A Dissertation

entitled

Developing a Focal Firm's Sustainable Supply Chain Framework:

Drivers, Orientation, Practices and Performance Outcomes

by

Ma Ga Yang

Submitted to the Graduate Faculty as partial fulfillment of the requirements for the

Doctor of Philosophy Degree in Manufacturing and Technology Management

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An Abstract of

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As global pressures to address climate change intensify, the costs of natural resources increase, public health and safety concerns grow, and diverse consumption patterns emerge, sustainability has become critical for competing in international markets (Epstein, 2008; Lubin and Esty, 2010; Wu and Pagell, 2011). The goal of sustainability is grounded in the concept of the triple bottom line, which indicates that balancing objectives related to profits, the planet, and people is essential for corporations as they grow and compete in the global economy (Kleindorfer et al., 2005).

Taking advantage of a broad and systemic approach to addressing sustainability issues, researchers increasingly acknowledge that linking sustainability with the supply chain is a crucial step for operations management (Hall, 2000; Zhu and Sarkis, 2004; Koplin et al., 2007; Matos and Hall, 2007). Despite a growing number of studies on sustainability from the point of view of the supply chain (Linton et al., 2007; Carter and Rogers, 2009; Pagell and Wu, 2009; Pullman et al., 2009), few researchers have developed an empirically based integrative research framework grounded in relevant theories. In particular, the literature lacks research that empirically examines the nomological network of sustainable supply chain encompassing drivers, strategy, practices, and performance outcomes with consideration for all three dimensions of sustainability (economic, environmental, and social performance) (Elkington, 1994, 1997; Kleindorfer et al., 2005; Seuring and Muller, 2008).

Drawing from the theoretical lenses of institutional theory (DiMaggio and Powell, 1983), strategic choice theory (Child, 1972), strategic orientation (Venkatraman, 1989), and the resource-based view of firms (Barney, 1991), this dissertation presents a framework, by taking a holistic view, of a sustainable supply chain aimed at explaining the relationships between the antecedents, strategic orientation, supply chain practices, and performance outcomes.

To develop reliable and valid instruments, this study conducted vigorous research methods, including pretest, structural interview, and pilot study (n=34). The hypothesized relationships in the proposed model are tested using structural equation modeling (SEM) from a large-scale survey of 212 U.S. manufacturing firms. Adopting Anderson and Gerbing's (1988) two-step approach, this study first tested confirmatory factor analysis (CFA) measurement model to establish validity and reliability of the scales. Next, the structural relationships were tested. Overall, 10 out of 15 hypotheses are supported, indicating that the proposed model may need to be revised. To find alternative significant paths, revised structural model with additional paths is conducted.

The empirical findings suggest that (1) external pressures (EPs) not only have a direct effect on firms' strategic sustainability orientation (SSO), but also have an indirect effect on it through top leadership culture (TLC) for sustainability, (2) higher SSO

enables firms to implement sustainable supply chain–based activities, (3) sustainability performance is realized only through firms' internal operations management practices, (4) supplier management practices do not have a direct effect on sustainability performance, rather they indirectly influence sustainability performance through their effect on operations management practices, and (5) customer management practices influence the social dimension of a firm's sustainability performance.

In sum, the contributions of this research are threefold: (1) identifying sustainable supply chain practices that consider the triple bottom line perspective in the context of the U.S. manufacturing industry, (2) identifying and developing the constructs for focal firms' sustainable supply chains, encompassing drivers, SSO, core sustainability practices, and performance outcomes, and (3) empirically validating how firms generate sustainable competitive advantage through sustainable supply chain practices.

First of all, I dedicate my dissertation work to God, my true Father and His Son, Jesus Christ. A special gratitude to my parents, Dr. Mark Yang and Anna Yang, who relentlessly supported me and prayed for me in love throughout the entire doctoral program.

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Chapter 1

Introduction

Over the past decade, sustainability has risen to prominence as firms vigorously pursue competitive advantage in a turbulent global environment (Elkington, 1994, 1997; Kleindorfer et al., 2005; Sharma and Henriques, 2005; Epstein, 2008; Mukherjee and Muga, 2010; Sarkis et al., 2010). The term *sustainability,* or sustainable development, has been popularized in almost every facet of society, including government (Tsai and Chou, 2008; Saha, 2009), higher education institutions (Allen-Gil et al., 2005; Fullan, 2005; Segalà et al., 2010; Waheed et al., 2011), corporations (Jennings and Zandbergen, 1995; Starik and Rands, 1995; Pullman et al., 2009; Hannon and Callaghan, 2011), local communities (Reed et al., 2006; Quak and de Koster, 2007), supply chains (Linton et al., 2007; Carter and Rogers, 2008; Seuring and Muller, 2008; Wu and Pagell, 2011), and global societies (Hart, 2007). Sustainability has been broadly defined as “development that meets the needs of the present without compromising the ability of future generations to meet their needs” (World Commission on Environment and Development, 1987, p. 8).

Since the release of Brundtland Report (WCED, 1987), sustainability has made a significant transition from a technical concept to a global, political, and mainstream business issue (Linton et al., 2007). Organizations have begun to address sustainability as a megatrend, just as firms of the 1970s and 1980s coped with quality improvement efforts and the IT revolution (Lubin and Esty, 2010). For example, a recent global survey conducted by KPMG suggested that over 80% of the Global Fortune 250 firms generated annual sustainability reports in 2008 to disclose their sustainability initiatives and performance (KPMG, 2008). Global firms like Toyota, McDonald, Interface, Wal-Mart, Starbucks, and Proctor & Gamble have made strategic commitments to respond to the sustainability trend (Simison and White, 1999; Kotler and Lee, 2005; Goldberg and Yagan, 2007; Plambeck, 2007).

Without comprehensible guidelines and frameworks, the macro-level definition of sustainability has little relevance to practical sustainability issues (Carter and Rogers, 2008). One concept that researchers have suggested guide the implementation of sustainability initiatives is the triple bottom line perspective (Elkington, 1997; Kleindorfer et al., 2005; Carter and Rogers, 2008). The triple bottom line defines sustainability as concurrent achievement of three objectives—economic viability, environmental stewardship, and social well-being (Carter and Rogers, 2008). This perspective of sustainability is widely accepted by practicing managers and academic researchers alike. Adopting this view of sustainability, the Association for Operations Management (APICS) states, "Sustainability occurs when a corporation's processes, products, and services are aligned in a way that is socially, economically, and environmentally responsible." In line with this, Lee Scott, the former CEO of Wal-Mart, stated, "Being a good steward of the environment and in our communities, and being an efficient and profitable business, is not mutually exclusive. In fact they are one in the same." (Twenty First Century Leadership, October 24, 2005)

Kleindorfer et al. (2005) suggested that to answer the call of the new business environment, firms must strive to accommodate the diverse needs and interests set by multiple stakeholders, such as supply chain members (suppliers and customers), local communities, and nongovernmental organizations (NGOs). In addition to boosting profitability (economic), a firm's efforts should extend to fostering relationships with the planet (environmental) and people (social) (Kleindorfer et al., 2005). Reviewing the literature related to sustainability, Seuring and Muller (2008) recognized that a growing number of studies have begun to integrate all three dimensions of sustainability in their conceptual or case-based research (Diniz and Fabbe-Costes, 2007; Koplin et al., 2007; Svensson, 2007).

Beske et al. (2008) examined how three standards of sustainability were applied to evaluating suppliers of the Volkswagen AG in Germany. Bai and Sarkis (2010) suggested the integration of three dimensions of sustainability into the selection of suppliers using grey system and rough set methodologies. Adoption of the triple bottom line perspective necessitates that organizations expand their focus from the single criterion of economic performance to the three dimensions of sustainability (economic, environmental, and social performance) (Angell and Klassen, 1999; Jimenez and Lorente, 2001; Pagell and Wu, 2009). The simultaneous consideration of economic, environmental, and social priorities can provide firms with a competitive advantage, enabling them to edge out competitors in winning target customers (Hill, 2000; Mason-Jones et al., 2000).

Economic criteria include indicators of traditional operational performance, such as cost, quality, flexibility and delivery, as well as measures of market and financial performance (profitability, sales growth, and market share) (Narasimhan and Kim, 2002;

Rosenzweig et al., 2003; Kristal et al., 2010). Fulfilling economic performance goals remains firms' dominant objective because, without meeting high standards of operational and business priorities in a highly competitive marketplace, their survival is hardly guaranteed.

Environmental criteria primarily consist of two aspects: minimizing the negative impact of environmental wastes and risks and improving the efficiency of consuming resources in terms of wastes, products, and energy (Beamon, 1999; Zhu and Sarkis, 2004; Hervani et al., 2005; Matos and Hall, 2007; Jacobs et al., 2010). Firms that intend to be environmentally friendly need to achieve two outcomes: innovation of their facilities to realize a high level of resource efficiency and reduction of negative environmental pollutants. Such endeavors will help firms conform to societal demands of sustainability and to satisfy environmentally conscious customers. Thus, a major concern of business managers is improving the environmental aspects of their company (Handfield et al., 1997; Sarkis, 2001; Pagell and Wu, 2009).

Social criteria are grounded in corporate social responsibility (CSR), which highlights an organization's public acts of good citizenship (Carroll, 1979, 1991; Wood, 1991; Drumwright, 1994; Orlitzky et al., 2003; Luo and Bhattacharya, 2006). The literature suggests two aspects of social performance: an internal aspect, which relates to employee well-being and equity (Brown, 1996; Hanna et al., 2000; Daily and Huang, 2001; Vachon and Mao, 2008; Pagell and Gobeli, 2009; Pullman et al., 2009), and an external aspect related to community performance indicators, such as corporate philanthropic commitment (Montabon et al., 2007; Carter, 2004; Vachon and Mao, 2008; Pagell and Gobeli, 2009; Pullman et al., 2009; Jacobs et al., 2010).

Increasingly, companies' efforts to address sustainability have extended beyond their internal operations to their suppliers' capabilities and to helping suppliers meet sustainability standards and satisfy customers' sustainability expectations. Incidents such as the Mattel toy recall (2007) and Unilever's palm oil contract suspension suggest that suppliers' failure to meet environmental standards has a substantial negative impact on focal companies, such as immediate financial losses and long-term reputation damage (Stenson, 2006; Kovács, 2008; Zhang et al., 2011). Firms like Nike and Adidas have struggled to address social equity issues such as inhumane working conditions (Preuss, 2001; Graafland, 2002; Seuring and Muller, 2008). These environmental and social problems primarily come from suppliers beyond the direct control of focal companies. Thus, firms increasingly realize the importance of engaging with supply chain partners to better manage sustainability.

In light of the growing importance of merging sustainability into supply chain, the concept of sustainable supply chain management (SSCM) has emerged. SSCM is used to meet the environmental and social expectations of multiple stakeholders, including supply chain members, as well as to maintain competitiveness (i.e., profits) by fulfilling customer needs and meeting traditional operational and business performance indicators (Carter and Roger, 2008; Seuring and Muller, 2008). In this study, SSCM is defined as a focal company's intra- and inter-organizational practices to manage upstream efforts, internal operations, and downstream activities in order to simultaneously achieve economic, environmental, and social performance.

Increasingly, firms learn lessons about the impact of sustainability throughout their supply chains. For example, McDonald found that sustainability is best achieved through a sustainable supply chain that yields high-quality, safe products and allows for caring for employees and their communities and preserving environment without interrupting supplies (Goldberg and Yagan, 2007). Studies have confirmed that linking sustainability to the supply chain is a crucial step and, ultimately, brings better sustainability performance (Zhu and Sarkis, 2004; Linton et al., 2007; Vachon and Mao, 2008).

Zhu and Sarkis (2004) found positive relationships between green supply chain practices and both economic and environmental performance. Linton et al. (2007) stressed the importance of looking at sustainability from the broad angle of the supply chain, which includes product design, by-product manufacturing, by-products produced during product use, product life extension, product end-of-life, and recovery processes at end-of-life. Vachon and Mao (2008) indicated that supply chain strength is positively linked to environmental and social sustainability, as well as to economic performance. Based on the literature, this dissertation presents a framework which explicitly examines the impact of a focal firm's SSCM practices on its economic, environmental, and social performance.

1.1. Problem Statement (Research Gaps)

The following research gaps are identified in the current sustainability and supply chain literature. First, an extensive review of the literature revealed that simultaneous examination of three dimensions of sustainability (economic, environmental, and social) under the unifying umbrella of sustainability is lacking (Seuring and Muller, 2008). Scholars acknowledged the deficit of studies that integrate all three dimensions of sustainability in the supply chain literature and called for research to fill this gap in literature (Boyd et al., 2007; Diniz and Fabbe-Costes, 2007; Linton et al., 2007; Matos and Hall, 2007). Although several studies have examined the three criteria of sustainability (Diniz and Fabbe-Costes, 2007; Koplin et al., 2007; Carter and Rogers, 2008; Beske et al., 2008; Bai and Sarkis, 2010), these studies are mostly anecdotal, conceptual, or case-based. Studies that have examined the impact of sustainability initiatives on performance outcomes using large-scale surveys remain fragmented making triangulation and generalization of results very difficult. In fact, there is a dearth of research that empirically examines and validates the consequences of sustainability while simultaneously examining the three dimensions of sustainability (Pullman et al., 2009).

Second, the literature is lacking in terms of illumination of two crucial antecedents, or drivers, of adoption of sustainability initiatives: (a) external pressures and (b) internal culture created by top leadership. Several studies investigated how focal firms perceive pressures from an external environment (DiMaggio and Power, 1983; Heugens and Lander, 2009) and how these pressures (mimetic, coercive, and normative pressures) influence an organization's adoption of interorganizational or environmental management practices (Teo et al., 2003; Delmas and Toffel, 2004; Darnall et al., 2008; Liu et al., 2010). In examining this direct relationship between external pressures and adoption of practices, these studies ignore the firm's orientation, which is an important intervening mechanism that translates the influence of pressures to implemented practices.

Researchers have often examined how top management plays a crucial role in forming the values and directions of an organization (Hambrick and Mason, 1984; Kotter, 1990), supporting strategic initiatives (Chen and Paulraj, 2004; Li et al., 2005), and motivating employees to be involved in certain activities (Kornbluh et al., 1989; Florida, 1996; Hanna et al., 2000; Daily and Huang, 2001). However, few endeavors have been made to examine how top management creates a culture that leads to the adoption and implementation of sustainability initiatives (Defee et al., 2009).

Third, the literature is fragmented in terms of identifying and developing supply chain practices that are important to meeting the three objectives of sustainability. One limitation is heavy focus on economic and environmental sustainability and lack of attention to the social dimension of sustainability (Shrivastava, 1995; Starik and Rands, 1995; Seuring and Muller, 2008). Another limitation is that the research has focused on each dimension of sustainability in isolation:

- Economic—quality management (QM), just-in-time (JIT) practices, revenue generation, productivity enhancement, and market share expansion (Shah and Ward, 2003, 2007; Corbett and Klassen, 2006; Yang et al., 2010)
- Environmental—green purchasing, eco-product design, cleaner process technology, environmental management systems (EMSs), product life extension, reverse logistics, closed-loop supply chains, and green supply chains (Beamon, 1999; Zhu and Sarkis, 2004; Klassen and McLaughlin, 1996; Bowen et al., 2001; Melnyk et al., 2003; Montabon et al., 2007)
- Social—workplace safety, employee well-being, ethical sourcing, purchasing social responsibility, and social responsibility buying (Brown, 1996; Carter, 2000; Carter, 2004; Vachon and Klassen, 2006; Koplin et al., 2007).

Pullman et al. (2009) examined how a focal firm's environmental and social practices lead to environmental performance and, in turn, economic performance (cost and quality improvements). However, Pullman et al. lacked instruments related to social sustainability practices in that they only considered internal aspects of social practices related to employees such as worker quality of life, worker skill development, worker job satisfaction and fair compensation, which made their study incomplete.

1.2. Research Questions and Objectives

To fill these research gaps, this dissertation develops an integrative research model to investigate how a focal firm addresses all three aspects of sustainability in the supply chain. Toward this end, the following research questions are identified:

1. Do external pressures and the culture created by top leadership positively influence strategic sustainability orientation (SSO)?
2. How does SSO influence the supply chain management practices adopted by firms?
3. What supply chain management practices do firms implement to bring about favorable sustainability performance?
4. Do SSCM practices positively influence corresponding sustainability performance outcomes?

To address these research questions, this dissertation develops a framework that examines (a) external pressures and top leadership culture as important antecedents/drivers of a focal firm's sustainability; (b) SSO that arises in response to both external pressures and the culture created by top leadership; (c) major constituents of SSCM practices i.e., supplier evaluation/development, just-in-time, environmental design, Environmental Management Systems (EMSs), employee well-being/equity, corporate social involvement, and customer management; and (d) sustainability performance outcomes. Due to the inclusive nature and complexity of the model, four established theories are employed to support the theoretical framework: institutional theory (DiMaggio and Powell, 1983), strategic choice theory (SCT) (Child, 1972), strategic orientation (Venkatraman, 1989), and the resource-based view (RBV) of the firm (Barney, 1991).

1.3. Contributions

A major contribution of this study is the empirical examination of a comprehensive sustainable supply chain framework that elucidates the relationships between drivers, strategic orientation, implementation and outcomes. A two step process is employed to establish this framework. The first step is to examine how firms formulate strategy (i.e. the relationships between drivers and strategic orientation). The next step is to find the specific ways of effectively implementing strategy to create favorable performance outcomes (i.e. the relationships between strategic orientation, implementation and outcomes) (Lubin and Esty, 2010). Research that empirically validates the sustainable supply chain practices of a manufacturing firm and encompasses components of drivers, strategic orientation, implementation and outcomes is lacking in the current sustainability literature. By using 212 data from U.S. manufacturing industry, this research reexamines and revalidates and adds to the fragmented results of previous investigations into the impact of sustainability on outcomes under a sustainable supply chain framework.

Another contribution of this study is to build up a holistic framework of a sustainable supply chain that simultaneously considers three dimensions of sustainability. This goal is a response to the call from scholars for more research into this area of study (Kleindorfer et al., 2005; Linton et al., 2007; Seuring and Muller, 2008). Firms' efforts to be sustainable throughout their supply chain are a reflection of their proactive responses to the complex business environment. As the scope of supply chains widens, firms often face challenges in managing supplier relationships and sustainability compliance across supply chains. Mattel's lead pain toy recalls were largely attributable to the mismanagement of supplier quality and the failure of compliance issue, which led to the negative impacts on firms' economic and environmental performance. Thus, it is important for focal firms to maintain and increase supplier quality and to reduce pollutants in the production and distribution processes. This study, in particular, sheds light on how firms manage suppliers, internal operations, and customers in ways to enhance sustainability. By proposing a holistic approach to the supply chain, this study aims to elucidate how firms achieve competitive advantage through implementing sustainability practices.

The organization of this dissertation is as follows. Chapter 2, titled "Theory Development," introduces the theories that underpin the research framework and includes a careful examination of research variables related to a focal firm's sustainability from the supply chain perspective. Based on the literature review and theory development, this chapter presents an integrative research framework of sustainability of a focal firm that addresses sustainability drivers, SSO, supply chain practices for suppliers, internal operations and customers, and sustainability performance. Then, the interrelationships among constructs are developed in the form of hypotheses. Chapter 3, titled "Instrument Development Phase I–Item Generation and Pilot Test," provides the research methodology for generating items for measurement instruments. This section includes pre-testing with practitioners and academicians, a structural interview, and a pilot study. Chapter 4, titled, "Instrument Development Phase II–Large Scale Administration and Instrument Validation," reports the results of large-scale survey, reliability and validity. In Chapter 5, titled, "Structural Model Analysis and Results," the results of hypotheses testing are provided, using structural equation modeling methodology. Chapter 6, titled, "Summary, Implications, Limitations, and Future Research," concludes the dissertation with the summary of research findings and contributions, significant theoretical and managerial implications, limitations of this study, and recommendations for future research.

Chapter 2

Theory Development

2.1. Research Framework

Drawing from institutional theory (DiMaggio and Powell, 1983), SCT (Child, 1972), strategic orientation (Venkatraman, 1989), and the RBV of the firm (Barney, 1991), this study will explore the interrelationships among sustainability drivers, strategy, practices, and performance (Figure 2-1).

Using institutional theory, this study will examine how external pressures trigger firms' SSO (H1). This study will elucidate why firms are oriented toward sustainability under different pressures through the theoretical perspective of obtaining social legitimacy (DiMaggio and Power, 1983; Heugens and Lander, 2009). Drawing from institutional theory, this research also examines how firms change their organizational structure and cultural norms (i.e., top leadership culture) to gain social legitimacy among external stakeholders such as competitors, governmental regulators, supply chain members, and NGOs (Rogers et al., 2007) (H2). From the perspective of SCT, this research examines how top management, using freedom of choice (discretion, interpretation, and perspective), creates a culture that influences firms' orientation to adopt sustainability initiatives (Sharma, 2000) (H3). Thus, the research framework will validate the process of creating a sustainability orientation (i.e. its antecedents) by relying on the theoretical perspectives of institutional theory and strategic choice theory.

Further, SSO is proposed as a vital organization-wide orientation that allows firms

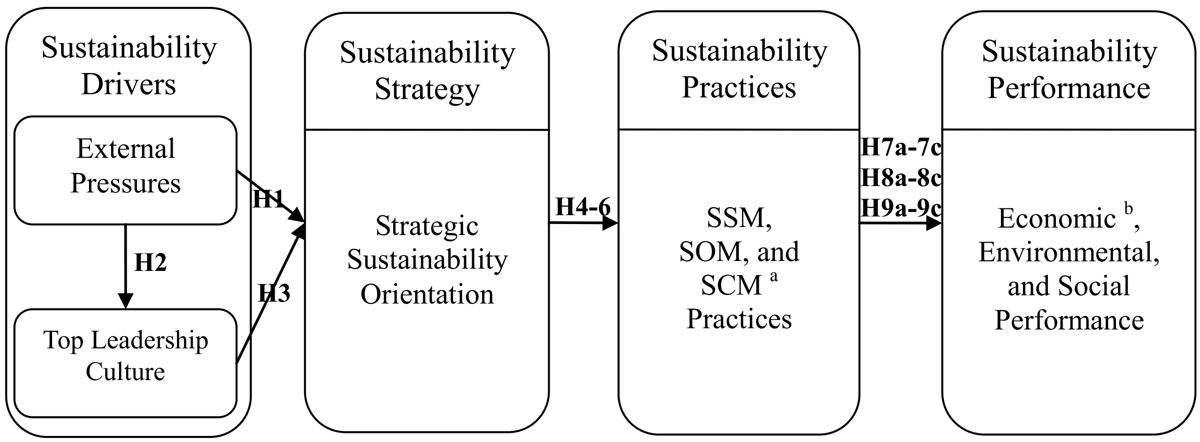


Figure 2-1. Research Framework

[a] SSM refers to sustainable supplier management; SOM refers to sustainable operations management; SCM refers to sustainable customer management.
[b] Economic performance refers to operational, market, and financial performance.

to invest different types of resources to implement economic, environmental, and social practices for sustainability (H4–H6). Finally, using the logic of the RBV, this study examines how sustainable supply chain practices, such as practices related to upstream suppliers, internal operations, and downstream customers, give firms a competitive advantage (H7a–H9c). In the next sections, each theoretical perspective is presented in a comprehensive way.

2.2. Institutional Theory

Institutional theory describes how external pressures influence an organization (DiMaggio and Powell, 1983; Roberts and Greenwood, 1997; Heugens and Lander, 2009). Institutional theory asserts that “firms operate within a social framework of norms, values, and taken-for-granted assumptions about what constitutes appropriate or acceptable economic behavior" (Oliver, 1997, p. 699). Socially constructed restrictions, such as norms, habits and customers, are important considerations when individuals or firms make economic decisions—not to mention the surrounding conditions of technological, informational, and income limits. Institutional theory suggests that social factors, such as social justification or social obligation, are the most important sources of influences on organizational structure and adoption of innovative practices (Rogers et al., 2007). Thus, from the perspective of institutional theory, most actions that an organization takes may be explained as symbolic attempts to influence and maintain legitimacy perceptions among key stakeholders, rather than as rational efforts to operate efficiently (Rogers et al., 2007).

Individuals and organizations "are assumed to be approval seeking, susceptible to social influence, and relatively obstinate creatures of habit and tradition" (Oliver, 1997, p. 699). Firms conform to social expectations and requirements set by various stakeholders, such as supply chain members, governmental regulators, and industry competitors, because organizational survival and success hinges on meaningful interactions with these stakeholders (DiMaggio and Powell, 1983; Baum and Oliver, 1991; Dacin et al., 2002). Firms respond to external relationships when organizational environments "are characterized by the elaboration of rules and requirements to which individual organizations must conform if they are to receive support and legitimacy" (Scott and Meyer, 1983). Firms also conform "because they are rewarded for doing so through increased legitimacy, resources, and survival capabilities" (Scott, 1987, p. 498).

A prominent argument relies on the notion of institutional isomorphism, which suggests that firms operating in similar fields are likely to adopt homogenous organizational forms and practices because they experience similar social pressures and stakeholder expectations (DiMaggio and Powell, 1983; Liu et al., 2010). Homogeneity pressures may be mimetic, whereby firms imitate the strategies of others as a hedge against uncertainty about their relative efficiency; coercive, as in the case of regulatory constraints that essentially force firms to adapt and behave in similar ways; or normative in the sense that social expectations may encourage the use of a particular practice (DiMaggio and Powell, 1983; Haunschild and Miner, 1997).

Scholars increasingly publicize institutional theory as an important perspective for studies on adoption of innovative supply chain practices (Heugens and Lander, 2009; Ketokivi and Schroeder, 2004; Rogers et al., 2007; Teo et al., 2003). They argue that institutional pressures emanating from the external environment and transmitted through operational channels can strongly affect a firm's inclination toward innovation adoption. Rogers et al. (2007) further contended, "Arguments from institutional theory can contribute to a better understanding of the social context of OM and SCM strategies" (p. 569). Further, Teo et al. (2003) suggested that the Internet-enabled supply chain innovations are driven more by institutional rationale than technical reasoning. Jennings and Zandbergen (1995) examined how coercive forces can affect firms' adoption of environmental management practices. They argued that because coercive forces such as regulations and regulatory enforcement have been the main impetus of environmental management practices, firms throughout the industry have implemented similar practices.

Delmas (2002) presented three perspectives (i.e., regulatory, normative, and cognitive) on why firms adopt ISO 14001 at different rates across countries. Delmas and Toffel (2004) questioned whether or not the institutional perspective addresses the fundamental issue of business strategy, by asking, "Why do organizations subject to the same level of institutional pressure pursue different strategies?" Their conclusion was that the difference between objective and perceived pressures leads to different responses. The adoption of environmental management practices by firms varies, therefore, not only due to different levels of institutional pressures, but also because of the organizational process that transforms objective pressures into perceived pressures. In a similar vein, institutional theory provides the foundational rationale for examining the drivers of adopting sustainability initiatives (Jennings and Zandbergen, 1995; King and Lenox, 2000; Lounsbury, 2001).

2.3. Strategic Choice Theory

SCT (Child, 1972) suggests the significant role that managerial discretion, interpretation, and perspective play in strategic decision making during the course of sharing organizational actions. SCT helps to explain why firms take proactive and committed actions toward urgent issues such as sustainability. The theory takes the perspective of managers' strategic choices when focal firms face external challenges (Child, 1972, 1997). SCT suggests that organizations have freedom of choice when formulating and implementing organizational strategies in response to environmental challenges to ensure effective outcomes.

Instead of feeling constrained, "organizations are continuously constructed, sustained, and changed by actors' definitions of the situation – the subjective meanings and interpretations that actors impute to their words as they negotiate and enact their organizational surroundings" (Astley and Van de Ven, 1983, p. 249). According to SCT, "both environment and structure are enacted to embody the meanings and actions of individuals. Managers are regarded as performing a proactive role; their choices are viewed as autonomous, and their acts are viewed as energizing forces that shape the organizational world" (Astley and Van de Ven, 1983, p.249).

SCT implies that the proactive response of top leadership results in a high level of commitment to sustainability initiatives over time and that different managerial attitudes/perspectives of similar sustainability challenges (e.g., economic, environmental, and social pressures) will result in different courses of action. Key to SCT is translating managerial foresight into sustained strategic commitment to addressing obvious and emerging stakeholders' pressures (Jørgensen and Jørgensen, 2009). In summary, proactive responses to sustainability issues allow firms to meet emerging market opportunities and, in turn, ensure competitive advantage (Andersson and Bateman, 2000; Sharma, 2000).

2.4. Strategic Orientation

Strategic orientation is a firm's overall direction and objectives toward an external business environment driven by top management (Venkatraman, 1989; Voss and Voss, 2000). In other words, it is "how an organization uses strategy to adapt or change aspects of its environment for a more favorable alignment" (Manu and Sriram, 1996, p. 79). Strategic orientation is also known as strategic fit, strategic preposition and strategic thrust, (Manu and Sriram, 1996). Organizational effectiveness is achieved mainly through having the right strategic orientation so that "it represents the competitive strategy implemented by a firm to create continuing performance improvements" (Morgan and Strong, 1998, p. 1055).

Kohli and Jaworski (1990) developed a market orientation and define it using three sets of activities: (a) *organization-wide generation of market intelligence* regarding current and future customer needs, (b) *dissemination of the intelligence* across departments, and (c) *organization-wide responsiveness* to it. Last construct, organization-wide responsiveness is further composed of a) response design, which is about development of plans using market intelligence and b) response implementation, which refers to the execution of such plans.

Synthesizing an extensive body of literature on management orientation, Klassen and Whybark (1999) suggested three related elements of environmental management orientation: proactive system analysis and planning, organizational responsibility, and management control. *Proactive system analysis and planning* is a systems-oriented approach to environmental management. Examples of proactive system analysis and planning include an environmental policy statement, environmental objectives as part of a business plan, and the long-term impact of environmental issues on operations. *Organizational responsibility* includes cross-functional integration of environmental activities, use of teams to identify environmental problems and opportunities, decentralization of environmental responsibilities, and development of an environmental specialist. *Management controls* involve setting goals, monitoring, and follow-up.

2.5. Resource-based view of the firm

The RBV of the firm serves as the theoretical basis of this study. The RBV posits that assets or resources become the primary predictors of sustained competitive advantage when the resources are valuable, rare, inimitable, and nonsubstitutable (Barney, 1991; Rugman and Fouts, 1997; Corbett and Claridge, 2002). A firm's unique resources include all of its assets and capabilities, its organizational culture, its attributes, information, and the knowledge it controls, which enable the firm to conceive of and implement value-creating strategies to improve its efficiency and effectiveness (Barney, 2001).

An important aspect of RBV is implementing the bundle of unique resources within and outside of the organization. Barney (1986) suggested that unique organizational skills and abilities involving a combination of firm resources might be a source of competitive advantage. With the increasing awareness of SCM, recent research on RBV has recognized the bundle of interorganizational resources that go beyond internal resources of a firm (Ho et al., 2002; Narasimhan and Jayram, 1998). Interorganizational resources such as supplier development and customer management must be built up to support superior organizational performance (Sambamurthy et al., 2003; Rai et al., 2006; Capaldo, 2007).

Scholars have further defined resources or capabilities in the supply chain. Supply chain-level resources or capabilities are defined as the ability of an organization to identify, utilize, and assimilate both internal and external resources/information to facilitate activities across the entire supply chain (Amit and Schoemaker, 1993; Bharadwaj, 2000; Wu et al., 2006). They are difficult to develop. Once firms develop them, they enjoy a higher level of protection against competitive imitation (Wu et al., 2006). Therefore, SSCM practices which represent organizational routines or bundles of organizational resources are regarded as supply chain capabilities that enable a firm to develop products and processes for long-term sustainability (Kleindorfer et al. 2005; Lee and Klassen, 2008; Pullman et al., 2009).

2.6. Literature review

To better understand sustainability, nine constructs are identified and proposed through a comprehensive literature review. Then this study develops a research framework that depicts the interrelationships among these constructs. The nine constructs fall into four main areas of sustainability: sustainability drivers, strategic sustainability orientation, sustainability practices, and sustainability performance. The primary goal is to comprehensively examine the sustainability of a focal company.

Variables contained in the research framework include (a) sustainability drivers (i.e., external pressures and top leadership culture), (b) strategic sustainability orientation (i.e., economic, environmental, and social orientation), (c) sustainability practices (i.e., sustainable supplier management practices, sustainable operations management practices, and sustainable customer management practices), and (d) sustainability performance (i.e., economic, environmental, and social performance). External pressures refer to the extent to which an organization faces the vital demands for sustainability. Top leadership culture is defined as the extent to which top/senior management creates an environment that is proactive and committed toward sustainability. SSO is defined as the extent to which an organization is proactive and committed to economic, environmental, and social priorities in decision making.

By synthesizing previous literature (Klassen and Vachon, 2003; Chen and Paulraj, 2004; Li et al., 2005), this study suggests that for successful implementation of sustainability, firms need to adopt a supply chain perspective. Therefore, managing suppliers, internal operations, and customers is key to sustainability. Three sets of SSCM practices are included in this study: sustainable supplier management practices, sustainable operations management (OM) practices, and sustainable customer management practices. Sustainability performance is defined to include economic, environmental, and social performance. Table 2.1 provides the definitions of these constructs with supporting literature.

Table 2.1. Construct definitions and related literature (aggregate level)

Construct	**Definition**	**Related Literature**
Sustainability drivers		
External pressures	The extent to which an organization faces the vital demands for sustainability	DiMaggio and Power, 1983; Henriques and Sadorsky, 1999; Teo et al., 2003; Delmas and Toffel, 2004; Darnall et al., 2008; Heugens and Lander, 2009; Liu et al., 2010; Sarkis et al., 2010
Top leadership culture	The extent to which top/senior management creates an environment that is proactive and committed to sustainability	Defee et al., 2009; Harland et al., 2007; McFadden et al., 2009
Sustainability strategy		
Strategic sustainability orientation	The extent to which an organization is proactive and committed toward economic, environmental, and social priorities in decision making	Venkatraman, 1989; Jaworski and Kohli, 1993; Klassen and Whybark, 1999; Defee et al., 2009; Pagell and Wu, 2009; Kroes and Ghosh, 2010
Sustainability practices		
Sustainable supplier management practices	The extent to which an organization evaluates and collaborates with its suppliers to improve suppliers' sustainability performance	Klassen and Vachon, 2003
Sustainable Operations Management Practices	The extent to which an organization implements a set of plans/ programs to improve sustainability performance of internal operations.	Angell and Klassen, 1999; Daily and Huang, 2001; Shah and Ward, 2003, 2007; Sroufe, 2003; Montabon et al., 2007; Pullman et al., 2009;
Sustainable customer management practices	The extent to which an organization collaborates with its major customers to improve sustainability performance of both parties	Klassen and Vachon, 2003; Li et al., 2005
Sustainability performance		
Economic performance	The extent to which a firm improves operational, market, and financial outcomes	Narasimhan and Kim, 2002; Flynn and Flynn, 2004; Menor et al., 2007; Kristal et al., 2010

Environmental performance	The extent to which an organization improves outcomes related to pollution control and environmental management	Sroufe, 2003; Zhu and Sarkis, 2004; Matos and Hall, 2007; Montabon *et al.*, 2007; Pullman et al., 2009; Jacobs et al., 2010
Social performance	The extent to which an organization improves employee- and community-oriented outcomes	Wood, 1991; Garriga and Mele, 2004; Rao and Holt, 2005

2.6.1. Sustainability Drivers

2.6.1.1. External Pressures

Three types of external pressures (mimetic, coercive, and normative) come from industry constituents, such as supply chain members (e.g., key suppliers, resource and product customers), regulatory bodies, professional agencies, and nongovernmental organizations (NGOs) (DiMaggio and Powell, 1983; Oliver, 1997; Ketokivi and Schroeder, 2004; Zsidisin et al., 2005). Facing uncertainties, organizations adopt practices in order to mimic other organizations (DiMaggio and Powell, 1983). Such pressures mainly come from a firm's major competitors that have successfully adopted certain practices.

Coercive pressures may be derived from both formal and informal political demands exerted on organizations by governmental forces and other organizations upon which the firm depends (e.g., major customers, a parent company) (DiMaggio and Powell, 1983). Normative pressures come from the context of interorganizational networks such as suppliers, as well as from labor unions, trade associations, local communities, and nongovernmental groups (Powell and DiMaggio, 1991). Such relational channels allow a focal company to share cultural norms and values with social network members and, thus, to facilitate consensus, which increases the strength of these norms and their potential influence on organizational behavior (Powell and DiMaggio, 1991).

Mimetic pressures. *Mimetic pressures* are the demands that arise when companies' main competitors successfully adopt -organizational practices (DiMaggio and Power, 1983; Teo et al., 2003; Delmas and Toffel, 2004; Liu et al., 2010). When firms face high uncertainty—in other words, "when organizational technologies are poorly understood, when goals are ambiguous, or when the environment creates symbolic uncertainty" (DiMaggio and Powell, 1983, p. 151)—and outcomes are difficult to predict, firms mimic or benchmark rival organizations that have resolved the similar issues (Perez-Batres et al., 2011). By doing so, firms overcome uncertain situations and seek viable solutions with little cost (DiMaggio and Powell, 1983).

The main reason firms imitate competitors is that they ascribe competitors' success to competitors' strategic choices; therefore, they imitate successful firms by adopting the same practices (John et al., 2001; Zsidisin et al., 2005). Thus, while mimicry may not be a perfect solution for addressing uncertainty, and may not always be justified by economic efficiency choices (Heugens and Lander, 2009), a firm may still submit to mimetic pressures to achieve the following goals: (a) the reduction of perceived risks and (b) the pursuit of status-conferring legitimacy (John et al., 2001; Grewal and Dharwadkar, 2002; Liu et al., 2010).

This logic may be extended to the context of a firm's sustainability adoption decision. Firms perceive mimetic pressures when their main competitors successfully adopt sustainability initiatives. Given the uncertainties in adopting sustainability initiatives, directly investigating the value of sustainability adoption is expensive. By imitating what trustworthy organizations—often, competitors—say and do, imitators enhance their legitimacy and prospects for their survival (Perez-Batres et al., 2011). Thus, firms facing uncertainty are likely to imitate the policies that leading sustainability firms have adopted. To save on research costs, or to minimize experimentation costs, firms may submit to the mimetic pressures and adopt sustainability initiatives (Liu et al., 2010).

Coercive pressures. *Coercive pressures* constitute sustainability-related political influence exerted by governmental regulations or other firms on which the focal firm depends, such as important customers or a parent company (DiMaggio and Power, 1983; Teo et al., 2003; Delmas and Toffel, 2004; Liu et al., 2010). These pressures are among the most influential in prompting firms to implement sustainability initiatives (Rugman and Verbeke, 1998; Henriques and Sadorsky, 1996; Seuring and Muller, 2008; Nawrocka et al., 2009; Defee et al., 2009). Examples of coercive pressures in the context of sustainability are governmental legislative requirements, directives, and policies related to environmental and social issues (Zhu and Sarkis, 2007).

In order to avoid losses due to being charged with unlawful actions, such as penalties and fines, organizations must comply with sustainability regulations. Companies that fall short of submitting reports to regulatory stakeholders may become exposed to costly lawsuits, which could seriously damage an organization's public image, and even relationship, with customers (Sarkis et al., 2010). Sometimes, coercive forces play a positive role in enhancing firms' competitiveness because tougher regulations can supplement voluntary actions (Porter & van der Linde, 1995).

Major customer firms can place coercive pressures on a focal company because they often impose reforms on their suppliers (Gelderman et al., 2008). Large corporations such as Wal-Mart and Unilever induce suppliers to become environmentally conscious by forcing them to comply with the law. For example, in 2008, Wal-Mart gave more than 1,000 suppliers in China directives regarding reducing waste and emissions, cutting packaging costs by 5% by 2013, and increasing the energy efficiency of products supplied to Wal-Mart stores by 25% in 3 years (NYT, February 26, 2010). Unilever also declared that by 2015, it would purchase palm oils and teas only from sustainable sources.

Parent companies also place coercive pressures on subsidiaries (Teo et al., 2003). Conformance to parent company practices and structures is essential for subsidiaries because they are not autonomous bodies. Most often, practices are mandated by the parent company, and the subsidiary must comply with those of the parent (Kostova and Roth, 2002). DiMaggio and Powell (1983) indicated that subsidiaries are obligated to conform to practices and structures that are consistent with the parent company rules. Therefore, parent companies' adoption of sustainability practices is likely to exert pressure on subsidiaries to do the same. By following the behavior of parent companies that have adopted sustainability practices, subsidiaries are more likely to secure their positions (Kostova and Roth, 2002).

Normative pressures. *Normative pressures* refer to the demands that stem from collective societal expectations, such as those of important suppliers, labor unions, trade associations, local communities, and NGOs (DiMaggio and Power, 1983; Teo et al., 2003; Darnall et al., 2008; Liu et al., 2010). Often, these normative pressures are exerted through interorganizational channels. Through these channels, collective expectations are shared. Firms conform to shared norms in order to ensure their position in the field and maintain "procedural legitimacy" (Liu et al., 2010, p. 374).

By nature, normative pressures are not mandatory to implement. In other words, normative pressures are less coercive than other types of regulatory pressures. Some normative pressures come in the form of voluntary initiatives or codes for matters such as pollution prevention. In response to sustainability pressures, firms may implement proactive action programs that go beyond compliance with laws, enhancing informal relationships and accruing political capital. By developing proactive environmental management practices, companies are better able to build collaborative relationships with political forces (Darnall et al., 2008). These collaborations can promote environmental learning capacity building in the form of training programs (Darnall and Edwards, 2006), as well as promote trust between companies and regulators (Hoffman, 2000).

Some examples of normative pressures include environmental NGOs such as Greenpeace, Friends of the Earth International, National Wildlife Federation, and Sierra Club. Another example is the World Business Council for Sustainable Development, which encourages its members to improve the environmental performance of their supply chains (Sharfman et al., 2009). Such NGOs require companies to address supply chain-related environmental and social problems (Nawrocka et al., 2009). Also, local communities potentially influence firms' sustainability decisions (Arts, 2002).

2.6.1.2. Top Leadership Culture

It is widely recognized in the literature that top leadership is an important driver, if not the sole driver, of successful organizational transformation (McFadden et al., 2009). The question remains why do major business change initiatives fail? Strong organizational and cultural inertia may hamper effective decision making and create unsuccessful results. The initial impetus for change may dwindle as major changes require a significant amount of time and energy to bring to fruition. Uncommitted leaders may fail to motivate, support, and participate in change initiatives.

Scholars (Kotter and Cohen, 2002; Kotter, 2007; Defee et al., 2010) argued that the successful launch and implementation of major changes hinges on the product of leadership. An organization's shift toward sustainability may be considered a major change initiative that requires cultural change throughout the entire organization (Harris and Crane, 2002). As such, the culture created by top leadership becomes a firm's vital resource to successfully implement sustainability initiatives (Defee et al., 2010).

Top leadership culture must be aligned with transformational leadership, or leadership based on charisma and inspiration (Bass and Riggio, 2006; McFadden et al., 2009). The term top leadership culture indicates that the focus of this study is not on top management per se, but on how top managers create a culture that is proactive and committed to sustainability. Proactive and committed top management culture can help an organization make a commitment to sustainability, thus giving the organization an SSO and enabling it to implement supply chain practices that generate sustainability performance outcomes. This study defines *top leadership culture* as the extent to which top/senior management creates an environment that is proactive and committed to sustainability.

Managerial attitude and perspective. Top leadership's attitude toward and perspective on sustainability must be proactive and committed in order for the culture of an organization to be conducive to sustainable change. A proactive and committed posture is formed through top leadership's view of sustainability as creating opportunities rather than threats (Sharma, 2000; Aragon-Correa and Sharma, 2003). Firms with a positive view of sustainability will form a sustainability orientation that leads to implementation of concrete sustainability practices (Nutt, 1984), whereas firms with a negative view (i.e., those that interpret sustainability as threat) will not take risks (Kahneman and Tversky, 1979). In the latter case, innovative solutions will escape these firms.

The development and commercialization of hybrid cars is an example of the importance of top leadership culture. In 1995, Francois Castaing, Chrysler's vice president, said that there were collisions between automotive manufacturers and customers, in part, because

> "Few car makers have their hearts in electric alternatives to the internal combustion engine, which they have nurtured most of this century. Even though emissions from conventional vehicles cause up to 60 percent of urban air pollution, they are driven to making the internal combustion engine more efficient, rather than replacing it." (Ballantine, 1995)

The big three U.S. automotive companies shared the same view of hybrid car technology development at the time: Hybrid technology presented threats rather than opportunities, despite high pressures from stakeholders.

On the other hand, Japanese firms (especially Toyota and Honda) took somewhat different approaches, integrating "boundaries innovation and knowledge integration" in the pursuit of "the fruit of new knowledge integration, while taking risks through vertical integration in pursuit of creativity" (Kodama, 2009). Japanese firms took emerging business opportunities and market challenges very seriously to achieve long-term competitive advantage. Toyota presented the U.S. market's first commercial hybrid, the Prius, in 1999 despite relatively low stakeholder pressures. Thus, Japanese manufacturers' proactive managerial response resulted in a high level of commitment to sustainability initiatives such as hybrid car development and commercialization.

Managerial perspectives on strategic issues influence the actions an organization takes and the sustainability strategy it chooses (Dutton and Jackson, 1987). Strategic intent is realized in the form of proactive managerial response to urgent issues such as sustainability initiatives facing the organizations. Reactive environmental/social investments made by adopting static strategy will hardly help a firm keep up with the demands of various sustainability regulations. Thus, these organizations will be relatively slow to create specific technologies and equipment that promote a clean environment (Majumdar and Marcus, 2001). In contrast, proactive responses to sustainability issues allow managerial discretion toward selecting emerging market opportunities (Andersson and Bateman, 2000; Sharma, 2000). In this study, *managerial attitude and perspective* is defined as the extent to which top/senior management views sustainability issues as opportunities rather than as threats.

Top management support. After creating a proactive and committed attitude toward sustainability, top leadership must provide substantial and tangible support. Such support plays a crucial role in organizational change initiatives (Mentzer et al., 2000). For example, Monczka et al. (1993) contended that top management must commit time, personnel, and financial resources to support suppliers who are willing to be long-term partners of a company through initiating supplier development. One of the major functions of top leadership is to influence the setting of organizational values, to develop suitable management styles to improve the firm’s performance, and to support an organization by arranging tangible and intangible resources.

Top management's realistic understanding how sustainability initiatives affect an organization will determine the level and extent of its commitment and support. Based on top management's perspective and attitude, organizational leaders determine when and how they will participate in sustainability programs, and what resources they will provide to functional departments such as information technology, human resources, production/operations, purchasing, and sales/marketing for sustainability programs (Monczka et al., 1993; Mentzer, 2000). In this study, *top management support* refers to the extent to which top/senior management is involved in sustainability programs and provides monetary and/or other resources to functional departments (Monczka et al., 1993; Krause, 1999; Chen and Paulraj, 2004).

Employee Motivation. A third aspect of top leadership culture is how top leadership inspires shop-floor employees to be involved in various sustainability programs. Employees are often regarded as important initiators and recipients of an organization's proactive sustainability initiatives (Daily and Huang, 2001; Hanna et al., 2000; Sarkis et al., 2010). In general, employees have superior knowledge of the shop floor (Daily and Huang, 2001). Thus, their participation in the decision-making process can contribute to work efficiency. Many researchers have highlighted the importance of employee involvement in sustainability initiatives (Kornbluh et al., 1989; Florida, 1996; Daily and Huang, 2001).

However, for employee involvement to be effective, employees must be supported and inspired by top leadership. Unless employees are motivated to commit to sustainability issues, effective implementation of sustainability initiatives will be impossible. Employees who are highly encouraged or inspired, and thus have a high level of motivation, are likely to be more involved in the improvement of sustainability. Employees can involve in sustainability initiatives by making constructive suggestions, joining problem-solving efforts, and participating in designing processes and tools that improve sustainability issues. In this study, *employee motivation* refers to the extent to which top/senior management inspires shop-floor employees to actively participate in sustainability practices. Table 2.2 shows the subconstructs of sustainability drivers (i.e., external pressures and top leadership culture).

