample selection in this study. We collected data using a web survey over a period of two months. In order to maximize the response rate and ensure the data quality, respondents were offered an incentive in the form of cash amounting to $5. A total of 72 were received, however, among those, cases with missing data were excluded. Finally, hypotheses were tested using the final sample of 47. The profile of the firms and respondents is given in Table 1.

The distribution of sample		**Percentage**
Respondent profile	Top management Director Manager Other management	19.1 14.9 51.1 14.9
Company profile (employees)	Below 100 100-200 200-300 300-400 400-500 Over 500	6.4 6.4 4.3 4.3 2.1 76.6
Company profile (2010 annual sales: billion)	Below 0.01 0.01-0.1 0.1-1 1-10 10-100	6.4 8.5 27.7 12.8 44.7

Table 1. Profile of the Respondents and the Firms

Measures

For the measurement items, we adopted existing validated scales and empirical procedures wherever possible and adapted them for this study. The research constructs and their sources are provided in Table 2. All variables were measured with multi-item instruments on a five-point Likert scale anchored from "strongly disagree" to "strongly agree". This research adapts existing scales to fit the study context or develop new scales based on relevant literature and an exploratory study via an interview. As shown in Table 1, scales were adapted and developed from Bharadwaj et al.'s (2007) and Vachon and Klassen's (2006) study. Also, performance scales were adapted from Zhu et al. (2008).

Variables		Sources
Independent Variables	Green Practice-Manufacturing Coordination	(Bharadwaj et al., 2007) and (Vachon and Klassen, 2006)
	Green Practice-Marketing Coordination	(Bharadwaj et al., 2007) and (Vachon and Klassen, 2006)
	Green Practice-IS Coordination	(Bharadwaj et al., 2007) and (Vachon and Klassen, 2006)
	Green Practice-SC Coordination	(Bharadwaj et al., 2007) and (Vachon and Klassen, 2006)
Mediating Variable	Environmental Performance	(Zhu et al., 2008)
Dependent Variable	Economic Performance	(Zhu et al., 2008)

Table 2. Research Variables and their Sources

RESULTS

This study used structural equation modeling called Partial Least Squares (PLS) to analysis the research model. PLS enables the researchers to place minimal demands on sample size and residual distribution (Chin, 1998). PLSGraph3.0 was used to perform the analysis.

Measurement Model

This study assessed the measurement model for reliability, convergent validity, and discriminant validity. First, overall, the reliability of the measurement scales is satisfied. The CFA results scales used in the study are above the threshold. However, two items in environmental performance (EVP4 and EVP5) were removed because of their poor factor loading. All items except item in environmental performance (EVP1) exhibit high loadings (>.70) on their respective constructs (Agarwal and Karahanna, 2000). As illustrated in table 3, composite reliability (CR) scores are greater than 0.90, which is very higher than the recommended cut-off (0.7), and average variance extracted (AVE) scores are greater than 0.50 (Gefen et al., 2000), supporting convergent validity. Finally, discriminant validity was assessed in two ways: (1) this study examined the cross loadings showed that no item loads more highly on another construct than its own construct; (2) this study compared the square root of AVEs from each construct with its correlations with the other constructs as a test of discriminant validity (shown on the Table 3 diagonal). All constructs pass the discriminant validity tests (Gefen et al., 2000) (see table 3). . In addition, one factor analysis was also run to demonstrate that there is no common factor loading on all measures. A single factor explained 49% of variances, indicating there was no common method bias on all measures (Podsakoff et al., 2003).

Construct	CR	AVE	Mean	SD	GP_MF	GP_MK	GP_IT	GP_SC	EVP	ECP
GP_MF	0.974	0.881	3.573	0.837	**0.939**					
GP_MK	0.958	0.820	3.323	0.742	0.601	**0.906**				
GP_IT	0.974	0.881	3.215	0.877	0.618	0.687	**0.939**			
GP_SC	0.962	0.836	3.300	0.805	0.614	0.734	0.705	**0.914**		
EVP	0.862	0.678	3.461	0.587	0.536	0.474	0.477	0.548	**0.823**	
ECP	0.884	0.655	3.341	0.673	0.389	0.340	0.455	0.369	0.617	**0.809**

Legend: GP_MF: Green Practice-Manufacturing Coordination; GP_MK: Green Practice-Marketing Coordination; GP_IT: Green Practice-IT Department Coordination; GP_SC: Green Practice-Supply Chain Coordination; EVP: Environmental Performance; ECP: Economic Performance. The bold numbers on the leading diagonal are the square root of the variance shared between the constructs and their measures.

Table 3. Descriptive Statistics and Inter-construct Correlations

Structural Model

The results of the PLS analyses for the structural model is summarized in Table 4 and Figure 2. The path coefficients *t*-values for the PLS structural model were computed using 300 re-sampling with bootstrapping (Chin et al., 2003). All of constructs were modeled as reflective. PLS results provide strong support for hypothesis 1 and 4. Hypotheses 2 and 3, which posited that green practice-marketing coordination and green practice-IS coordination would influence environmental performance were not supported. Lastly, the result showed that the path from environmental performance to economic performance was significant, supporting H5. Green practice-manufacturing coordination and Green practice-supply chain coordination together explain 36.7% of the variance in environmental performance. Environmental performance accounts for 38.1% of variance in economic performance.