Table 2.2. List of subconstructs for sustainability drivers

Construct	**Definition**	**Related literature**
External pressures The extent to which an organization faces the vital demands for sustainability		DiMaggio and Power, 1983; Teo et al., 2003; Delmas and Toffel, 2004; Darnall et al., 2008; Heugens and Lander, 2009; Liu et al., 2010; Sarkis et al., 2010
Mimetic pressures	The demands that arise when main competitors successfully adopt sustainability initiatives	DiMaggio and Power, 1983; Teo et al., 2003; Liu et al., 2010; Delmas and Toffel, 2004
Coercive pressures	Sustainability-related political influences exerted by governmental regulations and/or firms on which the focal firm depends, such as important customers and a parent company	DiMaggio and Power, 1983; Rugman and Verbeke, 1998; Henriques and Sadorsky, 1999; Teo et al., 2003; Delmas and Toffel, 2004; Liu et al., 2010
Normative pressures	The demands that stem from collective societal expectations, such as important suppliers, local communities, and NGOs with regard to sustainability	DiMaggio and Power, 1983; Teo et al., 2003; Darnall et al., 2008;; Liu et al., 2010
Top leadership culture The extent to which top/senior management creates an environment that is proactive and committed to sustainability		Defee et al., 2009; Harland et al., 2007; McFadden et al., 2009
Managerial attitude and perspective	The extent to which top/senior management views sustainability as opportunities rather than as threats	Jackson & Dutton, 1988; Sharma, 2000; Pagell and Gobeli, 2009
Top management support	The extent to which top/senior management is involved in sustainability initiatives and provides monetary and/or other necessary resources	Daily and Huang, 2001; Reed, 2002; Chen and Paulraj, 2004; Zhu and Sarkis, 2004; Li and Lin, 2006

Employee motivation	The extent to which top/senior management inspires shop-floor employees to actively participate in sustainability initiatives	Koufteros, 1998; Hanna et al, 2000; Daily and Huang, 2001; Reed, 2002

2.6.2. Strategic Sustainability Orientation

Pagell and Wu (2009) conceptually developed and define managerial orientation toward sustainability as the extent to which an organization is proactive and committed to economic, environmental, and social concerns in its decision making across its supply chain. To support this concept, Pagell and Wu (2009) provided four major aspects of SSO: (a) good alignment of environmental, social, and economic goals (i.e., economic sustainability should be aligned with firm's environmental and social goals); (b) regular conversation about sustainability (i.e., sustainability should be a part of day-to-day conversation, not an add-on or afterthought in decision making); (c) a guiding, or touchstone, value (i.e., a core value that guides the business model of a firm and is aligned with a nontraditional element of sustainability); and (d) sharing responsibility for sustainability across the organization (i.e., across all employees and functions, not housed with a single function or individual).

By adapting the definition of Pagell and Wu (2009), *SSO* is defined as the extent to which an organization is proactive and committed to economic, environmental, and social priorities in its decision making. This study suggests that to maximize the effect of sustainability orientation, each subdimension (economic, environmental, and social orientation) must be congruent with the overall sustainability strategy. To investigate congruence, it is necessary to identify the appropriate type of fit that might be applied to the study of interest (Kroes and Ghosh, 2010). According to Venkatrama (1989), there are six types of fit available to an organization: fit as moderation, fit as mediation, fit as matching, fit as gestalts, fit as profile deviation, and fit as covariation. In this study, fit as covariation is selected as the appropriate type of fit to adequately address the concept of SSO.

A fit as moderation perspective indicates that the impact of an independent variable on a dependent variable is affected by interaction between an independent variable and a third additional variable, or the moderating variable (Kroes and Ghosh, 2010). This approach is not suited to this study because the focus will be to examine the internal consistency of each dimension of sustainability, not the interaction effect between an independent variable and a third variable on a dependent variable.

Fit as mediation is used to examine the presence of significant intervening mechanisms between an antecedent variable and a consequent variable (Venkatraman, 1989). The tests of fit as mediation may be conducted using a path-analytic method. Full mediation indicates that the existence of intervening variable is essential to mediate the other variables, whereas partial mediation suggests mediation affects the relationship between the two variables only to some extent. This approach is not suited to this study as this research is searching for intervening mechanisms but, rather, investigating the coalignment of subdimensions of sustainability.

The fit-as-matching approach is only appropriate when the study consists of two variables of interest that are theoretically related without concern for an additional variable, which is not the case for this study. Fit as matching can be only valid if each subdimension of sustainability is matched and the relationship tested (i.e., economic–environmental, economic–social, and environmental–social). Some scholars recognized the value of such a matching approach in examining the different aspects of sustainability (Dyllick and Hockerts, 2002). Unfortunately, this approach is not in line with the triple bottom line perspective. Therefore, evaluating fit as matching does not allow for simultaneous examination of the overall SSO in three dimensions.

The fit-as-gestalts model is a multivariate taxonomical approach, wherein the variables are classified into different clusters with common attributes and the fit within each group is tested (Venkatraman, 1989). This approach is not suited to this study, as this research is not attempting to classify each type of sustainability but to see the overall effect of combined dimensions of sustainability at an aggregate level.

Evaluating fit using profile deviation helps determine the impact of the deviation between an observed set of characteristics and a theoretically defined set of characteristics on a dependent variable. This approach is not suited to this investigation because the focus of this study is to examine covariation among each dimension of sustainability.

A fit as covariation approach is deemed appropriate for this study as this approach is based on the prediction of internal consistency among a set of related variables. Each dimension of sustainability is regarded as an essential aspect to establish the complete SSO set. However, unless the degree of internal consistency among these three variables is tested, it is impossible to guarantee that the SSO is an effective strategic approach for simultaneously addressing all three dimensions of sustainability. More specifically, the fit as covariation approach helps conceptualize SSO as a second-order construct with three first-order factors: economic orientation, environmental orientation, and social orientation. Table 2.3 provides the definition of subconstructs for SSO.

Table 2.3. List of subconstructs for strategic sustainability orientation

Construct	Definition	Related literature
Strategic sustainability orientation	The extent to which an organization is proactive and committed to economic, environmental, and social priorities in its decision making	Venkatraman, 1989; Jaworski and Kohli, 1993; Klassen and Whybark, 1999; Defee et al., 2009; Pagell and Wu, 2009; Kroes and Ghosh, 2010
Economic orientation	The extent to which a firm is proactive and committed to positive market and financial priorities in its decision making	Venkatraman, 1989; Pagell and Wu, 2009; Kroes and Ghosh, 2010
Environmental orientation	The extent to which a firm is proactive and committed to positive ecological or green priorities in its decision making	Venkatraman, 1989; Klassen and Whybark, 1999; Pagell and Wu, 2009; Kroes and Ghosh, 2010
Social orientation	The extent to which a firm is proactive and committed to positive employee and communal priorities in its decision making	Venkatraman, 1989; Pagell and Wu, 2009; Kroes and Ghosh, 2010

2.6.3. Sustainability Practices

In this study, sustainability practices refer to a focal firm's SSCM practices. *SSCM practices* are defined as a focal firm's intra- and inter-organizational practices for managing upstream suppliers, internal operations, and downstream customers to simultaneously achieve economic, environmental, and social performance.

2.6.3.1. Sustainable Supplier Management Practices

Over the decades, supplier management has been regarded as one of the key functional practices in the supply chain (Carter and Narasimhan, 1996; Spekman et al., 1999; Chen et al., 2004). Managing suppliers in terms of maintaining quality, long-term, strategic relationships by selecting prospective suppliers, reducing the supplier base, and developing supplier programs has been long emphasized (Chen and Paulraj, 2004; Li et al., 2005). Thus, firms form strategic partnerships with major suppliers to maintain long-term healthy relationships through developing mutual trust and compatible cultures and sharing vision and information (Mentzer et al., 2000). Practices related to supplier selection, evaluation, and development have become a key strategic consideration in directly improving supplier and manufacturing performance (Klassen and Vachon, 2003; Prahinski and Benton, 2004; Modi and Mabert, 2007; Narasimhan et al., 2008; Yang et al., 2010).

As new business environments unfold, criterion such as price or quality is no longer adequate for measuring supplier qualifications (Sarkis and Talluri, 2002). Focal firms increasingly recognize the strategic importance of incorporating sustainability considerations in managing major suppliers' performance (Handfield et al., 2002; Koplin et al., 2007; Beske et al., 2008; Seuring and Müller, 2008; Bai and Sarkis, 2010). Drawing from Klassen and Vachon's (2003) study, three aspects of *sustainable supplier management practices* are included in this study: (a) supplier evaluation (short-term and control-oriented practices), (b) supplier development (long-term and collaborative/partnership-oriented practices), and (c) information sharing with major suppliers.

The construct of information sharing practices is included because information sharing with major suppliers is indispensable for both monitoring and developing suppliers. Evaluative activities are an essential part of information sharing and involve gathering and processing information in order to assess suppliers' operating performance (i.e., whether or not they are in legal compliance) and to mitigate any associated risks. Collaborative activities also involve information exchange in the form of tacit knowledge integration (Klassen and Vachon, 2003).

2.6.3.1.1. Supplier Evaluation Practices

With changing business climates, companies consider incorporating sustainability criteria into their supplier selection or evaluation schemes (Koplin et al., 2007; Beske et al., 2008; Seuring and Müller, 2008). Thus, there has been an increase in the potential risks of causing environmental damage and disobeying social standards related to suppliers' immediate activities (Koplin et al., 2007). NGOs and the media have revealed negative environmental practices of subsidiaries and suppliers in developing countries and their violations of labor laws (e.g., child labor misuse and inhuman working conditions) and ethical standards (Koplin et al., 2007). As a result, firms increasingly impose environmental and social requirements on suppliers to improve efficiency in the early stages of the supply chain (Koplin et al., 2007).

In this study, *supplier evaluation practices* are defined as focal companies' activities to assess or monitor major suppliers' sustainability (economic, environmental, and social) performance. Upstream supply chain activities involve monitoring and assessment of suppliers' performance, collectively termed supplier evaluation practices. In evaluating suppliers, firms may use a formal evaluation system with established guidelines and procedures. Firms make evaluations of suppliers based on pre-established economic performance standards (e.g., cost, quality, delivery and flexibility) (Sarkis and Talluri, 2002; Bai and Sarkis, 2010).

For example, a supplier could be evaluated and screened based on a number of factors including quality at the source, design competency, process capability, and equipment/labor flexibility (Sarkis and Talluri, 2002). Environmental standards may be implemented in two ways: as environmental practices (policies and procedures such as monitoring discharge and conducting periodical audits) and as environmental performance indicators (e.g., pollution control and resource efficiency) (Beske et al., 2008). Social aspects of sustainability may be considered according to internal social criteria (i.e., employee-related activities such as labor standards, gender equity, and occupational health and safety) or external social criteria (i.e., community-related activities such as philanthropic commitments and relationships with stakeholders) (Bai and Sarkis, 2010). Recognizing suppliers through providing constructive feedback about the economic, environmental and social results of their evaluations and offering sustainability-related awards also serve as tools for focal companies to monitor suppliers (Klassen and Vachon, 2003).

To integrate environmental or social standards into the evaluation of suppliers, additional information about the environmental or social performance of suppliers must be considered (Koplin et al., 2007). Companies often implement several regulatory regimes or voluntary standards to ensure that materials received from suppliers conform to environmental guidelines (Awasthi et al., 2010). One popular trend related to environmental performance is the use of internationally standardized EMSs, such as ISO 14001, which has been widely accepted by governments and NGOs.

Monitoring the social dimension of sustainability is much more complex. The most commonly reported social issues include illegal and unfair labor activities, such as illegal child labor, deficient safety facilities, low wages, unreasonable working hours, and gender discrimination (Preuss, 2001; Graafland, 2002; Beske et al., 2008). Examples of voluntary standards pertinent to social criteria are Social Accountability 8000 (SA 8000) and AccountAbility 1000 (AA 1000) (Koplin et al., 2007). For example, the minimum child labor age according to SA 8000 is 15 (Social Accountability Institute, 2001). Such standards help suppliers to signal that they fulfill socially acceptable requirements.

2.6.3.1.2. Supplier Development Practices

Collaborative activities with suppliers along the supply chain help focal firms to identify multiple sustainability challenges (Klassen and Vachon, 2003; Krause et al., 2007; Yang et al., 2010). Elkington (1998) explored how effective long-term partnerships with suppliers are crucial for companies to make the transition to sustainability. Bowen et al. (2001) studied green supply management capabilities and revealed that bundles of supply chain practices, including cross-functional liaisons, purchasing policies and procedures, supplier partnerships, and purchasing and environmental technical skill literacy (e.g., advanced understanding of environmental issues and how they affect supply), facilitate the implementation of green supply chains.

Vachon and Klassen (2008) found that environmental collaborative activities with supply chain members, such as joint environmental goal setting, shared environmental planning, and working together to reduce pollution or other environmental effects, positively affect manufacturing performance. Thus, supplier development practices may be regarded as a firm's collaborative activities with its suppliers. In this study, *supplier development practices* refer to a firm's efforts to improve its suppliers' capabilities or performance in regard to sustainability. Examples of a firm's collaborative activities include tacit knowledge transfer, which occurs through exchanging sensitive information with its suppliers (Purdy and Safayeni, 2000).

Companies can transfer their tacit knowledge pertinent to sustainability by visiting a supplier's site or by allowing suppliers to visit the focal company's sites. By doing so, suppliers increase their technical knowledge of how their products are used and delivered. Through knowledge sharing, firms can reduce their uncertainty and increase their willingness to change if disruptions occur.

Another important practice of supplier development is training and education programs for suppliers' personnel. Well-designed sustainability training and education programs are especially critical when suppliers are located in developing countries such as China. For example, many U.S. companies, such as Wal-Mart, began to impose environmental, workplace, and product-quality standards on Chinese suppliers, supplemented by a third-party audit and certification requirements. However, Wal-Mart realized that merely setting standards and auditing supplier performance were not enough to prevent an increasing rate of accidents (Bunch, 2008).

Suppliers may be confused by incompatible safety, quality, environmental, and social standards. Therefore, synchronization among buyers and suppliers is needed. Even with regular audits, suppliers may not stop engaging dishonest or unethical behaviors if buyers care only about price and delivery dates. One solution might be establishing higher sustainability standards and investing in building the capacity of suppliers so that suppliers are properly assisted to meet those standards. Wal-Mart's realization points to the fact that sustainability initiatives require comprehensive and well-designed training and educational programs. By building training programs and offering them to suppliers' personnel on a continual basis, trust may be built between companies and suppliers to support the pursuit of sustainability.

2.6.3.1.3. Information Sharing with Suppliers

Information sharing is usually defined as "the extent to which critical and proprietary information is communicated among supply chain partners" (Li and Lin, 2006). It is measured by the extent to which interorganizational information sharing meets the requirements of both organizations. In order to effectively solve supply chain-related problems, buyers (focal companies) and suppliers must share more information, including sensitive information such as design issues. In this study, *information sharing practices with suppliers* are defined as a firm's activities of receiving critical and proprietary information from major suppliers in regard to sustainability.

Suppliers may share critical economic information with focal firms. Such information includes information regarding delivery schedule, order status, and inventory level (Zhou and Benton, 2007). In addition, in the business market, where large-scale environmental and social impact is emphasized, being transparent by sharing environmental information about the impact of production and consumption on the natural environment is critical (Erlandsson and Tillman, 2009). Some of the vital environmental information that must be shared includes conformance to environmental regulations, improvement in environmental performance, and accounting for environmental costs, (Erlandsson and Tillman, 2009; Montabon et al., 2007).

Social information, such as how suppliers treat employees to ensure employees' well-being (i.e., health and safety) and equity (e.g., child labor, fair wages, etc.) and details of their relations with communities and society, also must be shared in order for both parties to be transparent. Information sharing practices among supply chain trading partners are an important requirement for making effective decisions related to sustainability. Such information is useful to marketplace and governmental bodies in terms of minimizing the negative economic, environmental, and social impact (Erlandsson and Tillman, 2009). Table 2.4 provides the definition of subconstructs for sustainable supplier management practices.

Table 2.4. List of subconstructs for sustainable supplier management practices

Construct	Definition	Related literature
Sustainable supplier management practices The extent to which an organization evaluates and collaborates with its major suppliers to improve their sustainability performance		Klassen and Vachon, 2003
Supplier evaluation practices	The extent to which a firm assesses or monitors suppliers' sustainability performance	Min and Galle, 2001; Handfield et al., 2002; Sarkis and Talluri, 2002; Koplin et al., 2007; Beske et al., 2008; Seuring and Muller, 2008; Awasthi et al., 2010
Supplier development practices	The extent to which a firm endeavors to improve its suppliers' performance or capabilities in regards to sustainability	Klassen and Vachon, 2003; Krause et al., 2007; Modi and Marbert, 2007; Bai and Sarkis, 2010; Yang et al., 2010
Information sharing practices	The extent to which a firm receives critical and proprietary information from major suppliers in regards to sustainability	Li and Lin, 2006; Krause et al., 2007; Montabon et al., 2007; Zhou and Benton, 2007; Erlandsson and Tillman, 2009

2.6.3.2. Sustainable Operations Management Practices

2.6.3.2.1. Quality Management and Just-in-Time Practices

A number of studies advocated that superior operational practices aimed at improving the quality of products/processes and the production flow, such as QM and JIT, have a positive association with economic and environmental performances (Shrivastava, 1995; Angell and Klassen, 1999; Pil and Rothenberg, 2003). In this study, *quality management* and *just-in-time practices* refer to a firm's implementation of a set of plans or programs to improve its economic performance.

Quality Management Practices. QM is well known for improving the quality of internal operations and maintenance of equipments (Angell and Klassen, 1999; Corbett and Klassen, 2006; Yang et al., 2011). QM is reflected in the implementation of practices such as total quality management, Six Sigma, quality circles, and total productive maintenance (Fullerton et al., 2003; Linderman et al., 2006). Such practices reduce variability in processes and enable better prediction of product output, reducing waste due to rework (Fullerton et al., 2003; Shah and Ward, 2003, 2007).

In addition to practices focusing on product quality, rigorous maintenance of equipment used for production through total productive maintenance prevents stop-and-go operations (McKone et al., 1999) and reduces process variability, ensuring higher throughput (Koufteros et al., 1998; Tu et al., 2006). QM is a manufacturing program designed to continuously improve the quality of products and processes by involving management, workforce, suppliers, and customers (Cua et al., 2001). The program is proven to have positive relationships with operational performance in terms of cost, quality, flexibility, and delivery, as well as with business performance (Yang et al., 2010; Yang et al., 2011).

Just-in-Time Practices. JIT focuses on elimination of wastes from within a firm's production systems through continuous improvement and process changes for reducing non-value-added activities to achieve cost efficiencies (Womack et al., 1990; Li et al., 2005; Shah and Ward, 2003, 2007). Practices focusing on streamlining the flow of material can reduce waste due to inventory, unnecessary material movement, and waiting, thereby decreasing cycle time and improving throughput (Swink et al., 2005). For example, cellular manufacturing can facilitate grouping of materials according to product families, reducing waste due to material movement. Similarly, reduced setup times enable quick changeover, along with reduced batch sizes, thereby reducing waste due to waiting.

Kanban systems can help streamline the flow of materials, reducing the work-in-process inventory and improving cycle times for manufacturing, enabling the implementation of pull systems. The benefits of JIT implementation include both operational and business performance outcomes: profitability, cost efficiency, improving product quality and reliability, augmenting product and process flexibility, and enhancing delivery speed or time to market (Fullerton et al., 2003; Shah and Ward, 2003; Narasimhan et al., 2006). Table 2.5 provides the definition of constructs for QM and JIT practices.

Table 2.5. List of subconstructs for sustainable operations management practices (QM and JIT practices)

Construct	Definition	Related literature
QM and JIT practices The extent to which an organization implements a set of plans/programs to improve its economic performance		
QM practices	The extent to which a firm improves the quality of products/processes and maintains equipment productivity	Angell and Klassen, 1999; Samson and Terziovski, 1999; Corbett and Klassen, 2006; Shah and Ward, 2003, 2007; Yang et al., 2010; Yang et al., 2011
JIT practices	The extent to which a firm manages or streamlines the flow of production	Womack et al., 1990; King and Lenox, 2001; Li et al., 2005; Shah and Ward, 2003, 2007; Yang et al., 2011

2.6.3.2.2. Corporate Environmental Management Practices

Three practices of corporate environmental management are included in this study: environmental design practices, environmental recycling practices, and EMSs. Corporate environmental management practices are an organization's a set of plans/programs to improve ecological performance.

Environmental Design Practices. *Environmental design practices*, known as eco-design or design for the environment (DfE), are defined as a firm's systematic integration of environmental considerations into product and process design (Sroufe, 2003; Knight and Jenkins, 2009). Environmental design is a useful approach that helps an organization reduce the environmental impact associated with a product system by introducing environmental considerations early on in the product and process design (Cerdan et al., 2009). Adopting innovative practices such as eco-design brings new opportunities in addressing environmental issues and offers new ways to add value to core business programs (Zhu et al., 2008).

Environmental design practices include design for disassembly (e.g., joint and component designs) and life cycle assessment (LCA) (Linton et al., 2007; Kurk and Eagan, 2008; Sarkis et al., 2010). Environmental design in the form of modular design (e.g., easy disassembly) has become prominent as labor costs increase. Therefore, it is unrealistic to replace most of a product' individual parts (Sroufe, 2003). Increasingly, modular designs facilitate remanufacturing activities such as automated diagnosis of problems and user repair or part replacement (Guide and Van Wassenhove 2001; Krikke et al., 2003; Kleindorfer et al., 2005). This practice aims to minimize costs by reducing the negative environmental impact of products throughout their life cycle.

LCA is defined as "a process to analyze the environmental burdens associated with the entire life cycle of a product or service" and is regarded as one of the most important eco-design tools (Cerdan et al., 2009). LCA evaluates the potential environmental impact of certain aspects of a product, process, or system by compiling an inventory of inputs/outputs, interpreting the result of the inventory, conducting an impact assessment in the context of study objectives, and suggesting improvements to achieve benefits in the future (Nakano and Hirao, 2011). LCA helps firms to implement eco-design by aiding in gathering and examining energy and material inputs and outputs of a product system and in evaluating the potential environmental impact throughout a product's useful life.

LCA also helps a firm to decide how to design a product to minimize its environmental impact over its useable life and beyond (Linton et al., 2007). It enables a firm to address environmental issues beyond the local boundaries of the product manufacturing phase. As such, it is essential that environmental issues are incorporated into the development process of products early on, for the sooner they are taken into account, the greater the potential is for environmental improvement and cost savings.

Environmental Recycling Practices. As profit margins decline, product life cycles shorten, and environmental concerns increase, firms are turning their attention to adopting recycling practices in order to save on costs related to environmental pollution (Defee et al., 2009). *Environmental recycling practices* are broadly defined as an organization's practices of reusing, recycling, and remanufacturing materials, components, and returned products. In a sense, reusing, recycling, and remanufacturing are different levels of the general term *recycling* (Sarkis, 2001). Activities like reusing, recycling, and remanufacturing can foster sustainability such that product recovery and reuse minimize the negative environmental impact of waste disposal, extracting raw materials, transport, and distribution.

Recycling usually entails waste source separation by employees for the purpose of cost saving. Waste source separation is aimed at making recycling efforts easier by segregating waste materials by source (recyclable, nonpolluting materials versus nonrecyclable, hazardous materials). Reuse differs from recycling in that the former keeps a product or part in its same form for the same use, whereas the latter does not

(Min and Galle, 2001). Recycling practices include rebuilding a product such that some of the parts or components are recovered while others are replaced; remanufacturing entails harvesting a product's primary components from used products and internal consumption of scrap and waste materials (Sroufe, 2003).

Environmental recycling practices may be summed up by the notion of a closed-loop or zero-pollution process, the goal of which is to reuse any waste or by-products within the internal manufacturing system (Sarkis, 2001). The success of a closed-loop manufacturing system requires both prevention (substitution) and reuse capabilities. Remanufacturing and reuse require some refurbishing and disassembly process capabilities. Processing equipment that is capable of cleaning and maintaining products is one of the first requirements. Disassembling products also is necessary for recycling materials that arrive from the after-market remnants of these products. The development of automated systems becomes necessary as markets for and pressures on remanufacturing, recycling, and reuse increase.

To effectively manage environmental issues, companies like BMW and DuPont increasingly use recycling activities (Angell and Klassen, 1999). For example, BMW opened a plant to disassemble automobiles for reuse and recycling of parts, thereby moving beyond the traditional approach of simply recovering automotive scrap. DuPont worked aggressively to eliminate the use of chlorofluorocarbons, a chemical responsible for damaging the ozone layer, by 2000.

Wal-Mart recycled tons of materials like aluminum, plastics, mixed paper, and cardboard by redirecting more than 64% of the waste generated by Wal-Mart stores and Sam's Club facilities (Wal-Mart Sustainability Report, 2010). Wal-Mart also began a test program, only offering reusable bags at three California stores. Instead of plastic bags, customers may choose to bring their own reusable bag or to purchase a reusable bag for 15 or 50 cents (Wal-Mart Sustainability Report, 2010). In an attempt to generate platinum catalyst wastes, some facilities of 3M have implemented a Pollution Prevention Pays (3P) program. This effort has turned waste into raw materials by working with a recycler to recover and process the waste for reuse. Through the new process, the facility saves more than $100,000 and prevents more than 1,000 tons of platinum waste annually (3M Sustainability Report, 2010).

Over the years, Starbucks has developed a recycling strategy to meet the goal of ensuring 100% of cups are reusable or recyclable by 2015 (Starbucks Shared Planet, Goals & Progress 2009). One such example is a pilot program sponsored by Global Green USA's Coalition for Resource Recovery to test the recyclability of paper cups with old corrugated cardboard, the most extensively recycled material in the United States. The use of postconsumer recycled fiber (PCF) in cups and other packaging also continues to be a priority for Starbucks, as it has been since 2006 when Starbucks launched the industry's first paper beverage cup containing PCF (Starbucks Shared Planet, Goals & Progress 2009). Over time, this effort has enabled Starbucks to conserve more than 60,000 tons of virgin wood fiber, the equivalent of more than 422,000 trees (Starbucks Shared Planet, Goals & Progress 2009).

Environmental Management System. In this study, *EMS* is defined as an organization's conformance to the ISO 14001 standard, which is aimed at improving environmental performance (Kitazawa and Sarkis, 2000; Melnyk et al., 2003; Sroufe, 2003). The ISO 14001 standard has been widely adopted throughout the globe. Currently, more than 130,000 organizations worldwide have certified their EMSs according to ISO requirements (ISO, 2006, 2007).

As a step in the adoption of an EMS, firms must meet the ISO 14001 standard, which requires certification by an independent third-party auditor, which ensures conformance to the ISO 14001 standard (Darnall et al., 2008). For the sake of certification preparation, an organization must possess the appropriate procedures to establish its EMS. Once certified, the organization implements a management system that outlines its pollution details and clarifies a pollution prevention process (Darnall and Edwards, 2006).

Overall, the ISO 14000 series provides the guidelines and requirements for EMSs (Melnyk et al*.,* 2003). EMSs help an organization formally track, monitor, and report its environmental impact. EMSs capture and summarize environmental performance, occasionally in the form of annual reports. Thus, an EMS is significant to supply chain members and has the potential to prevent pollution, which leads to cost reduction and profits improvement (Russo and Fouts, 1997).

EMSs have become increasingly significant as firms pursue sustainability practices as a hallmark of CSR. EMSs can be used to effectively manage a variety of environmental and social concerns and, thus, help improve corporate social performance (Sroufe, 2003). Moreover, EMSs generate competitive advantages for firms by providing unique environmental resources, capabilities, and benefits (Hart, 1995; Klassen and Whybark, 1996; Sroufe, 2003). Organizations that adopt and implement EMSs can improve their regulatory compliance, which in turn enhances their corporate image and increases financial performance.

To the extent that EMSs improve an organization's environmental performance (Khanna and Anton, 2002; Melnyk et al., 2003), they also increase a firm's economic gains through enhanced operational efficiencies (Russo and Fouts, 1997). EMSs also may improve manufacturing efficiency, create customer satisfaction, and help firms obtain access to new markets (Darnall et al., 2008). Table 2.6 provides the definition of subconstructs for corporate environmental management practices.

Table 2.6. List of subconstructs for sustainable operations management practices (corporate environmental management practices)

Corporate environmental management practices The extent to which an organization implements a set of plans/programs to improve its ecological performance		
Environmental design practices	The extent to which an organization systematically integrates environmental issues into product and process design	Allenby, 1993; Sroufe, 2003; Zhu and Sarkis, 2004; Montabon et al., 2007; Cerdan et al., 2009; Knight and Jenkins, 2009; Sarkis et al., 2010
Environmental recycling practices	The extent to which an organization reuses, recycles, and remanufactures materials, components, and/or returned products	Sarkis, 2001; Min and Galle, 2001; Sroufe, 2003; Montabon et al., 2007; Sarkis et al., 2010
Environmental management system	The extent to which an organization conforms to the ISO 14001 standard aimed at improving environmental performance	Kitazawa and Sarkis, 2000; Melnyk et al., 2003; Sroufe, 2003; Darnall et al., 2008

2.6.3.2.3. Corporate Social Responsibility Practices

CSR practices represent the people, or social, aspect of the triple bottom line (Kleindorfer et al., 2005). They are defined as the extent to which an organization implements a set of plans/programs to improve its employee and communal performance. They include internal (employee) and external (community and society) aspects of firms' social responsibility. First, the social dimension of sustainability aims at enhancing employee well-being (health and safety) and human rights (equity) (Kleindorfer et al., 2005; Pagell and Gobeli, 2009). Second, CSR practices are grounded in being a responsible organization (Orlitzky et al., 2003).

Carroll's (1979, 1991) CSR framework consists of four categories of social responsibilities: (a) economic responsibilities as the base level in a hierarchy of social responsibilities; (b) legal obligations (i.e., "ground rules" imposed by governments and regulatory agencies); (c) ethical responsibilities, or activities expected as a part of societal norms but not codified into law; and (d) discretionary responsibilities, or activities that are guided by an organization's discretion rather than by any legal requirements or ethical norms. CSR calls for companies to respond not only to their shareholders, but also to other important stakeholders, such as employees, customers, affected communities, and the public, on issues like employee welfare and human rights (Jenkins and Yakovleva, 2006). Three CSR practices are included in this study: employee well-being and equity practices, corporate sustainability reporting, and corporate social involvement practices (Brown, 1996; Daily and Huang, 2001; Kleindorfer et al., 2005; Castka and Balzarova, 2008; Vachon and Mao, 2008; Pagell and Gobeli, 2009; Pullman et al., 2009).

Employee Well-Being and Equity Practices. Traditionally, studies of OM have examined employee well-being in light of occupational health and safety (Brown, 1996; McFadden and Hosmane, 2001). Because workplace injuries in the United States have increased and accident occurrences have grown steadily over the last several years, maintaining workplace safety has been an important issue in regards to protecting employees' health and safety and promoting the welfare of employees engaged in work (Brown, 1996; McFadden and Hosmane, 2001; Das et al., 2008). Upholding good health and safety conditions in an organization becomes crucial as firms pursue sustainability (Jørgensen, 2008).

In general, firms address employee well-being by implementing human resource management and labor practices that enhance employees' competitiveness (Pagell and Gobeli, 2009). In order to achieve sustainable human resources, companies must recognize, value, and promote the capability of their people with appropriate human resource policies and practices for equity, development, and well-being (Daily and Huang, 2001). Pagell and Gobeli (2009) measured employee well-being by focusing on organizations' record for protecting employee health and safety (as evidenced by records of safety violations). Employee well-being, under the guise of health and safety, is the subject of a great deal of studies, within both managerial fields (Zohar and Luria, 2005) and the field of public health (Vredenburgh, 2002). It also has been reported that employee well-being practices are positively related to operational performance (Pagell and Gobeli, 2009).

As international standards of quality (ISO 9000) and environmental management (ISO 14000) have debuted, growing attention has been paid to developing ISO 26000 standards to effectively deal with the social responsibility agenda and to assist organizations and supply chains in addressing their social responsibilities. ISO 26000 is an international standard for social responsibility; its publication is planned for 2008 (Castka and Balzarova, 2008). Key components of ISO 26000 include human rights (universal declaration of human rights); workplace and employee issues, including occupational health and safety; unfair business practices including bribery, corruption, and anticompetitive practices; organizational governance; environmental aspects; marketplace and consumer issues; stakeholder involvement; and social development.

Recently, a few scholars have endeavored to operationalize social sustainability related to workplace and employee practices. Hutchins and Sutherland (2008) selected a few representative indicators related to workplace and employee well-being, such as (a) labor equity (e.g., the distribution of employee compensation within an organization calculated as the ratio of average hourly labor cost to the CEO's total compensation package), (b) healthcare (a corporation's role in providing/supporting the healthcare of employees and their families calculated as the ratio of the company-paid healthcare expenses per employee to market capitalization per employee), and (c) safety (the safety of the workplace within an organization calculated as the ratio of average days not injured to total days worked).

Vachon and Mao (2008) used fair labor practices related to workplace and employee well-being to measure social equity within the human resources operations and strategy of a company. Measurement items included the employment of women and wage equality of women in the workplace**.** Based on the literature, *employee well-being and equity practices* are defined as the extent to which a firm promotes and improves the overall quality of employees' health/safety and human rights.

Corporate Sustainability Reporting. Corporate sustainability reporting has become a widespread organizational practice as competitiveness and pressure for stakeholder accountability increase (Larsen, 2000; Montabon et al., 2007). Corporate sustainability reporting may be understood under the umbrella of corporate disclosure and public reporting (Emtairah, 2002). Disclosure of credible sustainability performance data may be viewed as a direct response to communities and societies that demand corporate behaviors that are more ethical and responsible (Kaler, 2002). This trend encompasses the overarching responsibilities of a firm toward stakeholders and society as a whole (Daub, 2007).

Contrary to the legal requirements that organizations frequently disclose financial information, sustainability reporting is not a mandatory choice. Leading companies voluntarily disclose sustainability information due to perceived social responsibility. Corporate sustainability reporting, however, often exposes companies to the information paradox—the more information an organization discloses, the more likely it is to meet increased demands for more information and the greater the possibility that stakeholders will question the validity and credibility of the disclosed information.

Because of this paradox, corporate sustainability reporting is of increasing strategic significance to top executives (Larsen, 2007). Reporting on achievements can enhance a company's public image but also present an opportunity for locating wastes and inefficiencies (Daub, 2007). For this reason, the legal demands for increased transparency regarding sustainability issues are becoming more obvious in some countries (Park and Brorson, 2005). Under various regulatory regimes, companies in the United States and Europe are required to report certain issues related to environment, health, and safety to the public authorities. The Toxic Release Inventory (TRI) in the United States and the Pollutant Release and Transfer Registers (PRTR) in Europe are examples of mandatory environmental disclosure schemes.

Examples of voluntary disclosure schemes are the annual environmental statement issued under the Eco-Management and Audit Scheme (EMAS) and any environmental information a company voluntarily makes available to the public, such as in the form of Certified Emission Reductions (CERs) (Emtairah, 2002). The Global Reporting Initiative (GRI) may be the best-known framework for voluntary sustainability reporting by business and other organizations worldwide (Brown et al., 2009). Mandatory schemes such as the TRI and PRTR can provide a powerful incentive for companies to reduce toxic releases. By making toxic release information accessible to interested parties, companies are encouraged to take pollution prevention measures (OECD, 1996).

In an attempt to tackle sustainability challenges, some organizations introduced third-party assurances of environmental reports in the early 1990s (ACCA, 2004). By allowing third parties to examine data and claims from an independent position, companies intend to add credibility to voluntary reporting in the same way that a financial audit adds credibility to a corporate financial report.

There are many reasons why corporations engage in sustainability reporting activities. Primarily, companies respond to changing trends to legitimize their actions to society (Daub, 2007). Morhardt et al. (2002) suggested the following reasons for this phenomenon:

- the attempt to meet regulatory requirements and reduce the potential cost of future regulations by adopting a proactive approach;
- the effort to bring operations into line with environmental codes, especially when under the threat of sanction for non-fulfillment;
- the effort to reduce operating costs; and
- the attempt to improve stakeholder relations.

Adopting the prior literature, this study defines *corporate sustainability reporting* as the extent to which a firm discloses quantitative and qualitative information on economic, environmental, and social performance.

Corporate Social Involvement Practices. Another CSR practice is corporate social involvement, which fits into the discretionary responsibilities of a firm (Caroll, 1979, 1991). Corporate social involvement practices are defined as a firm's philanthropic commitments within a community and to a greater society (Hutchins and Sutherland, 2008; Vachon and Mao, 2008).

Major organizations such as Toyota, BP, Procter & Gamble, Johnson & Johnson, Dell, IBM, Wal-Mart, and Starbucks have chosen to engage in corporate social involvement practices that are aligned with desired performance outcomes. For example, Procter & Gamble, manufacturer of Pampers disposable diapers, has been actively involved in sales-improving socially responsible practices such as infant life-saving health programs and education (Pullman et al., 2009). By funding these discretionary activities, including philanthropic donations and educational opportunities, firms become socially legitimate within communities (Hutchins and Sutherland, 2008).

Corporate social involvement practices enhance corporate social performance (the communal aspects of being a responsible organization in the supply chain) (Orlitzky et al., 2003; Pagell and Gobeli, 2009). Moreover, an organization's philanthropic practices may be regarded as add-ons to governmental activities aimed at providing social services. Positive interactions between an organization and its stakeholders help firms improve how they affect the esteem and self-actualization of society (Pullman et al., 2009).

Recently, a few scholars have endeavored to operationalize social sustainability related to social involvement practices. Hutchins and Sutherland (2008) listed one corporation's philanthropic commitments: building museums, funding performances and art shows, and providing fellowships to graduate students. Hutchins and Sutherland measured the outcomes using the ratio of charitable contributions to market capitalization.

Carter (2004) developed the concept of socially responsible purchasing with the support of corporate social responsibility. Carter operationalized socially responsible purchasing related to (a) diversity, (b) the environment, (c) human rights, (d) philanthropy and community, and (e) safety. Vachon and Mao (2008) measured corporate social involvement as a national-level social sustainability practice.

According to Steurer et al. (2005), the social dimension of sustainability should consider both internal social improvements for employees and external social improvements for other groups of stakeholders, such as local communities. Corporate social involvement indicators include (a) the extent of staff training, (b) involvement in charitable causes, (c) company promotion of volunteerism, and (d) the importance of corporate social responsibility. In sum, these social involvement practices are purely voluntary, and the decision to assume them is guided by a business's desire to engage in social roles that are not required by law and not even generally expected of businesses in an ethical sense (Carroll, 1979, 1991). Based on the literature, *corporate social involvement practices* are defined as the extent to which a firm makes philanthropic commitment within a community and to a greater society. Table 2.7 provides the definition of subconstructs for corporate social responsibility practices.

Table 2.7. List of subconstructs for sustainable operations management practices (corporate social responsibility practices)

Corporate social responsibility practices The extent to which an organization implements a set of plans/programs to improve its employee and communal performance		
Employee well-being & equity practices	The extent to which a firm promotes and improves the overall quality of employees' health/safety and human rights	Brown, 1996; Hanna et al., 2000; Daily and Huang, 2001; Jørgensen, 2008; Vachon and Mao, 2008; Pagell and Gobeli, 2009; Pullman et al., 2009
Corporate sustainability reporting practices	The extent to which a firm discloses quantitative and qualitative information on economic, environmental, and social performance	Larsen, 2000; Emtairah, 2002; Park and Brorson, 2005; Jenkins and Yakovleva, 2006; Daub, 2007; Montabon et al., 2007; Brown et al., 2009
Corporate social involvement practices	The extent to which a firm makes philanthropic commitment within a community and to a greater society.	Carter, 2004; Hutchins and Sutherland, 2008; Vachon and Mao, 2008; Pagell and Gobeli, 2009; Pullman et al., 2009; Jacobs et al., 2010

2.6.3.3. Sustainable Customer Management Practices

Traditional customer management practices have long existed to satisfy customers. In the era of sustainability, firms must revisit conventional customer management practices to advance and better respond to customer needs and requirements that are more complicated. Firms must utilize marketing skills and expertise to collaborate with major customers for improving the sustainability performance of both parties.

For example, to meet the quality expectations of customers, today's companies need to embrace sustainability criteria in terms of environmental improvements and social reputation, not to mention economic standards such as top quality, improved efficiency, increased production capacity, and cost competitiveness (Toyota Sustainability Report, 2009). Traditional customer management practices must be upgraded to meet customers' higher standards of sustainability. In this study, two sustainable customer management practices are examined: customer management practices and information sharing practices with customers.

2.6.3.3.1. Customer Management Practices

Customer management involves a firm's key activities that occur downstream in the supply chain (Li et al., 2005). Customer management practices are used to manage customer complaints, build long-term customer relationships, and improve the overall satisfaction of customers (Li et al., 2005). For decades, customer management has been known as an integral marketing strategy to improve cost and profit efficiency (Krasnikov et al., 2009). Understanding and meeting customers' needs and requirements is key for customer management. Close customer relationships allow an organization to differentiate its products from competitors', to dramatically extend the value it provides to customers, and to sustain customer loyalty.

Daub and Ergenzinger (2005) proposed the term *generalized customer* to indicate the increased interests and concerns of customers. Customers not only care about their consumption preferences but also are potential members of a variety of stakeholders such as family, community, and country. Generalized customers can only be satisfied by products or services that sustainability-oriented companies offer (Luo and Bhattacharya, 2006). In the sustainability era, recognizing and satisfying such customers' needs is critical. Firms that are capable of achieving profitability through delivering quality products and services while maintaining social and environmental sustainability are better prepared for current and future customers. In this sense, traditional customer management functions need much more refinement in terms of recognizing customers in a more holistic way.

In the context of sustainability, customers are more conscious of worldwide environmental and social pressures than ever before; thus, they demand more products and services that are aligned with sustainability goals. For example, HP's survey of 20 major customers in 1998 revealed the expectations of its business and consumer customers (Preston, 2001). More than 80% of the enterprises studied mentioned the following criteria in purchasing decisions: an ISO 14001-certified environmental management system, documentation of continuous improvement with regard to environmental performance objectives, and clear environmental attribute information for products. Over 50% of companies expected end-of-life programs, supply chain management programs, and safe, energy-efficient products.

Today, a considerable number of customers prefer to purchase eco-friendly offerings (Nidumolu et al., 2009). For example, market research shows that 15% of consumers treat health and sustainability as major criteria when making purchasing decisions, and 25% to 35% take environmental benefits into consideration (Nidumolu et al., 2009). To design sustainable products, companies must understand consumer concerns and carefully examine product life cycles. Firms must learn to combine marketing skills with their expertise in scaling up raw materials and distribution. Therefore, effectively managing customers' requirements becomes a foundational skills and knowledge base for addressing customers' increasing demands for sustainability.

2.6.3.3.2. Information Sharing with Customers

To effectively manage customers, firms consider receiving critical and proprietary information from their major customers (Li and Lin, 2006). The types of information shared with customers may not be the same as those shared with suppliers. Focal firms may wish to receive important economic, environmental, and social information from customers. Economic information includes changes in purchase order, planned order, and demand forecasting (Zhou and Benton, 2007). Some of the most vital environmental information may be customers' environmental policies and the changes in eco-design products (Erlandsson and Tillman, 2009). Customers also may share social information, such as information how they treat their employees in terms of well-being and equity and relationships with communities and society.

Researchers have argued that obtaining demand information the customers is positively related to reduction in inventory costs in the supply chain, because information sharing leads to the better information flow in the supply chain (Graham and Hardaker, 2000; Lee et al., 2000; Sezen, 2008). Thus, inventory reductions and efficient use of resources become possible. Bourland et al. (1996) proved that sharing timely demand information with customers improves delivery performance. Gurin (2000) demonstrated how Ford and UPS leverage information sharing to improve Ford's delivery performance. Table 2.8 provides the definition of subconstructs for sustainable customer management practices.

Table 2.8. List of subconstructs for sustainable customer management practices

Construct	**Definition**	**Related Literature**
Sustainable customer management practices The extent to which an organization collaborates with its major customers to improve sustainability performance of both parties		Klassen and Vachon, 2003; Li et al., 2005
Customer management practices	The extent to which an organization manages its main customers to improve their overall satisfaction in regards to sustainability	Li et al., 2005
Information sharing practices	The extent to which an organization receives critical and proprietary information from major customers in regards to sustainability	Li and Lin, 2006; Jamali, 2006; Zhou and Benton, 2007; Erlandsson and Tillman, 2009

2.6.4. Sustainability Performance

As global economic order unfolded, organizations are increasingly aware of measuring their sustainability performance outcomes. *Sustainability performance* is multifaceted. For this research, three dimensions of performance outcomes are relevant: economic, environmental, and social performance. Hubbard (2009) suggested that measuring performance is likely to become more complex as stakeholder expectations about companies' economic, environmental, and social responsibilities are constantly shifting. The following three feasible scenarios are provided to demonstrate the multifaceted and complex nature of sustainability performance:

- Scenario 1: high economic performance vs. low environmental and social performance. "Shareholders have been enjoying consistently high returns for the last five years, but the organization's relationships with its employees are far from healthy. Absenteeism and turnover are high. The organization is not popular in the local community or with regulators, as it is perceived to sail close to the wind on all legal and environmental issues" (Hubbard, 2009, p. 177).

- Scenario 2: high social performance vs. low economic performance. "The organization has won a prestigious 'Best Employer' award three times in the last decades, but its financial performance is tenuous. The investment community largely assumes that the company is run for the benefit of employees and has consigned it to their 'social responsibility' portfolios" (Hubbard, 2009, p. 177).

- Scenario 3: low economic performance and low social performance. "This firm is well known for being 'green', but, behind the publicity campaign, meeting self-imposed environmental standards has seriously compromised the company's manufacturing process efficiencies and increased its costs. The company is losing money and employee morale is rapidly falling as job cuts loom" (Hubbard, 2009, p. 177).

The variables considered in this study to investigate sustainability performance are economic performance (operational performance, as well as market and financial performance), environmental performance (pollution control and resource efficiency), and social performance (employee- and community-oriented outcomes).

2.6.4.1. Economic Performance

Economic performance is one of the most important motives for implementation of sustainable supply chain practices. Scholars (Walley and Whitehead, 1994; Bowen et al., 2001) suggested that implementing practices of sustainability might not bring positive profitability and sales performance in the short term due to the initially heavy upfront costs. However, these practices will prepare companies for superior long-term performance through improved capacity for managing environmental risks and effecting continuous environmental and social improvement (Zhu and Sarkis, 2004). In this study, *economic performance* includes two aspects: operational performance and business performance (market and financial performance).

Operational performance refers to the extent to which firms improve outcomes in cost, quality, delivery, and flexibility (Flynn and Flynn, 2004; Devaraj et al., 2007; Kristal et al., 2010). Achieving operational performance involves a firm's competitive capabilities, defined as "the manufacturer's actual or realized competitive strength relative to primary competitors in its target markets" (Rosenzweig et al., 2003, p. 438). In the sustainability era, operational performance becomes critical as a minimum requirement in the competitive marketplace (Hill, 2000; Mason-Jones et al., 2000; Rosenzweig et al., 2003).

Business performance takes into account organizations' responsibilities toward shareholders and involves a profit maximization objective (Friedman, 1970). In line with earlier research business performance, it is conceptualized with two dimensions: market performance (e.g., market share, the growth of market share, and sales growth) and financial performance (e.g., ROI, ROA, and profit margin on sales) (Narasimhan and Kim, 2002; Menor et al., 2007; Kristal et al., 2010).

2.6.4.2. Environmental Performance

With increasing demands for environmental and social performance, companies' winning criteria have been expanded to include not only conventional economic performance (i.e., cost, quality, delivery, and flexibility), but also environmental and social performance. Environmental and social performance is an important additional dimension of firms' objective to obtain sustainable competitive advantage (Angell and Klassen, 1999; Jiménez and Lorente, 2001; Delmas and Toffel, 2004; Pullman et al., 2009).

Environmental performance is a concern of managers due to needs related to regulatory and contractual compliance, public perception, and seeking competitive advantage. The literature (Florida, 1996; Handfield et al., 2002; Zhu and Sarkis, 2004) offers insight into potential patterns of supply chain relationships for improving environmental performance. Zhu and Sarkis (2004) empirically operationalized environmental performance outcomes in terms of reductions in environmental waste and energy consumption (Beamon, 1999; Sroufe, 2003; Hervani et al., 2005; Matos and Hall, 2007; Montabon et al., 2007). In this study, *environmental performance* is referred to as an organization's achievement of performance outcomes related to pollution control and resource efficiency (Kleindorfer et al., 2005).

2.6.4.3. Social Performance

Carroll (1979) presented a concise definition of corporate social performance, which consists of three elements: social responsibility categories, social issues, and philosophies of social responsiveness. Elaborating on the work of Carroll (1979), Wood (1991) defined corporate social performance as "a business organization's configuration of principles of social responsibility, processes of social responsiveness, and policies, programs, and observable outcomes as they relate to the firm's societal relationship" (Wood, 1991, p. 693).

Despite the realistic difficulties of measuring social performance, a matrix of social performance outcomes has been suggested among researchers (Keeble et al., 2003; Dias-Sardinha and Reijnders, 2005; Székely and Knirsch, 2005). Szekely and Knirsch (2005) suggested five dimensions of social performance indicators: human rights, labor/employment issues (e.g., health and safety, education, training, wages, benefits, conditions of work/employment, etc.), supplier relationships (e.g., contractual agreements with suppliers, supplier diversity, etc.), community initiatives (e.g., involvement in local communities, contribution to the local economy, etc.), and corporate philanthropy (e.g., donations, pre-tax profits, and grant programs). Dias-Sardinha and Reijnders (2005) developed a thematic balanced scorecard to address environmental and social performance evaluation of large Portuguese companies. Among five stakeholder perspectives (business ethics, labor practices and relations with society as reflected in ethical codes/policies, worker satisfaction, communication/reporting, relations with NGOs, and philanthropy), the second addresses most social issues.

Researchers agree that measuring social performance is a daunting task given the nature of complexity of social practices. By synthesizing the previous literature on corporate social performance, two elements of *social performance* are included: internal performance (i.e., employee-oriented outcomes such as employee quality of life, employee fair compensation, employee healthcare benefits, etc.) and external performance (i.e., community/society-oriented outcomes such as social commitment, social legitimacy, relationships with stakeholders such as governments and NGOs, etc.). Table 2.9 provides the definition of subconstructs for sustainability performance outcomes.

Table 2.9. List of subconstructs for sustainability performance outcomes

Construct	**Definition**	**Related literature**
Economic performance	The extent to which a firm improves operational, market, and financial outcomes compared to last year's performance	Narasimhan and Kim, 2002; Flynn and Flynn, 2004; Menor et al., 2007; Kristal et al., 2010
Operational performance	The extent to which a firm improves outcomes in regards to cost, quality, delivery, and flexibility compared to last year's performance	Rosenzweig et al., 2003; Flynn and Flynn, 2004; Devaraj et al., 2007; Kristal et al., 2010
Market performance	The extent to which a firm achieves market-valued outcomes such as sales and market growth	Narasimhan and Kim, 2002; Menor et al., 2007; Kristal et al., 2010
Financial performance	The extent to which a firm achieves profit-oriented outcomes such as ROI and ROA	Narasimhan and Kim, 2002; Menor et al., 2007; Kristal et al., 2010
Environmental performance	The extent to which an organization improves outcomes in regards to pollution control and resource efficiency compared to last year's performance	Sroufe, 2003; Zhu and Sarkis, 2004; Matos and Hall, 2007; Montabon *et al.,* 2007; Pullman et al., 2009; Jacobs et al., 2010
Pollution control	The extent to which a firm reduces environmental pollution	Zhu and Sarkis, 2004
Resource efficiency	The extent to which a firm reduces, reuses, and recycles waste/products/energy	Jacobs et al., 2010
Social performance	The extent to which an organization improves employee- and community-oriented outcomes compared to last year's performance	Wood, 1991; Garriga and Mele, 2004; Rao and Holt, 2005

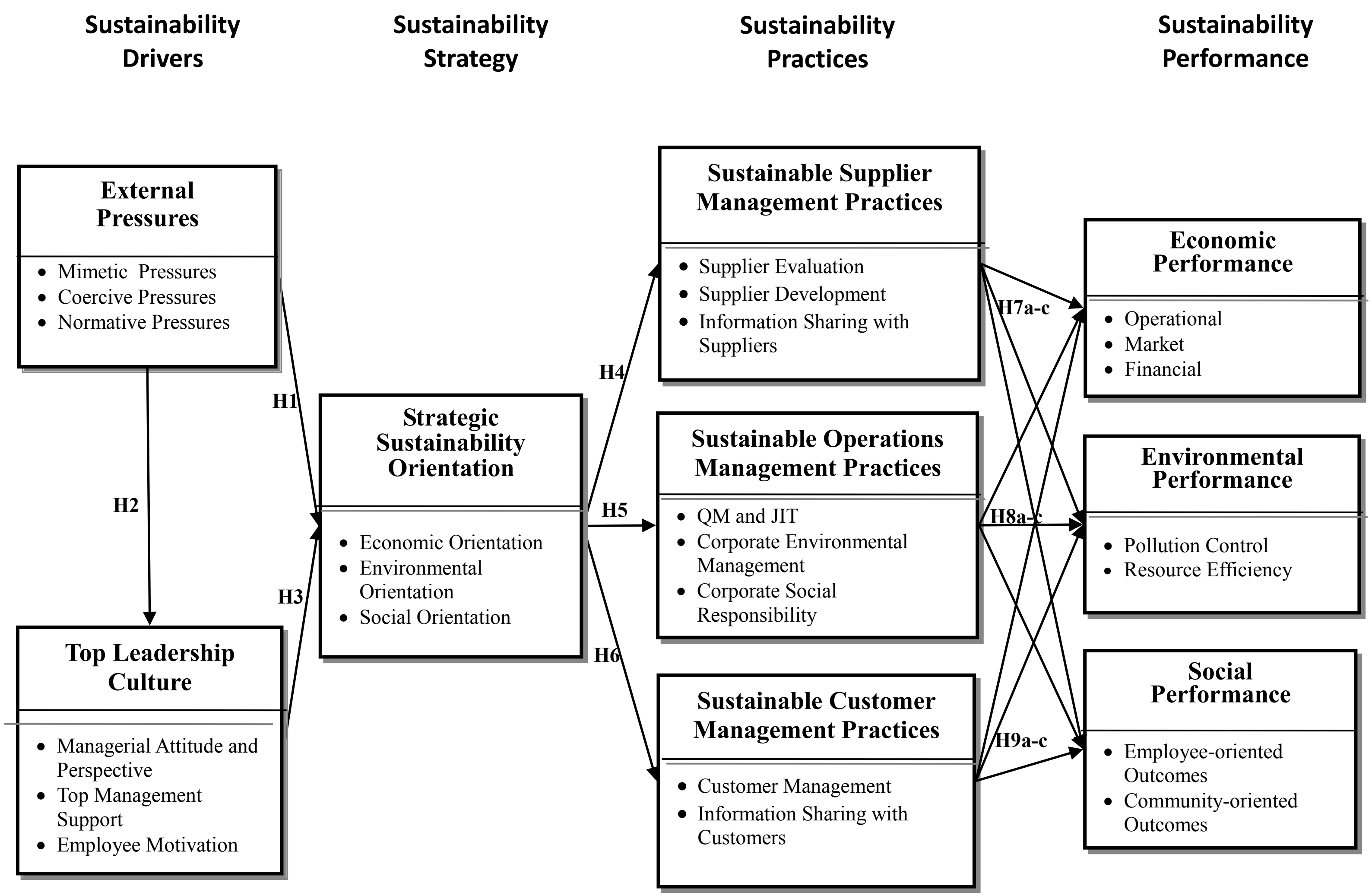
Employee-oriented outcomes	The extent to which a firm improves the employees' well-being/equity and addresses human rights concerns	Szekely and Knirsch, 2005
Community-oriented outcomes	The extent to which a firm enhances the community in which it operates	Szekely and Knirsch, 2005

2.7. Theoretical Model and Research Hypotheses

2.7.1. Research Model (Detailed)

Figure 2-2 presents a research model of the interrelationships among constructs, including sustainability drivers, sustainability orientation, SSCM practices, and sustainability performance. Specific hypotheses are discussed in the following text.

Figure 2-2. Research Model (Detailed)



2.7.2. Research Hypotheses H1–H3: Sustainability Drivers and Strategic Sustainability Orientation

Institutional theory suggests that external environments in which firms operate become influential social factors that affect focal firms' adoption of practices (Roberts and Greenwood, 1997; Heugens and Lander, 2009). Often, external environments serve as external pressures on focal firms (Oliver, 1997; Ketokivi and Schroeder, 2004; Zsidisin et al., 2005). Three commonly cited external pressures are mimetic, coercive, and normative (DiMaggio and Power, 1983; Teo et al., 2003; Delmas and Toffel, 2004; Darnall et al., 2008; Liu et al., 2010).

Mimetic pressures occur when firms' main competitors successfully adopt sustainability initiatives (Liu et al., 2010). Mimetic pressures invoke focal firms' intentions to reduce uncertainties by adopting the same practices as their competitors. Because firms do not want to invest in costly sustainability initiatives when the benefits are not guaranteed, mimicry of successful firms' actions can diminish these uncertainties. By adopting the same practices, firms are able to confer to social legitimacy and are likely to survive in the same industry (Perez-Batres et al., 2011). These prospective benefits may create a strong orientation to adopt sustainability initiatives.

Coercive pressures have been one of the most influential factors to drive firms to consider implementing sustainability initiatives (Rugman and Verbeke, 1998; Henriques and Sadorsky, 1996; Seuring and Muller, 2008; Nawrocka et al., 2009; Defee et al., 2009). The primary basis for coercive pressures lies in costs, but coercive pressures also extend to other aspects such as public image and customer relationships. Companies that fail to satisfy the requirements of governmental regulations are likely to be charged with costly lawsuits, which will cause them to lose their public or brand image and, thus, negatively affect their customer relationships (Sarkis et al., 2010). Similarly, firms that fall short of complying with the law, or with practices and structures that customers or a parent company require, will fail to secure their positions (Kostova and Roth, 2002; Teo et al., 2003; Gelderman et al., 2008). In sum, these political influences may cause firms to adopt sustainability initiatives.

Normative pressures are demands related to social expectations from suppliers, trade associations, labor unions, local communities, and NGOs. For example, NGOs and communities exert pressures on firms by monitoring new developments, trends, and changes in the environmental/social debate (Liu et al., 2010). These normative pressures enable firms to go beyond the mere compliance with laws by enhancing information relationships and accruing political capital. Actions by NGOs or local communities can even lead focal firms to become more accountable for environmental and social issues (Darnall et al., 2008). Therefore, when firms perceive higher levels of mimetic, coercive, and normative pressures, they experience a positive influence on their SSO. Therefore, it is hypothesized that

H1: Firms' perceived external pressures—that is, mimetic, coercive, and normative pressures toward sustainability—are positively related to their strategic sustainability orientation.

Organizational culture and norms are most often influenced by the external environment a firm faces (Gordon, 1991). Often, a company's survival and prosperity hinge on how the top management of a firm cultivates the firm's culture and norms that are appropriate to the external environment (Gordon, 1991). Thus, when firms perceive pressures from various stakeholders in several forms, they are likely to respond to pressures by changing organizational structures and cultural norms to gain social legitimacy among key stakeholders (Rogers et al., 2007).

Pressures that come from competitors' successful adoption of sustainability initiatives (mimetic pressures) can drive top management to create a culture that is conducive to sustainability. Political influences created by governmental regulations, important customers, or a parent company (coercive pressures) also become driving forces for top leadership to engage more proactively, beyond mere conformance to the regulations and rules. Finally, collective societal demands from various stakeholders such as suppliers, trade partners, and NGOs (normative pressures) encourage top leadership to participate in sustainability programs and practices. Thus, it is hypothesized that

> **H2**: Firms' perceived external pressures—that is, mimetic, coercive, and normative pressures toward sustainability—are positively related to their top leadership culture.

Firms with an enthusiastic, proactive, and committed top leadership culture have a better chance of success in organizational change initiatives (Kotter, 1990; McFadden et al., 2009). Kotter (1990) delineated three key leadership tasks that enable an organization to successfully perform a change initiative. First, top leadership must express a compelling vision that guides other activities. Second, it must communicate well enough for an entire organization to have a shared mission and purpose for what they do. Third, top leadership must inspire shop-floor employees to be involved in sustainability initiatives.

In the context of adopting sustainability initiatives, top leadership culture represents how the top management of an organization responds to sustainability-related pressures. SCT (Child, 1972) contends that top management plays a significant role in making strategic decisions in the course of shaping organizational actions by using managerial discretion, interpretation, and perspectives. SCT asserts that firms proactively seeking sustainability exceed more conformance to regulations and seek more innovative solutions to meet other stakeholders' expectations. Firms with proactive culture will have a higher chance to capture market opportunities (Covin and Miles, 1999). Thus, top leadership's committed and proactive attitude toward and perspectives on sustainability are more likely to create an orientation to adopt sustainability initiatives.

Top management's tangible and substantial support for the organization helps different functional departments run more smoothly in terms of developing sustainability programs. Top leadership that is willing to have monetary supports and tangible aids to functional departments can serve as a champion of sustainability initiatives to help the organization transition toward sustainability more smoothly and completely (Daily and Hwang, 2001). Thus, it will lead to firms' sustainability orientation.

Shop-floor employees who are highly motivated and inspired by top leadership will participate more enthusiastically in the improvement of sustainability programs by offering suggestions and innovative solutions (Hanna et al., 2000; Daily and Huang, 2001). Motivated employees can positively affect cultural change across the organization (Enander and Pannullo, 1990). In that regard, the success of a firm hinges on how effectively shop-floor workers are motivated by the top leadership of an organization to make their best effort. Organizational culture that holds motivated employees in participating in sustainability programs will be more likely to create a firm's sustainability orientation. These arguments lead to the following hypothesis:

H3: Firms' proactive and committed top leadership culture is positively related to their strategic sustainability orientation.

2.7.3. Research Hypotheses H4–H6: Strategic Sustainability Orientation and Sustainable Supply Chain Management Practices

A firm's SSO is the overall direction toward sustainability it adapts from the external environment (Venkatraman, 1989; Manu and Sriram, 1996). Firms with greater orientation toward sustainability tend to consider the whole supply chain and strive to reinvent their production and delivery processes for the sustainability of the supply chain (Linton et al., 2007; Hong et al., 2009). With an SSO, firms willingly implement interorganizational practices across the supply chain, from initial selection of the materials to disposal of products (Zhu and Sarkis, 2007; Seuring and Muller, 2008). When firms have a high level of SSO, they are likely to implement supply chain practices that bring tangible economic, environmental, and social outcomes (Defee et al., 2010).

Firms' SSO may positively influence the implementation of practices related to suppliers. An SSO allows a firm to be aware of the need for constant monitoring and assessment and a long-term investment in developing suppliers. With the intention to be strategically oriented toward sustainability, firms are more willing to invest in evaluating schemes such as classification/rating systems in order to have better evaluating standards for suppliers (Sarkis and Talluri, 2002). In addition, firms are more willing to establish supplier development programs when they have high level of SSO.

As shown in the example of Wal-Mart's suppliers, developing suppliers' long-term capacity to meet increasingly complex sustainability standards is a smart solution for the rising level of supplier-related accidents in developing countries such as China. Firms will establish the proper system to transfer tacit knowledge to suppliers. By offering education and training programs to better respond to sustainability criteria, firms also can build mutual trust with suppliers.

Similarly, firms with higher levels of SSO create more an internal environment of the firm to align with what external business market requires for sustainability (Manu and Sriram, 1996; Morgan and Strong, 1998). By receiving sensitive and critical sustainability information with their suppliers, firms can make sure whether suppliers whom they work with do keep pace with sustainability standards and requirements, which is the prerequisite of making sustainable products and delivering high-quality services to their marketplace. For instance, information in regard to how suppliers conform to environmental regulations and how suppliers treat employees for their wellbeing can be shared with focal firms to ensure the transparency of the supply chain. With high SSO, firms more want to receive such information from suppliers. Thus, it is hypothesized that

H4: Firms' strategic sustainability orientation is positively related to their implementation of sustainable supplier management practices (i.e., supplier evaluation practices, supplier development practices, and information sharing with suppliers).

Firms' SSO may also positively influence implementing practices related to internal operations. The key tenet of SSO is to ensure firms' economic, environmental, and social priorities. With this goal in mind, firms will implement superior operational practices such as QM and JIT. The main areas of improvement by implementing these practices are reduction of products/processes variation and achievement of cost efficiencies, which can lead to economic improvement (Corbett and Klassen, 2006; Shah and Ward, 2003, 2007). QM and JIT are also positively related to the improvement of environmental performance. Thus, with high SSO, firms consider implementing QM and JIT practices (King and Lenox, 2001; Yang et al., 2011).

Implementing corporate environmental management practices, such as environmental design, environmental recycling, and EMS, offers a higher chance to improve firms' environmental performance, which is one of the important priorities of SSO. By employing environmental design practices, firms can design products and processes in a way that polluting emissions and wastes are minimized. Firms also proactively manage their waste and pollutions by implementing activities like reusing, recycling and remanufacturing (Sroufe, 2003; Montabon et al., 2007; Sarkis et al., 2010). Firms that conform to the ISO 14001 standards certainly expect to have environmental improvement (Melynk et al., 2003). Taken together, firms with higher SSO will implement corporate environmental management practices, with aims of meeting environmental priorities.

Lastly, firms are interested in implementing employee well-being and equity, corporate sustainability reporting, and corporate social involvement practices to realize the goal of social priority of firms. Maintaining high level of employees' health and safety is key for firms' competiveness (Pagell and Gobeli, 2009). Ensuring human rights such as worker compensation and fair gender treatment becomes increasingly important to gain social legitimacy among the industry (Castka and Balzarova, 2008). By issuing sustainability reports and engaging in social involvement like philanthropic commitment, firms become a responsible member within a community and a greater society. Thus, the following hypothesis is proposed:

H5: Firms' strategic sustainability orientation is positively related to their implementation of sustainable operations management practices (i.e., QM and JIT practices, corporate environmental management practices, and corporate social responsibility practices).

The term *generalized customer,* coined by Daub and Ergenzinger (2005), refers to how a firm needs to deal with a more complex business environment. With the increasingly varied interests and concerns of customers, firms are considering the implementation of practices to satisfy customers who are highly conscious of sustainability. Firms with a higher level of SSO will exhibit higher levels of implementation of sustainable customer management practices because the effective management of customers' requirements becomes the foundational skills and knowledge base for addressing customers' increasing demands for sustainability.

With the goal of meeting all economic, environmental, and social priorities, it is important for firms to understand customers' intentions, plans, and practices and communicate clearly sustainability issues with customers. This will lead firms to receive critical and sensitive sustainability-related information from customers when they have higher SSO. Thus, it is hypothesized that

H6: Firms' strategic sustainability orientation is positively related to their implementation of sustainable customer management practices (i.e., customer management practices and information sharing with customers).

2.7.4. Research Hypotheses H7–H9: Sustainable SCM Practices and Sustainability Performance

RBV literature advocates that firms that implement practices that are valuable, rare, inimitable, and non-substitutable in bundle are likely to generate favorable performance outcomes (Barney, 1991; Narasimhan and Jayram, 1998; Holcomb and Hitt, 2007). Furthermore, the RBV of the firm can be applied to an interorganizational context, where firms develop their supply chain capabilities by implementing network-based supply chain practices. These supply chain practices, such as supplier evaluation/development practices, are harder to be duplicated by other firms, enabling firms to achieve competitive advantage (Wu et al., 2006; Capaldo, 2007).

Monitoring and evaluating suppliers as to whether they meet sustainability standards using proper evaluating schemes protects focal companies from potential risks related to causing environmental damage or violating social standards (Koplin et al., 2007). Thus, monitoring may prevent unnecessary financial losses. There is a high probability that supplier evaluation activities will improve environmental performance and bring positive economic performance. Also, managing the qualification of suppliers in the evaluation process will help an organization to manage corporate legitimacy and reputation (Bai and Sarkis, 2010), thereby improving social performance.

Collaborative activities with suppliers along the supply chain might help a focal company to identify multiple challenges that arise from dealing with sustainability issues, including environmental and social challenges (Klassen and Vachon, 2003; Krause et al., 2007; Yang et al., 2010). As in the Wal-Mart example, investing resources to improve suppliers' capabilities in regards to sustainability standards seems to be costly and requires a long timeframe, which makes companies reluctant. However, such activities will bring a company sustainable power to deal with unexpected disruptions that might destroy the entire supply chain.

Practices related to sharing vital information with suppliers are essential for a company to evaluate and develop its suppliers. Economic information from suppliers allows a firm to be aware of product-related situations such as delivery schedule for the firm's products, order status, and inventory level, enabling a firm to respond to the market faster and better and, therefore, leading to positive economic performance (Zhou and Benton, 2007). Environment-related information such as conformance to environmental regulations and supplier environmental performance improvements help a firm to deliver environmentally friendly products while minimizing negative environmental effects and improving the firm's environmental performance (Erlandsson and Tillman, 2009).

In addition, suppliers' social information, such as how suppliers manage employee-related health and safety and equity issues and how they develop their relationships with communities and society, facilitates a firm in managing suppliers' transparency. Thus, social information improves a firm's social reputation and brings social performance improvement. Therefore, it is hypothesized that

H7: Sustainable supplier management (SSM) practices positively influence sustainability performance.

- H7a: Higher levels of adoption of SSM practices are positively related to economic performance.
- H7b: Higher levels of adoption of SSM practices are positively related to environmental performance.
- H7c: Higher levels of adoption of SSM practices are positively related to social performance.

It is expected that implementation of a firm's sustainability practices with regard to internal operations is positively associated with each dimension of sustainability performance. These sustainability practices include QM, JIT, corporate environmental management, and corporate social responsibility practices.

Researchers have argued that the more often firms implement QM and JIT, the higher operational performance they achieve in terms of lower costs, higher product quality, faster and more reliable delivery, and process flexibility (Shah and Ward, 2003, 2007; Yang et al., 2010). These practices, which are useful in waste management, would also be helpful in managing environmental pollutants and waste to improve environmental performance (King and Lenox, 2001; Pil and Rothenberg, 2003; Yang et al., 2011). For instance, process superiority embodied in the ISO 9000 quality standard (a proxy for QM practices) can be a considerable aid to finding process defects and fixing them (Kleindorfer et al., 2005). In the similar way, process excellence can be linked to positive effects on employee health and safety and the associated EMS (Kleindorfer et al., 2005). The core principles of QM—getting things right from the beginning, elimination of waste, and focus on continuous improvement—can be applied in managing environmental matters (Shrivastava, 1995; Pil and Rothenberg, 2003).

Knowledge capacity related to JIT, such as differentiation of value-added and non-value-added tasks, use of metrics to track and reduce in-process waste, and team problem solving to address waste are relevant to the implementation of activities that focus on reducing environmental waste (King and Lenox, 2001). Within an organization, JIT creates the orientation to increase employee responsibility and involve employees in waste reduction efforts (Shah and Ward, 2003; Tu et al., 2006). Such an orientation helps firms to adopt environmental management practices that aim at reducing waste and pollutants (Yang et al., 2011). JIT also helps enhance energy efficiency (Kleindorfer et al., 2005; Nidumolu et al., 2009) and, thus, is the basis for being environmental friendly, or green (Florida, 1996; King and Lenox, 2001).

The positive linkage between corporate environmental management and pertinent sustainability performance indicators has been well recognized (Zhu and Sarkis, 2004; Rao and Holt, 2005; Pullman et al., 2009; Yang et al., 2011). For example, environmental design practices allow an organization to design eco-friendly products, thereby reducing their impact on the environment and improving environmental performance (Sroufe, 2003; Knight and Jenkins, 2009). Similarly, environmental recycling practices help firms to reuse, recycle, and remanufacture materials, components, and returned products, facilitating firms' environmental friendliness (Min and Galle, 2001; Sroufe, 2003; Sarkis et al., 2010), as evidenced by Wal-Mart's, 3M's, and Starbucks' recycling practices.

Finally, EMSs enable organizations to track, monitor, and coordinate information related to environmental performance, which in turn leads to improved environmental performance (Melnyk et al., 2003; Sroufe, 2003; Darnall et al., 2008) and gains in market share through improving brand reputation (Klassen and McLaughlin, 1996). In sum, corporate environmental management practices allow organizations to take environmental effects into consideration throughout the lifecycle of their products and processes, hence positioning them to improve their sustainability performance.

A firm's CSR practices include both internal (employee health/safety and equity) and external (community and society) practices. Internally, CSR practices are aimed at boosting employees' well-being by enhancing their health and safety (Kleindorfer et al., 2005; Pagell and Gobeli, 2009). Externally, CSR practices are intended to bring greater legitimacy to the community and society by acting as a responsible organization (Orlitzky et al., 2003). A firm's employee well-being practices are positively related to environmental improvement and overall improved sustainability performance outcomes (Florida, 1996; Rothenberg et al., 2001). One study showed that when employees are well taken care of, an organization's environmental performance improves (Marshall et al., 2005).

Scholars also supported the notion that a firm's social practices, which are directly related to positive employee attitudes and satisfaction, lead to overall quality improvements (Flynn et al., 1995). A firm's philanthropic activities also can improve the firm's brand image (Orlitzky et al., 2003; Pagell and Gobeli, 2009). Therefore, CSR practices are positively associated with sustainability performance. Thus, the following hypothesis is posited:

H8: Sustainable operations management (SOM) practices positively influence sustainability performance.

H8a: Higher levels of adoption of SOM practices are positively related to economic performance.

H8b: Higher levels of adoption of SOM practices are positively related to environmental performance.

H8c: Higher levels of adoption of SOM practices are positively related to social performance.

Customer management practices are directly related to increasing customer satisfaction (Li et al., 2005). As customers' demands and requirements become more complex and diversified, firms must develop an intimate relationship with customers by heavily investing in market research and customer management. Companies that face sustainability-conscious customers may need to make additional efforts to keep a loyal customer base by offering environmentally friendly products and services. This leads to improved customer satisfaction and, consequently, enhances the social image and reputation of firms (Antonides and Raaij, 1998). Although efforts to understand customers' concerns and preferences take costs and time, they have lasting effects on customers' satisfaction and have a positive influence on sustainability performance.

Companies' practices of information sharing with major customers help to improve sustainability performance in the supply chain (Lee et al., 2000). Improved information flow from customers to focal companies positively affects the level of supply chain integration, reducing the negative influence of the bullwhip effect (Sahin and Robinson, 2002). Sharing information with customers also helps supply chains to be more responsive to volatile demand environments, thereby improving competitiveness of the supply chain (Lee et al., 2000; Sahin and Robinson, 2005).

Sharing sustainability-related information with customers directly affects the improvement of delivery performance (Zhou and Benton, 2007). These activities also improve customer satisfaction, which is a positive indicator of sustainability performance. Customers' environmental information such as customers' policies on environmental management and their plan to change in eco-design products will help better prepare a focal firm's environmental management, improving their environmental performance. Likewise, social information of customers such as how they treat their employees and their relationships with communities and society can help firms to be more transparent in their supply chain activities, improving a focal firm's social performance. Therefore, the following hypotheses are posited:

H9: Sustainable customer management practices positively influence sustainability performance.

- H9a: Higher levels of adoption of sustainable customer management practices are positively related to economic performance.
- H9b: Higher levels of adoption of sustainable customer management practices are positively related to environmental performance.
- H9c: Higher levels of adoption of sustainable customer management practices are positively related to social performance.

Chapter 3

Instrument Development Phase I – Item Generation and Pilot Test

To test the hypothesized relationships between the constructs proposed in Figure 2.2, a reliable and valid measure for each construct must first be developed. Thus, this study developed measures for these constructs covered in the research model: (1) external pressures (EPs), (2) top leadership culture (TLC), (3) strategic sustainability orientation (SSO), (4) sustainable supplier management practices (SSMPs), (5) sustainable operations management practices (SOMPs), (6) sustainable customer management practices (SCMPs), and (7) sustainability performance (SPerf). The instrument development process can be divided into three phases: first, item generation; second, structured interview and pretest; and third, a pilot study (Churchill, 1979; Segar, 1998).

3.1 Item Generation

To generate items for each construct, previous relevant literature is extensively reviewed, and an initial list of potential items is compiled. The essential requirement for a good measure is content validity, which indicates that the measurement items contained in an instrument should cover the major content domain of a construct (Churchill, 1979). Content validity can be achieved through comprehensive literature review and interviews with practitioners and academic research experts (Fink, 1998). A list of initial items for each construct was generated based on a comprehensive review of relevant literature. Items are organized into groups to measure a particular dimension of a construct domain. The literature basis for items in each construct is briefly discussed below.

To achieve the content validity for EPs, previous literature in institutional theory is reviewed (DiMaggio and Power, 1983; Teo et al., 2003; Delmas and Toffel, 2004; Darnall et al., 2008; Heugens and Lander, 2009; Liu et al., 2010; Sarkis et al., 2010). EPs include three domains: (1) coercive pressures (DiMaggio and Power, 1983; Rugman and Verbeke, 1998; Henriques and Sadorsky, 1999; Teo et al., 2003; Delmas and Toffel, 2004; Liu et al., 2010), (2) normative pressures (DiMaggio and Power, 1983; Teo et al., 2003; Darnall et al., 2008; Liu et al., 2010), and (3) mimetic pressures (DiMaggio and Power, 1983; Teo et al., 2003; Delmas and Toffel, 2004; Liu et al., 2010). Based on the definition presented in Table 2.2, initial pools of items are generated to measure the three dimensions of EPs. A five-point Likert scale is used to indicate these constructs (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree, NA = not applicable).

To generate items for TLC, previous research is reviewed (Sharma, 2000; Harland et al., 2007; Defee et al., 2009; McFadden et al., 2009). For managerial attitude and perspective, items are generated from the following literature: Jackson and Dutton (1988), Sharma (2000), and Pagell and Gobeli (2009). Top management support is measured with items that are drawn from Daily and Huang (2001), Reed (2002), Chen and Paulraj (2004), Zhu and Sarkis (2004), and Li and Lin (2006). Finally, items for employee motivation are adapted from Koufteros (1998), Hanna et al. (2000), Daily and Huang (2001), and Reed (2002). A five-point Likert scale is used to indicate these constructs (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree, NA = not applicable).

Items for SSO are generated by reviewing the relevant strategic orientation literature and associated operations management (OM)/supply chain management (SCM) literature (Venkatraman, 1989; Jaworski and Kohli, 1993; Klassen and Whybark, 1999; Defee et al., 2009; Pagell and Wu, 2009; Kroes and Ghosh, 2010). Based on the conceptualization of previous literature, items of three dimensions of SSO are generated: (1) economic orientation, (2) environmental orientation, and (3) social orientation. A five-point Likert scale is used to indicate these constructs (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree, NA = not applicable).

For sustainable supply chain management practices, the literature on supply chain management is thoroughly reviewed (Klassen and Vachon, 2003; Chen and Paulraj, 2004; Li et al., 2005). For SSMP, three dimensions are captured: supplier evaluation (Min and Galle, 2001; Handfield et al., 2002; Sarkis and Talluri, 2002; Koplin et al., 2007; Beske et al., 2008; Seuring and Muller, 2008; Awasthi et al., 2010), supplier development (Klassen and Vachon, 2003; Krause et al., 2007; Modi and Marbert, 2007; Bai and Sarkis, 2010; Yang et al., 2010), and information sharing with suppliers (Li and Lin, 2006; Krause et al., 2007; Montabon et al., 2007; Zhou and Benton, 2007; Erlandsson and Tillman, 2009). Initial item pools are developed to measure SSMP. A five-point Likert scale is used to indicate these constructs (1 = not at all, 2 = to a small extent, 3 = to a moderate extent, 4 = to a considerable extent, 5 = to a great extent, NA = not applicable).

To measure SOMP, three dimensions are developed: (1) quality and process improvement (quality management [QM] and just-in-time [JIT] practices), (2) corporate environmental management (environmental design, environmental recycling, and environmental management system), and (3) corporate social responsibility (employee wellbeing and equity, corporate sustainability reporting, and corporate social involvement practices). For QM practices, the following literature is reviewed: Angell and Klassen (1999), Samson and Terziovski (1999), Corbett and Klassen (2006), Shah and Ward (2003; 2007), Yang et al. (2010), and Yang et al. (2011). For JIT practices, the following literature is reviewed: Womack et al. (1990), King and Lenox (2001), Li et al. (2005), Shah and Ward (2003; 2007), and Yang et al. (2011). A five-point Likert scale is used to indicate these constructs (1 = not at all, 2 = to a small extent, 3 = to a moderate extent, 4 = to a considerable extent, 5 = to a great extent, NA = not applicable).

To develop items for corporate environmental management practices, the following literature is reviewed and adapted: Allenby (1993), Kitazawa and Sarkis (2000), Min and Galle (2001), Sarkis (2001), Melnyk et al. (2003), Sroufe (2003), Zhu and Sarkis (2004), Montabon et al. (2007), Darnall et al. (2008), Cerdan et al. (2009), Knight and Jenkins (2009), and Sarkis et al. (2010). Finally, items for corporate social responsibility practices, the following literature is reviewed and adapted: Brown (1996), Hanna et al. (2000), Larsen (2000), Daily and Huang (2001), Emtairah (2002), Carter (2004), Park and Brorson (2005), Jenkins and Yakovleva (2006), Daub (2007), Montabon et al. (2007), Jørgensen (2008), Hutchins and Sutherland (2008), Vachon and Mao (2008), Brown et al. (2009), Pagell and Gobeli (2009), Pullman et al. (2009), and Jacobs et al. (2010). A five-point Likert scale is used to indicate these constructs (1 = not at all, 2 = to a small extent, 3 = to a moderate extent, 4 = to a considerable extent, 5 = to a great extent, NA = not applicable).

As for sustainability performance, three dimensions are developed. The first of these is economic performance. Items for operational performance are adopted from Rosenzweig et al. (2003), Flynn and Flynn (2004), and Kristal et al. (2010). Items for market and financial performance are adopted from Narasimhan and Kim (2002), Menor et al. (2007), and Kristal et al. (2010). The second dimension is environmental performance. Items are adapted from the studies of Zhu and Sarkis (2004) and Jacobs et al. (2010). The third dimension is social performance. Items are created based on the following literature: Wood (1991), Garriga and Mele (2004), Rao and Holt (2005), and Szekely and Knirsch (2005). A five-point Likert scale is used to indicate these constructs (1 = significant decrease, 2 = decrease, 3 = same as before, 4 = increase, 5 = significant increase, NA = not applicable).

3.2 Structured Interview and Pretest

To further ensure content validity, the measurement items generated from literature review were pretested in the form of structured interviews with a number of academics and practitioners. The focus of this process is to check the relevance and clarity of each subconstruct's definition. Then, interviewees are asked to sort the survey items into corresponding subconstructs. The objective is to preassess the convergent and discriminant validity of the scales. The basic procedure is to show interviewees the conceptual model and definitions of each construct and to see whether the model and construct make sense to practitioners. Then, practitioners act as judges and sort the items into separate subconstructs. Items are subjected to two sorting rounds by two independent judges per round.

Each item is printed on a 3 × 2.5-inch index card. The cards are shuffled into random order for presentation to the judges. Judges then put each card into categories based on their judgment. A "not available (NA)" category is included to ensure that the judges do not force any items into a particular category. Before sorting the cards, the judges are briefed with a standard set of instructions that were previously tested with a separate judge to ensure comprehensiveness and comprehensibility of the instructions. Judges are allowed to ask any questions related to model, definition, and procedures to ensure that they understand the procedures correctly.

A copy of the revised definitions and measurement items are distributed to five academicians (college professors and doctoral students in the fields of OM/SCM) for review purposes. They are asked to review each item and keep, drop, modify, or add new items to some constructs based on their discretion. The focus of this step is to further refine the items and to assess whether the items are measuring the proposed subconstructs based on the definitions provided or whether any additional items are needed to cover the domain. Based on the feedback from these reviewers, some items are further modified. Overall, 167 questionnaire items are ready to be sent out for pilot study. The pilot survey questionnaire items are provided in Appendix A. Results of the Q-sort are not reported in this dissertation, because a more comprehensive pilot study is conducted. The methodology, procedures, and results of pilot study are reported in the next section.

3.3 Pilot Study Methodology

Conducting a pilot study with a small number of respondents (preferably, the sample size of 30 or more) before the large-scale survey administration provides valuable preliminary information about the reliability and validity of the measurement scales. It offers a last opportunity to further purify the scales.

A pilot study was administered using the Internet survey tool Zoomerang (www.zoomerang.com). Zoomerang has been used as an effective Internet survey tool in previous literature, including OM literature (Autry et al., 2010). Zoomerang is a subscription service that allows users to develop surveys, which are emailed double-blind to a potential participant panel retained by Zoomerang. Potential respondents are selected based on specific characteristics and knowledge related to the survey topics. Zoomerang allows users to create customized response panels suitable for academic or market research purposes.

Zoomerang panels are mostly IT-/IS-related professionals but are not limited to manufacturing or supply chain–related professionals. Given the nature of the current study, qualified potential respondents are selected through careful screening procedures. All target respondents have a job title of “manager”, “director”, “vice president”, or “CEO/president” and are sufficiently knowledgeable of the firm’s sustainability initiatives in the supply chain. Their job functions include corporate executive, purchasing, manufacturing production, retail, transportation, sales and others.

The survey did not specify the Standard Industrial Classification (SIC) code, but the following business categories are included: automotive or parts, fabricated metal products, electronics, electrical equipment, furniture and fixtures, appliances, rubber and plastic products, industrial machinery and equipment, transportation equipment, instruments and related products, and others.

Two rounds of survey have been conducted. In the first round, out of 618 invitations, 59 respondents completed the survey. In the second round, out of 309 invitations, four respondents completed the survey. In total, 63 surveys were collected, with a response rate of 6.8%. However, after eliminating responses with missing values, 34 valid responses were used for the pilot analysis, with the following objectives in mind: purification, unidimensionality, and reliability.

First, before conducting factor analysis, purification needs to be done. Churchill (1979) suggests the need for the purification of the item. He argues that “when factor analysis is done before purification, there seems to be a tendency for factor analysis to produce many more dimensions than can be conceptually identified, confounding the interpretation of the factor analysis (Koufteros et al., 1998).” For the purpose of item purification, the Corrected Item Total Correlation (CITC) is calculated for each item (Kerlinger, 1978). Items with CITC of less than or equal to 0.5 are eliminated one by one. A slightly lower CITC may be acceptable if that item is considered to be important to the construct.

Second, after purifying the items, an exploratory factor analysis (EFA) (i.e., dimension-level factor analysis) of the remaining items for each construct is conducted to assess the unidimensionality of each subconstruct and to eliminate the cross-loading items. Dimension-level factor analysis can also provide useful directions for possible merge or split of existing construct dimensions. If a construct-level factor analysis is not possible because of small sample size, correlation coefficients are checked to ensure discriminant validity of measurement scales. Items with loadings on more than one factor at 0.45 or higher are considered to be eliminated. If a certain subdimension has two factors or more, the items for this subdimension are closely examined.

Third, once unidimensionality is determined, the reliability (internal consistency) of the remaining items using Cronbach’s alpha (Cronbach, 1951) is assessed. Alpha values greater than 0.7 are considered acceptable (Nunnally, 1978). The following sections will present the pilot test results for each construct used in the model.

3.4 Results for Pilot Study

3.4.1 EPs

The EP construct was initially represented by three dimensions drawn from the institutional theory: coercive pressures (eight items), normative pressures (18 items), and mimetic pressures (nine items). The initial 35 items and their corresponding code names are listed in Table 3.1.

Table 3.1. External Pressures -Pilot Study Measurement Items

Code	Items
	Coercive Pressures (CP)
CP1	Government regulations obligate us to comply with environmental preservation.
CP2	Government regulations compel us to abide by social justice.
CP3	Our main customers require us to improve cost performance.
CP4	Our key customers require us to improve environmental performance.
CP5	Our primary customers require us to improve social performance.
CP6	Our parent company demands that we adopt productivity initiatives.
CP7	Our parent company requires that we adopt environmental initiatives.
CP8	Our parent company compels that we adopt social initiatives.
	Normative Pressures (NP)
NP1	Our economic initiatives (e.g., quality or productivity improvement program) have been widely influenced by our important suppliers.
NP2	Our economic initiatives (e.g., quality or productivity improvement program) have been widely influenced by labor unions.
NP3	Our economic initiatives (e.g., quality or productivity improvement program) have been widely influenced by trade associations.
NP4	Our economic initiatives (e.g., quality or productivity improvement program) have been widely influenced by local communities.
NP5	Our economic initiatives (e.g., quality or productivity improvement program) have been widely influenced by environmental interest groups.
NP6	Our economic initiatives (e.g., quality or productivity improvement program) have been widely influenced by employees' suggestions.
NP7	Our economic initiatives (e.g., recycling or pollution control program) have been widely influenced by our important suppliers.
NP8	Our environmental initiatives (e.g., recycling or pollution control program) have been widely influenced by labor unions.
NP9	Our environmental initiatives (e.g., recycling or pollution control program) have been widely influenced by trade associations.
NP10	Our environmental initiatives (e.g., recycling or pollution control program) have been widely influenced by local communities.
NP11	Our environmental initiatives (e.g., recycling or pollution control program) have been widely influenced by environmental interest groups.
NP12	Our environmental initiatives (e.g., recycling or pollution control program) have been

	widely influenced by employees' suggestions.
NP13	Our social initiatives (e.g., employee development or charity to the local communities) have been widely influenced by our important suppliers.
NP14	Our social initiatives (e.g., employee development or charity to the local communities) have been widely influenced by labor unions.
NP15	Our social initiatives (e.g., employee development or charity to the local communities) have been widely influenced by trade associations.
NP16	Our social initiatives (e.g., employee development or charity to the local communities) have been widely influenced by local communities.
NP17	Our social initiatives (e.g., employee development or charity to the local communities) have been widely influenced by environmental interest groups.
NP18	Our social initiatives (e.g., employee development or charity to the local communities) have been widely influenced by employees' suggestions.
Mimetic Pressures (MP)	
MP1	When our main competitors adopt economic initiatives (e.g., quality or productivity improvement program) they benefit greatly.
MP2	When our main competitors adopt economic initiatives (e.g., quality or productivity improvement program) they are perceived favorably by customers.
MP3	When our main competitors adopt economic initiatives (e.g., quality or productivity improvement program) they are more competitive.
MP4	When our main competitors adopt environmental initiatives (e.g., recycling or pollution control program) they benefit greatly.
MP5	When our main competitors adopt environmental initiatives (e.g., recycling or pollution control program) they are perceived favorably by customers.
MP6	When our main competitors adopt environmental initiatives (e.g., recycling or pollution control program) they are more competitive.
MP7	When our main competitors adopt social initiatives (e.g., employee development or charity to the local communities) they benefit greatly.
MP8	When our main competitors adopt social initiatives (e.g., employee development or charity to the local communities) they are perceived favorably by customers.
MP9	When our main competitors adopt social initiatives (e.g., employee development or charity to the local communities) they are more competitive.

The analysis began with purification using the CITC analysis and Cronbach's alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.2. All the items with CITCs less than 0.50 appear in bold on Table 3.2. Only one item (CP1) from the scales had a CITC less than 0.50, and it was eliminated. An initial reliability analysis for the EPs shows an alpha of greater than 0.90, indicating sufficient evidence of the high level of reliability.

Table 3.2. External Pressures –Item Purification Results (CITC/Alpha)

Items	Initial CITC	Final CITC	Alpha if deleted	Cronbach's Alpha
Coercive Pressure (CP)				
CP1	**.454**	**Item Dropped After Purification**		**.925**
CP2	.724	.704	.920	
CP3	.619	.561	.932	
CP4	.794	.811	.909	
CP5	.837	.861	.904	
CP6	.757	.791	.911	
CP7	.779	.766	.914	
CP8	.841	.861	.904	
Normative Pressure (NP)				
NP1	.579	.579	.974	**.973**
NP2	.888	.888	.970	
NP3	.913	.913	.970	
NP4	.769	.769	.972	
NP5	.819	.819	.971	
NP6	.746	.746	.972	
NP7	.833	.833	.971	
NP8	.865	.865	.971	
NP9	.924	.924	.970	
NP10	.635	.635	.973	
NP11	.858	.858	.971	
NP12	.688	.688	.973	
NP13	.882	.882	.971	
NP14	.910	.910	.970	
NP15	.918	.918	.970	
NP16	.696	.696	.973	
NP17	.874	.874	.971	
NP18	.673	.673	.973	
Mimetic Pressure (MP)				
MP1	.916	.916	.971	**.975**
MP2	.914	.914	.971	
MP3	.886	.886	.972	
MP4	.907	.907	.971	
MP5	.916	.916	.970	
MP6	.877	.877	.972	
MP7	.869	.869	.973	
MP8	.876	.876	.972	
MP9	.837	.837	.974	

Note: Items in bold have CITC below 0.50
Legend: CP=Coercive Pressures, NP=Normative Pressures, and MP= Mimetic Pressures.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.3. To make it easier to interpret the factor structure, item loadings less than 0.30 are not reported. The eight items from the coercive pressures scale and the nine items from the mimetic pressures scale all loaded onto one factor, respectively, and had fairly high loadings (greater than 0.70) except for one item (CP3). However, the 18 items from the normative pressures scale loaded onto two factors. Some of the items had high cross-loadings or low loadings (less than 0.30). Thus, the following five items were eliminated: NP4, NP5, NP6, NP7, and NP11. It seems that two factors are loaded based on the type of stakeholders. For example, one factor is related to such stakeholders as labor unions, trade associations, and environmental interest groups, whereas the other factor is associated with important suppliers, local communities, and employee's suggestions. But a few items (NP1, NP13) randomly loaded onto these two factors.

Table 3.3. External Pressures –Factor Analysis (within each variable) for Retained Items

Items After Assessing CITC	**Factor Loadings**	
Coercive Pressure (CP)		
CP2	.776	
CP3	.649	
CP4	.873	
CP5	.911	
CP6	.855	
CP7	.826	
CP8	.910	
Normative Pressure (NP)		
NP1		.785
NP2	.860	
NP3	.933	
NP4	-	
NP5	-	
NP6	-	
NP7	-	
NP8	.862	
NP9	.937	
NP10		.754
NP11		-
NP12		.653
NP13	.774	
NP14	.919	
NP15	.872	
NP16		.828

NP17	.847	
NP18		.759
Mimetic Pressure (MP)		
MP1	.935	
MP2	.933	
MP3	.911	
MP4	.928	
MP5	.934	
MP6	.904	
MP7	.896	
MP8	.902	
MP9	.871	

3.4.2 TLC

The TLC construct was initially represented by three dimensions: managerial attitude and perspective (four items), top management support (four items), and employee motivation (five items). The initial 13 items and their corresponding code names are listed in Table 3.4.

Table 3.4. Top Leadership Culture -Pilot Study Measurement Items

Code	**Items**
Managerial Attitude and Perspective (MAP)	
MAP1	Our top management believes that our firm is likely to gain by implementing initiatives for productivity enhancements.
MAP2	Our top management considers environmental preservation to be important.
MAP3	Our top management gives high priority to social responsibility for strategic decision making.
MAP4	Our top management considers improving the quality of life in respective local communities to be important.
Top Management Support (TMS)	
TMS1	Our top management is supportive of our efforts to improve operations productivity.
TMS2	Our top management assigns adequate resources to environmental programs.
TMS3	Our top management supports employee development programs with the resources we need.
TMS4	Our top management actively participates in local community outreach programs
Employee Motivation (EM)	
EM1	Our top management rewards shop-floor employees for their productivity improvement.
EM2	Our top management encourages shop-floor employees' efforts to reduce harmful environmental wastes.
EM3	Our top management motivates shop-floor employees to make suggestions on reducing rework.
EM4	Our top management provides incentives to shop-floor employees for reducing scraps.
EM5	Our top management involves shop-floor employees in quality of life improvement

	initiatives.