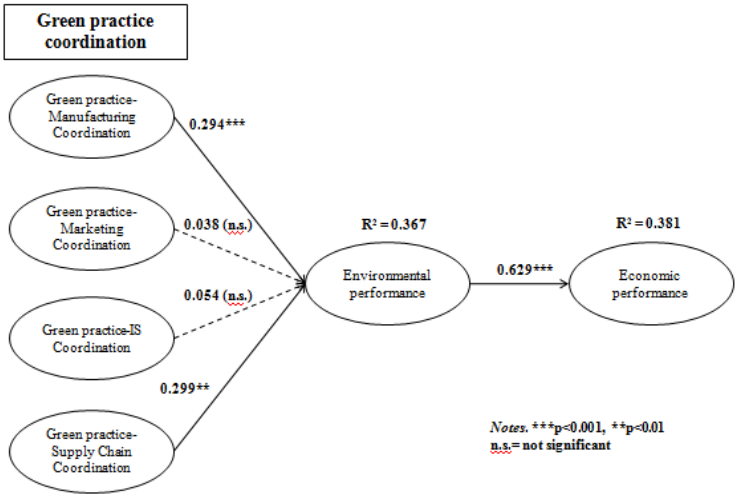

Figure 2. PLS Results

Hypothesis		Path Coefficient	Support
H1	Green Practice-Manufacturing Coordination → Environmental Performance	0.294***	Yes
H2	Green Practice-Marketing Coordination → Environmental Performance	0.038	No
H3	Green Practice-IS Coordination → Environmental Performance	0.054	No
H4	Green Practice-SC Coordination → Environmental Performance	0.299**	Yes
H5	Environmental Performance → Economic Performance	0.629***	Yes

****p<0.01; **p<0.01*

Table 4. Hypotheses Result

DISCUSSION, LIMITATIONS, AND FUTURE RESEARCH DIRECTIONS

Despite the rise of interests in environmental sustainability, few have attempted to address empirically the links among green practices, their coordination with other operations, and its consequences on organizational performance (Sharma et al., 2010). Thus, this study focused primarily on the conceptualization and measurement of green practice coordination and their impacts on both environmental and economic performance.

First, this study presents a model of environmental performance by measuring the effects of a firm's green practice in conjunction with inter-functional coordination mechanisms. We conceptualized green practices coordination with other operations (i.e. green practice-manufacturing coordination, green practice-marketing coordination, green practice-IS coordination, and green practice-SC coordination).

Second, we investigated the effects of those four green practices coordination on both environmental and economic performance. The results show that green practice-manufacturing coordination is important to environmental performance. Furthermore, our findings also reveal that green practice-supply chain coordination positively influences environmental

performance, indicating the importance of clear environmental in life-cycle production to gain better environmental performance (Sharma et al., 2010). These results imply that firms that enjoy an ecological reputation will seek business suppliers that also are taking environmentally responsible actions.

However, our unanticipated result is that green practice-marketing coordination does not influence environmental performance. One possible explanation may be related to the nature of information itself. The integration of green practice into marketing function should be collaborated with environmental awareness of both consumers and companies (Rex and Baumann, 2007). Once a company develops a green marketing, a proper marketing mix is likely to focus on consumers, not directly on environment. The study also shows that there is no a relationship between green practice-IS coordination. The first reason can be associated with the direct effect of green technology. As indicated by Berkhout and Hertin (2004), the direct effects of IS/IT are generally negative and stem from the production, use and disposal of hardware. They are not make a significant different from the environmental effects of many other products, but pose a number of specific problems in terms of both resource use, emissions and waste management. By adopting green practice, companies need to shift their existing process and generally this process requires a long term implementation.

Finally, the results of this study support that environmental performance influences economic performance. These results imply that economic performance which has been influenced by environmental performance may motivate firms to participate in green practices (Vachon and Klassen, 2006). Eco-sustainability has emerged not only as an important organizational challenge but also opportunity to create competitive advantage (Melville, 2010; Molla et al., 2009). Thus, balancing economic and environmental performance is the key issue.

Although the present study offered several contributions to the literature concerning green practices, we acknowledge the limitations of this study. First, all of our samples were located in South Korea and the sample is a little skewed toward smaller firms. Hence, the interpretation of our results is subject to the constraints of cultural characteristics of smaller firms as well as one country. In order to increase the external validity of the findings of this study, future research incorporating a sample from multiple companies in other countries is needed. Second, several researches assert that the perspectives of the partners in supply chain differ in regard to their cooperative relationships such as knowledge exchange (Kim et al., 2010). Thus, future research needs to determine whether the attitudes to green practices differ, and, if so, to explain why.

The results of this study make several contributions to IS literature and practitioners. Our study was one of the first to provide empirical evidence that the impacts of green practice coordination on both environmental and economic performance. Even though the relationship between green practice-IS coordination was insignificant, it does not indicate that Green IS is not important. It is likely that this IS should be integrated with manufacturing process or supply chain process over a long period in order to improve environmental performance in the future (Berkhout and Hertin, 2004). A further research should validate this result. This study also shows that green practice-manufacturing coordination and green practice-supply chain coordination played significant role in environmental performance. Also, environmental performance is confirmed as the important antecedents of economic performance. Moreover, this research provides a reasonable answer why organizations should be encouraged to go green. A cooperative strategy with suppliers, which can facilitate the introduction of new greener products and cooperate in green strategy, needs to induce suppliers to go green.

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