The analysis began with purification using the CITC analysis and Cronbach's alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.5. All the items with CITCs less than 0.50 appear in bold on Table 3.5. Only one item (MAP1) from the scales had a CITC less than 0.50, and it was eliminated. An initial reliability analysis for the EPs shows an alpha of greater than 0.80, indicating sufficient evidence of the high level of reliability.

Table 3.5. Top Leadership Culture –Item Purification Results (CITC/Alpha)

Items	Initial CITC	Final CITC	Alpha if deleted	Cronbach's Alpha
Management Attitude and Perspective (MAP)				
MAP1	**.480**	**Item Dropped After Purification**		**.903**
MAP2	.868	.871	.808	
MAP3	.750	.783	.883	
MAP4	.753	.783	.881	
Top Management Support (TMS)				
TMS1	.620	.620	.865	**.866**
TMS2	.718	.718	.832	
TMS3	.783	.783	.802	
TMS4	.767	.767	.808	
Employee Motivation (EM)				
EM1	.755	.755	.839	**.876**
EM2	.786	.786	.830	
EM3	.744	.744	.843	
EM4	.553	.553	.885	
EM5	.718	.718	.849	

Note: Items in bold have CITC below 0.50
Legend: MAP=Managerial Attitude and Perspective, TMS=Top Management Support, and EM= Employee Motivation.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.6. To make it easier to interpret the factor structure, item loadings less than 0.30 are not reported. The four items from managerial attitude and perspective (MAP), the four items from top management support (TMS), and the five items from the employee motivation (EM) scale all loaded onto one factor, respectively, and had fairly high loadings (greater than 0.70). This shows that all three dimensions of TLC are reliable and valid.

Table 3.6. Top Leadership Culture –Factor Analysis (within each variable) for Retained Items

Items after Assessing CITC	Factor Loadings
Management Attitude and Perspective (MAP)	
MAP2	.947
MAP3	.901
MAP4	.900
Top Management Support (TMS)	
TMS1	.776
TMS2	.847
TMS3	.885
TMS4	.875
Employee Motivation (EM)	
EM1	.858
EM2	.867
EM3	.854
EM4	.691
EM5	.830

3.4.3 SSO

The SSO construct was initially represented by three dimensions: economic orientation (four items), environmental orientation (four items), and social orientation (five items). The initial 13 items and their corresponding code names are listed in Table 3.7.

Table 3.7. Strategic Sustainability Orientation-Pilot Study Measurement Items

Code	Items
Economic Orientation (EcO)	
EcO1	Our firm's mission statement communicates the importance of financial performance.
EcO2	Our firm is committed to improving market share.
EcO3	Our financial priorities are communicated to all employees.
EcO4	Our firm uses short-term productivity outcomes for operational decision making.
Environmental Orientation (EvO)	
EvO1	Our firm's mission statement communicates the importance of environmental performance
EvO2	Our firm is committed to pollution control.
EvO3	Our ecological priorities are communicated to all employees.
EvO4	Our firm evaluates the environmental impact of operational decisions.
Social Orientation (ScO)	

ScO1	Our firm's mission statement communicates the importance of employees' wellbeing.
ScO2	Our firm is committed to support social philanthropy.
ScO3	Our firm is committed to enhancing social responsibility.
ScO4	Our employees understand the importance of social responsibility.
ScO5	Our firm evaluates social implications of our operational decisions.

The analysis began with purification using the CITC analysis and Cronbach's alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.8. The CITCs of all the items are greater than 0.50, and thus all items are retained. An initial reliability analysis for the EPs shows an alpha of greater than 0.80, indicating sufficient evidence of the high level of reliability.

Table 3.8. Strategic Sustainability Orientation –Item Purification Results (CITC/Alpha)

Items	**Initial CITC**	**Final CITC**	**Alpha if deleted**	**Cronbach's Alpha**
Economic Orientation (EcO)				
EcO1	.814	.814	.836	**.889**
EcO2	.729	.729	.867	
EcO3	.722	.722	.875	
EcO4	.774	.774	.851	
Environmental Orientation (EvO)				
EvO1	.536	.536	.832	**.827**
EvO2	.754	.754	.733	
EvO3	.617	.617	.800	
EvO4	.719	.719	.754	
Social Orientation (ScO)				
ScO1	.770	.770	.876	**.901**
ScO2	.749	.749	.880	
ScO3	.790	.790	.872	
ScO4	.733	.733	.884	
ScO5	.731	.731	.884	

Note: Items in bold have CITC below 0.50

Legend: EcO=Economic Orientation, EvO=Environmental Orientation, and ScO= Social Orientation.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.9. To make it easier to interpret the factor structure, item loadings less than 0.30 are not reported. The four items from economic orientation (EcO), the four items from environmental orientation (EvO), and the five items from the social orientation (ScO) scale all loaded onto one factor, respectively, and had fairly high loadings (greater than 0.70). This shows that all three dimensions of SSO are reliable and valid.

Table 3.9. Strategic Sustainability Orientation–Factor Analysis (within each variable) for Retained Items

Items after Assessing CITC	Factor Loadings
Economic Orientation (EcO)	
EcO1	.905
EcO2	.849
EcO3	.842
EcO4	.879
Environmental Orientation (EvO)	
EvO1	.717
EvO2	.882
EvO3	.790
EvO4	.860
Social Orientation (ScO)	
ScO1	.857
ScO2	.844
ScO3	.873
ScO4	.831
ScO5	.828

3.4.4 SSMP

The SSMP construct was initially represented by three dimensions: supplier evaluation practices (five items), supplier development practices (five items), and information sharing with suppliers (six items). The initial 16 items and their corresponding code names are listed in Table 3.10.

Table 3.10. Sustainable Supplier Management Practices -Pilot Study Measurement Items

Code	Items
Supplier Evaluation Practices (SEP)	
SEP1	Our firm uses formal evaluation system to assess suppliers' environmental performance.
SEP2	Our firm assesses the quality standard of suppliers through ISO 9000 series certification.
SEP3	Our firm evaluates suppliers' environmental commitment through ISO 14000 series certification.
SEP4	Our firm assesses the quality of suppliers' social responsibility initiatives.
SEP5	Our firm emphasizes cost targets for suppliers.
Supplier Development Practices (SDP)	

SDP1	Our firm offers training for suppliers' personnel to improve quality performance.
SDP2	Our firm visits suppliers' sites to help improve environmental performance.
SDP3	Our firm educates suppliers about social responsibility.
SDP4	Our firm offers technical assistance to suppliers for pollution control.
SDP5	Our firm has a supplier development team.
Information Sharing with Suppliers (ISS)	
ISS1	Our major suppliers share delivery schedule for our products with us.
ISS2	Our major suppliers share order status with us.
ISS3	Our major suppliers share environmental regulations with us.
ISS4	Our major suppliers share availability of new environmentally safe components with us.
ISS5	Our major suppliers share fair labor practices with us.
ISS6	Our major suppliers share local community outreach initiatives with us.

The analysis began with purification using the CITC analysis and Cronbach's alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.11. All the items with CITCs less than 0.50 appear in bold on Table 3.11. Two items (ISS1 and ISS2) from the scales had CITCs below 0.50 and were eliminated. An initial CITC of ISS2 was 0.533, but after eliminating ISS1, the CITC of ISS2 was less than 0.5, and thus ISS2 was dropped. An initial reliability analysis for the SSMP shows an alpha of greater than 0.90, indicating sufficient evidence of the high level of reliability.

Table 3.11. Sustainable Supplier Management Practices –Item Purification Results (CITC/Alpha)

Items	Initial CITC	Final CITC	Alpha if deleted	Cronbach's Alpha
Supplier Evaluation Practices (SEP)				
SEP1	.838	.838	.862	**.902**
SEP2	.744	.744	.885	
SEP3	.822	.822	.866	
SEP4	.685	.685	.895	
SEP5	.709	.709	.890	
Supplier Development Practices (SDP)				
SDP1	.876	.876	.940	**.953**
SDP2	.870	.870	.942	
SDP3	.912	.912	.934	
SDP4	.927	.927	.931	
SDP5	.763	.763	.958	
Information Sharing with Suppliers (ISS)				
ISS1	**.362**	**Item Dropped After Purification**		**.940**

ISS2	.533	**Item Dropped After Purification**		
ISS3	.773	.888	.915	
ISS4	.863	.841	.927	
ISS5	.852	.846	.925	
ISS6	.800	.877	.919	

Note: Items in bold have CITC below 0.50
Legend: SEP=Supplier Evaluation Practices, SDP=Supplier Development Practices, and ISS=Information Sharing with Suppliers.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.12. To make it easier to interpret the factor structure, item loadings less than 0.30 are not reported. The five items from supplier evaluation practices (SEP), the five items from supplier development practices (SDP), and the six items from the information sharing with suppliers (ISS) scale all loaded onto one factor, respectively, and had fairly high loadings (greater than 0.80). Two items of ISS were dropped because of low CITC. This shows that all three dimensions of SSO are reliable and valid.

Table 3.12. Sustainable Supplier Management Practices –Factor Analysis (within each variable) for Retained Items

Items after Assessing CITC	**Factor Loadings**
Supplier Evaluation Practices (SEP)	
SEP1	.902
SEP2	.841
SEP3	.895
SEP4	.788
SEP5	.817
Supplier Development Practices (SDP)	
SDP1	.922
SDP2	.918
SDP3	.946
SDP4	.955
SDP5	.841
Information Sharing with Suppliers (ISS)	
ISS1	-
ISS2	-
ISS3	.938
ISS4	.911
ISS5	.913
ISS6	.934

3.4.5 SOMP: QM and JIT Practices

The QM and JIT practices construct was initially represented by two dimensions: QM practices (five items) and JIT practices (five items). The initial 10 items and their corresponding code names are listed in Table 3.13.

Table 3.13. QM and JIT Practices -Pilot Study Measurement Items

Code	Items
Quality Management Practices (QM)	
QM1	Our firm implements continuous quality improvement program.
QM2	Our firm is ISO 9000 certified.
QM3	Our firm uses statistical process control techniques to reduce process variance.
QM4	Our firm schedules a portion of everyday to maintain equipment productivity.
QM5	Our firm undertakes preventive maintenance programs to maximize equipment effectiveness.
Just-In-Time (JIT)	
JIT1	Our firm uses set-up time reduction in our plant.
JIT2	Our firm adopts continuous flow production in operations.
JIT3	Our firm uses a “Pull” production system.
JIT4	Our firm implements cellular manufacturing in our plant.
JIT5	Our firm orders in small lot sizes from our suppliers.

The analysis began with purification using the CITC analysis and Cronbach’s alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.14. The CITCs of all the items are greater than 0.50, and thus all items are retained. An initial reliability analysis for QM and JIT practices shows an alpha of greater than 0.80, indicating sufficient evidence of the high level of reliability.

Table 3.14. QM and JIT Practices –Item Purification Results (CITC/Alpha)

Items	Initial CITC	Final CITC	Alpha if deleted	Cronbach’s Alpha
Quality Management Practices (QM)				
QM1	.843	.843	.817	**.871**
QM2	.552	.552	.895	
QM3	.714	.714	.841	
QM4	.714	.714	.840	
QM5	.776	.776	.830	
Just-In-Time Practices (JIT)				
JIT1	.771	.771	.841	**.880**
JIT2	.648	.648	.871	

JIT3	.805	.805	.834	
JIT4	.795	.795	.834	
JIT5	.575	.575	.887	

Note: Items in bold have CITC below 0.50
Legend: QM=Quality Management Practices and JIT=Just-in-Time Practices.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.15. To make it easier to interpret the factor structure, item loadings less than 0.30 are not reported. The five items from QM practices and the five items from the JIT practices scale all loaded onto one factor, respectively, and had fairly high loadings (greater than 0.70). This shows that the two dimensions of QM and JIT practices are reliable and valid.

Table 3.15. QM and JIT Practices–Factor Analysis (within each variable) for Retained Items

Items after Assessing CITC	**Factor Loadings**
Quality Management Practices (QM)	
QM1	.924
QM2	.681
QM3	.812
QM4	.847
QM5	.884
Just-In-Time Practices (JIT)	
JIT1	.864
JIT2	.773
JIT3	.888
JIT4	.887
JIT5	.702

3.4.6 SOMP: Corporate Environmental Management Practices

The corporate environmental management practices construct was initially represented by three dimensions: environmental design practices (EDP; six items), environmental recycling practices (ERP; four items), and environmental management system (EMS; five items). The initial 15 items and their corresponding code names are listed in Table 3.16.

Table 3.16. Corporate Environmental Management Practices -Pilot Study Measurement Items

Code	Items
Environmental Design Practices (EDP)	
EDP1	Life Cycle Analysis (LCA) is employed for product design.
EDP2	Our products are designed for reduced consumption of energy.
EDP3	Our products are designed for reuse, recycle, recovery of material/component parts.
EDP4	Our products are designed to reduce the use of hazardous products and their manufacturing process.
EDP5	Our firm designs eco-packaging to help reduce our carbon footprint.
EDP6	Our firm designs an eco-labeling scheme for products and processes.
Environmental Recycling Practices (ERP)	
ERP1	Our products/materials are reused.
ERP2	Our solid waste is recycled in all production processes.
ERP3	Our products/materials are recycled in all production processes.
ERP4	Our products/materials are remanufactured in fabrication stages.
Environmental Management System (EMS)	
EMS1	Our firm has a formal department that is responsible for monitoring environmental affairs.
EMS2	Our environmental performance is formally tracked and reported.
EMS3	Our environmental achievements are regularly reported.
EMS4	Our environmental impact is periodically reported.
EMS5	Our environmental procedures are included in training.

The analysis began with purification using the CITC analysis and Cronbach's alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.17. The CITCs of all the items are greater than 0.50, and thus all items are retained. An initial reliability analysis for EDP, ERP, and EMS shows an alpha of greater than 0.90, indicating sufficient evidence of the high level of reliability.

Table 3.17. Corporate Environmental Management Practices –Item Purification Results (CITC/Alpha)

Items	Initial CITC	Final CITC	Alpha if deleted	Cronbach's Alpha
Environmental Design Practices (EDP)				
EDP1	.785	.785	.904	
EDP2	.735	.735	.910	
EDP3	.709	.709	.915	**.920**
EDP4	.641	.641	.922	
EDP5	.881	.881	.889	
EDP6	.902	.902	.886	
Environmental Recycling Practices (ERP)				
ERP1	.797	.797	.877	**.906**

ERP2	.744	.744	.898	
ERP3	.814	.814	.871	
ERP4	.824	.824	.868	
Environmental Management System (EMS)				
EMS1	.766	.766	.907	**.919**
EMS2	.883	.883	.884	
EMS3	.834	.834	.893	
EMS4	.741	.741	.911	
EMS5	.751	.751	.911	

Note: Items in bold have CITC below 0.50
Legend: EDP=Environmental Design Practices, ERP=Environmental Recycling Practices, and EMS=Environmental Management System.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.18. To make it easier to interpret the factor structure, item loadings less than 0.30 are not reported. The six items from EDP, the four items from ERP, and the five items from the EMS scale all loaded onto one factor, respectively, and had fairly high loadings (greater than 0.70). This shows that all three dimensions of corporate environmental management practices are reliable and valid.

Table 3.18. Corporate Environmental Management Practices –Factor Analysis (within each variable) for Retained Items

Items after Assessing CITC	Factor Loadings
Environmental Design Practices (EDP)	
EDP1	.856
EDP2	.820
EDP3	.794
EDP4	.733
EDP5	.924
EDP6	.940
Environmental Recycling Practices (ERP)	
ERP1	.884
ERP2	.856
ERP3	.903
ERP4	.901
Environmental Management System (EMS)	
EMS1	.851
EMS2	.929
EMS3	.900
EMS4	.837
EMS5	.842

3.4.7 SOMP: Corporate Social Responsibility Practices

The corporate social responsibility practices construct was initially represented by three dimensions: employee wellbeing and equity practices (EWEP; five items), corporate sustainability reporting practices (CSRP; six items), and corporate social involvement practices (CSIP; five items). The initial 16 items and their corresponding code names are listed in Table 3.19.

Table 3.19. Corporate Social Responsibility Practices -Pilot Study Measurement Items

Code	Items
Employee Wellbeing and Equity Practices (EWEP)	
EWEP1	Our firm supports employees' initiatives to improve health (e.g., subsidizes gym membership).
EWEP2	Our firm commits to safe work environment.
EWEP3	Our firm's management is quite culturally diverse
EWEP4	Our firm provides fair compensation.
EWEP5	Our senior management reflects gender equality.
Corporate Sustainability Reporting Practices (CSRP)	
CSRP1	Our firm discloses information related to productivity.
CSRP2	Our firm discloses information related to market share.
CSRP3	Our firm discloses information related to employees' health and safety.
CSRP4	Our firm discloses information related to employees' human right.
CSRP5	Our firm discloses information related to environmental performance.
CSRP6	Our firm discloses information related to contribution to the local communities.
Corporate Social Involvement Practices (CSIP)	
CSIP1	Our firm contributes to charitable causes through our employees.
CSIP2	Our firm volunteers for social causes.
CSIP3	Our firm promotes corporate codes of conduct.
CSIP4	Our firm has volunteers supporting local charities.
CSIP5	Our firm donates to community organizations.

The analysis began with purification using CITC analysis and Cronbach's alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.20. All the items with CITCs less than 0.50 appear in bold on Table 3.20. One item (CSRP2) from the scales had a CITC less than 0.50 and was eliminated. An initial reliability analysis for the corporate social responsibility practices shows an alpha of greater than 0.80, indicating sufficient evidence of the high level of reliability.

Table 3.20. Corporate Social Responsibility Practices–Item Purification Results (CITC/Alpha)

Items	**Initial CITC**	**Final CITC**	**Alpha if deleted**	**Cronbach's Alpha**
Employee Wellbeing and Equity Practices (EWEP)				
EWEP1	.608	.608	.851	**.858**
EWEP2	.679	.679	.827	
EWEP3	.665	.665	.831	
EWEP4	.761	.761	.807	
EWEP5	.695	.695	.826	
Corporate Sustainability Reporting Practices (CSRP)				
CSRP1	.682	.622	.871	**.877**
CSRP2	**.429**	-	-	
CSRP3	.660	.728	.846	
CSRP4	.692	.705	.852	
CSRP5	.736	.740	.843	
CSRP6	.756	.751	.842	
Corporate Social Involvement Practices (CSIP)				
CSIP1	.887	.887	.883	**.921**
CSIP2	.869	.869	.891	
CSIP3	.579	.579	.940	
CSIP4	.834	.834	.896	
CSIP5	.840	.840	.894	

Note: Items in bold have CITC below 0.50
Legend: EWEP=Employee Wellbeing and Equity Practices, CSRP=Corporate Sustainability Reporting Practices, and CSIP=Corporate Social Involvement Practices.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.21. To make it easier to interpret the factor structure, item loadings less than 0.30 are not reported. The five items from EWEP, the five items from CSRP, and the five items from the CSIP scale all loaded onto one factor, respectively, and had fairly high loadings (greater than 0.70) except for one item (CSIP3, which had a value of 0.695). This shows that all three dimensions of corporate social responsibility practices are reliable and valid.

Table 3.21. Corporate Social Responsibility Practices –Factor Analysis (within each variable) for Retained Items

Items after Assessing CITC	Factor Loadings
Employee Wellbeing and Equity Practices (EWEP)	
EWEP1	.741
EWEP2	.790
EWEP3	.800
EWEP4	.869
EWEP5	.823
Corporate Sustainability Reporting Practices (CSRP)	
CSRP1	.751
CSRP2	-
CSRP3	.834
CSRP4	.819
CSRP5	.844
CSRP6	.851
Corporate Social Involvement Practices (CSIP)	
CSIP1	.934
CSIP2	.924
CSIP3	.695
CSIP4	.897
CSIP5	.902

3.4.8 SCMP

The SCMP construct was initially represented by two dimensions: customer management practices (CMPs; five items) and information sharing with customers (ISC; six items). The initial 11 items and their corresponding code names are listed in Table 3.22.

Table 3.22. Sustainable Customer Management Practices -Pilot Study Measurement Items

Code	Items
Customer Management Practices (CMP)	
CMP1	Our firm provides our customers with assistance for recycling-related problem solving.
CMP2	Our firm evaluates the quality-related complaints of our customers.
CMP3	Our firm gives feedback to our customers for environmental concern.
CMP4	Our firm evaluates our customers' satisfaction for socially responsible initiatives.
CMP5	Our firm determines future customer consumption patterns for environmentally-friendly products.
Information Sharing with Customers (ISC)	
ISC1	Our major customers share changes in purchase order with us.
ISC2	Our major customers share planned order with us.

ISC3	Our major customers share their existing environmental policies with us.
ISC4	Our major customers share changes in eco-design products with us.
ISC5	Our major customers share their employees' wellbeing and equity policy with us.
ISC6	Our major customers share their policy initiatives for local community outreach with us.

The analysis began with purification using CITC analysis and Cronbach's alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.23. All the items with CITCs less than 0.50 appear in bold on Table 3.23. One item (CMP2) from the scales had a CITC less than 0.50 and was eliminated. An initial reliability analysis for the corporate social responsibility practices shows an alpha of greater than 0.90, indicating sufficient evidence of the high level of reliability.

Table 3.23. Sustainable Customer Management Practices –Item Purification Results (CITC/Alpha)

Items	**Initial CITC**	**Final CITC**	**Alpha if deleted**	**Cronbach's Alpha**
Customer Management Practices (CMP)				
CMP1	.818	.847	.889	**.921**
CMP2	**.382**	-	-	
CMP3	.820	.845	.888	
CMP4	.814	.903	.866	
CMP5	.745	.690	.940	
Information Sharing with Customers (ISC)				
ISC1	.534	.534	.910	**.902**
ISC2	.632	.632	.899	
ISC3	.879	.879	.861	
ISC4	.872	.872	.862	
ISC5	.779	.779	.877	
ISC6	.707	.707	.889	

Note: Items in bold have CITC below 0.50
Legend: CMP=Customer Management Practices and ISC=Information Sharing with Customers.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.24. To make it easier to interpret the factor structure, item loadings less than 0.30 are not reported. The four items from the CMP scale all loaded onto one factor and had fairly high loadings (greater than 0.80). However, the six items from the ISC scale loaded onto two factors, and one item (ISC4) had a high cross-loading and thus was eliminated. Economic-related information sharing items (ISC1 and ISC2) are loaded distinctly from the items with environmental- and social-related information sharing (ISC3, ISC5, and ISC6). This reflects the current reality of manufacturing firms in the United States in regards to sustainability. Economic-related information, such as changes in purchase order and planned order, is shared to a large extent with customers, as shown in the data, whereas few companied shared environmental-related (e.g., existing environmental policies and changes in eco-design products) and social-related (e.g., EWEP and policy initiatives for local community outreach) information with their major customer companies.

Table 3.24. Sustainable Customer Management Practices –Factor Analysis (within each variable) for Retained Items

Items after Assessing CITC	**Factor Loadings**	
Customer Management Practices (CMP)		
CMP1	.921	
CMP2	-	
CMP3	.922	
CMP4	.950	
CMP5	.807	
Information Sharing with Customers (ISC)		
ISC1		.939
ISC2		.895
ISC3	.874	
ISC4	-	
ISC5	.904	
ISC6	.921	

3.4.9 Sustainability Performance: Economic Performance (EcP)

The economic performance construct was initially represented by three dimensions: operational performance (OP; eight items), market performance (MP; three items), and financial performance (FP; three items). The initial 14 items and their corresponding code names are listed in Table 3.25.

Table 3.25. Economic Performance -Pilot Study Measurement Items

Code	Items
Operational Performance (OP)	
OP1	Conformance quality.
OP2	Product reliability.
OP3	Production costs
OP4	Inventory turns
OP5	Delivery speed
OP6	Delivery reliability
OP7	Ability to rapidly change production volumes.
OP8	Ability to rapidly change product mix.
Market Performance (MP)	
MP1	Market share.
MP2	The growth of market share.
MP3	The growth of sales.
Financial Performance (FP)	
FP1	Return on investment (ROI).
FP2	Return on asset (ROA).
FP3	Profit margin on sales.

The analysis began with purification using CITC analysis and Cronbach's alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.26. The CITCs of all the items are greater than 0.50, and thus all items are retained. An initial reliability analysis for OP, MP, and FP shows an alpha of greater than 0.80, indicating sufficient evidence of the high level of reliability.

Table 3.26. Economic Performance –Item Purification Results (CITC/Alpha)

Items	Initial CITC	Final CITC	Alpha if deleted	Cronbach's Alpha
Operational Performance (OP)				
OP1	.669	.669	.924	**.927**
OP2	.863	.863	.909	
OP3	.702	.702	.922	
OP4	.774	.774	.916	
OP5	.782	.782	.916	
OP6	.754	.754	.918	
OP7	.761	.761	.918	
OP8	.726	.726	.920	
Market Performance (MP)				
MP1	.679	.679	.870	**.864**
MP2	.807	.807	.750	
MP3	.764	.764	.789	

Financial Performance (FP)				
FP1	.697	.697	.748	**.826**
FP2	.599	.599	.841	
FP3	.762	.762	.676	

Note: Items in bold have CITC below 0.50
Legend: OP=Operational Performance, MP=Market Performance, and FP=Financial Performance.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.27. To make it easier to interpret the factor structure, item loadings below 0.30 are not reported. The eight items from OP, the three items from MP, and the three items from the FP scale all loaded onto one factor, respectively, and had fairly high loadings (greater than 0.70). This shows that three dimensions of economic performance are reliable and valid.

Table 3.27. Economic Performance –Factor Analysis (within each variable) for Retained Items

Items after Assessing CITC	Factor Loadings
Operational Performance (OP)	
OP1	.748
OP2	.903
OP3	.769
OP4	.832
OP5	.841
OP6	.818
OP7	.824
OP8	.790
Market Performance (MP)	
MP1	.848
MP2	.920
MP3	.896
Financial Performance (FP)	
FP1	.872
FP2	.804
FP3	.908

3.4.10 Sustainability Performance: Environmental Performance (EvP)

The environmental performance construct was initially represented by two dimensions: pollution control (PC; five items) and environmental management (EM; seven items). The initial 12 items and their corresponding code names are listed in Table 3.28.

Table 3.28. Environmental Performance -Pilot Study Measurement Items

Code	Items
Pollution Control (PC)	
PC1	Air emission.
PC2	Waste water.
PC3	Solid waste.
PC4	Consumption for toxic materials.
PC5	Frequency for environmental accidents
Environmental Management (EM)	
EM1	Reduction of solid waste
EM2	Reduction of energy consumption
EM3	Reduction of emissions
EM4	Recycling of waste materials
EM5	Recycling of products
EM6	Reuse of waste
EM7	Reuse of products

The analysis began with purification using CITC analysis and Cronbach's alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.29. The CITCs of all the items are greater than 0.50, and thus all items are retained. An initial reliability analysis for PC and EM shows an alpha of greater than 0.90, indicating sufficient evidence of the high level of reliability.

Table 3.29. Environmental Performance –Item Purification Results (CITC/Alpha)

Items	Initial CITC	Final CITC	Alpha if deleted	Cronbach's Alpha
Pollution Control (PC)				
PC1	.788	.788	.944	**.946**
PC2	.898	.898	.925	
PC3	.857	.857	.933	
PC4	.885	.885	.928	
PC5	.837	.837	.936	
Environmental Management (EM)				
EM1	.822	.822	.948	**.954**
EM2	.902	.902	.941	
EM3	.802	.802	.949	
EM4	.734	.734	.954	
EM5	.881	.881	.943	
EM6	.858	.858	.945	
EM7	.900	.900	.942	

Note: Items in bold have CITC below 0.50
Legend: PC=Pollution Control and EM=Environmental Management.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.30. To make it easier to interpret the factor structure, item loadings less than 0.30 are not reported. The five items from PC and the seven items from the EM scale all loaded onto one factor, respectively, and had fairly high loadings (greater than 0.70). This shows that all three dimensions of environmental performance are reliable and valid.

Table 3.30. Environmental Performance –Factor Analysis (within each variable) for Retained Items

Items after Assessing CITC	Factor Loadings
Pollution Control (PC)	
PC1	.861
PC2	.936
PC3	.911
PC4	.929
PC5	.898
Environmental Management (EM)	
EM1	.870
EM2	.930
EM3	.856
EM4	.798
EM5	.915
EM6	.898
EM7	.930

3.4.11 Sustainability Performance: Social Performance (ScP)

The social performance construct was initially represented by two dimensions: employee-oriented outcomes (EOO; six items) and community-oriented outcomes (COO; seven items). The initial 13 items and their corresponding code names are listed in Table 3.31.

Table 3.31. Social Performance -Pilot Study Measurement Items

Code	**Items**
	Employee-Oriented Outcomes (EOO)
EOO1	Employee quality of life.
EOO2	Employee health and safety
EOO3	Employee fair compensation.
EOO4	Fair employment opportunity.
EOO5	Employment gender equality
EOO6	Cultural diversity in management
	Community-Oriented Outcomes (COO)
COO1	Corporate reputation/image.
COO2	Social commitment.
COO3	Reportable contributions to communities.
COO4	Engagement with government officials
COO5	Investor relations
COO6	The relationship with local communities
COO7	The relationship with NGOs

The analysis began with purification using CITC analysis and Cronbach's alpha for reliability. The CITCs and an alpha score for each item are shown in Table 3.32. The CITCs of all the items are greater than 0.50, and thus all items are retained. An initial reliability analysis for EOO and COO shows an alpha of greater than 0.90, indicating sufficient evidence of the high level of reliability.

Table 3.32. Social Performance –Item Purification Results (CITC/Alpha)

Items	**Initial CITC**	**Final CITC**	**Alpha if deleted**	**Cronbach's Alpha**
Employee-Oriented Outcomes (EOO)				
EOO1	.829	.829	.916	**.932**
EOO2	.783	.783	.923	
EOO3	.831	.831	.916	
EOO4	.812	.812	.918	
EOO5	.763	.763	.924	
EOO6	.818	.818	.920	

Community-Oriented Outcomes (COO)				
COO1	.787	.787	.950	**.953**
COO2	.926	.926	.938	
COO3	.823	.823	.946	
COO4	.821	.821	.946	
COO5	.860	.860	.943	
COO6	.886	.886	.941	
COO7	.781	.781	.950	

Note: Items in bold have CITC below 0.50
Legend: EOO=Employee-Oriented Outcomes and COO=Community-Oriented Outcomes.

The factor analysis (EFA) of the retained items in each of the scales is reported in Table 3.33. To make it easier to interpret the factor structure, item loadings less than 0.30 are not reported. The six items from EOO and the seven items from the COO scale all loaded onto one factor, respectively, and had fairly high loadings (greater than 0.80). This shows that the two dimensions of social performance are reliable and valid.

Table 3.33. Social Performance–Factor Analysis (within each variable) for Retained Items

Items after Assessing CITC	**Factor Loadings**
Employee-Oriented Outcomes (EOO)	
EOO1	.886
EOO2	.852
EOO3	.889
EOO4	.869
EOO5	.835
EOO6	.876
Community-Oriented Outcomes (COO)	
COO1	.842
COO2	.949
COO3	.873
COO4	.868
COO5	.898
COO6	.918
COO7	.840

Chapter 4

Instrument Development Phase II – Large Scale Administration and Instrument Validation

Data are collected via a large-scale survey after item generation, structured interview, and the pilot study. The main purposes of the large-scale survey are to collect data useful for the validation of the instrument developed as well as to test the hypothesized relationships among variables in the research model. Chapter 4 presents the research methodology used in the large-scale survey (section 4.1) and discusses the validity and the reliability of the confirmatory factor analysis (CFA) measurement models of the constructs (section 4.2).

4.1. Research Methodology

This section describes the data collection and procedures, the sample frames used for data collection, the respondent profiles, and the tests of the biases.

4.1.1. Large-scale Data Collection: Methods

This study uses a sample survey approach for data collection. Survey is an attractive method of data collection, because of its potential to afford the researcher a large amount of information that can be analyzed to test relationships between two or more variables (Miller, 1991). Survey is also attractive because of its ability to generate a great deal of information from a large sample of the subjects under study (Kerlinger, 1986). This presents the opportunity to validate a researcher's psychometric measurement scales and also increase the generalizability of findings beyond that of case study or structured interview methods (Jin, 2008; Dobrzykowski, 2010). This study in particular adopted an online survey over a mail survey, because the Internet has come to permeate almost all organizations and is available to individual respondents (Dillman, 2009). Despite the many strengths of the survey method, it is not free from limitations.

A primary challenge faced by the researcher including operations management when using the survey method is low response rate. Reaching a high response rate is a critical matter, because this improves the generalizability of a research study's findings (Malhotra and Grover, 1998). This is an important concern for researchers, because response rates in academic studies have been steadily decreasing in recent decades (Baruch, 1999). These challenges are more obviously observed in the context of web-based Internet surveys owing to such reasons as personal reluctance to use the Internet, limited web access, and difficulty obtaining valid email addresses (Klassen and Jacobs, 2001).

In light of these challenges, three actions were taken. First, to enhance the response to the survey, the design of the survey questionnaire is simplified so that respondents can easily read and understand the questions. Given that the respondents are either managers or top-level executives in their companies, they tend to skip questions if they feel confused when reading the survey. To make their responses quick, the survey instrument for this study was designed to be easy to read and understand following the advice of Blankenship and Breen (1992). Whenever possible, the sentences of the survey instruments were simplified through several iterations.

Second, to enhance survey participation rate, relevant incentives are used (Erdos, 1970). Instead of entering everyone into a drawing to win one large amount of money, this study mailed a smaller amount ($5 Starbucks gift card) to every person who completed the online survey. It is suggested that monetary incentives may not work well, because our target respondents are all upper-level managers or C-level executives who are well off. All survey participation is on a voluntary basis. So those who are willing to participate in the survey will do so regardless of monetary rewards. The gift cards were given as a small token of appreciation for participating in the survey.

Third, it is reported that personalized emails can increase the response rate (Erdos, 1970; Blankenship and Breen, 1992; Dillman et al., 2009). Personalized contacts, rather than sending out the survey in bulk, establish a connection between the surveyor and the respondent that is necessary to invoke social exchange, and it draws the respondent out of the group. A respondent gets personal attention with emails when they receive individual, rather than bulk, messages. Studies have been done to test the effectiveness of email invitation personalization (Heerwegh, 2005; Joinson and Reips, 2007). In Belgium, students were randomly assigned to receive either a personalized (Dear [First and last name]) or an unpersonalized (Dear student) email invitation to participate in a web survey. The personalized invitations resulted in nearly an 8-percentage point increase in response rates over the unpersonalized invitations (Heerwegh, 2005). Another study in which students were asked to join an online survey panel for their university revealed that personalizing the invitation with “Dear [First name]” resulted in a 4.5-percentage point increase in the number of students who joined the panel compared with the less personal salutation “Dear Student” (Joinson and Reips, 2007). Following the previous literature, each potential respondent was contacted via telephone and asked about their willingness to participate in the survey to prequalify them and enable the personalization of an e-mail containing the respondent’s name as well as the reasons for and importance of the study (see Appendix E). The prequalification step (when possible) also mitigated another threat to survey research—"that the questionnaire may be answered by someone other than the addresses" (Erdos, 1970, p. 125).

4.1.2. Large-scale Data Collection: Procedures

The large-scale email lists are obtained from the Society of Manufacturing Engineers (SME), an internationally renowned organization of manufacturing managers and engineers. The SME is "the premier source for manufacturing knowledge, education and networking… SME is a leader in manufacturing workforce development issues, working with industry, academic and government partners to support the current and future skilled workforce" (http://www.sme.org/about-sme/). The SME has served as the sample frame for other scholarly studies in operations management and supply chain management literature (Tu et al., 2001; Li et al., 2005; Tu et al., 2006). The procedures for obtaining the workable email lists are described below.

First, a manager from SME was contacted to discuss with the purchase of the email lists. However, the manager indicated that it was not possible to send email lists directly to an individual person, because it was not in compliance with federal and local regulations. Instead, the manager suggested leasing the requested database (e.g., phone lists of the potential respondents) to a telemarketing company. Three telemarketing company managers were introduced. After contacting all three, one telemarketing company was selected owing to the discounted offer on the hourly rate for launching the calling project. A total of 5000 phone lists from SME were selected after the careful screening of SIC codes, job function, and job title. SME leased those phone lists to a selected telemarketing company. The callers from the selected telemarketing company launched the calling project to obtain the email lists for the study. A director of operations from a telemarketing company sent the "call report" after completing the calling project each day (see Appendix E).

Three steps were taken to ensure a high-quality and usable e-mail list with a high response rate. First, a brief telemarketing script was prepared for calling (see Appendix D). This script was used when telemarketing callers (hereafter, "callers") spoke with the targeted respondents, explained the study, and encouraged respondents to provide their email addresses. Second, callers contacted target respondents via telephone, asking about their qualifications to answer the survey (i.e., respondents should be the person who knows the sustainability initiatives in the supply chain of the company) and their willingness to participate in the survey. If they are qualified and willing to participate in the survey, they are asked to share their email addresses. In this way, email addresses obtained are mostly accurate and current (McFadden et al., 2009). Third, after obtaining email addresses from people who are qualified and willing to participate in the survey, personalized email messages linked to the online survey were sent promptly within 24 hours after the phone call. After receiving the completed surveys, an appreciation email was sent to each individual respondent by the end of the day (see Appendix G). As a token of appreciation, $5 Starbuck gift cards were sent via mail based on the mailing addresses indicated in the survey.

From January 4, 2012 to January 27, 2012, two rounds of the calling project[1] were conducted: the first round took place from January 4 to 11, and the second round took place from January 24 to 27. Two rounds of the calling project from the telemarketing company produced general information from a total of 600 respondents who agreed to participate in

[1] Calling project refers to the efforts made by callers from the selected telemarketing company. Based on the telephone number lists leased by the SME, callers made multiple telephone attempts to obtain available email addresses.

the survey. This information included a respondent name, job title, company name and address, phone number, and email address. Out of 600, 385 were obtained from the first round of the calling project, and 215 were obtained from the second round. Out of 600 email addresses, 47 failed to be delivered because the addresses were wrong, 15 respondents declined participating in the survey, and seven respondents expressed that they were not the right person to fill out the survey. As such, the total number of usable email addresses was 531. From these, 255 survey responses were received. After screening, 43 of the surveys were deleted from the database because they were incomplete. Therefore, the final number of complete and usable responses was 212, representing a response rate of 39.9% (calculated as 212 / [600 - 69]).

4.1.3. The Characteristics of the Sample: Summary of Sustainability Initiatives, Company, and Respondent Profiles

This section discusses the characteristics of the sample (Tables 4.1, 4.2, and 4.3). Table 4.1 summarizes the sustainability initiatives/certifications/reporting initiatives. The purpose of this survey was to benchmark to what degree U.S. manufacturing companies implement sustainability initiatives. Toward this end, before answering the survey questions, basic general questions are asked for screening purposes. The respondents who felt that their companies are not implementing any of those initiatives considered quitting the survey. Questions were: (1) Please click on the specific organization-wide "Sustainability Initiatives i.e., Sustainable Supply Chain Management Practices" if your organization has been implementing (mark all that apply); (2) What (sustainability-related) certification have you attained? (mark all that apply); and (3) as a Social Auditing, Accounting, and Reporting (SAAR) scheme, which sustainability reporting initiatives do your companies adopt and implement (mark all that apply)?

In terms of sustainable supply chain management practices, three practices are dominantly adopted by most companies: productivity improvement programs (85.4%), recycling programs (74.7%), and employee development programs (70.7%), whereas other practices are still lacking (sustainability-based supplier evaluation [23.7%], corporate social involvement programs [43.4%], and sustainability reporting initiatives [22.2%]). More than 70% of companies represented in this survey adopted ISO 9000 (quality management) certification programs, whereas slightly less than 20% of companies adopted environmental programs (18.4%), and very few adopted social certification programs (0.5%). Most companies were not aware of sustainability reporting initiatives, such as GRI, ISEA, and AA 1000 series.

Table 4.1. Summary of Sustainability Initiatives/Certifications/Reporting Initiatives

Classification		#	%
Sustainability Initiatives (i.e., Sustainable SCM Practices)	Supplier evaluation based on either environmental or social criteria or both	47	23.7
	Productivity improvement programs	169	85.4
	Recycling programs	148	74.7
	Employee development programs (e.g., health, safety, and equity)	140	70.7
	Corporate social involvement programs (e.g., charity to the local communities)	86	43.4
	Sustainability reporting initiatives	44	22.2
Sustainability Certifications	ISO 9000 (Quality Management)	139	70.9
	ISO 14000 (Environmental Management)	36	18.4
	ISO 26000 (Social Responsibility)	1	0.5
	SA 8000 (Working conditions/Human rights)	1	0.5
	None	55	28.1
	Others		
Sustainability Reporting Initiatives	GRI (Global Reporting Initiative)	9	4.7
	ISEA (Institute of Social and Ethical Accountability)	3	1.6
	AA (AccountAbility) 1000 Series	1	0.5

	None	180	93.8
	Others		

Table 4.2 displays the company profiles in terms of union status, number of employees, annual revenues, and primary businesses (SIC code). More than 80% of the companies indicated that they are nonunionized (83.5%), whereas 16.5% stated they are unionized. About 65% of firms are small and medium-sized (<250) companies, whereas 35% come from large organizations (>250). One-fourth of the companies have annual revenues exceeding 100 million dollars, and approximately 61% of the companies have annual revenues less than 50 million dollars. 15% of the companies have revenue volumes between 51 and 100 million dollars. The sample covered firms under the two-digit SIC code 30 and from 34 to 38: 5.9% were SIC 30 ("Rubber and miscellaneous plastic products"), 40.3% were SIC 34 ("Fabricated Metal Products"), 28.5% were SIC 35 ("Industrial machinery and equipment"), 11.8% were SIC 36 ("Electronic and other electric equipment"), 8.6% were SIC 37 ("Transportation equipment"), and 4.8% were SIC 38 ("Instruments and Related Products").

Table 4.2. Company Profiles

Classification		#	%
The Union Status	Unionized	15	16.5
	Non-Unionized	177	83.5
Number of Employees (Firm size)	< 100	83	39.15
	101-250	54	25.47
	251-500	37	17.45
	501-1000	12	5.66
	> 1000	26	12.26
Annual revenues ($ in Millions)	< $10	34	16.0
	$10-50	94	44.3
	$51-100	32	15.1
	$101-500	29	13.7
	> $500	23	10.8
Primary business (SIC)	SIC 30: Rubber and Miscellaneous Plastic Products	11	5.9
	SIC 34: Fabricated Metal	75	40.3

	Products		
	SIC 35: Industrial Machinery and Equipment	53	28.5
	SIC 36: Electronic and Other Electric Equipment	22	11.8
	SIC 37: Transportation Equipment	16	8.6
	SIC 38: Instruments and Related Products	9	4.8
	Others	26	12.3

Table 4.3 displays the profiles of the survey respondents. Survey respondents are collected from the job titles of Chief Executive Officer (CEO), Chief Operating Officer (COO), President, Vice President, Director, Manager–General Manager, Manager–Supply Chain Manager, or Manager–Purchasing Manager. A total of 25.9% of respondents indicated they are vice presidents, and 28.4% indicated they are general managers. The rest of the respondents (23.6%) indicated that they belong to the "Other" category. In terms of job function, 25.2% of the respondents belong to corporate executive, whereas 19.8% are responsible for manufacturing engineering, and 28.7% are responsible for manufacturing production. Finally, years of expertise are measured by years worked in the field and at the company. More than 60% of respondents stated that they worked for more than 20 years in their fields of expertise (62.3%), whereas 38.2% indicated that they worked for more than 20 years at their current companies.

Table 4.3. Respondents Profiles

Classification		#	%
Job title	Chief Executive Officer (CEO)	10	6.2
	Chief Operating Officer (COO)	3	1.9
	President	16	9.9
	Vice President	42	25.9
	Director	26	16.0
	Manager- General Manager	46	28.4
	Manager- Supply Chain Manager	11	6.8
	Manager- Purchasing Manager	8	4.9

	Others	50	23.6
Job function	Corporate Executive	51	25.2
	Manufacturing Engineering	40	19.8
	Quality Assurance/Control	6	3.0
	Product Design/R&D	20	9.9
	Purchasing	9	4.5
	Manufacturing Production	58	28.7
	Sales/Marketing	15	7.4
	Finance/Accounting	1	0.5
	Transportation/Logistics/Distribution	1	0.5
	Retail/Warehouse	1	0.5
Years worked at:	Field (average)	24.3 years	
	< 10 years	16	7.5
	10-20 years	64	30.2
	> 20 years	132	62.3
	Company (average)	18.3 years	
	< 10 years	54	25.5
	10-20 years	77	36.3
	> 20 years	81	38.2

The data for this study were collected using survey methodology; therefore, it is important to address the limitations of survey data (Darnall et al., 2008). Acknowledging the limitations of the survey data, this study addresses the three criticisms of survey data suggested by Tan and Peng (2003): nonresponse bias, common method bias (CMB) (or common method variance [CMV]), and social desirability bias (SDB). These three limitations are addressed in the following sections.

4.1.4. Nonresponse Bias Test

The first concern that is typical of the survey methodology is that information collected from respondents might cause a nonresponse bias. Nonrespondents change the sample frame and can lead to a sample that does not represent the population (Forza, 2002). In that regard, nonrespondents can limit the generalizability of results. Thus, nonresponse bias testing is an important step before the sample is generalized to the population (Armstrong and Overton, 1977). This research did not investigate nonresponse bias directly, because it had limited access to any information regarding the organizational details except name, phone, and addresses of the individuals. According to Armstrong and Overton (1977) and Lambert and Harrington (1990), it is assumed that the late return of surveys represents the opinion of nonrespondents. Following this assumption, this study compared those who responded early (e.g., those who responded after the initial emails) with those who responded late (e.g., those who responded to the follow-up emails). Similar methodology has been used in previous studies of operations management (OM) and supply chain management (SCM) (Handfield and Bechtel, 2002; Moberg et al., 2002; Narasimhan and Kim, 2001; Li et al., 2005). Out of 212 completed surveys, the first round (e.g., initial emails) produced 81 responses, and the second, third, and fourth rounds (e.g., follow-up emails) generated 131 responses.

For the nonresponse bias test, there are two commonly used methods in operations management research: independent *t* tests (Armstrong and Overton, 1977; Krause et al., 2001; Modi and Mabert, 2007) and the chi-square test (Joreskog, 1971; Meyer and Collier, 2001; Li et al., 2005). The independent *t* tests were conducted to examine mean differences between items of early and late respondents. After dividing 212 surveys into two groups (81 early responses and 131 late responses), 168 variables were selected, and *t* tests were performed between the two groups. The results showed that there are no statistically significant differences among those variables, except for three items (EM2, EWEP4, and OP1; $P < 0.05$).

Chi-square tests were used among certain variables (i.e., firm size and annual revenue). The constructs are considered to be distinct if the hypothesis that the two constructs together form a single construct is rejected. To test this hypothesis, a pairwise comparison of measurement models was performed by comparing the model with correlation constrained to equal one with an unconstrained model. A difference between the χ^2 values (d.f. = 1) of the two models that is significant at the P < 0.05 level would indicate support for the discriminant validity (Joreskog, 1971). Using the χ^2 statistic and P < 0.05, it was found that there were no significant differences between the two groups in terms of firm size represented by number of employees and annual revenue (Table 4.4). This shows that received respondents represent an unbiased sample. Although these results do not rule out the possibility of nonresponse bias, they suggest that nonresponse bias may not be a problem to the extent that late respondents represent the opinions of nonrespondents.

Table 4.4. Comparison of Sample and Respondents: Non-Response Bias Test

Variables	**Early Respondents (Initial E-mails)**	**Late Respondents (Follow-up E-mails)**		**Chi-square Test**
	Frequency (%)	Expected Frequency (%)	Observed Frequency (%)	
Firm size (n=212)				
< 100 (1)	35 (43.2)	57 (43.2)	48 (36.6)	χ^2=3.37 d.f. =4 p > .10
101-250 (2)	20 (24.7)	32 (24.7)	34 (26.0)	
251-500 (3)	12 (14.8)	19 (14.8)	25 (19.1)	
501-1000 (4)	4 (4.9)	6 (4.9)	8 (6.1)	
> 1000 (5)	10 (12.3)	16 (12.3)	16 (12.2)	
Annual revenue ($ in Millions) (n=212)				
< $10 (1)	18 (22.2)	29 (22.2)	15 (11.5)	χ^2=9.09 d.f. =4 p > .05
$10-50 (2)	34 (42.0)	55 (42.0)	60 (45.8)	
$51-100 (3)	11 (13.6)	18 (13.6)	21 (16.0)	
$101-500 (4)	10 (12.3)	16 (12.3)	19 (14.5)	
>$500 (5)	8 (9.9)	13 (9.9)	16 (12.2)	

Note: Figures in parentheses are percentage.

The calculation formula: $\chi^2 = \sum_{i=1}^{k} \frac{(f_i - e_i)^2}{e_i}$ where, f_i = observed frequency for category *i*, e_i = expected frequency for category *i, k* = number of categories, and degrees of freedom = *k-1*.

4.1.5. Test of Common Method Bias (CMB)

The second concern is the potential for CMB (also referred to as common method variance [CMV]; hereafter, these two terms are interchangeably used). CMV occurs because all data are self-reported and collected through the same questionnaire during the same period of time with cross-sectional research design. CMV refers to variance that is attributed to the measurement method rather than the constructs of interest and it may cause systematic measurement error and further bias the estimates of the true relationship among theoretical constructs (Podsakoff and Organ, 1986; Bagozzi and Yi, 1990; Podsakoff, 2003). In other words, the data collection method is susceptible to CMB when the researcher seeks responses from a single respondent per firm (in studies when the unit of analysis is at the firm level). CMB is essentially the tendency of the survey respondent to "edit their responses to be more socially desirable, lenient, acquiescent, and consistent with how they think the researcher wants them to respond" (Podsakoff et al., 2003, p. 888).

Two methods are used to test the presence of common method effect. First, post hoc statistical tests are used. All the variables are entered into an exploratory factor analysis (EFA), using unrotated principal components factor analysis, principal component analysis with varimax rotation, and principal axis analysis with varimax rotation to determine the number of factors that are necessary to account for the variance in the variables. If a substantial amount of CMV is present, either (1) a single factor will emerge from the factor analysis, or (2) one general factor will account for most of the covariance among the variables (Podsakoff and Organ, 1986; Andersson and Bateman, 1997; Podsakoff et al., 2003; Steensma et al., 2005). Second, following the guidance of Podsakoff et al. (2003), Harman's single factor test using CFA is conducted to test the hypothesis that a single factor accounts for all the variance in the data. If CMV is largely responsible for the relationship among the variables, the single-factor CFA model should fit the data well (Mossholder et al., 1998; Posdakoff et al., 2003). Although the results of these analyses do not preclude the possibility of CMB, they do suggest that CMV is not of great concern and thus is likely to confound the interpretations of results.

4.1.6. Test of Social Desirability Bias (SDB)

The third concern of survey data is SDB, which refers to the situation where individual respondents attempt to answer survey questions in ways that they deem socially desirable (Darnall et al., 2008). Podsakoff et al. (2003) advocate for statistical analysis techniques that enable the researcher to control for such biases. The scale has been developed and validated by Manning et al. (2009) and has been designed to capture what the authors' refer to as agent's socially desirable responding (ASDR). This is defined as "organizational informants' tendencies to present the firm favorably with respect to norms and standards" (Manning et al., 2009, p. 33). The original items of the ASDR scale are included here (see Table 4.5). These items associated with a previously validated scale are added to the survey instrument to allow the researcher to control for SDB. A 7-point scale (not true [1] to very true [7]) is modified in this study into a 5-point scale (strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, and strongly agree = 5). To control the potential issue associated with SDB, this study adopts measurement items developed by Manning et al. (2009) and adds them to survey instruments and all CFA measurement models.

Table 4.5. Measurement items to control for Social Desirability Bias (SDB) (Adapted from Manning et al., 2009)

Measurement items:
SDR1: None of the managers at my firm feel dissatisfied with their jobs.
SDR2: Different functional areas within my firm, such as marketing and production, sometimes lack cohesion or unity [a].
SDR3: At my company, all of the employees are outstanding performers.
SDR4: Sometimes my firm fails to exercise good judgment [a].
SDR5: Managers at my firm are sometimes afraid to voice their disagreement with a higher level manager's ideas [a].
SDR6: Employees at my company are always trustworthy.
SDR7: At my company, hiring decisions have always been based only on qualifications.
SDR8: My firm has downplayed an event that customers might view as negative.

* A 5-point scale anchored by strongly disagree (1) and strongly agree (5).
[a] indicates reverse coded items.

4.2. Large-Scale Instrument Validation Methodology

The survey instrument used in the large-scale study was subjected to rigorous reliability and validity assessment using the 212 survey responses. This section describes the procedures used during the instrument validation process and the consequent statistical results.

4.2.1. Structural Equation Modeling (SEM)

SEM is used to analyze the data and to test hypothesized relationships among the variables of interest in this study. The data for this study consist primarily of perceptual measures, and the hypotheses represent a series of simultaneous relationships that include exogenous and endogenous variables. Because of 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, because the purpose of this study is to examine a series of interrelationships between simultaneous endogenous and exogenous variables in defining multifaceted constructs and studying path-dependent variances (Hair et al., 1998).

This study adopted Anderson and Gerbing's (1988) recommended two-step approach to test the hypothesized relationships. In the first step, the measurement model is tested to establish validity and reliability of the scales used in the analysis; in the second step, the structural relationships are tested. Details regarding the measurement model as well as the reliability and validity of the survey items are discussed next.

4.2.2. Measurement Model, Validity, and Reliability

The researchers' ability to produce meaningful scientific findings hinges on whether they use valid and reliable measurement instruments. The criteria for the objectivity of the survey instrument are validity and reliability. Validity measures the extent to which the item or scale truly measures what it is supposed to measure (Flynn et al., 1990). Reliability represents the extent to which researchers all measure the same thing (Flynn et al., 1990; Hair et al., 2006). Reliable instruments produce the same measurement results and are able to replicate the study over time and populations (Flynn et al., 1990). A construct cannot be valid if it fails to be reliable, although that same construct can be reliable in the absence of validity (Gordis, 2009).

Bagozzi and Phillips (1982) suggest that the key validity and reliability indicators for measurement models are content validity, convergent validity, discriminant validity, and reliability. Whereas content validity is assessed through comprehensive literature review (Nunnally, 1978), SEM provides rigorous statistical tests to examine a construct's convergent validity, discriminant validity, and reliability (Fornell and Larcker, 1981; Anderson and Gerbing, 1988; Jarvis et al., 2003). Thus, CFA incorporating IBM Statistical Package for the Social Sciences (SPSS) Statistics 20 and Analysis of Moment Structures (AMOS) 20 was used to evaluate the properties of the measures addressing the latent first-order constructs in this study.

Content validity assesses the representativeness of each measurement item in relation to its theoretically posited construct. Content validity is established when the measurement items are a sample of a universe in which the research investigator is interested (Cronbach and Meehli, 1955) and when the items of the construct sufficiently cover the domain of that construct (Kerlinger, 1978; Churchill, 1979). One can examine content validity through reviewing literature comprehensively (Nunnally, 1978) and having expert judges (e.g., academic researchers or practitioners) evaluate the measurement items with structured interviews (Moore and Banbasat, 1991). This study used these procedures to ensure the content validity of the constructs.

Convergent validity assesses the extent to which the measurement items in one construct come together to form a single common dimension and thus is assessed by checking the value of the loading for an item (Bagozzi and Yi, 1998). CFA methods using AMOS are used to assess the validity of the first-order measurement models. The literature suggests 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: absolute fit and incremental fit measures. Absolute fit indices (i.e., χ^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 null model, which assumes there are no correlated constructs, and an ideal model, which perfectly matches the hypothesized model

(Shah and Goldstein, 2006). The literature has identified appropriate and acceptable cut-off values for model fit indices (Hu and Bentler, 1998; Modi and Mabert, 2006; Yang et al., 2011).

Generally, values of GFI >0.80 are considered acceptable model fit, and scores of 0.90 or higher are evidence of good fit (Joreskog and Sorbom, 1986; Hair et al., 1998; Papke-Shields et al., 2002). SRMR is an error fit indicator, and thus lower values represent adequacy in the model. SRMR values <0.05 indicate good fit, whereas values <0.08 represent reasonably acceptable errors of approximation (Browne and Cudeck, 1993). RMSEA values <0.05 indicate good fit, and values up to 0.09 indicate acceptable errors of approximation. This study also uses NFI, CFI, and IFI as widely accepted as incremental model fit indices, and values of 0.90 or higher are associated with good model fit (Hair et al., 2006).

In CFA, the average variance extracted (AVE) among a set of construct items may also be used as an indicator of convergence, and thus AVE is provided for each first-order measurement model (Fornell and Larcker, 1981; Hair et al., 2006). It is suggested that values of 0.5 or higher are an adequate measure of convergence and will represent the target threshold for convergent validity in this study.

Discriminant validity examines the extent to which the measurement items form a unique dimension of a construct that is independent of all other dimensions (Bagozzi and Phillips, 1982). Evidence of discriminant validity exists if the AVE of each construct is greater than the square of the correlations (Braunscheidel and Suresh, 2009). The square root of a construct's AVE should be greater than the correlations between constructs (Fornell and Larcker, 1981; Koufteros et al., 2001).

Reliability is the extent to which a construct can produce the same results in repeated attempts. Although reliability values >0.70 are preferable, values >0.60 are acceptable for newly developed scales (Cronbach, 1951; Nunnally, 1978). Cronbach's α and composite reliability (Fornell and Larcker, 1981) are used to examine the reliability values. The targeted CFA statistical cut-off values used in this study are summarized in Table 4.6.

Table 4.6. Fit statistics for validating the measurement models

Fit statistic	**Recommended cut-off values**
RMSEA	< 0.09
GFI	> 0.85
CFI	> 0.90
NFI	> 0.90
IFI	> 0.90
SRMR	< 0.08
AVE	> 0.50
Cronbach's alpha	> 0.60

4.2.3. CFA Measurement Model Analysis and Results

The CFA measurement model validation results for each of the seven constructs are provided in the following subsections (4.2.3.1 through 4.2.3.7). CFA is a multivariate statistical procedure used to test how well the measured variables represent the number of constructs. CFA and EFA are similar techniques, but in EFA, data are simply explored and information is provided about the numbers of factors required to represent the data. In EFA, all measured variables are related to every latent variable. However, CFA requires researchers to specify the number of factors required in the data and which measured variable is related to which latent variable (Shah and Goldstein, 2006).

In CFA, regression coefficients in the regression of observed variables on latent variables are regarded as factor loadings. On the first-order level of measurement models, the standard factor loadings of observed variables (items) on latent variables (factors) are estimates of the validity of the observed variables. For second- or higher-order (usually, third-order) levels, the standard coefficients are estimates of the validity of the factors. The larger the factor loadings or coefficients (as compared with their standard errors and expressed by the corresponding *t* values) the stronger the evidence that the measured variables or factors represent the underlying constructs (Bollen, 1989; Mueller, 1994; Doll et al., 1994).

4.2.3.1. Summary of a CFA Measurement Model for External Pressures (EPs)

The initial 29 items for EPs and their corresponding labels are listed in Table 4.7. EPs are represented by three dimensions (coercive pressures [CPs], normative pressures [NPs], and mimetic pressures [MPs]), and each dimension measures three dimensions of sustainability: economic (Ec), environmental (Ev), and social sustainability (Sc).

Convergent validity and reliability. The factor loadings both at the first-order and second-order measurement models are provided. First, CFA was conducted for all the constructs at the first-order level. Second, CFA was conducted for all the higher-order level (e.g., second-order) constructs to be in line with the theory provided in the previous chapters. AVE and Cronbach's α values for the final measurement model are displayed. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

As for coercive pressures (CPs), CP1Ev and CP2Sc were deleted because of low factor loadings, although these were related to government regulations. One reason is that items that measure government regulations for economic sustainability were not included, causing inconsistency to the other items. So it was decided to delete those items. As for normative pressures (NPs), NP1Ec and NP4Ec were deleted because of low factor loadings. All items for mimetic pressures (MP) were kept. Analysis of modification indices showed that high error correlation existed in the following items: CP6Ec and CP7Ev, CP7Ev and CP8Sc, NP3Ec and NP3Ev, NP4Ev and NP4Sc, MP2Ec and MP2Ev, and MP2Ev and MP2Sc. Those items were important; therefore, it was decided to correlate the items. Measurement model fit indices indicated adequate convergent validity for each dimension of the construct (see final model fit indices for the first- and second-order level). The AVE for each construct shows adequate convergent validity, exceeding the threshold value of 0.50, except for CP_Ec (AVE = 0.444). In addition, all Cronbach's α values are greater than 0.70 (except CP_Ec and CP_Ev), providing sufficient evidence of reliability for each dimension of the construct.

Table 4.7. Summary of a CFA Measurement Model for External Pressures

Label	Description of Items	Factor Loadings (1st order)	Factor Loadings (2nd order)
Coercive Pressures: CP_Ec [b](*final* AVE= .444, α= 0.609)			**.440 (.438)**
CP3Ec	Our main customers require us to improve cost performance.	.736 (.704)	.687 (.694)
CP6Ec	Our parent company demands that we adopt productivity initiatives.	.545 (.570)	.552 (.547)
Coercive Pressures: CP_Ev [b](*final* AVE= .523, α= 0.680)			**.934 (.939)**
~~CP1Ev~~[a]	~~Government regulations obligate us to comply with environmental preservation.~~	~~.336~~	~~.336~~
CP4Ev	Our key customers require us to improve environmental performance.	.918 (.918)	.915 (.914)
CP7Ev	Our parent company requires that we adopt environmental initiatives.	.588 (.593)	.588 (.588)
Coercive Pressures: CP_Sc[b] (*final* AVE= .565, α= 0.706)			**.980 (.975)**
~~CP2Sc~~[a]	~~Government regulations compel us to abide by social justice.~~	~~.454~~	~~.454~~
CP5Sc	Our primary customers require us to improve social performance.	.937 (.935)	.921 (.922)
CP8Sc	Our parent company compels that we adopt social initiatives.	.593 (.594)	.601 (.601)
Normative Pressures: NP_Ec [b](*final* AVE= .687, α= 0.811)			**.860 (.860)**
~~NP1Ec~~[a]	~~Economic initiatives have been widely influenced by our important suppliers.~~	~~.473~~	~~.473~~
NP2Ec	Economic initiatives have been widely influenced by local communities.	.877 (.874)	.878 (.877)
NP3Ec	Economic initiatives have been widely influenced by environmental interest groups.	.777 (.779)	.778 (.779)
~~NP4Ec~~[a]	~~Economic initiatives have been widely influenced by employees' suggestions.~~	~~.363~~	~~.363~~
Normative Pressures: NP_Ev[b] (*final* AVE= .500, α= 0.787)			**.989 (.992)**
NP1Ev	Environmental initiatives have been widely influenced by our important suppliers.	.738 (.741)	.734 (.735)
NP2Ev	Environmental initiatives have been widely influenced by local communities.	.722 (.720)	.725 (.725)

NP3Ev	Environmental initiatives have been widely influenced by environmental interest groups.	.797 (.796)	.801 (.801)
All NP4Ev	Environmental initiatives have been widely influenced by employees' suggestions.	.543 (.547)	.543 (.545)
Normative Pressures: NP_Sc [b](*final* AVE= .567, α= 0.838)			**.987 (.984)**
NP1Sc	Social initiatives have been widely influenced by our important suppliers.	.866 (.867)	.860 (.859)
NP2Sc	Social initiatives have been widely influenced by local communities.	.719 (.718)	.723 (.723)
NP3Sc	Social initiatives have been widely influenced by environmental interest groups.	.832 (.832)	.834 (.833)
NP4Sc	Social initiatives have been widely influenced by employees' suggestions.	.553 (.553)	.563 (.564)
Mimetic Pressures: MP_Ec [b](*final* AVE= .695, α=0.876)			**.576 (.578)**
MP1Ec	When our main competitors adopt economic initiatives, they benefit greatly.	.870 (.871)	.868 (.868)
MP2Ec	When our main competitors adopt economic initiatives, they are perceived favorably by customers.	.752 (.753)	.749 (.749)
MP3Ec	When our main competitors adopt economic initiatives, they are more competitive.	.873 (.872)	.874 (.874)
Mimetic Pressures: MP_Ev [b](*final* AVE= .649, α=0.837)			**1.016 (1.007)**
MP1Ev	When our main competitors adopt environmental initiatives, they benefit greatly.	.908 (.908)	.913 (.913)
MP2Ev	When our main competitors adopt environmental initiatives, they are perceived favorably by customers.	.651(.651)	.631 (.630)
MP3Ev	When our main competitors adopt environmental initiatives, they are more competitive.	.836 (.836)	.839 (.839)
Mimetic Pressures: MP_Sc [b](*final* AVE= .551, α=0.785)			**.844 (.852)**
MP1Sc	When our main competitors adopt social initiatives, they benefit greatly.	.761 (.760)	.780 (.780)
MP2Sc	When our main competitors adopt social initiatives, they are perceived favorably by customers.	.657 (.659)	.632 (.632)
MP3Sc	When our main competitors adopt social initiatives, they are more competitive.	.802 (.802)	.811 (.812)
***Initial* Model Fit (1st)**	χ^2/df = 3.090, RMSEA=.100, GFI= .735, CFI=.802, NFI=.737, IFI=.806, SRMR= .0775		
***Final* Model Fit (1st)**	χ^2/df = 2.223, RMSEA=.076, GFI= .837, CFI=.914, NFI=.857, IFI=.916, SRMR= .0626		
***Final* Model Fit (SD 1st)**	χ^2/df = 1.757, RMSEA=.060, GFI= .817, CFI=.912, NFI=.820, IFI=.914, SRMR= .0636		
***Initial* Model Fit (2nd)**	χ^2/df = 3.093, RMSEA=.100, GFI= .715, CFI=.788, NFI=.719, IFI=.791, SRMR= .0826		
***Final* Model Fit (2nd)**	χ^2/df = 2.261, RMSEA=.077, GFI= .819, CFI=.902, NFI=.839, IFI=.903, SRMR= .0735		
***Final* Model Fit (SD 2nd)**	χ^2/df = 1.793, RMSEA=.061, GFI= .804, CFI=.901, NFI=.804, IFI=.903, SRMR= .0713		

Note: Factor loadings in parenthesis indicate factor loadings with Social Desirability (SD) construct.

[a] Items deleted during purification.

[b] Ec (Economic dimension of sustainability), Ev (Environmental dimension of sustainability), and Sc (Social dimension of sustainability).

Figure 4-1. First-order CFA Model for External Pressures

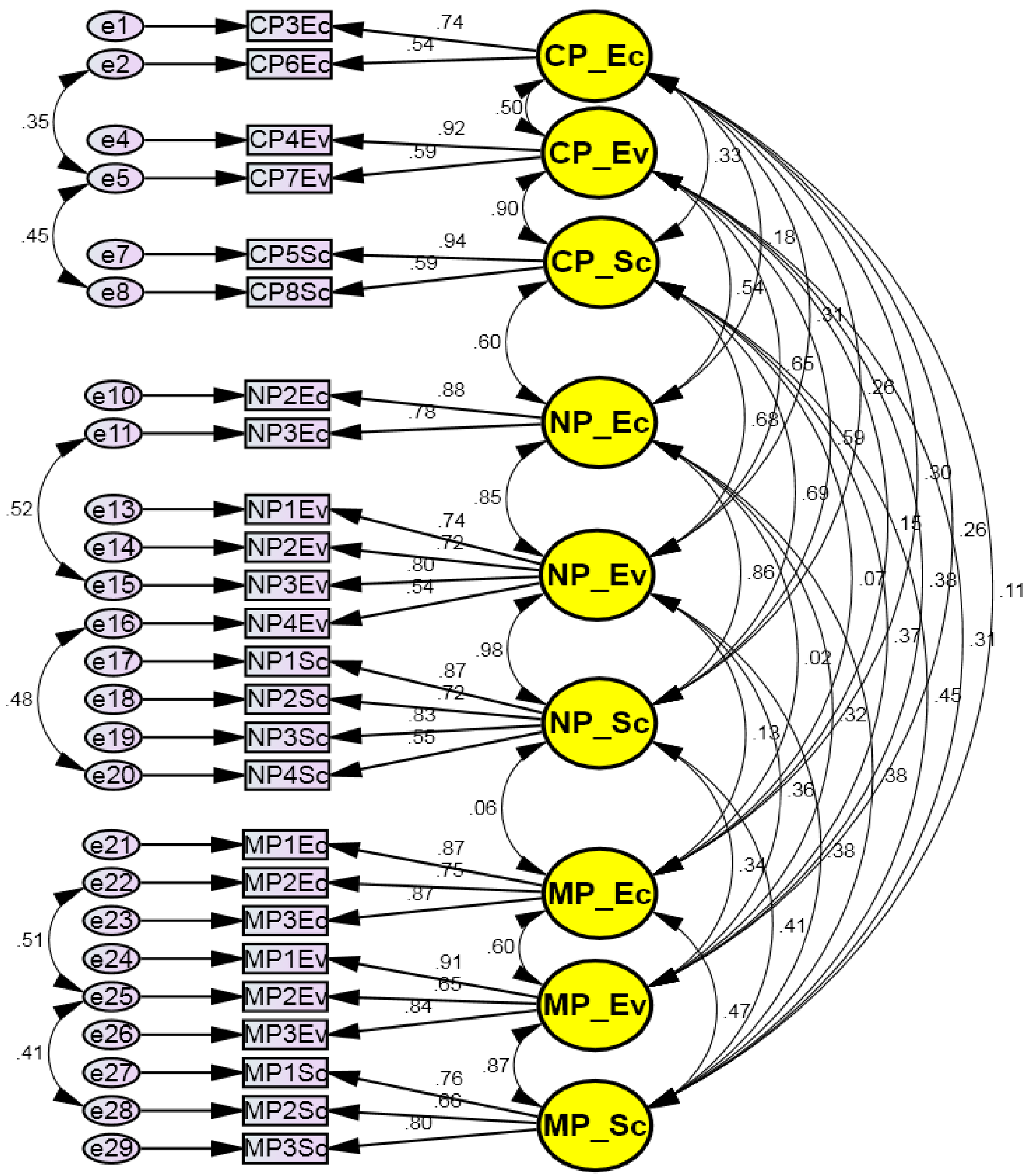
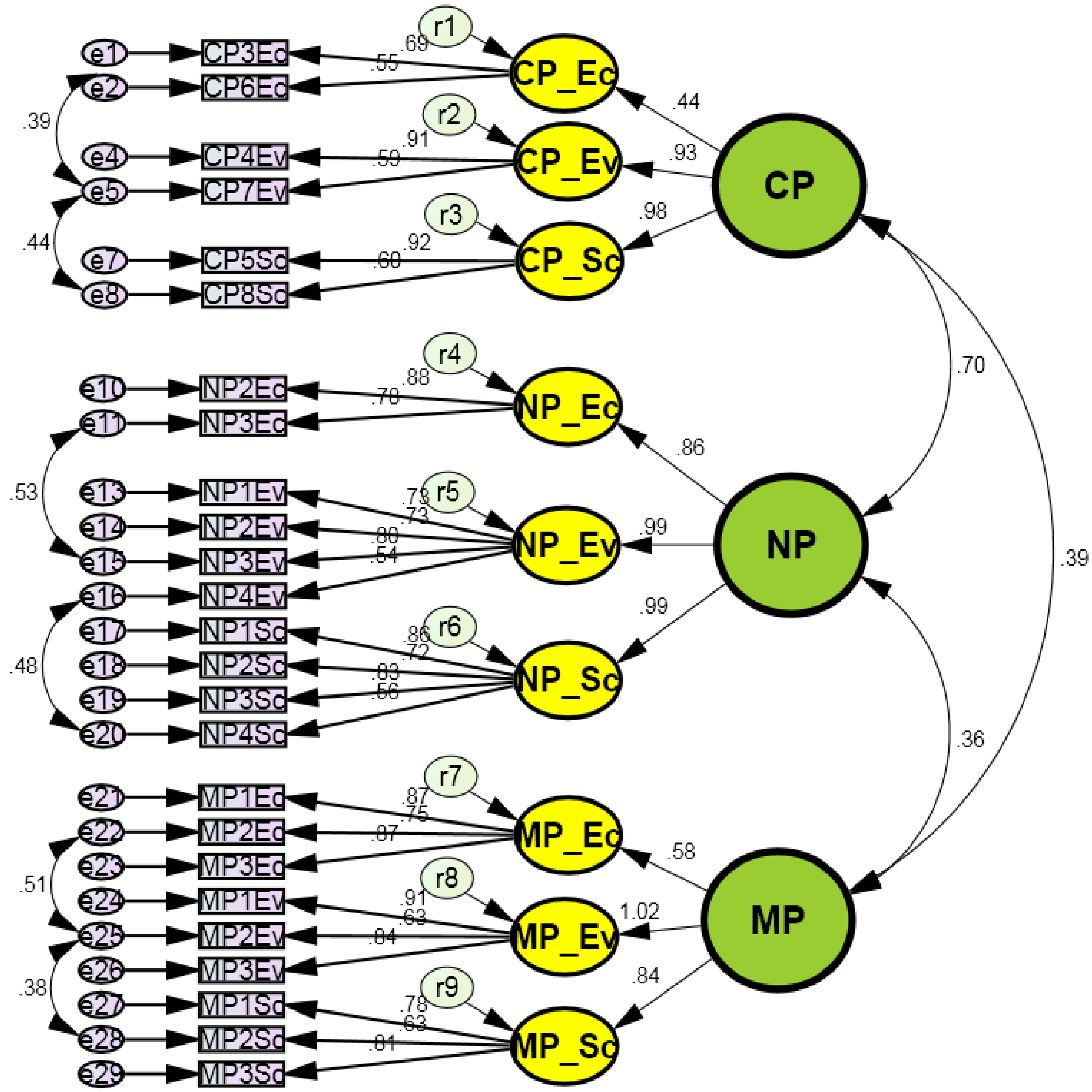


Figure 4-2. Second-order CFA Model for External Pressures



Discriminant validity. Table 4.8 indicates that most constructs show an adequate level of discriminant validity. Some constructs (CP_Ev and CP_Sc, NP_Ec and NP_Ev, NP_Ev and NP_Sc, and MP_Ev and MP_Sc) have high correlations, violating discriminant validity. To establish the discriminant validity between these variables, another test of discriminant validity (the pairwise χ^2 test) was conducted. Table 4.9 displays the results of the pairwise χ^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at P < 0.01 (d.f. = 1), providing evidence of discriminant validity. In sum, for this measurement model for EPs, there are weak discriminant validities among certain variables, which potentially adds a limitation to this study. However, the pairwise χ^2 test indicates that statistically discriminant validity can be established between these variables.

Table 4.8. Inter-construct correlations and discriminant validity for External Pressures

	CP_Ec	CP_Ev	CP_Sc	NP_Ec	NP_Ev	NP_Sc	MP_Ec	MP_Ev	MP_Sc
CP_Ec	**.666**								
CP_Ev	.499	**.723**							
CP_Sc	.332	.899	**.751**						
NP_Ec	.178	.543	.601	**.829**					
NP_Ev	.311	.650	.680	.847	**.707**				
NP_Sc	.257	.585	.688	.596	.978	**.753**			
MP_Ec	.302	.145	.075	.017	.132	.059	**.834**		
MP_Ev	.258	.375	.366	.317	.362	.341	.596	**.805**	
MP_Sc	.106	.306	.447	.376	.380	.414	.466	.865	**.743**

* Squared root of AVEs are on the diagonal in bold.

Table 4.9. A pairwise chi-square difference test: Assessment of discriminant validity for External Pressures

Description	Chi-square statistics				
	Unconstrained model [a]	d.f.	Constrained model [b]	d.f.	Difference
CP_Ec with CP_Ev	0	0	17.12	1	17.12
CP_Ec with CP_Sc	5.207	1	57.381	2	52.174
CP_Ec with NP_Ec	4.912	1	114.765	2	109.853
CP_Ec with NP_Ev	22.44	8	140.833	9	118.393
CP_Ec with NP_Sc	45.508	8	159.423	9	113.915
CP_Ec with MP_Ec	7.521	4	92.822	5	85.301
CP_Ec with MP_Ev	6.471	4	116.996	5	110.525
CP_Ec with MP_Sc	0.673	4	134.596	5	133.923
CP_Ev with CP_Sc	0	0	54.749	1	54.749
CP_Ev with NP_Ec	1.224	1	71.118	2	69.894
CP_Ev with NP_Ev	20.161	8	94.209	9	74.048
CP_Ev with NP_Sc	50.54	8	118.778	9	68.238
CP_Ev with MP_Ec	1.061	4	79.093	5	78.032
CP_Ev with MP_Ev	14.611	4	99.311	5	84.7
CP_Ev with MP_Sc	13.211	4	111.025	5	97.814

CP_Sc with NP_Ec	0.005	1	74.246	2	74.241
CP_Sc with NP_Ev	10.683	8	93.602	9	82.919
CP_Sc with NP_Sc	45.727	8	118.819	9	73.092
CP_Sc with MP_Ec	5.059	4	115.774	5	110.715
CP_Sc with MP_Ev	12.288	4	96.713	5	84.425
CP_Sc with MP_Sc	14.013	4	112.108	5	98.095
NP_Ec with NP_Ev	19.746	7	82.368	8	62.622
NP_Ec with NP_Sc	64.482	8	118.234	9	53.752
NP_Ec with MP_Ec	6.676	4	122.223	5	115.547
NP_Ec with MP_Ev	6.091	4	95.161	5	89.07
NP_Ec with MP_Sc	7.577	4	104.759	5	97.182
NP_Ev with NP_Sc	74.23	18	132.482	19	58.252
NP_Ev with MP_Ec	26.235	13	154.91	14	128.675
NP_Ev with MP_Ev	27.027	13	136.628	14	109.601
NP_Ev with MP_Sc	33.664	13	158.868	14	125.204
NP_Sc with MP_Ec	46.851	13	185.492	14	138.641
NP_Sc with MP_Ev	42.37	13	151.851	14	109.481
NP_Sc with MP_Sc	51.433	13	169.242	14	117.809
MP_Ec with MP_Ev	24.132	7	94.741	8	70.609
MP_Ec with MP_Sc	32.675	8	126.222	9	93.547
MP_Ev with MP_Sc	41.829	7	106.423	8	64.594

Note: All χ^2 differences are significant (for 1 degree of freedom) at $p < 0.01$.
[a] Unconstrained model indicates a model with correlation without constraint of variance. [b] Constrained model indicates a model with correlation constrained to one.

Test of CMB. To test the hypothesis that a single factor accounts for all the variance in the data, Harman's single factor test incorporating CFA was used. Given that SDB will highly likely influence the answers of the respondents in the sustainability context, this study included a social desirability construct in the CFA measurement models to control for the bias (Podsakoff et al., 2003; Manning et al., 2009). All the loadings are constrained to be the same for all items (regression weight was constrained to be "a"). The model fit indicates that a single factor model does not represent the data well (χ^2 /d.f. = 4.156, GFI = 0.520, CFI = 0.575, IFI = 0.577, NFI = 0.509, RMSEA = 0.122, SRMR = 0.138). Furthermore, the AVE by a single factor is 31.1%, indicating that a less than great proportion of the variance in the data is accounted for by a single factor. Factor loadings and model fit indices for both first-order and second-order level constructs with social desirability construct are displayed in Table 4.7.

4.2.3.2. Summary of a CFA Measurement Model for Top Leadership Culture (TLC)

The initial 13 items for TLC and their corresponding labels are listed in Table 4.10. Analysis steps are the same as the previous constructs.

Convergent validity and reliability. The factor loadings for both first-order and second-order level measurement model are provided. First, CFA was conducted for all constructs at the first-order level. Second, CFA was conducted for all higher-order level (e.g., second-order or higher) constructs to be in line with the theory provided in the previous chapters. AVE and Cronbach's α values for the final measurement models (both first-order and second-order level) are displayed. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

The initial three dimensions of TLC—managerial attitude and perspective (MAP), top management support (TMS), and employee motivation (EM)—were modified into economic sustainability of top leadership culture (TLC_Ec), environmental sustainability of top leadership culture (TLC_Ev), and social sustainability of top leadership culture (TLC_Sc) to be consistent with the triple bottom-line theory. Two items were deleted (MAP1_Ec and TMS3_Sc) to improve the model fit indices. MAP1_Ec and TMS3_Sc were also deleted based on the modification indices. Measurement model fit indices indicate adequate convergent validity for each dimension of the construct (see final model fit indices). The AVE for each construct shows adequate convergent validity, exceeding the threshold value of 0.50, except TLC_Sc (AVE = 0.494). In addition, all Cronbach's α values are greater than 0.70, providing sufficient evidence of reliability for each dimension of the construct.

Table 4.10. Summary of a CFA Measurement Model for Top Leadership Culture

Label	Description of Items	Factor Loadings (1st order)	Factor Loadings (2nd order)
	Top Leadership Culture_Ec [b] (*final* AVE= .520, α= .801)		**.544 (.560)**
~~MAP1_Ec~~ [a]	~~Our top management believes that our firm is likely to gain by implementing initiatives for productivity enhancements.~~	-	-
TMS1_Ec	Our top management is supportive of our efforts to improve operations productivity.	.470 (.470)	.470 (.470)
EM1_Ec	Our top management rewards shop-floor employees for their productivity improvement.	.796 (.797)	.796 (.796)
EM3_Ec	Our top management motivates shop-floor employees to make suggestions on reducing rework.	.755 (.755)	.755 (.755)
EM4_Ec	Our top management provides incentives to shop-floor employees for reducing scraps.	.815 (.813)	.815 (.813)
	Top Leadership Culture_Ev [b] (*final* AVE= .505, α= .749)		**.909 (.890)**
MAP2_Ev	Our top management considers environmental preservation to be important.	.726 (.722)	.726 (.719)
TMS2_Ev	Our top management assigns adequate resources to environmental programs.	.737 (.738)	.737 (.737)
EM2_Ev	Our top management encourages shop-floor employees' efforts to reduce harmful environmental wastes.	.661 (.665)	.661 (.668)
	Top Leadership Culture_Sc [b] (*final* AVE= .494, α= .794)		**.919 (.933)**
MAP3_Sc	Our top management gives high priority to social responsibility for strategic decision making.	.714 (.705)	.714 (.702)
MAP4_Sc	Our top management considers improving the quality of life in respective local communities to be important.	.730 (.737)	.730 (.733)
~~TMS3_Sc~~ [a]	~~Our top management supports employee development programs with the resources we need.~~	-	-
TMS4_Sc	Our top management actively participates in local community outreach programs	.684 (.677)	.684 (.676)
EM5_Sc	Our top management involves shop-floor employees in quality of life improvement initiatives.	.695 (.701)	.695 (.708)
***Initial* Model Fit**	χ^2/df =4.064, RMSEA=.121, GFI= .832, CFI=.834, NFI=.794, IFI=.836, SRMR= .0865		
***Final* Model Fit**	χ^2/df = 3.009, RMSEA=.098, GFI= .894, CFI=.909, NFI=.871, IFI=.910, SRMR= .0740		
Model Fit (SD 1st)	χ^2/df =1.913, RMSEA=.066, GFI= .870, CFI=.906, NFI=.824, IFI=.907, SRMR= .0706		
Model Fit (SD 2nd)	χ^2/df =1. 904, RMSEA=.065, GFI= .867, CFI=.905, NFI=.822, IFI=.907, SRMR= .0682		

Note: Factor loadings in parenthesis indicate factor loadings with Social Desirability (SD) construct.
[a] Item deleted during purification.
[b] Ec (Economic dimension of sustainability), Ev (Environmental dimension of sustainability), and Sc (Social dimension of sustainability).

Figure 4-3. First-order CFA Measurement Model for Top Leadership Culture

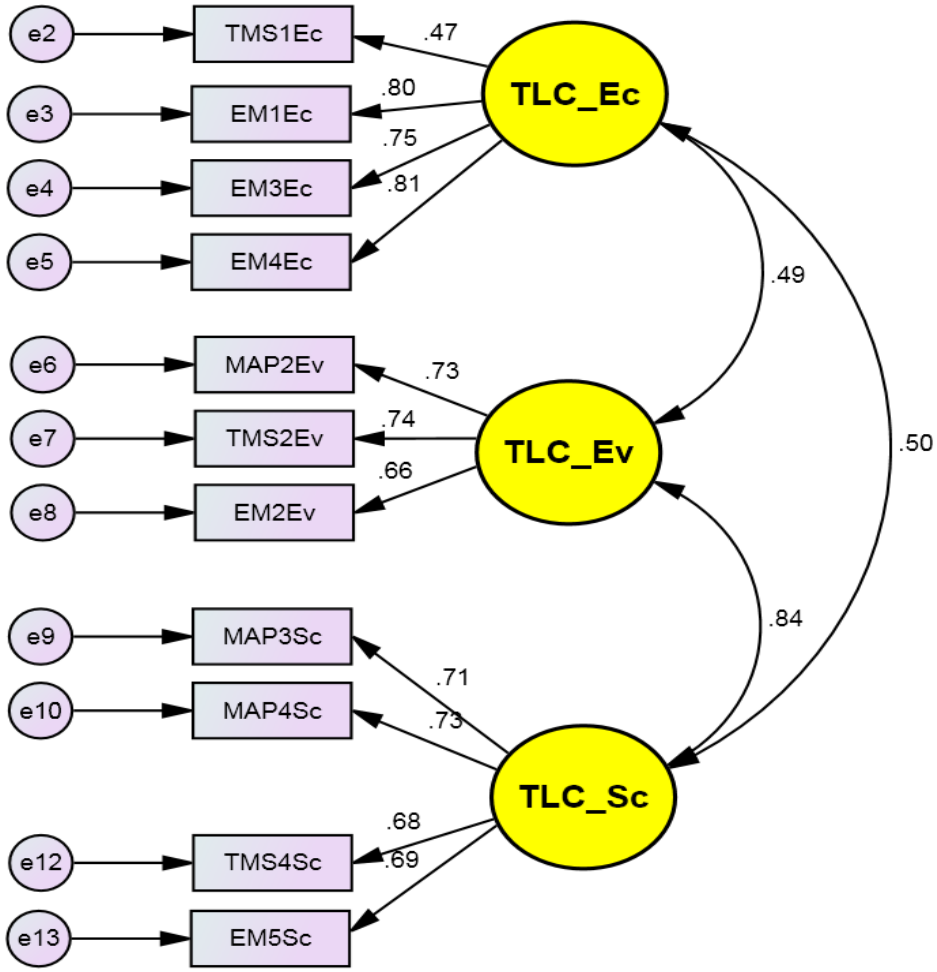
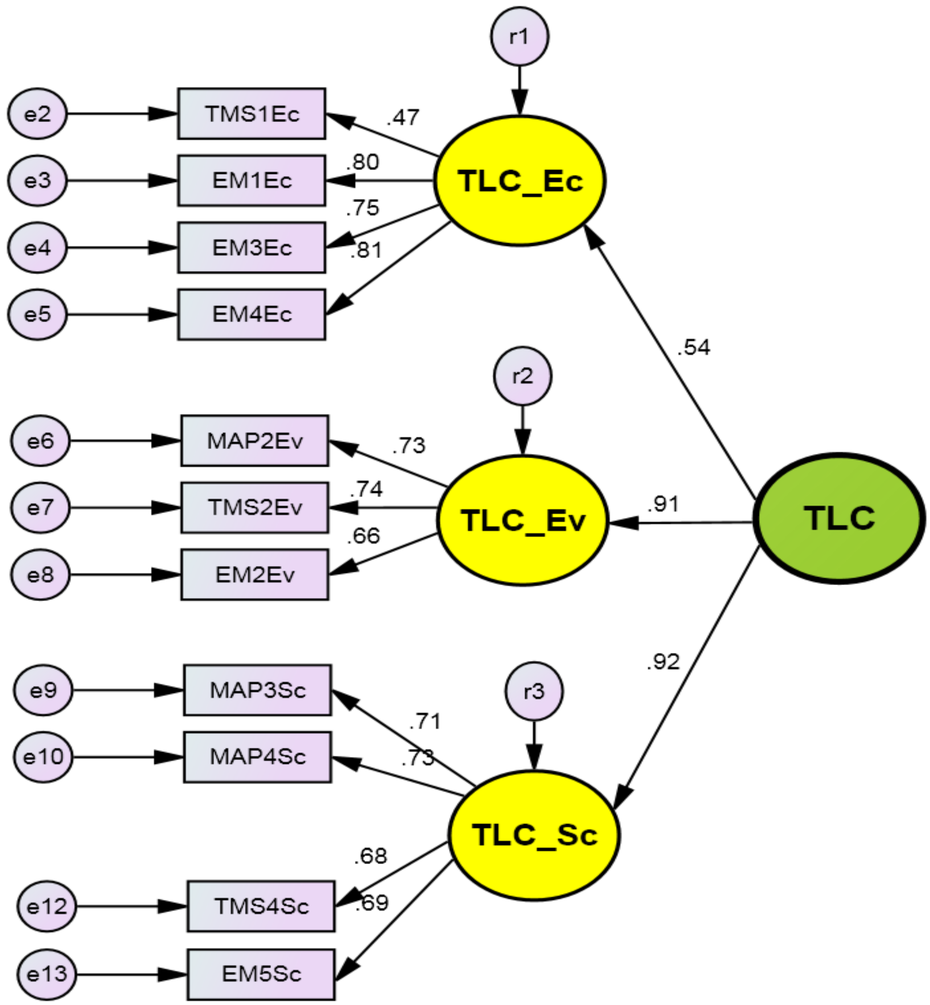


Figure 4-4. Second-order CFA Measurement Model for Top Leadership Culture



Discriminant validity. Table 4.11 indicates that all constructs show an adequate level of discriminant validity, except two variables (TLC_Ev and TLC_Sc). To establish the discriminant validity between these two variables, another test of discriminant validity (the pairwise χ^2 test) was conducted. Table 4.12 displays the results of the pairwise χ^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at $P < 0.01$ (d.f. = 1), providing evidence of discriminant validity. In sum, for this measurement model for TLC, there is weak discriminant validity between TLC_Ev and TLC_Sc, which potentially adds a limitation to this study. However, the pairwise χ^2 test indicates that statistically discriminant validity can be established between these two variables.

Table 4.11. Inter-construct correlations and discriminant validity for Top Leadership Culture

	TLC_Ec	TLC_Ev	TLC_Sc
TLC_Ec	**0.721**		
TLC_Ev	0.494	**0.711**	
TLC_Sc	0.500	0.835	**0.703**

* Squared root of AVEs are on the diagonal in bold.

Table 4.12. A pairwise chi-square difference test: Assessment of discriminant validity for Top Leadership Culture

Description	Chi-square statistics				
	Unconstrained model [a]	d.f.	Constrained model [b]	d.f.	Difference
TLC_Ec with TLC_Ev	42.657	13	101.073	14	58.416
TLC_Ec with TLC_Sc	71.608	19	136.501	20	64.893
TLC_Ev with TLC_Sc	37.340	13	112.242	14	74.902

Note: All χ^2 differences are significant (for 1 degree of freedom) at $p < 0.01$.
[a] Unconstrained model indicates a model with correlation without constraint of variance. [b] Constrained model indicates a model with correlation constrained to one.

Test of CMB. To test the hypothesis that a single factor accounts for all the variance in the data, Harman's single factor test using CFA was conducted. In addition, given that SDB will very likely influence the answers of the respondents in the sustainability context, this study included a social desirability construct in the CFA measurement models to control for the bias (Podsakoff et al., 2003; Manning et al., 2009). All the loadings are constrained to be the same for all items (regression weight was constrained to be "a"). The model fit indicates that a single factor model does not represent the data well (χ^2 /d.f. = 3.211, GFI = 0.763, CFI = 0.748, IFI = 0.750, NFI = 0.674, RMSEA = 0.102, SRMR = 0.095). Furthermore, the AVE by a single factor is 35.8%, indicating that a less than great proportion of the variance in the data is accounted for by a single factor. Factor loadings and model fit indices for both first- and second-order level constructs with social desirability construct are displayed in Table 4.10.

4.2.3.3. Summary of a CFA Measurement Model for Strategic Sustainability Orientation (SSO)

The initial 13 items for SSO and their corresponding labels are listed in Table 4.13. SSO is represented by three dimensions: economic orientation (EcO), environmental orientation (EvO), and Social orientation (ScO). Analysis steps are the same as the previous constructs.

Convergent validity and reliability. The factor loadings at both the first-order and second-order measurement models are provided. First, CFA was conducted for all constructs at the first-order level. Second, CFA was conducted for all constructs at the second-order level to be in line with the theory provided in the previous chapters. AVE and Cronbach's α values for the final measurement models (both first- and second-order level) are displayed. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

All items are kept to ensure the items of each dimension of sustainability, keeping the perspective of the triple bottom line (Erlington, 1996). Each dimension of sustainability captures four important aspects of sustainability: mission statement, commitment, communication to all employees, and operational decision making (Wu and Pagell, 2009). Measurement model fit indices indicate adequate convergent validity for each dimension of the construct (see final model fit indices). The AVE for each construct shows adequate convergent validity, exceeding the threshold value of 0.50, except EcO (AVE = 0.371). In addition, all Cronbach's α values are >0.70 (except EcO = 0.694), providing sufficient evidence of reliability for each dimension of the construct.

Table 4.13. Summary of a CFA Measurement Model for Strategic Sustainability Orientation

Label	Description of Items	Factor Loadings (1st order)	Factor Loadings (2nd order)
Economic Orientation (EcO) (*final* AVE= .371 (.372), α= .694)			**.556 (.513)**
EcO1	Our firm's mission statement communicates the importance of financial performance.	.708 (.709)	.708 (.703)
EcO2	Our firm is committed to improving market share.	.532 (.534)	.532 (.530)
EcO3	Our financial priorities are communicated to all employees.	.674 (.671)	.674 (.682)
EcO4	Our firm uses short-term productivity outcomes for operational decision making.	.497 (.499)	.497 (.493)
Environmental Orientation (EvO) (*final* AVE= .596 (.596), α= .852)			**.852 (.755)**
EvO1	Our firm's mission statement communicates the importance of environmental performance	.780 (.780)	.780 (.777)
EvO2	Our firm is committed to pollution control.	.728 (.729)	.728 (.729)
EvO3	Our ecological priorities are communicated to all employees.	.786 (.785)	.786 (.787)
EvO4	Our firm evaluates the environmental impact of operational decisions.	.793 (.793)	.793 (.794)
Social Orientation (ScO) (*final* AVE= .626 (.627), α=.885)			**.812 (.922)**
ScO1	Our firm's mission statement communicates the importance of employees' wellbeing.	.650 (.652)	.650 (.652)
ScO2	Our firm is committed to support social philanthropy.	.782 (.783)	.782 (.782)
ScO3	Our firm is committed to enhancing social responsibility.	.891 (.886)	.891 (.886)
ScO4	Our employees understand the importance of social responsibility.	.809 (.809)	.809 (.810)
ScO5	Our firm evaluates social implications of our operational decisions.	.806 (.810)	.806 (.810)
***Final* Model Fit**	χ^2 / df =2. 104, RMSEA=.072, GFI= .918, CFI=.946, NFI=.904, IFI=.947, SRMR= .055		
Model Fit (SD 1st)	χ^2 / df =1. 884, RMSEA=.065, GFI= .869, CFI=.912, NFI=.832, IFI=.913, SRMR= .055		
Model Fit (SD 2nd)	χ^2 / df =1. 889, RMSEA=.065, GFI= .867, CFI=.911, NFI=.829, IFI=.912, SRMR= .055		

Note: Factor loadings in parenthesis indicate factor loadings with Social Desirability (SD) construct.

Figure 4-5. First-order CFA Measurement Model for Strategic Sustainability Orientation

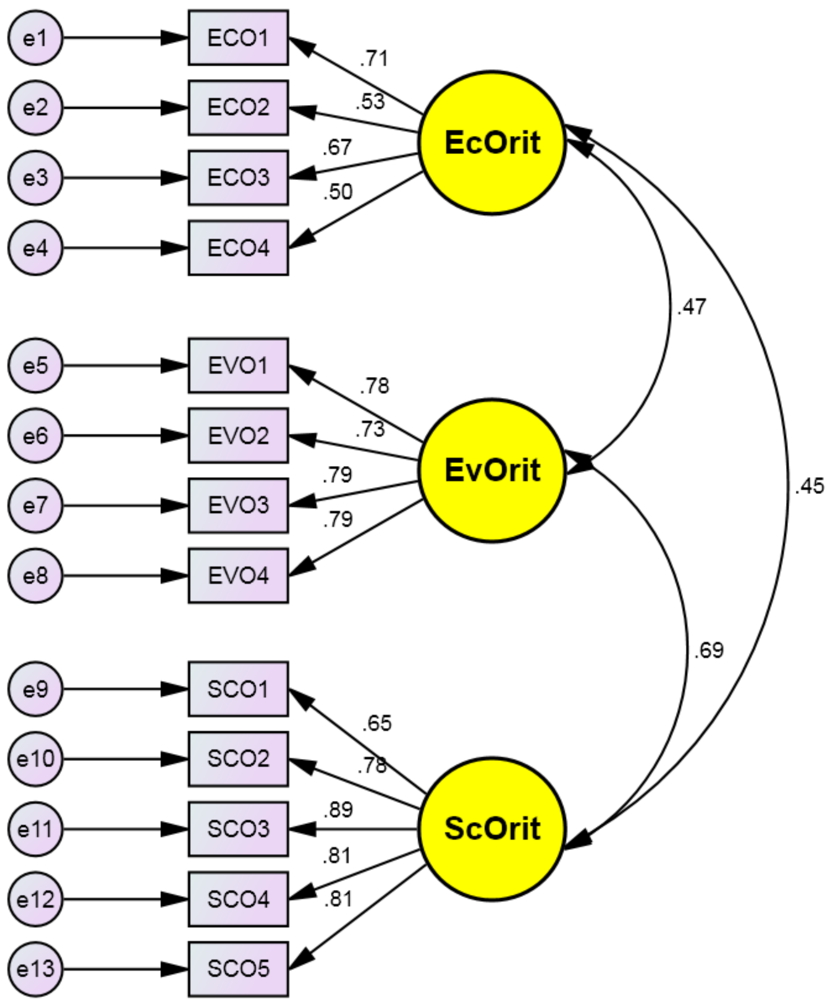
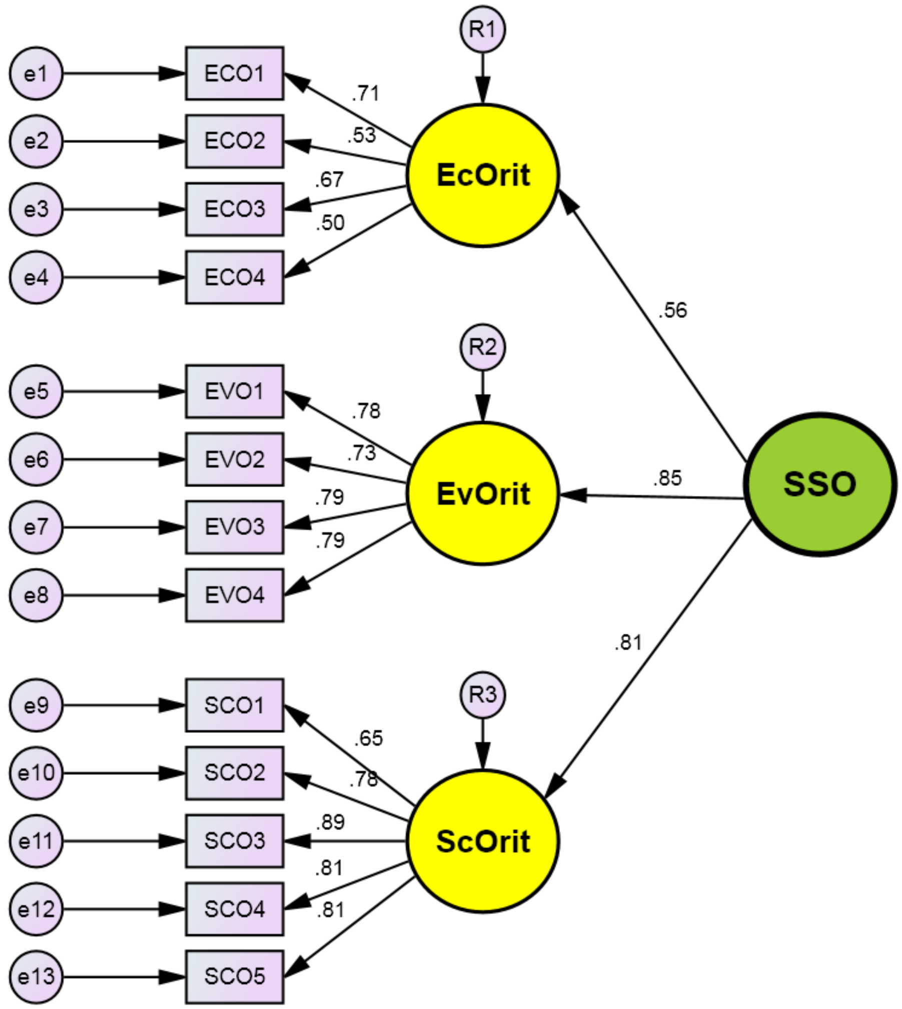


Figure 4-6. Second-order CFA Measurement Model for Strategic Sustainability Orientation



Discriminant validity. Table 4.14 indicates that all constructs show an adequate level of discriminant validity. Table 4.15 displays the results of the pairwise χ^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at P < 0.01 (d.f. = 1), providing sufficient evidence of discriminant validity.

Table 4.14. Inter-construct correlations and discriminant validity for Strategic Sustainability Orientation

	EcO	EvO	ScO
EcO	**0.609**		
EvO	0.474	**0.773**	
ScO	0.451	0.692	**0.792**

* Squared root of AVEs are on the diagonal in bold.

Table 4.15. A pairwise chi-square difference test: Assessment of discriminant validity for Strategic Sustainability Orientation

Description	Chi-square statistics				
	Unconstrained model	d.f.	Constrained model	d.f.	Difference
EcO with EvO	60.682	19	162.813	20	102.131
EcO with ScO	54.736	26	169.575	27	114.839
EvO with ScO	63.518	26	121.466	27	57.948

Note: All χ^2 differences are significant (for 1 degree of freedom) at $p < 0.01$.

[a] Unconstrained model indicates a model with correlation without constraint of variance. [b] Constrained model indicates a model with correlation constrained to one.

Test of CMB. To test the hypothesis that a single factor accounts for all the variance in the data, Harman's single factor test using CFA was conducted. In addition, given that SDB will very likely influence the answers of the respondents in the sustainability context, this study included a social desirability construct in the CFA measurement models to control for the bias (Podsakoff et al., 2003; Manning et al., 2009). All the loadings are constrained to be the same for all items (regression weight was constrained to be "a"). The model fit indicates that a single factor model does not represent the data well (χ^2 /d.f. = 3.665, GFI = 0.719, CFI = 0.710, IFI = 0.712, NFI = 0.642, RMSEA = 0.112, SRMR = 0.114). Furthermore, the AVE by a single factor is 40.1%, indicating that a less than great proportion of the variance in the data is accounted for by a single factor. Factor loadings and model fit indices for both first- and second-order level constructs with social desirability construct are displayed in Table 4.13.

4.2.3.4. Summary of a CFA Measurement Model for Sustainable Supplier Management Practices (SSMPs)

The initial 17 items for SSMP and their corresponding labels are listed in Table 4.16. SSMP is represented by two dimensions: supplier management practices (SMP) and information sharing with suppliers (ISS). Then, each dimension is split into three dimensions of sustainability: Ec (economic sustainability), Ev (environmental sustainability) and Sc (social sustainability). Analysis steps are the same as for the previous constructs.

Convergent validity and reliability. The factor loadings at both the first- and second-order measurement models are provided. First, CFA was conducted for all constructs at the first-order level. Second, CFA was conducted for all constructs at the second-order level to be in line with the theory provided in the previous chapters. AVE and Cronbach's α values for the final measurement models (both first- and second-order level) are displayed. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

As shown in Table 4.16, SMP conceptually consists of supplier evaluation practices (SEP) and supplier development practices (SDP). Among these items, SMP4_Ec is not regarded as accurately measuring the economic dimension of SMP. Also, SMP4_Ev was not necessary for this construct. Thus, two items (SMP4_Ec and SMP4_Sc) were deleted to improve the model fit indices. Measurement model fit indices indicate adequate convergent validity for each dimension of the construct (see final model fit indices for the first- and second-order level). The AVE for each construct shows adequate convergent validity, exceeding the threshold value of 0.50, except SMP_Ec (AVE = 0.398). In addition, all Cronbach's α values are >0.70 (except SMP_Ec = 0.657), providing adequate evidence of reliability for each dimension of the construct.

Table 4.16. Summary of a CFA Measurement Model for Sustainable Supplier Management Practices

Label	Description of Items	Factor Loadings (1st order)	Factor Loadings (2nd order)
Supplier Management Practices: SMP_Ec (*final* AVE= .398 (.398), α= .657)			**.850 (.853)**
SMP1_Ec (SEP2)	Our firm assesses the quality standard of suppliers through ISO 9000 series certification.	.539 (.538)	.515 (.515)
SMP2_Ec (SEP5)	Our firm emphasizes cost targets for suppliers.	.654 (.654)	.632 (.632)
SMP3_Ec (SDP1)	Our firm offers training for suppliers' personnel to improve quality performance.	.691 (.691)	.730 (.730)
~~SMP4_Ec (SDP5)~~ [a]	~~Our firm has a supplier development team.~~	-	
Supplier Management Practices: SMP_Ev (*final* AVE= .624 (.623), α= .833)			**.993 (.993)**
SMP1_Ev (SEP1)	Our firm uses formal evaluation system to assess suppliers' environmental performance.	.777 (.777)	.776 (.777)
SMP2_Ev (SEP3)	Our firm evaluates suppliers' environmental commitment through ISO 14000 series certification.	.783 (.782)	.779 (.778)
SMP3_Ev (SDP2)	Our firm visits suppliers' sites to help improve environmental performance.	.809 (.809)	.813 (.813)
~~SMP4_Ev (SDP4)~~ [a]	~~Our firm offers technical assistance to suppliers for pollution control.~~	-	
Supplier Management Practices: SMP_Sc (*final* AVE= .716 (.716), α= .832)			**1.036(1.035)**
SMP1_Sc (SEP4)	Our firm assesses the quality of suppliers' social responsibility initiatives.	.846 (.845)	.846 (.846)
SMP2_Sc (SDP3)	Our firm educates suppliers about social responsibility.	.846 (.847)	.846 (.847)
Information Sharing with Suppliers: ISS_Ec (*final* AVE= .764 (.764), α= .853)			**.240 (.246)**
ISS1_Ec	Our major suppliers share delivery schedule for our products with us.	.969 (.969)	.908 (.907)
ISS2_Ec	Our major suppliers share order status with us.	.768 (.768)	.820 (.820)
Information Sharing with Suppliers: ISS_Ev (*final* AVE= .548 (.549), α= .706)			**.941 (.945)**
ISS3_Ev	Our major suppliers share environmental regulations with us.	.767 (.772)	.753 (.755)
ISS4_Ev	Our major suppliers share availability of new environmentally safe components with us.	.713 (.708)	.726 (.724)
Information Sharing with Suppliers: ISS_Sc (*final* AVE= .590 (.591), α= .709)			**.999 (.995)**
ISS5_Sc	Our major suppliers share fair labor practices with us.	.680 (.678)	.706 (.709)
ISS6_Sc	Our major suppliers share local community outreach initiatives with us.	.847 (.850)	.816 (.813)
Model Fit (1st)	χ^2/df =2.442, RMSEA=.083, GFI= .907, CFI=.944, NFI=.911, IFI=.945, SRMR= .0439		
Model Fit (2nd)	χ^2/df =2.914, RMSEA=.095, GFI= .875, CFI=.916, NFI=.880, IFI=.918, SRMR= .0641		
Model Fit (1st SD)	χ^2/df =1.634, RMSEA=.055, GFI= .881, CFI=.943, NFI=.868, IFI=.944, SRMR= .0493		

Model Fit (2nd SD)	χ^2 / df =1.833, RMSEA=.063, GFI= .859, CFI=.920, NFI=.842, IFI=.921, SRMR= .0613

Note: Factor loadings in parenthesis indicate factor loadings with Social Desirability (SD) construct.
[a] Item deleted during purification.

Figure 4-7. First-order CFA Measurement Model for Sustainable Supplier Mgt Practices

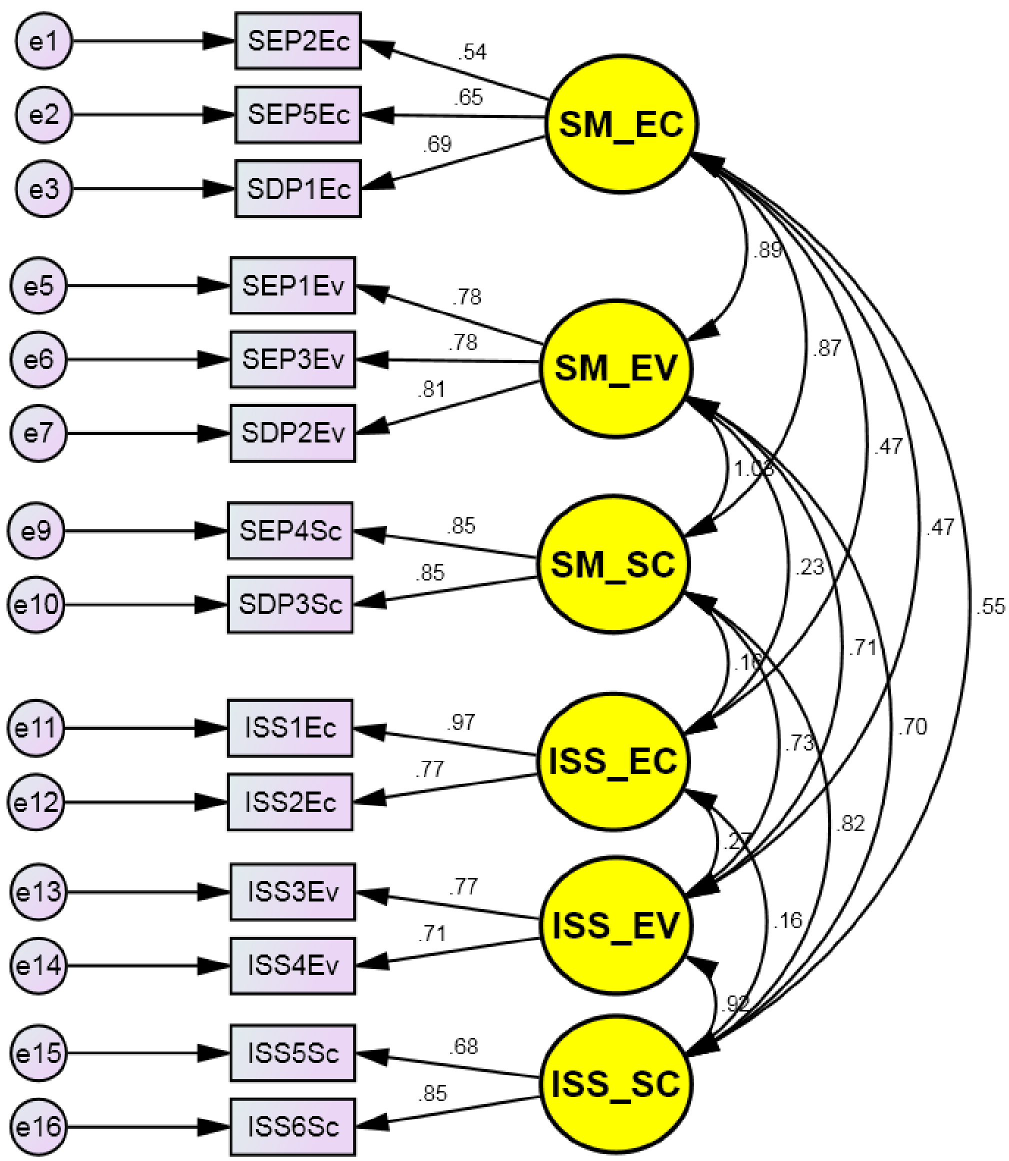
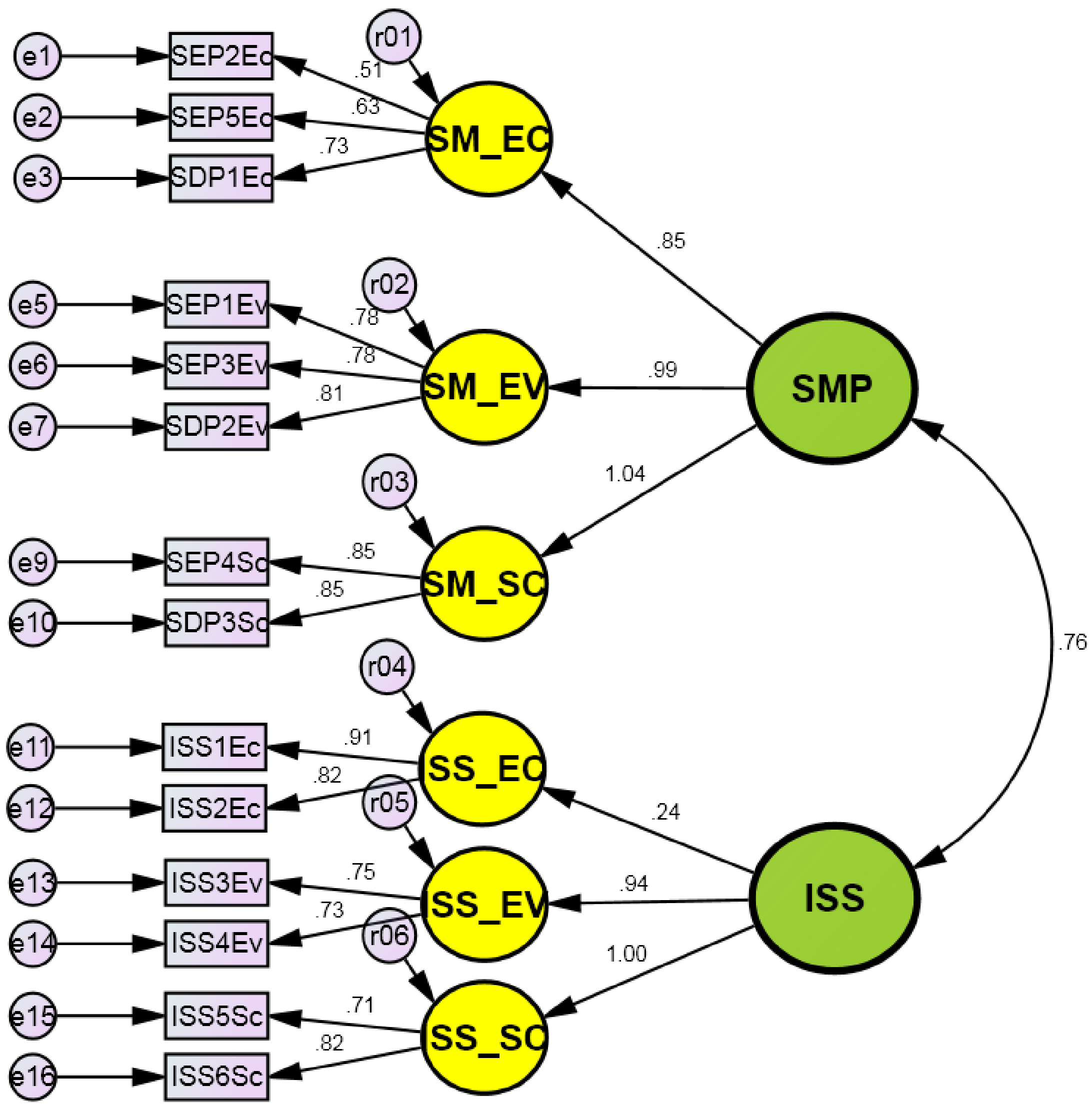


Figure 4-8. Second-order CFA Measurement Model for Sustainable Supplier Mgt Practices



Discriminant validity. Table 4.17 indicates that most constructs show an adequate level of discriminant validity, except for SMP_Ec and SMP_Ev, SMP_Ec and SMP_Sc, SMP_Ev and SMP_Sc, SMP_Sc and ISS_Sc, and ISS_Ev and ISS_Sc. To establish discriminant validity between these two variables, another test of discriminant validity (the pairwise χ^2 test) was conducted. Table 4.18 displays the results of the pairwise χ^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at P < 0.01 (d.f. = 1), providing evidence of discriminant validity for those variables.

Table 4.17. Inter-construct correlations and discriminant validity for Sustainable Supplier Mgt Practices (n=212)

	SMP_Ec	SMP_Ev	SMP_Sc	ISS_Ec	ISS_Ev	ISS_Sc
SMP_Ec	**.631**					
SMP_Ev	.895	**.790**				
SMP_Sc	.870	1.026	**.846**			
ISS_Ec	.472	.234	.164	**.874**		
ISS_Ev	.468	.707	.734	.270	**.740**	
ISS_Sc	.552	.705	.819	.160	.923	**.768**

* Squared root of AVEs are on the diagonal in bold.

Table 4.18. A pairwise chi-square difference test: Assessment of discriminant validity for Sustainable Supplier Mgt Practices

Description	Chi-square statistics				
	Unconstrained model [a]	d.f.	Constrained model [b]	d.f.	Difference
SMP_Ec with SMP_Ev	38.739	8	52.047	9	13.308
SMP_Ec with SMP_Sc	25.847	4	38.833	5	12.986
SMP_Ec with ISS_Ec	4.387	4	52.64	5	48.253
SMP_Ec with ISS_Ev	7.116	4	35.77	5	28.654
SMP_Ec with ISS_Sc	3.028	4	45.089	5	42.061
SMP_Ev with SMP_Sc	36.332	4	48.383	5	12.051
SMP_Ev with ISS_Ec	3.649	4	83.202	5	79.553
SMP_Ev with ISS_Ev	7.761	4	33.34	5	25.579
SMP_Ev with ISS_Sc	8.284	4	46.287	5	38.003
SMP_Sc with ISS_Ec	1.151	1	92.48	2	91.329
SMP_Sc with ISS_Ev	0.049	1	29.258	2	29.209
SMP_Sc with ISS_Sc	3.502	1	40.23	2	36.728
ISS_Ec with ISS_Ev	0.204	1	56.942	2	56.738
ISS_Ec with ISS_Sc	0.501	1	106.266	2	105.765
ISS_Ev with ISS_Sc	1.696	1	9.848	2	8.152

Note: All χ^2 differences are significant (for 1 degree of freedom) at p < 0.01.

[a] Unconstrained model indicates a model with correlation without constraint of variance. [b] Constrained model indicates a model with correlation constrained to one.

Test of CMB. To test the hypothesis that a single factor accounts for all the variance in the data, Harman's single factor test using CFA was conducted. In addition, given that SDB will very likely influence the answers of the respondents in the sustainability context, this study included a social desirability construct in the CFA measurement models to control for the bias (Podsakoff et al., 2003; Manning et al., 2009). All the loadings are constrained to be the same for all items (regression weight was constrained to be "a"). The model fit indicates that a single factor model does not represent the data well (χ^2 /d.f. = 3.701, GFI = 0.717, CFI = 0.714, IFI = 0.716, NFI = 0.648, RMSEA = 0.113, SRMR = 0.102). Furthermore, the AVE by a single factor is 42.5%, indicating that a less than great proportion of the variance in the data is accounted for by a single factor. Factor loadings and model fit indices for both first- and second-order level constructs with social desirability construct are displayed in Table 4.16.

4.2.3.5. Summary of a CFA Measurement Model for Sustainable Operations Management Practices (SOMPs)

The initial 41 items for SOMP and their corresponding labels are listed in Tables 4.19 and 4.20. SOMP is represented by four dimensions: SOMP for economic sustainability (SOMP_Ec), SOMP for environmental sustainability (SOMP_Ev), SOMP for social sustainability (SOMP_Sc), and corporate sustainability reporting practices (CSRP). SOMP_Ec includes two dimensions (QM practices and JIT practices). SOMP_Ev consists of three dimensions (environmental design practices [EDP], environmental recycling practices [ERcP], and environmental management system [EMS]). SOMP_Sc has two dimensions (employee wellbeing and equity practices [EWEP] and corporate social involvement practices [CSIP]). Finally, CSRP has three dimensions of sustainability: CSRP for economic sustainability (CSRP_Ec), CSRP for environmental sustainability (CSRP_Ev), and CSRP for social sustainability (CSRP_Sc).

Convergent validity and reliability. The factor loadings at both the first- and third-order measurement models are provided. First, CFA was conducted for all constructs at the first-order level. Second, CFA was conducted for all constructs at the third-order level to be in line with the theory provided in the previous chapters. AVE and Cronbach's α values for the final measurement models (both first- and third-order level) are displayed. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

First, in SOMP_Ec (see Table 4.19), two items (QM2 and JIT5) are deleted to improve the model fit based on modification indices. Second, in SOMP_Ev (see Table 4.19), EMS initially had five items (EMS1, EMS2, EMS3, EMS4, and EMS5). After carefully reviewing those items, it was decided that EMS2, EMS3, and EMS4 are more closely related to CSRP, because wording for these items includes the word "reported". Thus, they are moved to CSRP for environmental sustainability (CSRP_Ev). Therefore, EMS has two items (EMS1, EMS5). All other items are kept. Third, in SOMP_Sc (see Table 4.19), two items (EWEP2 and CSIP3) were deleted to improve the model fit based on modification indices. Fourth, in CSRP (see Table 4.20), one item (CSRP5_Ev) was deleted because of low factor loading. This item was regarded to be redundant.

Measurement model fit indices indicate adequate convergent validity for each dimension of the construct (see final model fit indices for the first- and third-order level). The AVE for each construct shows adequate convergent validity, exceeding the threshold value of 0.50, except for ERcP (AVE = 0.444) and EWEP (AVE = 0.416). In addition, all

Cronbach's α values are >0.70, providing adequate evidence of reliability for each dimension of the construct.

Table 4.19. Summary of a CFA Measurement Model for Sustainable Operations Mgt Practices

Label	Description of Items	Factor Loadings (1st order)	Factor Loadings (3rd order)
Sustainable Operations Management Practices_Economic (SOMP_Ec)			**.833 (.841)**
Quality Management Practices: QM (*final* AVE=.614 (.614), α=.854)			**.805 (.821)**
QM1	Our firm implements continuous quality improvement program.	.770 (.773)	.773 (.775)
~~QM2~~ [a]	~~Our firm is ISO 9000 certified.~~	-	-
QM3	Our firm uses statistical process control techniques to reduce process variance.	.703 (.697)	.702 (.701)
QM4	Our firm schedules a portion of everyday to maintain equipment productivity.	.847 (.846)	.846 (.845)
QM5	Our firm undertakes preventive maintenance programs to maximize equipment effectiveness.	.807 (.810)	.807 (.807)
Just-In-Time Practices: JIT (*final* AVE=.564 (.563), α=.839)			**.863 (.847)**
JIT1	Our firm uses set-up time reduction (i.e., Single Minute Exchange of Die or SMED).	.776 (.776)	.776 (.774)
JIT2	Our firm adopts continuous flow production in operations.	.833 (.833)	.830 (.830)
JIT3	Our firm uses a "Pull" production system.	.696 (.695)	.699 (.701)
JIT4	Our firm implements cellular manufacturing layout.	.689 (.688)	.690 (.692)
~~JIT5~~ [a]	~~Our firm orders in small lot sizes from our suppliers.~~	-	-
Sustainable Operations Management Practices_Environmental (SOMP_Ev)			**.884 (.860)**
Environmental Design Practices: EDP (*final* AVE=.532 (.531), α=.869)			**.877 (.887)**
EDP1	Life Cycle Analysis (LCA) is employed for product design.	.751 (.751)	.755 (.755)
EDP2	Our products are designed for reduced consumption of energy.	.684 (.684)	.680 (.681)
EDP3	Our products are designed for reuse, recycle, recovery of material/component parts.	.676 (.678)	.672 (.675)
EDP4	Our products are designed to reduce the use of hazardous products and their manufacturing process.	.721 (.722)	.719 (.721)
EDP5	Our firm designs eco-friendly packaging.	.741 (.738)	.743 (.741)
EDP6	Our firm designs an eco-friendly labeling for products and processes.	.796 (.794)	.796 (.795)
Environmental Recycling Practices: ERcP (*final* AVE=.444 (.444), α=.753)			**.622 (.627)**
ERcP1	Our firm reuses production materials whenever possible.	.710 (.710)	.698 (.699)
ERcP2	Our manufacturing scrap is recycled in production processes whenever possible.	.617 (.617)	.620 (.622)
ERcP3	Our products have recycled raw material content.	.734 (.734)	.744 (.742)
ERcP4	Our firm engages in remanufactured of products.	.592 (.592)	.590 (.589)
Environmental Management System: EMS (*final* AVE=.733 (.735), α=.840)			**.751 (.740)**
EMS1	Our firm has a formal department that is responsible for monitoring environmental affairs.	.895 (.902)	.867 (.861)
EMS5	Our environmental procedures are included in employee training programs.	.816 (.810)	.843 (.849)
Sustainable Operations Management Practices_Social (SOMP_Sc)			**1.022 (1.030)**
Employee Wellbeing and Equity Practices: EWEP (*final* AVE=.416 (.418), α=.711)			**.830 (.837)**
EWEP1	Our firm supports employees' initiatives to improve health (e.g., subsidizes gym membership).	.634 (.628)	.634 (.631)
~~EWEP2~~ [a]	~~Our firm commits to safe work environment.~~	-	-
EWEP3	Our firm's management is quite culturally diverse.	.723 (.716)	.725 (.715)
EWEP4	Our firm provides fair compensation.	.642 (.657)	.641 (.656)

EWEP5	Our senior management reflects gender equality.	.572 (.576)	.571 (.574)
Corporate Social Involvement Practices: CSIP (*final* AVE=.762 (.762), α=.927)			**.606 (.602)**
CSIP1	Our firm contributes to charitable causes through our employees.	.843 (.844)	.843 (.844)
CSIP2	Our firm volunteers for social causes.	.879 (.879)	.879 (.879)
~~CSIP3~~ [a]	~~Our firm promotes corporate codes of conduct.~~	-	-
CSIP4	Our firm has volunteers supporting local charities.	.894 (.893)	.893 (.892)
CSIP5	Our firm donates to community organizations.	.876 (.876)	.877 (.877)
***Final* Model Fit (1st)**	χ^2 / df =1.612, RMSEA=.054, GFI= .843, CFI=.934, NFI=.846, IFI=.936, SRMR= .0549		
***Final* Model Fit (3rd)**	χ^2 / df =1.606, RMSEA=.054, GFI= .839, CFI=.933, NFI=.842, IFI=.934, SRMR= .0580		
Model Fit (SD 1st)	χ^2 / df =1.520, RMSEA=.050, GFI= .811, CFI=.919, NFI=.798, IFI=.920, SRMR= .0611		
Model Fit (SD 3rd)	χ^2 / df =1.523, RMSEA=.050, GFI= .804, CFI=.916, NFI=.791, IFI=.917, SRMR= .0645		

Note: Factor loadings in parenthesis refer to factor loadings with Social Desirability (SD) construct.
[a] Item deleted during purification.

Table 4.20. The summary of a CFA Measurement Model for Corporate Sustainability Reporting Practices

Label	**Description of Items**	**Factor Loadings (1st order)**	**Factor Loadings (2nd order)**
Corporate Sustainability Reporting Practices_Economic: CSRP_Ec (*final* AVE= .700 (.700), α=.820)			**.744 (.761)**
CSRP1_Ec	Our firm discloses information related to productivity.	.877 (.877)	.877 (.875)
CSRP2_Ec	Our firm discloses information related to market share.	.794 (.794)	.794 (.796)
Corporate Sustainability Reporting Practices_Environmental: CSRP_Ev (*final* AVE= .861 (.861), α=.948)			**.412 (.423)**
EMS2_Ev	Our environmental performance is formally tracked and reported.	.941 (.941)	.941 (.941)
EMS3_Ev	Our environmental achievements are regularly reported.	.966 (.966)	.966 (.966)
EMS4_Ev	Our environmental impact is periodically reported.	.875 (.875)	.875 (.875)
~~CSRP5_Ev~~ [a]	~~Our firm discloses information related to environmental performance.~~	-	-
Corporate Sustainability Reporting Practices_Social: CSRP_Sc (*final* AVE= .635 (.636), α=.837)			**1.149 (1.122)**
CSRP3_Sc	Our firm discloses information related to employees' health and safety.	.866 (.861)	.866 (.860)
CSRP4_Sc	Our firm discloses information related to employees' human right.	.833 (.840)	.833 (.841)
CSRP6_Sc	Our firm discloses information related to contribution to the local communities.	.681 (.680)	.681 (.680)
Model Fit (1st)	χ^2 / df =2.427, RMSEA=.082, GFI= .954, CFI=.981, NFI=.968, IFI=.981, SRMR= .0486		
Model Fit (2nd)	χ^2 / df =2.427, RMSEA=.082, GFI= .954, CFI=.981, NFI=.968, IFI=.981, SRMR= .0486		
Model Fit (SD 1st)	χ^2 / df =1.558, RMSEA=.051, GFI= .918, CFI=.969, NFI=.918, IFI=.969, SRMR= .0547		
Model Fit (SD 2nd)	χ^2 / df =1.529, RMSEA=.051, GFI= .918, CFI=.970, NFI=.918, IFI= .970, SRMR= .0546		

Note: Factor loadings in parenthesis refer to factor loadings with Social Desirability (SD) construct.
[a] Item deleted during purification.

Figure 4-9. First-order CFA Measurement Model for Sustainable Operations Mgt practices

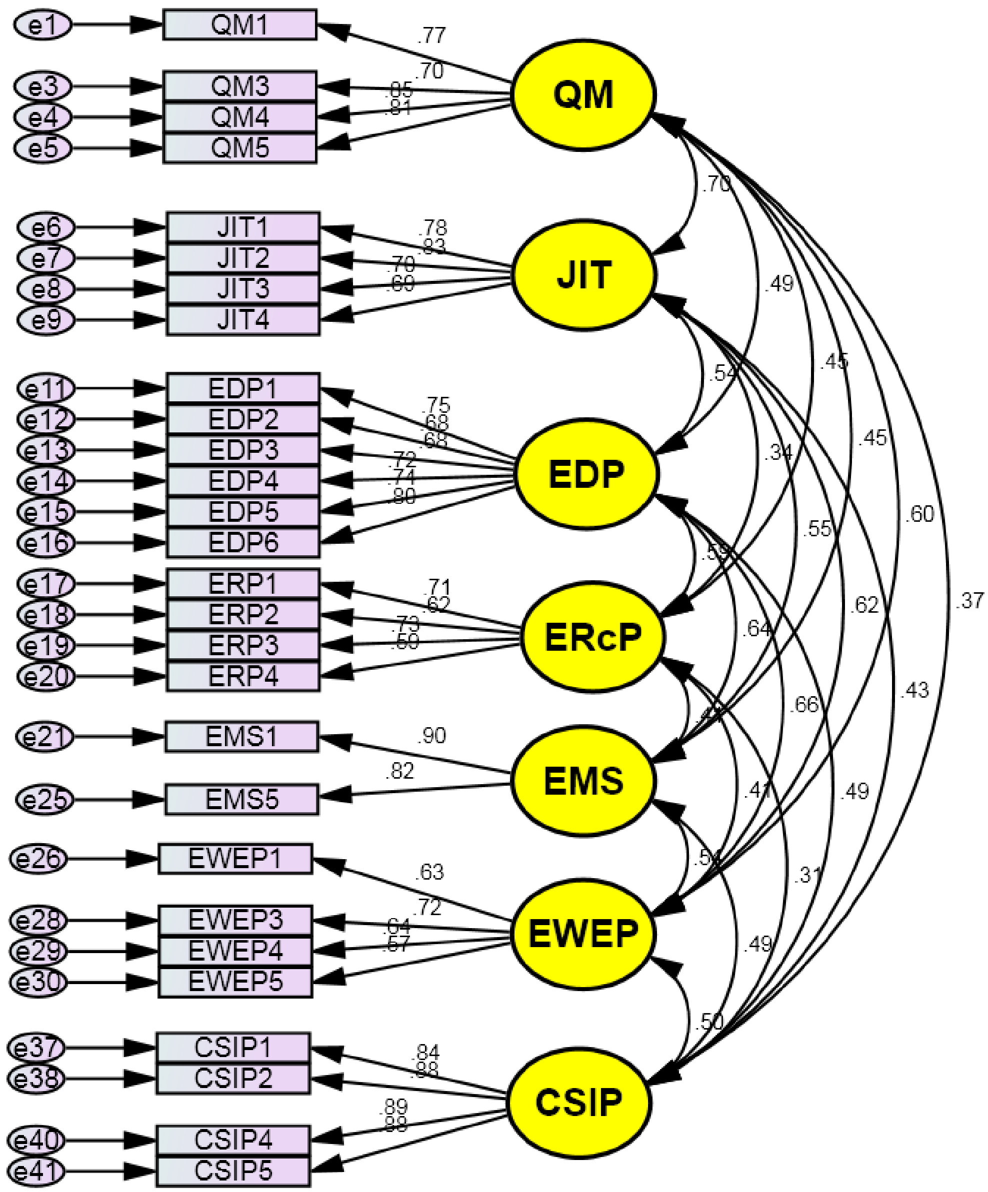


Figure 4-10. Third-order CFA Measurement Model for Sustainable Operations Mgt practices

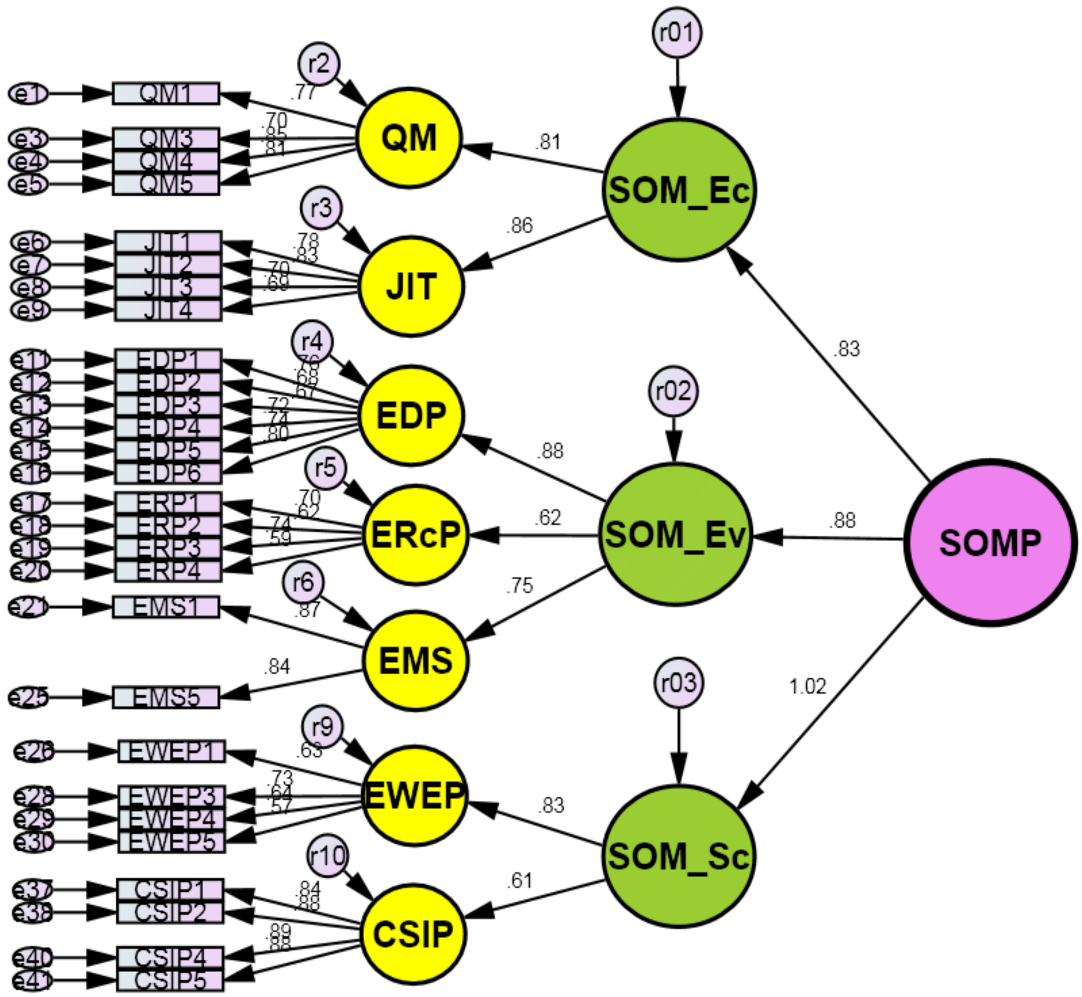


Figure 4-11. First-order CFA Measurement Model for Corporate Sustainability Reporting Practices

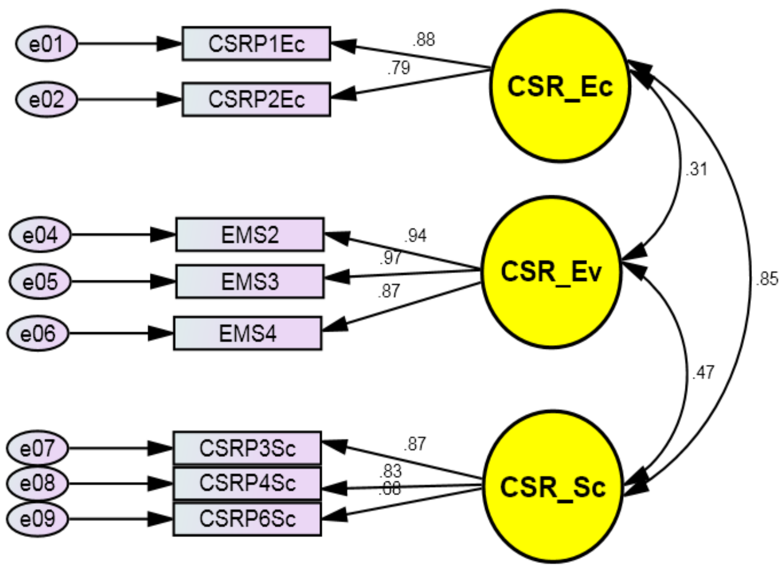
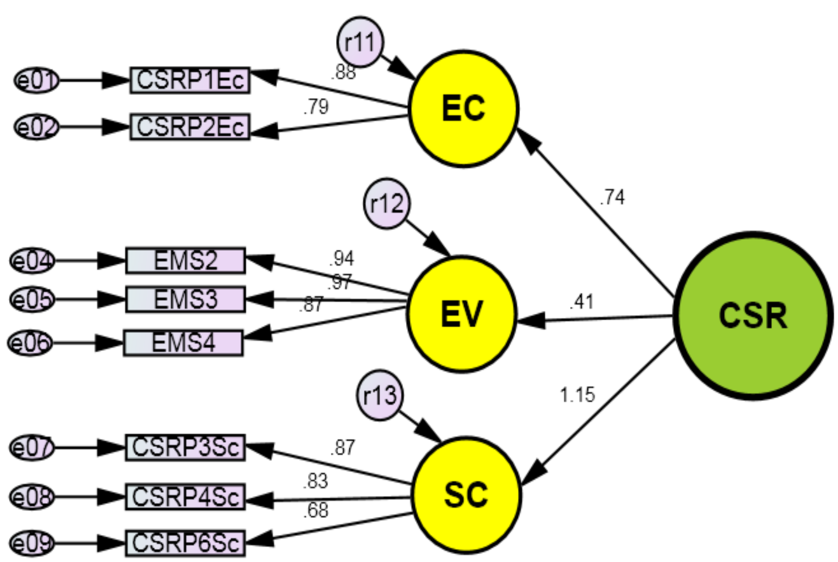


Figure 4-12. Second-order CFA Measurement Model for Corporate Sustainability Reporting Practices



Discriminant validity. As for SOMP, Table 4.21 indicates that all constructs show an adequate level of discriminant validity, except EDP and EWEP. To establish the discriminant validity between these two variables, another test of discriminant validity (the pairwise χ^2 test) was conducted. Table 4.22 displays the results of the pairwise χ^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at $P < 0.01$ (d.f. = 1), providing evidence of discriminant validity for these two variables.

In regards to SOMP (CSRP), Table 4.23 indicates that most constructs show an adequate level of discriminant validity, except CSRP_Ec and CSRP_Sc. To establish the discriminant validity between these two variables, another test of discriminant validity (the pairwise χ^2 test) was conducted. Table 4.24 displays the results of the pairwise χ^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at $P < 0.05$ (d.f. = 1) (except CSRP_Ec and CSRP_Ev), providing evidence of discriminant validity for those variables. In sum, there is one violation of discriminant validity between CSRP_Ec and CSRP_Ev, which potentially adds a limitation to this study.

Table 4.21. Inter-construct correlations and discriminant validity for Sustainable Operations Mgt Practices

	QM	JIT	EDP	ERcP	EMS	EWEP	CSIP
QM	**.784**						
JIT	.695	**.751**					
EDP	.487	.538	**.729**				
ERcP	.454	.342	.593	**.666**			
EMS	.454	.546	.636	.413	**.856**		
EWEP	.599	.620	.659	.409	.538	**.645**	
CSIP	.368	.434	.488	.312	.493	.504	**.873**

* Squared root of AVEs are on the diagonal in bold.

Table 4.22. Pairwise comparison of chi-square values for Sustainable Operations Mgt Practices

Description	Chi-square statistics				
	Unconstrained model [a]	d.f.	Constrained model [b]	d.f.	Difference
QM with JIT	49.796	19	63.16	20	13.364
QM with EDP	97.149	34	128.389	35	31.24
QM with ERcP	35.474	19	68.207	20	32.733
QM with EMS	25.012	8	42.687	9	17.675
QM with EWEP	68.466	19	92.919	20	24.453
QM with CSIP	39.323	19	72.04	20	32.717
JIT with EDP	72.704	34	91.197	35	18.493
JIT with ERcP	16.181	19	48.806	20	32.625
JIT with EMS	13.413	8	26.814	9	13.401
JIT with EWEP	36.556	19	55.112	20	18.556
JIT with CSIP	29.205	19	46.629	20	17.424
EDP with ERcP	76.849	34	94.526	35	17.677
EDP with EMS	45.164	19	52.791	20	7.627
EDP with EWEP	74.661	34	95.995	35	21.334
EDP with CSIP	73.511	34	93.196	35	19.685
ERcP with EMS	14.030	8	33.944	9	19.914
ERcP with EWEP	34.439	19	69.647	20	35.208
ERcP with CSIP	18.24	19	50.095	20	31.855
EMS with EWEP	7.152	4	19.907	5	12.755
EMS with CSIP	12.961	12.961	28.097	9	15.136
EWEP with CSIP	54.362	19	76.911	20	22.549

Note: All χ^2 differences are significant (for 1 degree of freedom) at $p < 0.01$.

[a] Unconstrained model indicates a model with correlation without constraint of variance. [b]Constrained model indicates a model with correlation constrained to one.

Table 4.23. Inter-construct correlations and discriminant validity for Corporate Sustainability Reporting Practices

	CSRP_Ec	CSRP_Ev	CSRP_Sc
CSRP_Ec	**.837**		
CSRP_Ev	.306	**.928**	
CSRP_Sc	.855	.473	**.797**

* Squared root of AVEs are on the diagonal in bold.

Table 4.24. Pairwise comparison of chi-square values for Corporate Sustainability Reporting Practices

Description	Chi-square statistics				
	Unconstrained model [a]	d.f.	Constrained model [b]	d.f.	Difference
CSRP_Ec with CSRP_Ec	2.054	4	21.346	5	19.292 *
CSRP_Ec with CSRP_Ev	15.410	4	15.444	5	0.034
CSRP_Ec with CSRP_Sc	10.887	8	16.276	9	5.389 **

* χ^2 differences are significant (for 1 degree of freedom) at $p < 0.01$. ** χ^2 differences are significant (for 1 degree of freedom) at $p < 0.05$.
[a] Unconstrained model indicates a model with correlation without constraint of variance.
[b] Constrained model indicates a model with correlation constrained to one.

Test of CMB. To test the hypothesis that a single factor accounts for all the variance in the data, Harman's single factor test using CFA was conducted. In addition, given that SDB will very likely influence the answers of the respondents in the sustainability context, this study included a social desirability construct in the CFA measurement models to control for the bias (Podsakoff et al., 2003; Manning et al., 2009). All the loadings are constrained to be the same for all items (regression weight was constrained to be "a"). The model fit indicates that a single factor model does not represent the data well (χ^2 /d.f. = 3.403, GFI = 0.589, CFI = 0.590, IFI = 0.591, NFI = 0.505, RMSEA = 0.107, SRMR = 0.103). Furthermore, the AVE by a single factor is 31.6%, indicating that a less than great proportion of the variance in the data is accounted for by a single factor. Factor loadings and model fit indices for both first- and second-order level constructs with social desirability construct are displayed in Tables 4.19 and 4.20.

4.2.3.6. Summary of a CFA Measurement Model for Sustainable Customer Management Practices (SCMPs)

The initial 11 items for SCMP and their corresponding labels are listed in Table 4.25. SCMP is represented by two dimensions: customer management practices (CMP) and information sharing with customers (ISC). Then, each dimension is split into three dimensions of sustainability: economic sustainability (Ec), environmental sustainability (Ev), and social sustainability (Sc). Analysis steps are the same as for the previous constructs.

Convergent validity and reliability. The factor loadings at both the first- and second-order measurement models are provided. First, CFA was conducted for all constructs at the first-order level. Second, CFA was conducted for all constructs at the second-order level to be in line with the theory provided in the previous chapters. AVE and Cronbach's α values for the final measurement models (both first- and second-order level) are displayed. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

As shown in Table 4.25, all items are kept to ensure the items of each dimension of sustainability. CMP for economic sustainability (CMP_Ec) and CMP for social sustainability (CMP_Sc) have single items. In the context of SEM, for single items, the measurement error term is typically fixed at zero (i.e., it is assumed that the measure is a perfect indicator for the construct being observed). With multiple items, only a portion of the item's variance reflects the construct (thus the loading of <1). We have relaxed the assumption of zero error. We assume that the indicators (CMP_Ec and CMP_Sc) have 81.8% reliability. The formula for error variance is (1 – average reliability) x (actual item variance). Thus, the sensitivity analysis indicates that error variance for CMP_Ec is (1 – 0.818)*1.012 = 0.184, and thus the factor loading of this item is 0.90. In the same way, the sensitivity analysis indicates that error variance for CMP_Sc is (1 – 0.818)*1.278 = 0.233, and thus the factor loading of this item is 0.90. ISC has two items each for each dimension of sustainability.

Measurement model fit indices indicate sufficient convergent validity for each dimension of the construct (see final model fit indices for the first- and second-order level).

The AVE for each construct shows adequate convergent validity, exceeding the threshold value of 0.50. In addition, all Cronbach's α values are >0.70, providing satisfactory evidence of reliability for each dimension of the construct.

Table 4.25. Summary of a CFA Measurement Model for Sustainable Customer Management Practices

Label	**Description of Items**	**Factor Loadings (1st order)**	**Factor Loadings (2nd order)**
Customer Management Practices: CMP_Ec			**.269 (.275)**
CMP2_Ec [a]	Our firm evaluates the quality-related complaints of our customers.	.904 (.904)	.904 (.904)
Customer Management Practices: CMP_Ev (AVE= .709 (.709), α= .880)			**1.034 (1.026)**
CMP1_Ev	Our firm provides our customers with assistance for recycling-related problem solving.	.824 (.823)	.824 (.823)
CMP3_Ev	Our firm gives feedback to our customers for environmental concern.	.843 (.841)	.841 (.839)
CMP5_Ev	Our firm determines future customer consumption patterns for environmentally-friendly products.	.859 (.862)	.861 (.863)
Customer Management Practices: CMP_Sc			**.892 (.898)**
CMP4_Sc [a]	Our firm evaluates our customers' satisfaction for socially responsible initiatives.	.904 (.904)	.904 (.904)
Information Sharing With Customers: ISC_Ec (AVE= .602 (.601), α= .746)			**.276 (.275)**
ISC1_Ec	Our major customers share changes in purchase order with us.	.806 (.806)	.608 (.606)
ISC2_Ec	Our major customers share planned order with us.	.744 (.743)	.986 (.988)
Information Sharing With Customers: ISC_Ev (AVE= .650 (.651), α= .787)			**.982 (.982)**
ISC3_Ev	Our major customers share their existing environmental policies with us.	.834 (.839)	.828 (.828)
ISC4_Ev	Our major customers share changes in eco-design products with us.	.778 (.773)	.783 (.783)
Information Sharing With Customers: ISC_Sc (AVE= .757 (.756), α= .859)			**.938 (.938)**
ISC5_Sc	Our major customers share their employees' wellbeing and equity policy with us.	.905 (.901)	.900 (.901)
ISC6_Sc	Our major customers share their policy initiatives for local community outreach with us.	.834 (.837)	.838 (.837)
***Final* Model Fit (1st)**	χ^2/df =1.293, RMSEA=.037, GFI= .968, CFI=.993, NFI=.970, IFI=.993, SRMR= .0421		
***Final* Model Fit (2nd)**	χ^2/df =2.161, RMSEA=.074, GFI= .931, CFI=.964, NFI=.936, IFI=.965, SRMR= .0653		
Model Fit (SD 1st)	χ^2/df =1.355, RMSEA=.041, GFI= .917, CFI=.973, NFI=.907, IFI=.974, SRMR= .0503		
Model Fit (SD 2nd)	χ^2/df =1.644, RMSEA=.055, GFI= .891, CFI=.947, NFI=.877, IFI=.948, SRMR= .0653		

Note: Factor loadings in parenthesis refer to factor loadings with Social Desirability (SD) construct.

Figure 4-13. First-order CFA Measurement Model for Sustainable Customer Mgt Practices

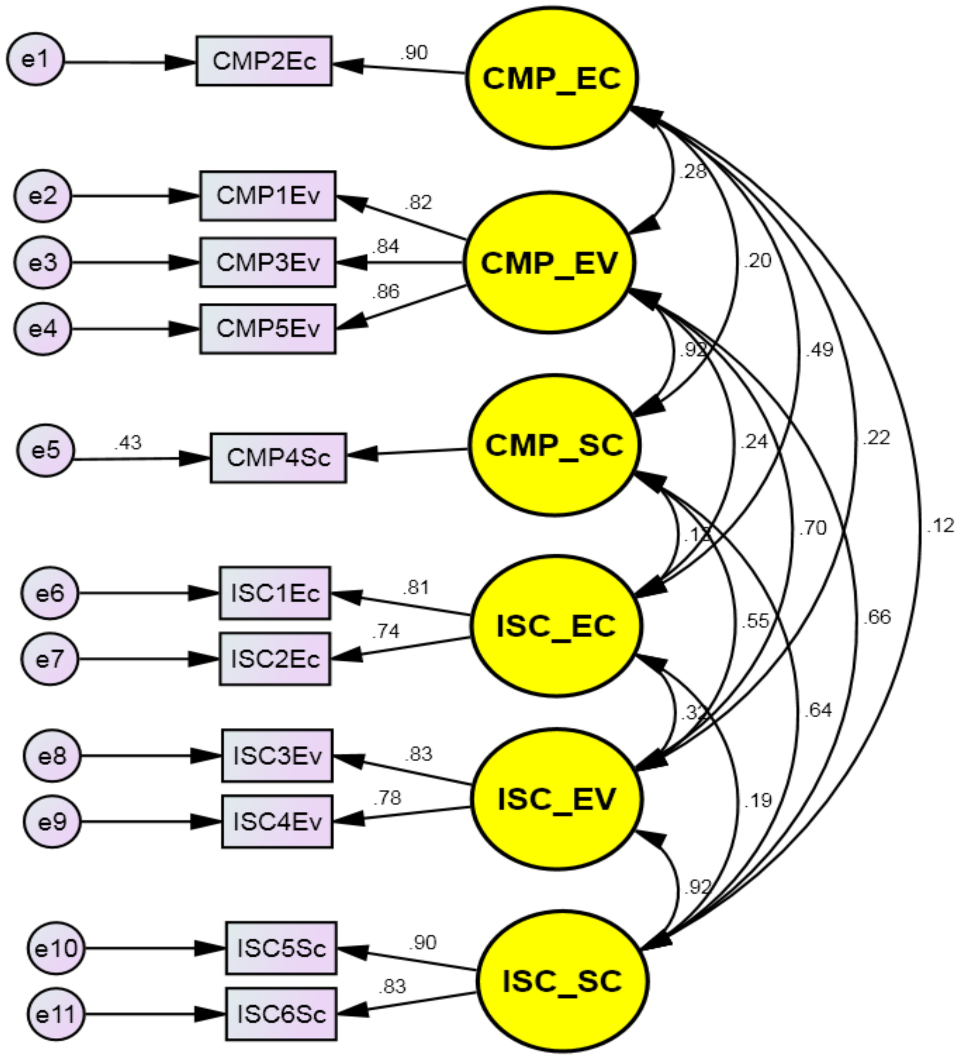
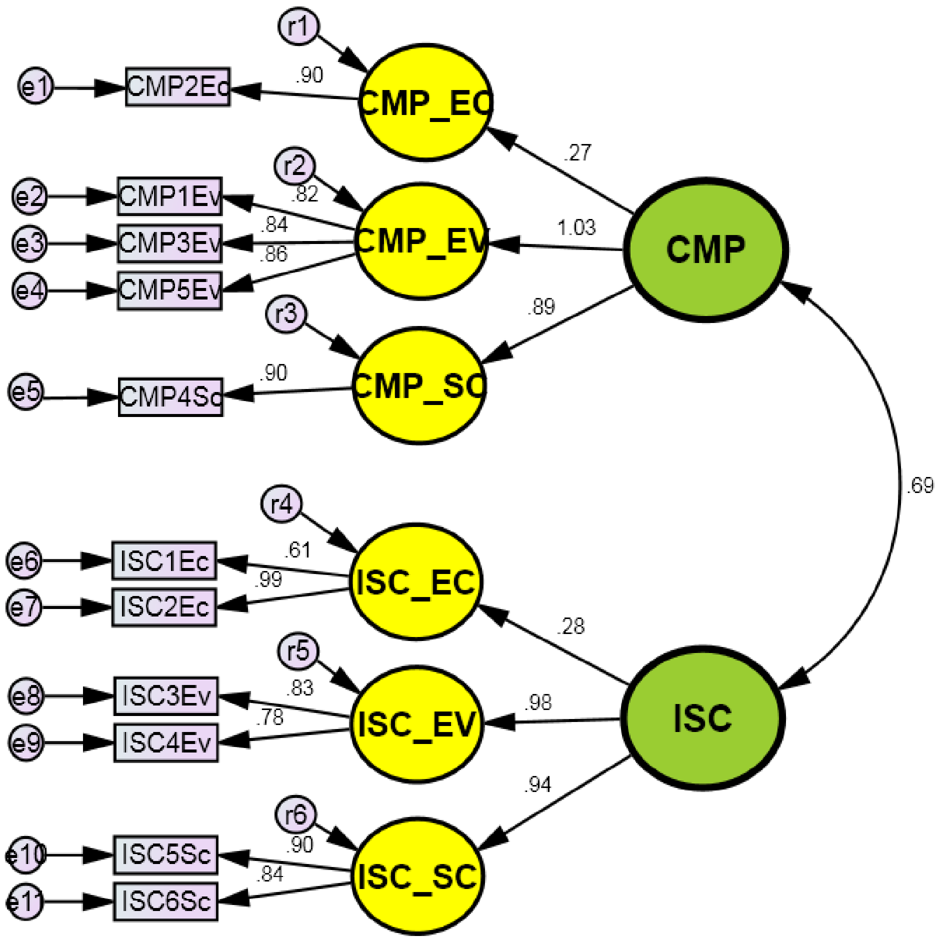


Figure 4-14. Second-order CFA Model for Sustainable Customer Management Practices



Discriminant validity. Table 4.26 indicates that most constructs show an adequate level of discriminant validity, except for two sets of variables: CMP_Ev and CMP_Sc, and ISS_Ev and ISS_Sc. To establish the discriminant validity between these variables, another test of discriminant validity (the pairwise χ^2 test) was conducted. Table 4.27 displays the results of the pairwise χ^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at P < 0.05 (d.f. = 1) (except CMP_Ev and CMP_Sc), providing evidence of discriminant validity for those variables. In sum, there is one violation of discriminant validity between CMP_Ev and CMP_Sc. It could be drawn from the measurement scale design problem and thus could potentially add a limitation to this study.

Table 4.26. Inter-construct correlations and discriminant validity for Sustainable Customer Mgt Practices

	CMP_Ec	CMP_Ev	CMP_Sc	ISC_Ec	ISC_Ev	ISC_Sc
CMP_Ec	**-**[a]					
CMP_Ev	.284	**.842**				
CMP_Sc	.200	.922	**-**[a]			
ISC_Ec	.487	.235	.127	**.776**		
ISC_Ev	.220	.695	.548	.317	**.806**	
ISC_Sc	.121	.663	.644	.193	.921	**.870**

* Squared root of AVEs are on the diagonal in bold.
[a] Single-item construct.

Table 4.27. A pairwise chi-square difference test: Assessment of discriminant validity for Sustainable Customer Mgt Practices

Description	Chi-square statistics				
	Unconstrained model [a]	d.f.	Constrained model [b]	d.f.	Difference
CMP_Ec with CMP_Ev	3.714	2	44.542	3	40.828*
CMP_Ec with CMP_Sc	0	0	50.532	1	50.532*
CMP_Ec with ISC_Ec	0	0	33.794	1	33.794*
CMP_Ec with ISC_Ev	0	0	51.574	1	51.574*
CMP_Ec with ISC_Sc	0	0	71.948	1	71.948*
CMP_Ev with CMP_Sc	0.08	2	0.139	3	0.059
CMP_Ev with ISC_Ec	4.328	4	37.677	5	33.349*
CMP_Ev with ISC_Ev	6.738	4	12.573	5	5.835**
CMP_Ev with ISC_Sc	7.878	4	21.264	5	13.386*
CMP_Sc with ISC_Ec	0	0	41.581	1	41.581*
CMP_Sc with ISC_Ev	0	0	14.16	1	14.16*
CMP_Sc with ISC_Sc	0	0	17.777	1	17.777*
ISC_Ec with ISC_Ev	0.081	1	40.693	2	40.612*
ISC_Ec with ISC_Sc	0.358	1	51.417	2	51.059*
ISC_Ev with ISC_Sc	0.095	1	12.951	2	12.856*

Note: All χ^2 differences are significant (for 1 degree of freedom) at $p < 0.01$.

* χ^2 differences are significant (for 1 degree of freedom) at $p < 0.01$. ** χ^2 differences are significant (for 1 degree of freedom) at $p < 0.05$.
[a] Unconstrained model indicates a model with correlation without constraint of variance. [b]Constrained model indicates a model with correlation constrained to one.

Test of CMB. To test the hypothesis that a single factor accounts for all the variance in the data, Harman's single factor test using CFA was conducted. In addition, given that SDB will very likely influence the answers of the respondents in the sustainability context, this study included a social desirability construct in the CFA measurement models to control for the bias (Podsakoff et al., 2003; Manning et al., 2009). All the loadings are constrained to be the same for all items (regression weight was constrained to be "a"). The model fit indicates that a single factor model does not represent the data well (χ^2 /d.f. = 8.088, GFI = 0.454, CFI = 0.344, IFI = 0.347, NFI = 0.318, RMSEA = 0.183, SRMR = 0.140). Furthermore, the AVE by a single factor is 44.2%, indicating that a less than great proportion of the variance in the data is accounted for by a single factor. Factor loadings and model fit indices for both first- and second-order level constructs with social desirability construct are displayed in Table 4.25.

4.2.3.7. Summary of a CFA Measurement Model for Sustainability Performance

The initial 37 items for sustainability performance and their corresponding labels are listed in Table 4.28. Sustainability performance (SPerf) is represented by three dimensions: economic performance (EcP), environmental performance (EvP), and social performance (ScP). EcP has three dimensions: operational performance (OP), market performance (MP), and financial performance (FP), EvP has two dimensions (pollution control [PC] and environmental management [EvM]), and ScP has two dimensions (employee-oriented outcomes [EOO] and community-oriented outcomes [COO]). Analysis steps are the same as for the previous constructs.

Convergent validity and reliability. The factor loadings at both the first- and higher-order (e.g., second- and third-order) measurement models are provided. First, CFA was conducted for all constructs at the first-order level. Second, CFA was conducted for all constructs at the second- and third-order levels to be in line with the theory provided in the previous chapters. AVE and Cronbach's α values for the final measurement models (both first- and higher-order level) are displayed. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

As shown in Table 4.28, all items for EcP (OP, MP, and FP) were kept to ensure the items of economic dimension of sustainability. OP has two items each to measure cost (OP3 and OP4), quality (OP1 and OP2), delivery (OP5 and OP6), and flexibility (OP7 and OP8). MP and FP have three items each (MP1, MP2, and MP3 and FP1, FP2, and FP3, respectively). Furthermore, all items for EvP (PC and EvM) were kept to ensure the items of environmental dimension of sustainability. PC measures the reactive aspect of preserving the environment, whereas EvM measures the proactive aspect of protecting the environment. Finally, three items (EOO2, COO4, and COO5) for ScP were deleted to improve the model fit indices. In regard to EOO2, deletion of this item was deemed appropriate, because there are a sufficient number of items to measure EOO. As far as COO4 and COO5 are concerned, it was concluded that engagement with government officials and investor relations were not appropriate items to measure COO. Thus, three items were eliminated.

Measurement model fit indices indicate adequate convergent validity for each dimension of the construct (see final model fit indices for the first- and higher-order level). The AVE for each construct shows adequate convergent validity, exceeding the threshold value of 0.50, except for OP (AVE = 0.454). In addition, all Cronbach's α values are >0.70, providing acceptable evidence of reliability for each dimension of the construct.

Table 4.28. Summary of a CFA Measurement Model for Sustainability Performance

Label	Description of Items	Factor Loadings (1st order)	Factor Loadings (2nd order)	Factor Loadings (3rd order)
Sustainability Performance: Economic Performance (EcP)				**.910 (1.009)**
Operational Performance: OP (AVE= .454 (.456), α= .867)			**.774 (.805)**	**.774 (.806)**
OP1	Conformance quality.	.667 (.679)	.678 (.680)	.678 (.680)
OP2	Product reliability.	.634 (.635)	.635 (.637)	.635 (.637)
OP3	Production costs	.595 (.593)	.595 (.594)	.595 (.595)
OP4	Inventory turns	.561 (.561)	.558 (.558)	.558 (.559)
OP5	Delivery speed	.805 (.805)	.806 (.804)	.806 (.803)
OP6	Delivery reliability	.786 (.789)	.789 (.791)	.789 (.789)
OP7	Ability to rapidly change production volumes.	.640 (.638)	.639 (.638)	.639 (.639)
OP8	Ability to rapidly change product mix.	.667 (.663)	.663 (.660)	.663 (.662)
Market Performance: MP (AVE= .725 (.726), α= .875)			**.511 (.475)**	**.511 (.477)**
MP1	Market share.	.885 (.886)	.878 (.878)	.878 (.878)
MP2	The growth of market share.	.926 (.926)	.937 (.938)	.937 (.937)
MP3	The growth of sales.	.731 (.731)	.723 (.722)	.723 (.722)
Financial Performance: FP (AVE= .814 (.814), α= .923)			**.541 (.525)**	**.541 (.523)**
FP1	Return on investment (ROI).	.946 (.946)	.945 (.946)	.945 (.946)
FP2	Return on asset (ROA).	.955 (.954)	.956 (.954)	.956 (.955)
FP3	Profit margin on sales.	.796 (.796)	.796 (.797)	.796 (.797)
Sustainability Performance: Environmental Performance (EvP)				**.599 (.562)**
Pollution Control: PC (AVE= .670 (.670), α=.909)			**.716 (.717)**	**.716 (.700)**
PC1	Air emission.	.834 (.833)	.833 (.833)	.833 (.833)
PC2	Waste water.	.810 (.812)	.811 (.811)	.811 (.811)
PC3	Solid waste.	.844 (.845)	.845 (.845)	.845 (.845)
PC4	Consumption for toxic materials.	.837 (.837)	.836 (.836)	.836 (.836)
PC5	Frequency for environmental accidents	.765 (.764)	.766 (.766)	.766 (.765)
Environmental Management: EvM (AVE= .546 (.545), α= .841)			**.902 (.901)**	**.902 (.922)**
EvM1	Reduction of energy consumption	.553 (.553)	.548 (.548)	.548 (.547)
EvM2	Recycling of waste materials	.721 (.721)	.720 (.720)	.720 (.721)
EvM3	Recycling of products	.838 (.836)	.836 (.836)	.836 (.835)
EvM4	Reuse of waste	.773 (.774)	.773 (.774)	.773 (.774)
EvM5	Reuse of products	.776 (.777)	.780 (.780)	.780 (.781)
Sustainability Performance: Social Performance (ScP)				**1.002 (.911)**
Employee-oriented Outcomes: EOO (AVE= .551 (.552), α=.853)			**.747 (.735)**	**.747 (.749)**
EOO1	Employee quality of life.	.750 (.752)	.749 (.751)	.749 (.752)
~~EOO2~~[a]	~~Employee health and safety~~	-	-	-
EOO3	Employee fair compensation.	.730 (.734)	.730 (.730)	.730 (.733)
EOO4	Fair employment opportunity.	.812 (.813)	.815 (.815)	.815 (815)
EOO5	Employment gender equality	.789 (.785)	.789 (.786)	.789 (.784)
EOO6	Cultural diversity in management	.616 (.614)	.614 (.612)	.614 (.610)
Community-oriented Outcomes: COO (AVE= .577 (.577),			**.686 (.698)**	**.686 (.686)**

α= .865)				
COO1	Corporate reputation/image.	.694 (.693)	.695 (.695)	.695 (.695)
COO2	Social commitment.	.833 (.835)	.832 (.833)	.832 (.832)
COO3	Reportable contributions to communities.	.757 (.754)	.757 (.756)	.757 (.756)
~~COO4~~ [a]	~~Engagement with government officials~~	-	-	-
~~COO5~~[a]	~~Investor relations~~	-	-	-
COO6	The relationship with local communities	.805 (.805)	.807 (.806)	.807 (.807)
COO7	The relationship with NGOs	.699 (.700)	.698 (.699)	.698 (.698)
***Initial* Model Fit (1st)**	χ^2/df =1.654, RMSEA=.056, GFI= .803, CFI=.911, NFI=.805, IFI=.912, SRMR= .060			
***Final* Model Fit (1st)**	χ^2/df =1.624, RMSEA=.054, GFI= .820, CFI=.925, NFI=.828, IFI=.926, SRMR= .0552			
***Final* Model Fit (SD 1st)**	χ^2/df =1.473, RMSEA=.047, GFI= .799, CFI=.921, NFI=.793, IFI=.922, SRMR= .0566			
***Initial* Model Fit (2nd/3rd)**	χ^2/df =1.691, RMSEA=.057, GFI= .794, CFI=.905, NFI=.797, IFI=.906, SRMR= .071			
***Final* Model Fit (2nd/3rd)**	χ^2/df =1.668, RMSEA=.056, GFI= .812, CFI=.918, NFI=.819, IFI=.919, SRMR= .0699			
***Final* Model Fit (SD 2nd/3rd)**	χ^2/df =1.431, RMSEA=.045, GFI= .804, CFI=.928, NFI=.797, IFI=.929, SRMR= .0671			

Note: Factor loadings in parenthesis refer to factor loadings with Social Desirability (SD) construct.
[a] Items deleted during purification.

Figure 4-15. First-order CFA Measurement Model for Sustainability Performance

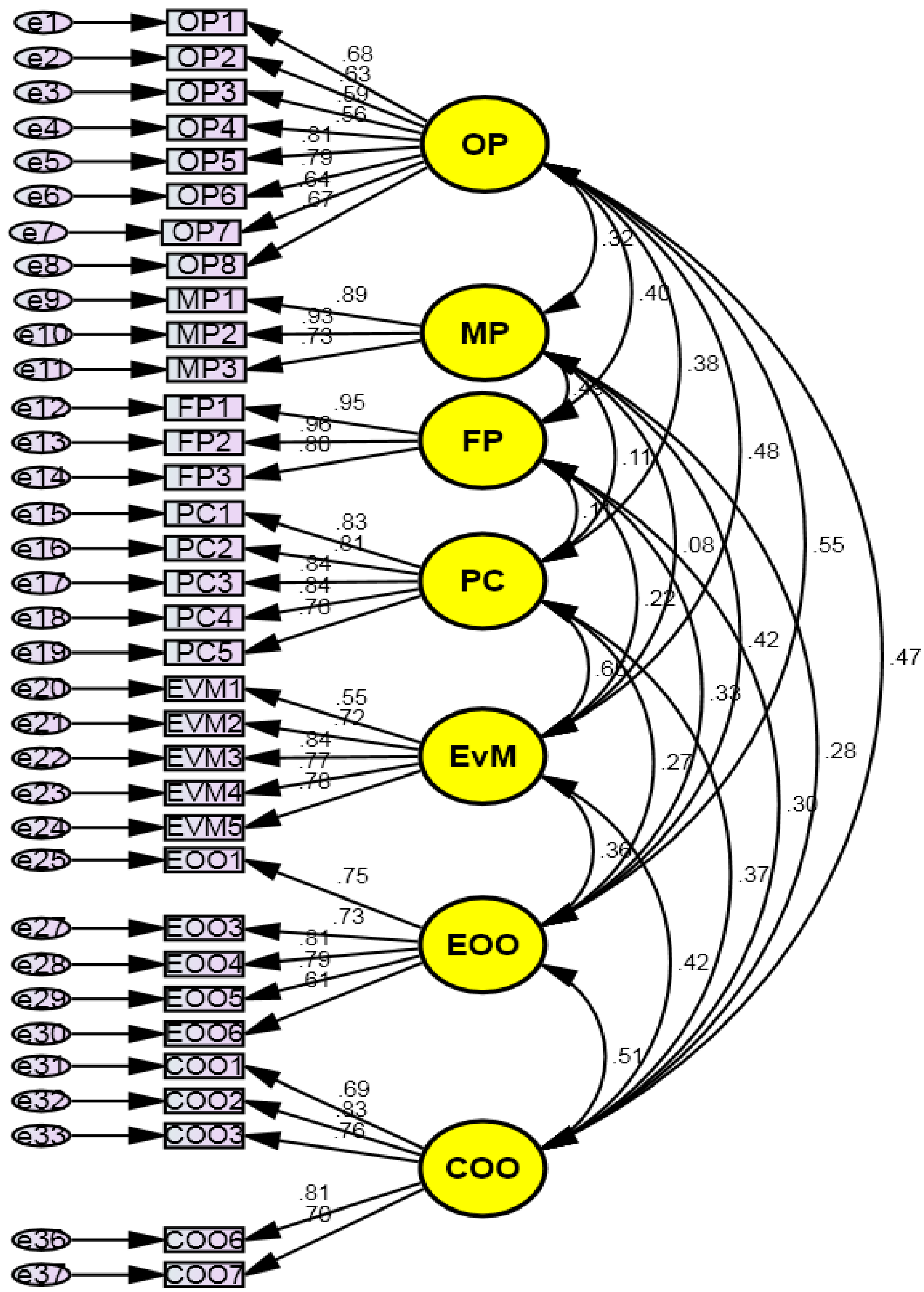


Figure 4-16. Second-order CFA Measurement Model for Sustainability Performance

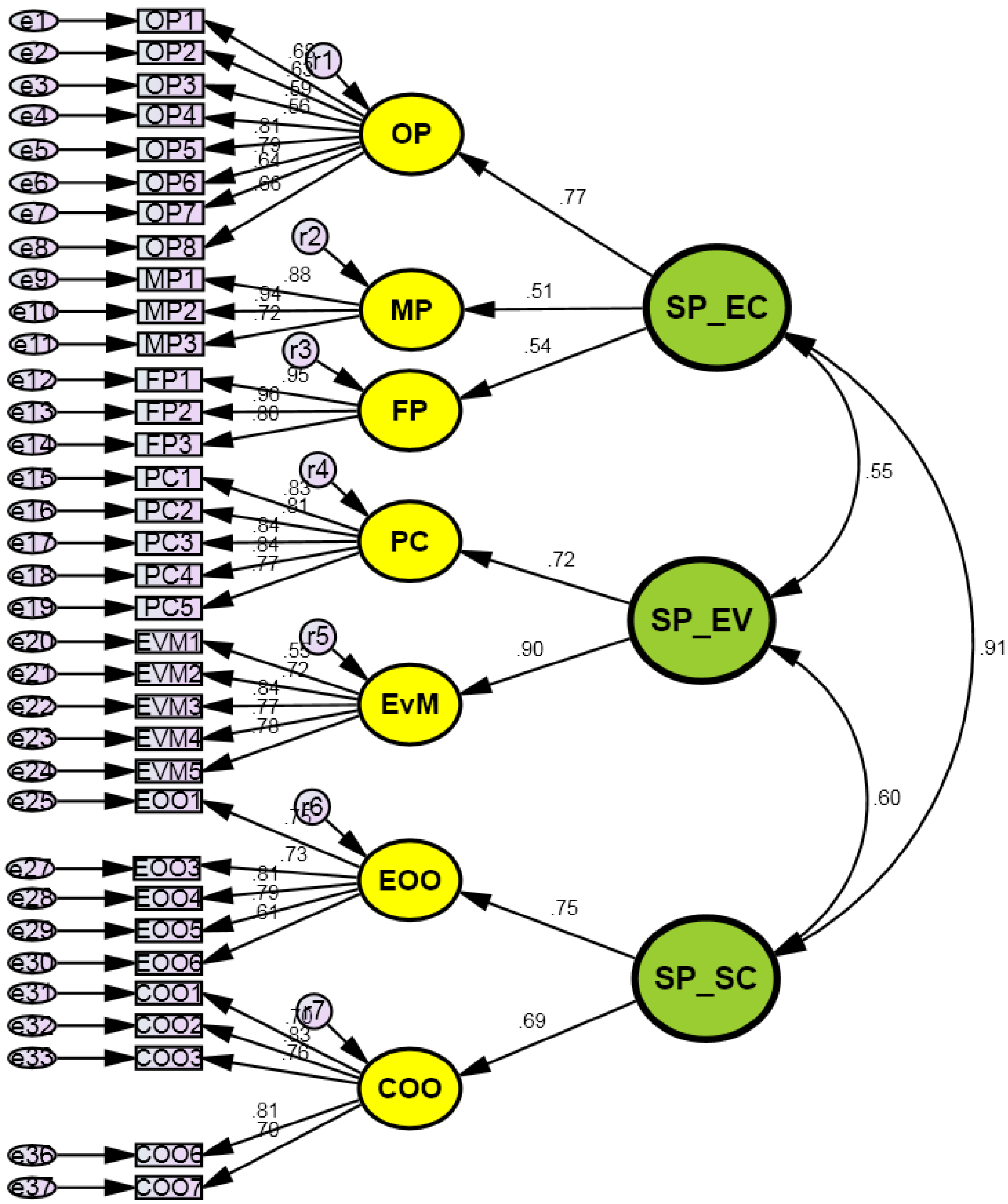
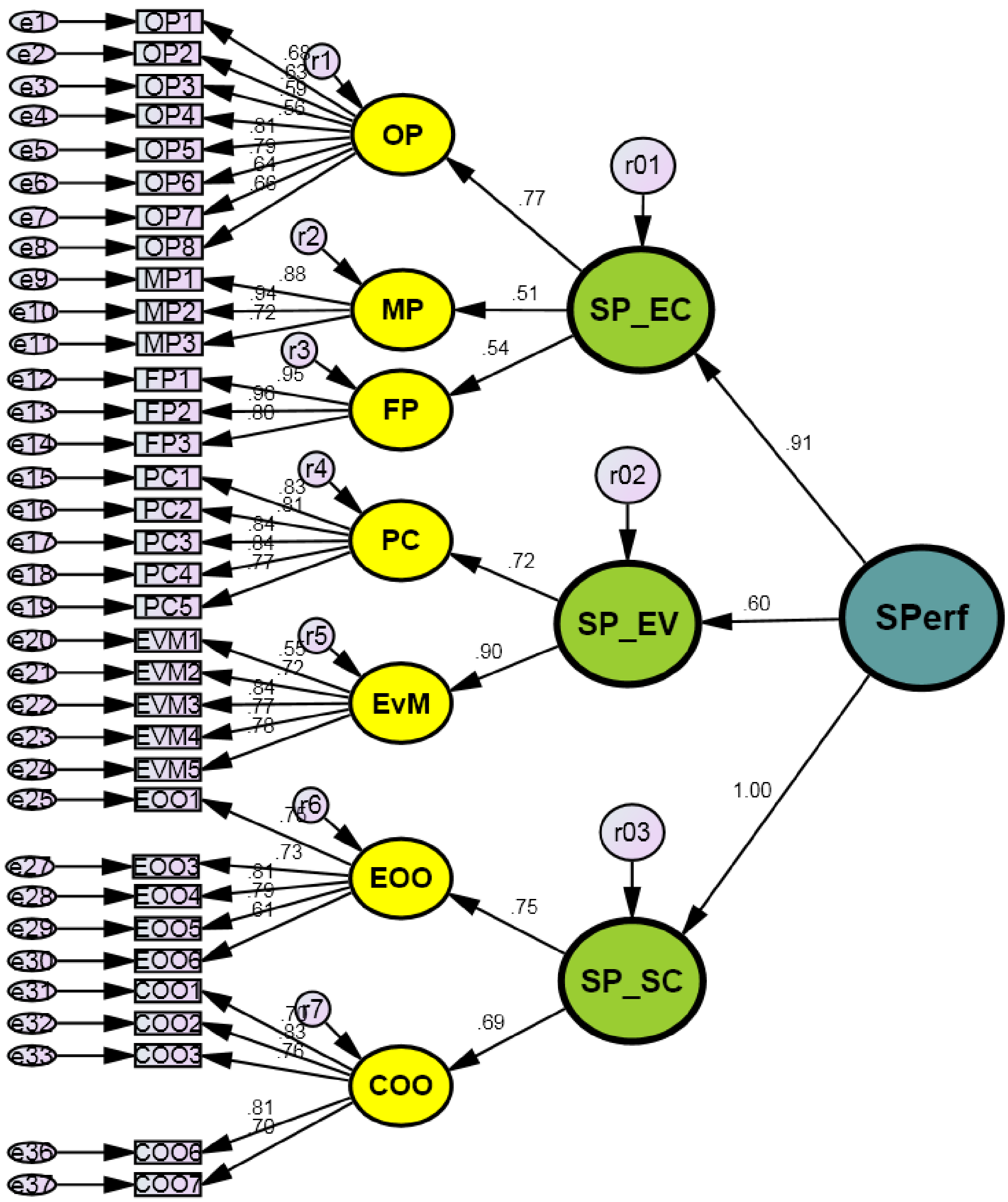


Figure 4-17. Third-order CFA Measurement Model for Sustainability Performance



Discriminant validity. Table 4.29 indicates that the square root of AVE for all constructs is greater than the average shared variance (square of the correlations in the off-diagonals) between two constructs, suggesting sufficient evidence of discriminate validity. In addition, the differences in chi-square values for each pair of dimensions are all significant at $P < 0.05$ (d.f. = 1), providing evidence of discriminant validity for those variables (Table 4.30).

Table 4.29. Inter-construct correlations and discriminant validity for Sustainability Performance

	OP	MP	FP	PC	EvM	EOO	COO
OP	**.674**						
MP	.322	**.851**					
FP	.395	.485	**.902**				
PC	.383	.114	.112	**.819**			
EvM	.481	.081	.218	.646	**.739**		
EOO	.555	.423	.327	.265	.361	**.742**	
COO	.475	.281	.305	.371	.421	.514	**.760**

* Squared root of AVEs are on the diagonal in bold.

Table 4.30. Pairwise comparison of chi-square values for Sustainability Performance

Description	Chi-square statistics				
	Unconstrained model [a]	d.f.	Constrained model [b]	d.f.	Difference
OP with MP	149.988	43	267.693	44	117.705
OP with FP	164.682	43	269.977	44	105.295
OP with PC	197.401	64	343.027	65	145.626
OP with EvM	169.937	64	295.025 (.8)	65	125.088
OP with EOO	202.429	64	334.902 (.8)	65	132.473
OP with COO	166.613	64	300.688 (.7)	65	134.075
MP with FP	12.722	8	88.631	9	75.909
MP with PC	61.501	19	224.294	20	162.793
MP with EvM	29.441	19	189.085 (.8)	20	159.644
MP with EOO	49.249	19	203.911	20	154.662
MP with COO	17.498	19	175.400 (.8)	20	157.902
FP with PC	50.194	19	212.246	20	162.052
FP with EvM	33.63	19	170.992 (.8)	20	137.362
FP with EOO	45.474	19	198.412 (.9)	20	152.938
FP with COO	19.579	19	154.998 (.7)	20	135.419
PC with EvM	95.78	34	203.617 (.7)	35	107.837

PC with EOO	82.019	34	226.721 (.6)	35	144.702
PC with COO	72.097	34	216.218 (.6)	35	144.121
EvM with EOO	69.977	34	200.744 (.5)	35	130.767
EvM with COO	46.427	34	181.152 (.5)	35	134.725
EOO with COO	83.645	34	222.500 (.5)	35	138.855

Note: All χ^2 differences are significant (for 1 degree of freedom) at $p < 0.01$.
[a] Unconstrained model indicates a model with correlation without constraint of variance. [b] Constrained model indicates a model with correlation constrained to one.

Test of CMB. To test the hypothesis that a single factor accounts for all the variance in the data, Harman's single factor test using CFA was conducted. In addition, given that SDB will very likely influence the answers of the respondents in sustainability context, this study included social desirability construct in the CFA measurement models to control for the bias (Podsakoff et al., 2003; Manning et al., 2009). All the loadings are constrained to be the same for all items (regression weight was constrained to be "a"). The model fit indicates that a single factor model does not represent the data well (χ^2 /d.f. = 4.005, GFI = 0.491, CFI = 0.462, IFI = 0.464, NFI = 0.393, RMSEA = 0.119, SRMR = 0.123). Furthermore, the AVE by a single factor is 26.6%, indicating that a less than great proportion of the variance in the data is accounted for by a single factor. Factor loadings and model fit indices for both first- and higher-order (e.g., second- and third-order) level constructs with social desirability construct are displayed in Table 4.28.

4.2.4. Summary of the CFA Measurement Models

Table 4.31 displays the summary of the CFA measurement analysis. Each construct dimension, the number of final construct measurement items, Cronbach's α (Alpha) and AVE scores are provided. From the table, the final alpha scores for most construct dimensions are greater than the threshold value of 0.70, and most of the constructs pass the minimum requirement of 0.50 for AVE. Overall, the final measurement instrument for all eight constructs in the current study is found to be valid and reliable and thus can be used in future research.

Table 4.31. Summary of a CFA Measurement Analysis

Constructs (Third-order)	**Sub-constructs (Second-order)**	**Sub-constructs (First-order)**	**# of items**	**Alpha**	**AVE**
External Pressures (EP)	Coercive Pressures (CP)	CP from Economic Sustainability (CP_Ec)	2	.609	.444
		CP from Environmental Sustainability (CP_Ev)	2	.680	.523
		CP from Social Sustainability (CP_Sc)	2	.706	.565
	Normative Pressures (NP)	NP from Economic Sustainability (NP_Ec)	2	.811	.687
		NP from Environmental Sustainability (NP_Ev)	4	.787	.500
		NP from Social Sustainability (NP_Sc)	4	.838	.567
	Mimetic Pressures (MP)	MP from Economic Sustainability (MP_Ec)	3	.876	.695
		MP from Environmental Sustainability (MP_Ev)	3	.837	.649
		MP from Social Sustainability (MP_Sc)	3	.785	.551
N/A	**Top Leadership Culture (TLC)**	TLC for Economic Sustainability (TLC_Ec)	4	.801	.520
		TLC for Environmental Sustainability (TLC_Ev)	3	.749	.505
		TLC for Social Sustainability (TLC_Sc)	4	.794	.494
N/A	**Strategic Sustainability Orientation (SSO)**	Economic Orientation (EcO)	4	.694	.371
		Environmental Orientation (EvO)	4	.852	.596
		Social Orientation (ScO)	5	.885	.626
Sustainable Supplier Mgt Practices (SSMP)	Supplier Mgt Practices (SMP)	SMP for Economic Sustainability (SMP_Ec)	3	.657	.399
		SMP for Environmental Sustainability (SMP_Ev)	3	.833	.624
		SMP for Social Sustainability (SMP_Sc)	2	.832	.716
	Information Sharing with Suppliers (ISS)	ISS for Economic Sustainability (ISS_Ec)	2	.853	.764
		ISS for Environmental Sustainability (ISS_Ev)	2	.706	.548
		ISS for Social	2	.709	.590

		Sustainability (ISS_Sc)			
Sustainable Operations Mgt Practices (SOMP)	OMP for Economic Sustainability	Quality Management Practices (QM)	4	.854	.614
		Just-in-time Practices (JIT)	4	.839	.564
	OMP for Environmental Sustainability	Environmental Design Practices (EDP)	6	.869	.532
		Environmental Recycling Practices (ERcP)	4	.753	.444
		Environmental Mgt System (EMS)	2	.840	.733
	OMP for Social Sustainability	Employee Wellbeing and Equity Practices (EWEP)	4	.711	.416
		Corporate Social Involvement Practices (CSIP)	4	.927	.762
	Corporate Sustainability Reporting Practices (CSRP)	Corporate Economic Sustainability Reporting Practices (CSRP_Ec)	2	.820	.700
		Corporate Environmental Sustainability Reporting Practices (CSRP_Ev)	3	.948	.861
		Corporate Social Sustainability Reporting Practices (CSRP_Sc)	3	.837	.636
Sustainable Customer Mgt Practices (SCMP)	Customer Mgt Practices (CMP)	CMP for Economic Sustainability (CMP_Ec)	1	NA *	NA *
		CMP for Environmental Sustainability (CMP_Ev)	3	.880	.709
		CMP for Social Sustainability (CMP_Sc)	1	NA *	NA *
	Information Sharing with Customers (ISC)	ISC for Economic Sustainability (ISC_Ec)	2	.746	.602
		ISC for Economic Sustainability (ISC_Ev)	2	.787	.650
		ISC for Economic Sustainability (ISC_Sc)	2	.859	.757
Sustainability Performance (SP)	**Economic Performance (EcP)**	Operational Performance (OP)	8	.867	.454
		Market Performance (MP)	3	.875	.725
		Financial Performance (FP)	3	.923	.814
	Environmental Performance (EvP)	Pollution Control (PC)	5	.909	.670
		Environmental Management (EvM)	5	.841	.546
	Social Performance (ScP)	Employee-oriented Outcomes (EOO)	5	.853	.551
		Community-oriented Outcomes (COO)	5	.865	.577

* Single-item constructs

Chapter 5

Structural Model Analysis and Results

The purpose of this chapter is to describe the procedures used in testing the structural model. The aim of testing the structural model is, in fact, to test the proposed hypotheses. Anderson and Gerbing (1988) recommended a two-step approach to test hypotheses. In step 1, the confirmatory factor analysis (CFA) measurement models were tested to establish the validity and reliability of the scales described in Chapter 4. Then, the structural relationships were tested in step 2, which is the focus of this chapter. To test the proposed hypotheses, this study uses partial least square (PLS), a component-based structural estimation modeling technique and, more specifically, SmartPLS package version 2.0.M3 (Ringle et al., 2005; Claassen et al., 2008).

The methodology for PLS is detailed in section 5.1. The proposed research model is reviewed in section 5.2. The structural model results and discussion of hypotheses are provided in section 5.3. Finally, the test of social desirability bias (SDB) is conducted in section 5.4.

5.1. Methodology for PLS

PLS has its distinct features compared with other structural equation modeling (SEM) techniques, such as LISREL/AMOS and covariance-based structural equation modeling (CBSEM) techniques. For example, PLS does not have minimal requirements of the restrictive assumptions, such as the measurement scales, sample size, and distributional assumptions imposed by the LISREL-like models (Chin, 1998; Guenzi et al., 2007). As a result, instead of relying on the overall fit of the proposed model by goodness-of-fit tests, PLS tests the strength and direction of individual paths by statistical significance (Calantone et al., 1998). PLS is also most useful for exploratory studies where theory is still being developed, whereas maximum-likelihood modeling techniques (e.g., LISREL) are most suitable for confirmatory studies (Lee et al., 2006; Ainuddin et al., 2007). As such, Peng and Lai (2012) summarized the advantages of using PLS: (1) the ability to estimate research models using small samples, (2) no strict distribution assumptions, (3) the ability to model both reflective and formative constructs within the same research model, and (4) the ability to avoid the inadmissible solutions and factor indeterminacy of CBSEM (Chin, 1988).

Peng and Lai (2012) recommended that researchers should check the sign, magnitude, and significance of each path coefficient, aligning with theory. Before proceeding to the PLS structural model results, the SEM evaluation criteria used in the PLS analysis are briefly discussed below.

Standardized Beta Coefficient. Traditionally, the structural model is evaluated by examining the size of the structural path coefficients. The size of the coefficients serves to assess the interaction of the path coefficient between two constructs (Chin, 1998). Although it is not strictly applied, the cut-off value for the standardized beta coefficient is 0.20 (sometimes, coefficients <0.20 will be significant at $P < 0.05$). The higher coefficient (0.20 or higher) indicates a meaningful relationship between the constructs (Chin, 1998).

T-statistics. PLS does not assume a multivariate normal distribution. Thus, traditional parametric-based techniques for significance tests are not appropriate (Chin, 1998; Peng and Lai, 2012). Consequently, there is no proper overall goodness-of-fit measure for models using PLS. Using a bootstrapping procedure, PLS allows researchers to estimate standard errors and the significance of parameter estimates (Chin, 1998). T-statistics evaluates the level of significance in the proposed hypotheses (Cohen, 1988; Rosnow, 2000; Chin et al., 2003). In the case of two-tailed test, a t value <1.96 indicates that the relationship in the hypothesis is not significant ($P < 0.10$) and that the statistical power of significance is $<5\%$. At this level of t value, the hypothesis is not usually supported, whereas for a t value between 1.96 and 2.58, the relationship in the hypothesis is considered significant at the 0.05 level. For a t value >2.58, the hypothesis is considered significant at the 0.01 level (Chin et al., 2003).

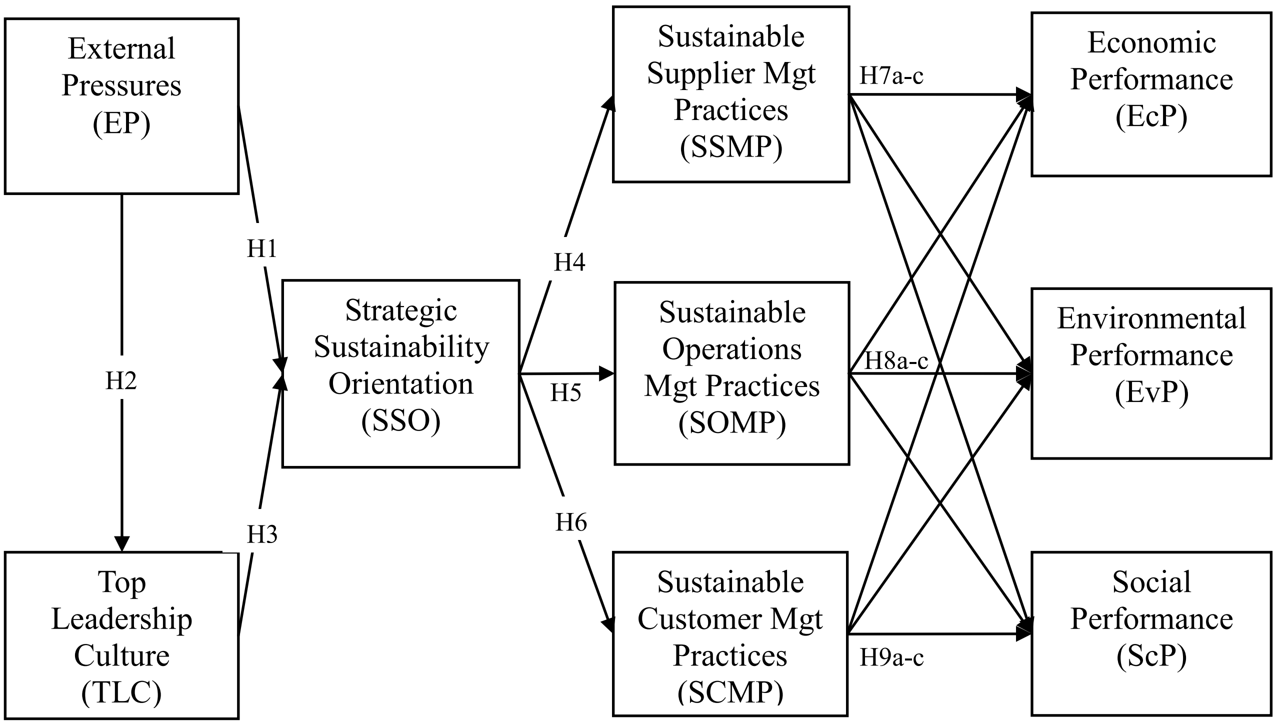
Explanatory power (R^2 value). One technique to evaluate the predictive power (or explanatory power) of the structural model is the indices for explained variability (R^2). R^2 of the endogenous constructs assesses the extents to which the research model has the predictive power. It is consistent with the goal of PLS to maximize variance explained in the endogenous variables. R^2 values of 0.67, 0.33, and 0.19 are consisted to be substantial, moderate, and weak, respectively (Chin, 1998). At the early stage in path models, R^2 values of 0.165 can be adequate (Braunscheidel and Suresh, 2009), whereas R^2 values of 0.186 and 0.197 are regarded as the adequate values at later stages (Rai et al., 2006).

Predictive relevance (Q^2). The Q^2 test for predictive relevance (redundancy) measures the quality of the structural model, taking into account the measurement model (Tenenhaus et al., 2005). This test measures how well observed values are reproduced by the model and its parameter estimates (Chin, 1998). A positive value of Q^2 implies that the model has predictive relevance, whereas a negative value of Q^2 suggests that the model is lacking predictive relevance (Real et al., 2006).

5.2. Proposed Research Model

Figure 5-1 shows the theoretical model suggested in the theory development section (see the detailed model in Figure 2.2). The research model includes nine higher-order (e.g., second- or third-order) constructs. The model begins with the exogenous variable, External Pressures (EPs), and is followed by eight endogenous variables, conceptualized as top leadership culture (TLC), strategic sustainability orientation (SSO), sustainable supplier management practices (SSMPs), sustainable operations management practices (SOMPs), sustainable customer management practices (SCMPs), and three sustainability performance (SPerf) variables, including economic performance (EcP), environmental performance (EvP), and social performance (ScP).

Figure 5-1. Proposed Research Model [Simplified]



This model contains 15 hypotheses, which were theorized in Chapter 2. Hypothesis H1 is the relationship of EP to SSO, hypothesis H2 is the relationship of EP to TLC, hypothesis H3 is the relationship of TLC to SSO, hypothesis H4 is the relationship of SSO to SSMP, hypothesis H5 is the relationship of SSO to SOMP, hypothesis H6 is the relationship of SSO to SCMP, hypotheses H7 (H7a to H7c) are the relationships of SSMP to EcP, EvP, and ScP, hypotheses H8 (H8a to H8c) are the relationships of SOMP to EcP, EvP, and ScP, and hypotheses H9 (H9a to H9c) are the relationships of SCMP to EcP, EvP, and ScP.

5.3. Testing of the Structural Model Using PLS

This section provides the results of hypotheses tests in subsection 5.3.1, followed by the discussion of hypotheses in subsection 5.3.2. In subsection 5.3.3, the revised model based on the results of hypotheses tests is suggested. Finally, the result of testing to assess the potential effects of SDB is provided in subsection 5.3.4.

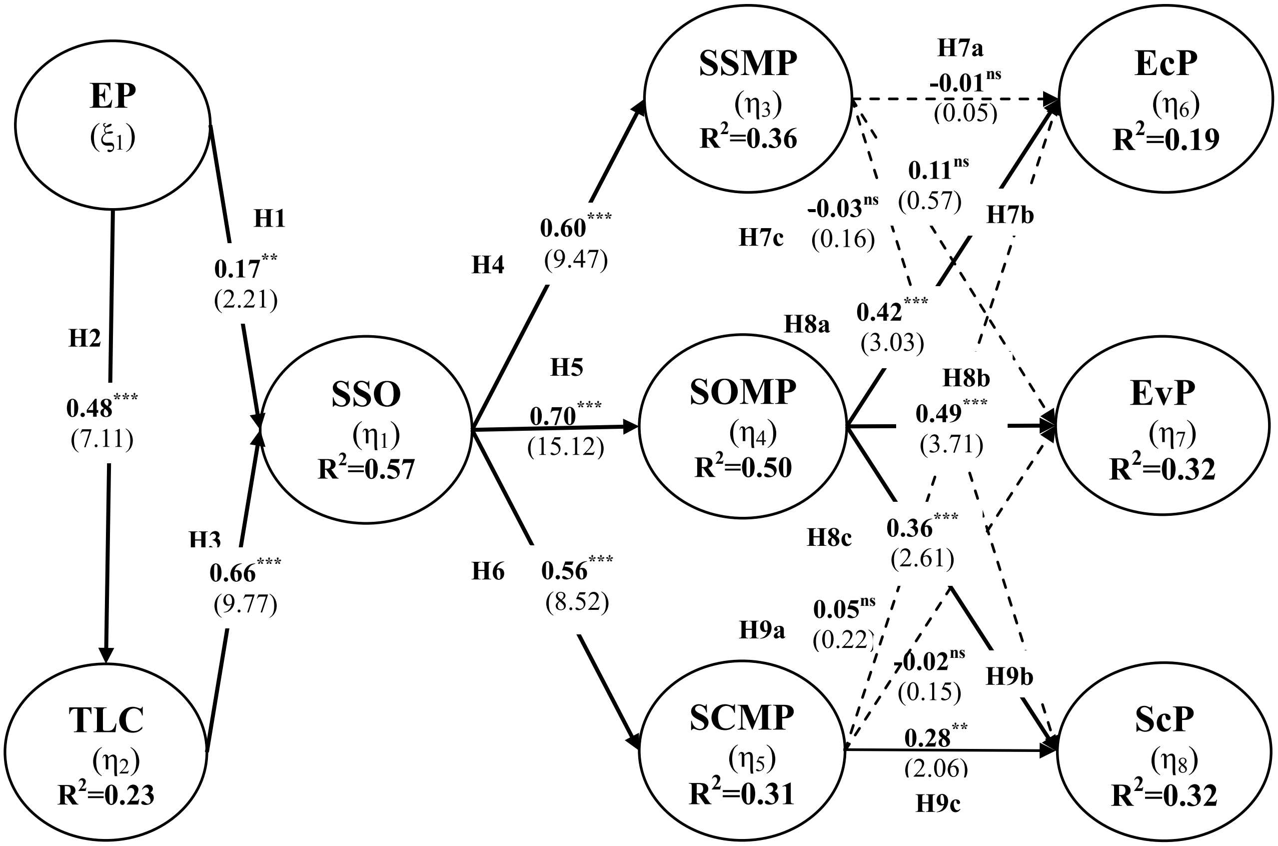
5.3.1. Results of Hypotheses (Proposed Model)

Figure 5-2 (three dimensions of sustainability performance individually [i.e., economic, environmental, and social performance]) and Figure 5-3 (sustainability performance in aggregation) show the structural model with path coefficients. T-statistics are provided in parentheses. The research hypotheses are tested by assessing the direction, strength, and level of significance of the path coefficients estimated by PLS using a bootstrap resampling method with 250 resamples (Chin, 1998; Claassen et al., 2008; Peng and Lai, 2012). The results of the hypothesis testing are summarized in Table 5.1. Overall, all eight hypotheses (H1, H2, H3, H4, H5, H6, H8, and H9c) are supported both at $P < 0.05$ and $P < 0.01$. Five hypotheses (H7a to H7c and H9a and H9b) are not supported ($P > 0.10$).

The indices for explained variability (R^2) and the Q^2 test for predictive relevance (redundancy) are shown in Table 5.3.1.1. The endogenous variables have achieved R^2 values of 0.567 for SSO, 0.227 for TLC, 0.361 for SSMP, 0.496 for SOMP, 0.310 for SCMP, 0.195 for EcP, 0.317 for EvP, and 0.315 for ScP.

A positive value of Q^2 implies that the model has predictive relevance, whereas a negative value of Q^2 suggests that the model is lacking predictive relevance (Real et al., 2006). The range for each construct is from 0.014 to 0.236, which contains all positive values except EvP (–0.015), assessing good predictive relevance for most of the constructs of the structural model.

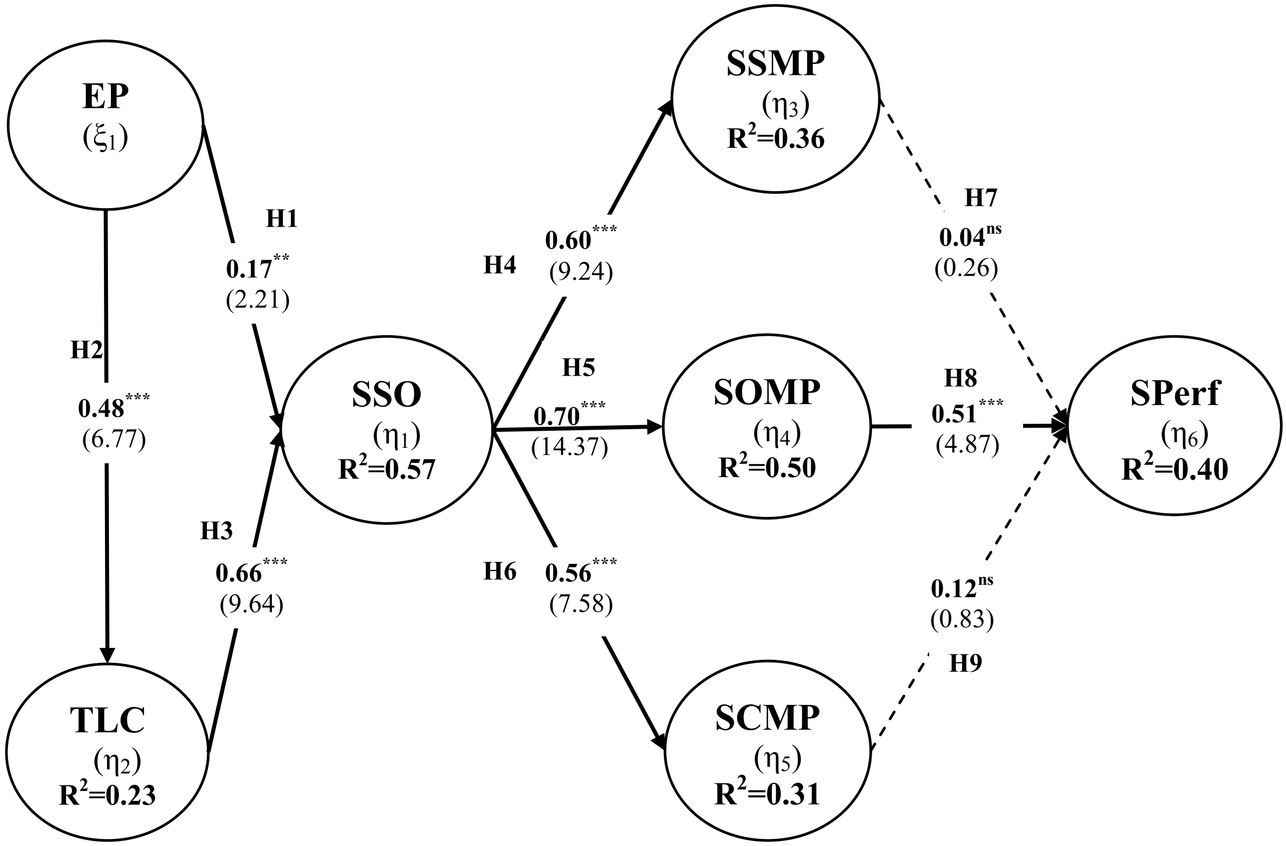
Figure 5-2. Initial PLS Structural Results (Separate Performance)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$ (two-tailed), ** significant at $p < 0.05$, * significant at $p < 0.10$, ns not significant. R^2 values represent the explained variance for the endogenous variables.

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SOMP–Sustainable Operations Management Practices, SCMP–Sustainable Customer Management Practices, EcP–Economic Performance, EvP–Environmental Performance, ScP–Social Performance.

Figure 5-3. Initial PLS Structural Results (Aggregate Performance)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ^{ns} not significant. R^2 values represent the explained variance for the endogenous variables.

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SOMP–Sustainable Operations Management Practices, SCMP–Sustainable Customer Management Practices, SPerf-Sustainability Performance (in aggregation).

Table 5.1. Hypotheses Test Results (Direct Effects)

Hypotheses: Path	Path coefficient (T-stat.)[a]	Variance Explained (R^2)[b]	Redundancy (Q^2)[c]	Supported?
H1: EP → SSO	0.168^{**} (2.208)	0.567	0.084	Yes
H2: EP → TLC	0.476^{***} (7.111)	0.227	0.145	Yes
H3: TLC → SSO	0.659^{***} (9.771)	0.567	0.084	Yes
H4: SSO → SSMP	0.601^{***} (9.470)	0.361	0.196	Yes
H5: SSO → SOMP	0.704^{***} (15.124)	0.496	0.236	Yes
H6: SSO → SCMP	0.558^{***} (8.519)	0.312	0.154	Yes
H7: SSMP → SPerf	0.044^{ns} (0.263)	0.398	0.054	No
H7a: SSMP → EcP	-0.012^{ns} (0.054)	0.196	0.014	No
H7b: SSMP → EvP	0.114^{ns} (0.569)	0.318	-0.015	No
H7c: SSMP → ScP	-0.026^{ns} (0.158)	0.315	0.149	No
H8: SOMP → SPerf	0.505^{***} (3.873)	0.398	0.054	Yes
H8a: SOMP → EcP	0.419^{***} (3.030)	0.196	0.014	Yes
H8b: SOMP → EvP	0.490^{***} (3.709)	0.318	-0.015	Yes
H8c: SOMP → ScP	0.355^{***} (2.610)	0.315	0.149	Yes
H9: SCMP → SPerf	0.122^{ns} (0.827)	0.398	0.054	No
H9a: SCMP → EcP	0.046^{ns} (0.222)	0.196	0.014	No
H9b: SCMP → EvP	-0.022^{ns} (0.151)	0.318	-0.015	No
H9c: SCMP → ScP	0.280^{**} (2.061)	0.315	0.149	Yes

[a] *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ^{ns} not significant.
[b] R^2 values represent the explained variance for the endogenous variables.
[c] $Q^2 > 0$ implies that the model has predictive relevance, whereas $Q^2 < 0$ suggests that the model is lacking predictive relevance.

5.3.2. Discussion of Hypotheses

5.3.2.1. Link of Antecedents (EPs and TLC) to SSO: H1, H2, and H3.

In relation to the antecedents or drivers of sustainability for a focal firm, the relationships expressed by hypotheses H1, H2, and H3, which represent the links between EPs, TLC, and SSO, have been demonstrated. The model predicts 56.7% of the variance of SSO. This explanatory power is caused by external institutional pressures and internal TLC that is proactively committed to sustainability adoption in the firm. In a firm, the presence of EP, represented by political influence (coercive pressures), normative pressures, and mimetic pressures, and internal culture developed by top leadership in an effort to adopt sustainability initiatives have been proven to be important antecedents.

H1: Firms' perceived EPs (i.e., mimetic, coercive, and normative pressures toward sustainability) are positively related to their SSO.

The estimated coefficient of 0.168 (t = 2.208) between EP and SSO supports H1 ($P < 0.05$). This empirical result suggests that EP has a direct effect on SSO. This finding is consistent with earlier literature (Roberts and Greenwood, 1997; Heugens and Lander, 2009). External institutional pressures represented by regulatory, societal, and competitors' pressures directly influence a firm's SSO. This relationship supports the notion that higher levels of SSO are observed in the presence of higher levels of EP. Further, R^2 for the estimated structural equation indicates that 56.7% of the variance for SSO may be explained by both EP and TLC (Table 5.3.1.1).

H2: Firms' perceived EPs (i.e., is, mimetic, coercive, and normative pressures toward sustainability) are positively related to their TLC.

The proposed relationship (H2) between EP and TLC is supported with an estimated coefficient of 0.476 (t = 7.111) at $P < 0.01$. R^2 of 0.23 for the estimated structural equation implies that 22.7% of the variance in TLC can be explained by EP (Table 5.3.1.1). Existing research indicates that firms with higher perceived pressures from diverse stakeholders are likely to change a corporation's organizational structures and cultural norms (Gordon, 1991; Rogers et al., 2007). This research expands the current literature into the context of sustainability. As such, firms are more likely to develop proactive and committed TLC for sustainability when they perceive higher levels of institutional pressures.

H3: Firms' proactive and committed TLC is positively related to their SSO.

The path coefficient from TLC to SSO is statistically significant, supporting H3 (0.659, t = 9.771) at $P < 0.01$. This indicates that there is a positive significant relationship between TLC and SSO. This finding is in line with previous literature that addresses the significant role of top management in shaping and initiating strategic imperatives, such as sustainability (Child, 1972; Kotter, 1990; McFadden et al., 2009). This result indicates that strategic orientation for sustainability is driven by top-down leadership culture. In addition, this suggests that sustainability is effectively carried out when top management is clearly committed to the strategy (Epstein, 2008). Firms must earn support from senior executives, and the strategic decisions, mission, and vision must be communicated throughout the organization. Finally, this result also indicates that top leadership's strategic decisions need to be delivered to the bottom-line shop floor employees.

5.3.2.2. Link of SSO to Sustainable Supply Chain Management Practices (H4, H5, and H6)

H4, H5, and H6 are all supported, because path coefficients are 0.601 for H4 (t = 9.470, $P < 0.01$), 0.704 for H5 (t = 15.124, $P < 0.01$), and 0.558 for H6 (t = 8.519, $P < 0.01$). With respect to the relationships of SSO and the consequent variables of the model, the effects of SSO on SSMP, SOMP, and SCMP are obvious, supporting H4, H5, and H6, respectively, at the $P < 0.01$ level. The empirical results confirm the previous literature (Linton et al., 2007; Zhu and Sarkis, 2007; Seuring and Muller, 2008; Defee et al., 2010), arguing that firms with greater sustainability orientation opt to implement interorganizational practices throughout the firm's supply chains, from managing suppliers to internal operations processes to dealing with key customers.

H4: Firms' SSO is positively related to their implementation of SSMP (i.e., supplier evaluation practices, supplier development practices, and information sharing with suppliers).

The estimated coefficient for the relationship between SSO and SSMP is 0.601, which is significant (at $P < 0.01$), supporting H4. An R^2 of 0.361 for the estimated structural equation implies that 36.1% of the variance in SSMP can be explained by SSO. This result indicates that firms are more likely to invest in managing suppliers to be sustainable with higher levels of SSO. With increasing attention on sustainability issues, firms are more aware of the strategic significance of evaluating suppliers' ability to meet their firms' sustainability criteria as well as developing suppliers' long-term capacity to make their firms' sustainability possible. This result supports this link in such a way that firms with higher SSO implement more SSMP.

H5: Firms' SSO is positively related to their implementation of SOMP (i.e., QM and JIT practices, corporate environmental management practices, and corporate social responsibility practices).

The estimated coefficient for the relationship between SSO and SOMP is 0.704, which is significant (at $P < 0.01$), supporting H5. The R^2 for the estimated structural equation indicates that 49.6% of the variance for SOMP may be explained by SSO. This result is in line with earlier findings in literature (Melynk et al., 2003; Shah and Ward, 2003; Pagell and Gobeli, 2009; Yang et al., 2011). These empirical results suggest that companies that are cautious of implementing sustainability practices for operations improvement because of high costs implement more when they perceive higher SSO. Therefore, it is critical for firms to cultivate the culture of strategic orientation for sustainability to put practices in place.

H6: Firms' SSO is positively related to their implementation of SCMP (i.e., customer management practices and information sharing with customers).

The estimated coefficient for the relationship between SSO and SCMP is 0.558, which is significant (at $P < 0.01$), supporting H6. The R^2 for the estimated structural equation also indicates that 31.2% of the variance for SCMP may be explained by SSO. These results show that when firms perceive higher levels of SSO, they use more customer management practices to achieve sustainability performance. It has been proven that firms are likely to put those practices into action with the perception of the positive linkage between intimate customer relationships and sustainability performance.

5.3.2.3. Link of Sustainable Supply Chain Management Practices (SSCMPs) to Sustainability Performance: H7 (H7a to H7c), H8 (H8a to H8c), and H9 (H9a to H9c)

First, any paths from SSMP to three dimensions of sustainability performance (EcP, EvP, and ScP) are not statistically significant (H7a [–0.012, t = 0.054, $P > 0.10$], H7b [0.114, t = 0.569, $P > 0.10$], and H7c [–0.026, t = 0.158, $P > 0.10$]), indicating that no hypotheses are supported. Second, paths from SOMP to EcP, EvP, and ScP are all statically significant, indicating support for all hypotheses (H8a [0.419, t = 3.030, $P < 0.01$], H8b [0.490, t = 3.709, $P < 0.01$], and H8c [0.355, t = 2.610, $P < 0.01$]). Third, H9a and H9b are not supported (H9a [0.046, t = 0.222, $P > 0.10$] and H9b [–0.022, t = 0.151, $P > 0.10$]), whereas H9c is supported (0.280, t = 2.061, $P < 0.05$).

The linkages between sustainable supply chain management (SCM) practices and sustainability performance provide results that are in conflict with the proposed hypotheses. The first series of hypotheses (H7a to H7c), which test the causal relationships between SSMP and sustainability performance (EcP, EvP, and ScP), are not supported, indicating that SSMP does not directly influence sustainability performance outcomes. The third series of hypotheses (H9a and H9b, excluding H9c) are not supported either. On the other hand, the positive significant influences of SOMP on sustainability performance, in accordance with what is expressed in the second series of hypotheses (H8a to H8c), have been fully confirmed.

H7: SSMPs positively influence sustainability performance.
- H7a: Higher levels of adoption of SSMPs are positively related to economic performance.
- H7b: Higher levels of adoption of SSMPs are positively related to environmental performance.
- H7c: Higher levels of adoption of SSMPs are positively related to social performance.

The estimated coefficient for the relationship between SSMP and sustainability performance is 0.044 (t = 0.263), which is not significant; therefore, H7 is rejected (see Figure 5.3.1.2). Specifically, all three path coefficients from SSMP to EcP, EvP, and ScP are –0.012, 0.114, and –0.026, respectively, which does not support H7a, H7b, and H7c (see Figure 5.3.1.1). These results are somewhat unexpected, because they are in conflict with the earlier findings in literature (Klassen and Vachon, 2003; Krause et al., 2007; Zhou and Benton, 2007; Yang et al., 2010). That is, direct effects of SSMP on three dimensions of sustainability performance are not found. This may suggest that there is no convincing evidence that SSMPs have direct effects on any dimensions of sustainability performance or on sustainability performance in aggregation.

These insignificant results may suggest that firms are not yet fully integrating sustainability standards and principles in implementing their supplier management programs (e.g., supplier evaluation, supplier development, and information sharing with suppliers). Supporting this argument, the survey indicated that the mean scores of practicing environmental (1.838) and social (1.642) dimensions of sustainability for suppliers are far less than for practicing the economic (2.594) dimension of sustainability. In addition, firms are still reluctant to share environmental (2.151) and social (1.748) dimensions of sustainability with their key suppliers, whereas they are more willing to share the economic (3.986) dimension of sustainability. In light of this, the nonsignificant result may indicate that, despite growing awareness of the strategic importance of managing suppliers to be sustainable, the current implementation by U.S. manufacturing firms of sustainability principles into supplier management is lacking and requires more attention and actual actions.

H8: SOMPs positively influence sustainability performance.

- H8a: Higher levels of adoption of SOMPs are positively related to economic performance.
- H8b: Higher levels of adoption of SOMPs are positively related to environmental performance.
- H8c: Higher levels of adoption of SOMPs are positively related to social performance.

The estimated coefficient for the relationship between SOMP and sustainability performance is 0.505 (t = 3.873), which is statistically significant, supporting H8 ($P < 0.01$) (see Figure 5.3.1.2). Specifically, all three path coefficients from SOMP to EcP, EvP, and ScP are 0.419, 0.490, and 0.355, respectively, supporting H8a, H8b, and H8c ($P < 0.01$) (see Figure 5.3.1.1). These results are in line with the previous literature (King and Lenox, 2001; Orlitzky et al., 2003; Sroufe, 2003; Zhu and Sarkis, 2004). That is, the direct effects of SOMP on EcP, EvP, and ScP as well as on sustainability performance in aggregation are found.

For instance, lean manufacturing, represented by variation reduction, quality improvement, and cost efficiencies, proves to be a convincing practice to positively effect operational, business (market and financial), and environmental performance as well as social performance (corporate image) (Shah and Ward, 2003, 2007; Yang et al., 2011). Firms' practices that are designed to improve environmental management (e.g., design for environment, recycling programs, environmental management system) are now widely adopted and implemented because of the improvement in quality, environmental, and social performance (Melnyk et al., 2003; Darnall et al., 2008). Firms with growing awareness of corporate social responsibility outcomes implement these practices, because they believe that they brings positive benefits to their firms' sustainability performance (Pagell and Gobeli, 2009). In sum, the results of this study empirically provide evidence of the previously stated research arguments.

H9: SCMPs positively influence sustainability performance.

H9a: Higher levels of adoption of SCMPs are positively related to economic performance.

H9b: Higher levels of adoption of SCMPs are positively related to environmental performance.

H9c: Higher levels of adoption of SCMPs are positively related to social performance.

The estimated coefficient for the relationship between SCMP and sustainability performance is 0.122, which is not significant; therefore, H9 is rejected (see Figure 5.3.1.2). Specifically, two path coefficients from SCMP to EcP and EvP are not significant, not supporting H9a (0.046, $P > 0.10$) and H9b (–0.022, $P > 0.10$), whereas the path from SCMP to ScP is significant at $P < 0.05$, supporting H9c (see Figure 5.3.1.1). For H9c, the path coefficient (0.280, $t = 2.061$) suggests that the path is significant at $P < 0.05$. These results suggest that customer management programs (e.g., collaborative activities to improve sustainability for a focal firm and its customers) are more related to improved social performance, such as social image and reputation (Antonides and Raaij, 1998). However, direct influence on improving economic (i.e., operational benefits, market and financial outcomes) and environmental performance outcomes are not found (Sahin and Robinson, 2002; Zhou and Benton, 2007).

5.3.3. Revised Structural Model

The original structural model had five hypotheses (H7a to H7c and H9a and H9b) that were found to be not significant. These nonsignificant relationships indicated probable deficiencies of the proposed model that required alterations. Therefore, the hypotheses for which statistical analysis showed nonsignificant relationships for the original structural model and for the initial model had to be reanalyzed to find alternative significant paths. The following subsection (5.3.3.1) displays the breakdown of the original structural model to find rationales for why the current hypotheses (H7a to H7c and H9a and H9b) are not supported.

5.3.3.1. Structural Model Breakdown

This section describes the breakdown of the suggested original structural model (see Figures 5.4 to 5.11). To begin this process, the key question was why SSMP and SCMP have no effect, whereas SOMP has a direct effect on sustainability performance. To explore the insignificant paths, the initial structural model was split into four different structural models: (1) SSMP model, (2) SCMP model, (3) SSMP/SCMP model, and (4) SSCMP model (SSMP, SCMP, and SOMP combined).

SSMP model. This model isolates SSMP, without SOMP and SCMP. Figures 5-4 and 5-5 show the SSMP model, indicating that SSMP alone does influence EcP, EvP, and ScP (path coefficients are all significant: 0.352 [t = 3.829], 0.454 [t = 4.943], and 0.476 [t = 5.104], respectively, at $P < 0.01$) as well as sustainability performance in aggregate (SPerf) (path coefficient [0.522, t = 6.146] is significant at $P < 0.01$).

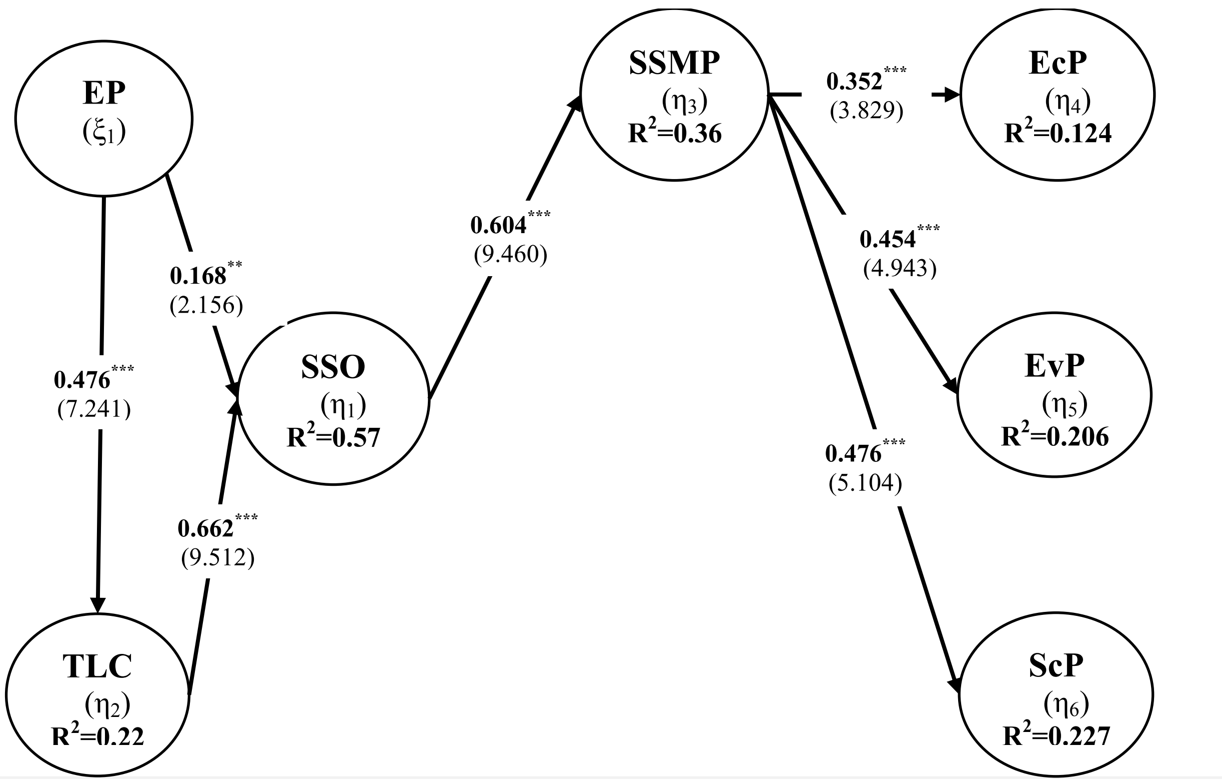
SCMP model. This model isolates SCMP, without SSMP and SOMP. Figures 5-6 and 5-7 show the SCMP model, indicating that SCMP alone effects EcP, EvP, and ScP (path coefficients are all significant: 0.256 [t = 2.680], 0.421 [t = 4.245], and 0.445 [t = 5.694], respectively, at $P < 0.01$) as well as SPerf (path coefficient [0.503, t = 4.820] is significant at $P < 0.01$).

SSMP/SCMP model. This model combines SSMP and SCMP, without SOMP. When SSMP and SCMP are put together (Figures 5-8 and 5-9), the model shows mixed results: SSMP to SPerf (0.335, t = 2.214, $P < 0.05$), SSMP to EcP (0.234, t = 1.139, $P > 0.1$), SSMP to EvP (0.391, t = 2.578, $P < 0.01$), SSMP to ScP (0.180, t = 1.081, $P > 0.1$), SCMP to SPerf (0.225, t = 1.455, $P > 0.1$), SCMP to EcP (0.122, t = 0.560, $P > 0.1$), SCMP to EvP (0.088, t = 0.576, $P > 0.1$), and SCMP to ScP (0.352, t = 2.004, $P < 0.05$). In sum, SSMP has a direct effect on EvP (as well as SPerf), and SCMP has a direct effect only on ScP (and not on SPerf).

SSCMP model. This model combines SSMP, SOMP, and SCMP (Figures 5-10 and 5-11). This overall model (with all three practices) shows that only the paths from SOMP to EcP, EvP, ScP as well as SPerf are significant, whereas the paths from SSMP and SCMP to EcP, EvP, ScP as well as SPerf (except SCMP to ScP) are not significant.

Findings and implications. These results reveal that SSMP and SCMP separately influence performance measures. If the model is run without SOMP and shown with only SSMP or SCMP, the direct paths are all significant. These results explain why SSMP and SCMP do not affect performance outcomes when SOMP is in the model. These results indicate that SOMP dominates the other two practices (SSMP and SCMP) in affecting performance outcomes. Theoretically, SSMP and SCMP are front-end practices in terms of their effect on performance outcomes, and thus direct effects on final performance outcomes (i.e., measuring end results, not intermediate or process results) are not found. Practically, SOMPs are dominantly affecting performance outcomes, because much of the performance outcomes measure the end results, not the process results. These results offer rationales for why the current model needs to be revised. Thus, the following subsection (5.3.3.2) is devoted to developing the revised structural model based on the above insightful findings.

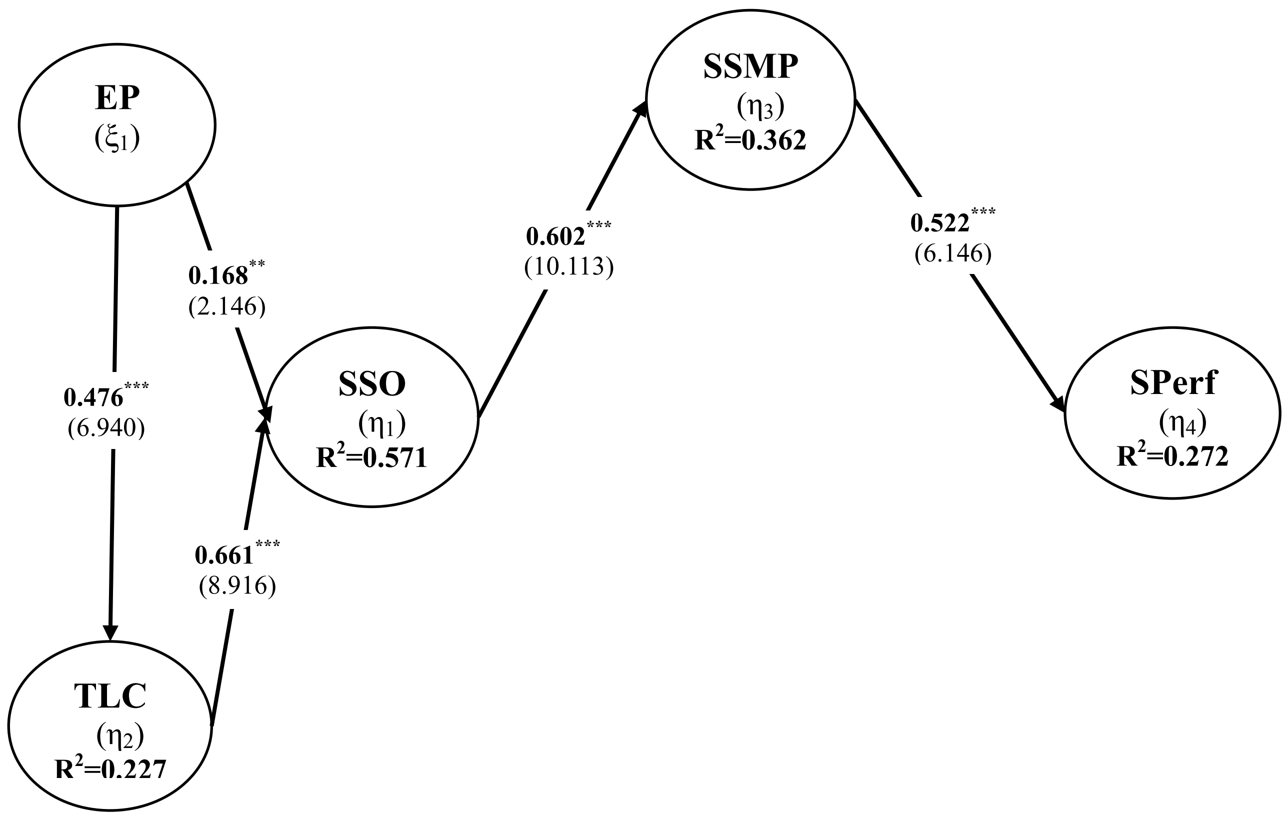
Figure 5-4. PLS Structural Results
(Sustainable Supplier Mgt Practices Model: Sustainability Performance in Separation)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ^{ns} not significant. R^2 values represent the explained variance for the endogenous variables.

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, EcP- Economic Performance, EvP- Environmental Performance, and ScP- Social Performance.

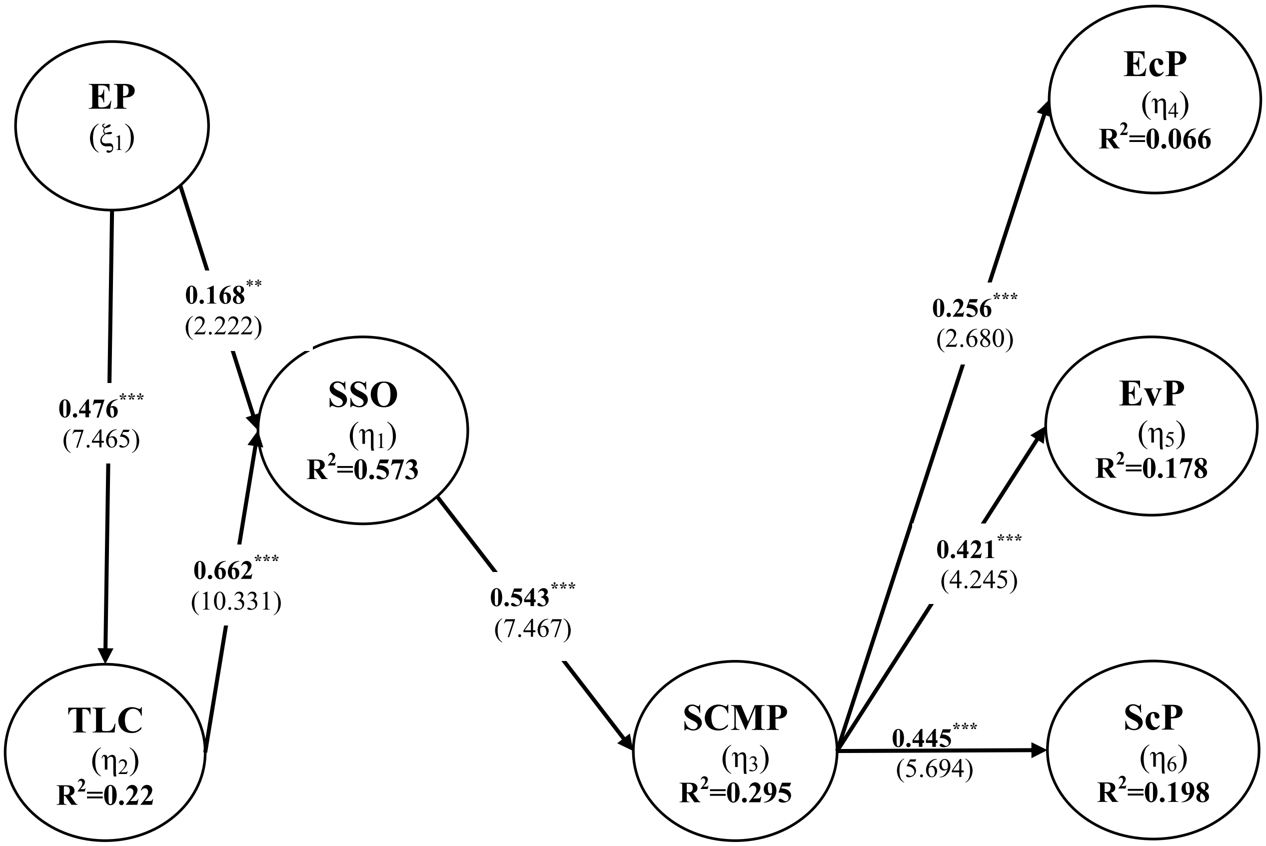
Figure 5-5. PLS Structural Results
(<u>Sustainable Supplier Mgt Practices Model: Sustainability Performance in Aggregation</u>)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ns not significant. R^2 values represent the explained variance for the endogenous variables.

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SPerf- Sustainability Performance (in Aggregation).

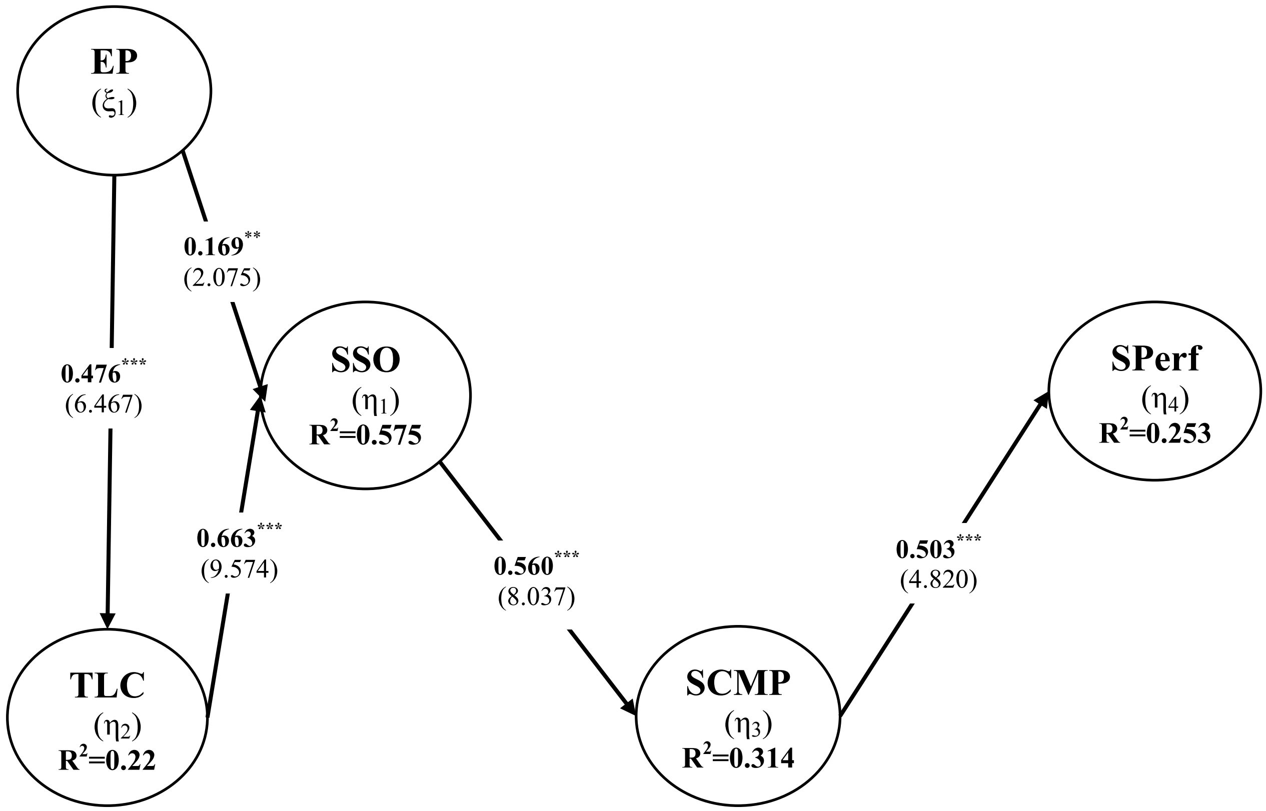
Figure 5-6. PLS Structural Results
(Sustainable Customer Mgt Practices Model: Sustainability Performance in Separation)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ^{ns} not significant. R^2 values represent the explained variance for the endogenous variables.

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SCMP–Sustainable Customer Management Practices, EcP- Economic Performance, EvP- Environmental Performance, and ScP- Social Performance.

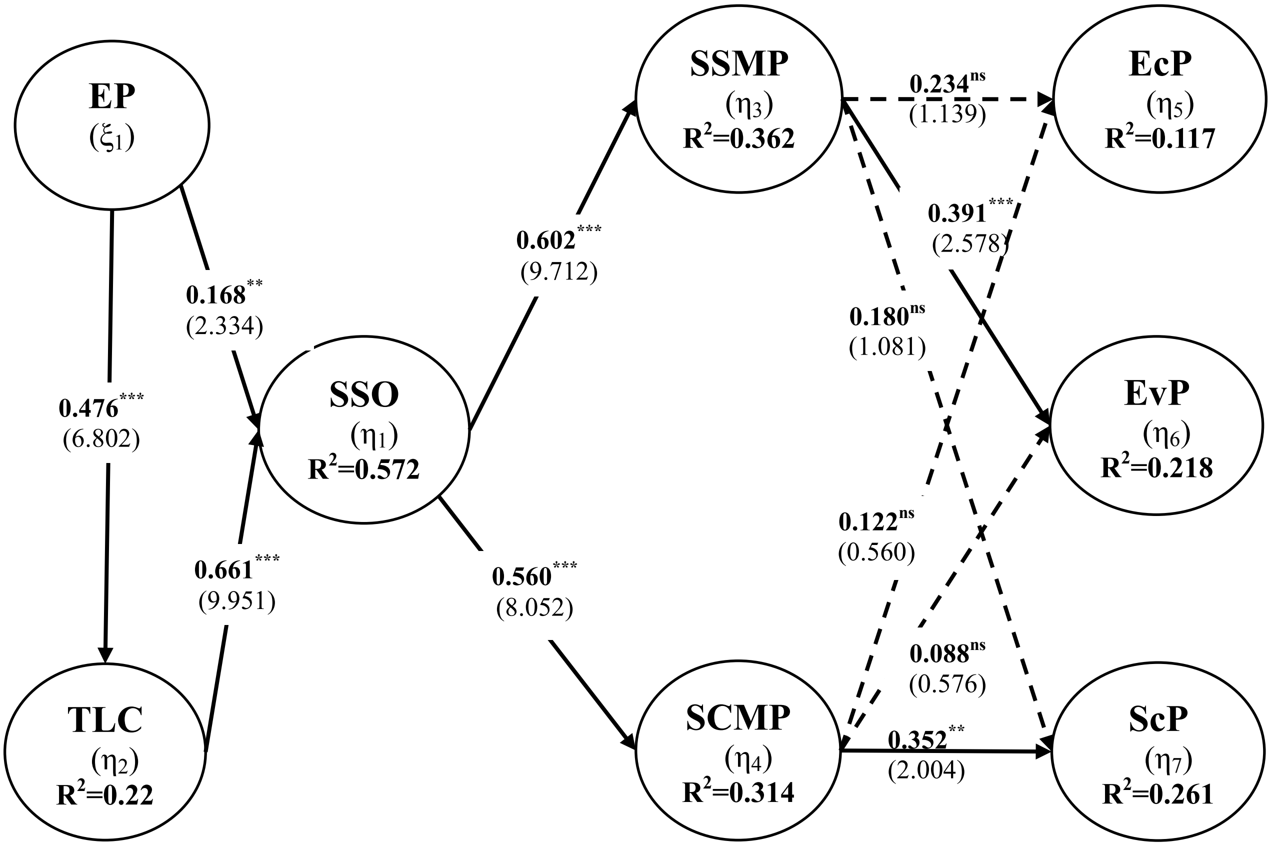
Figure 5-7. PLS Structural Results
(Sustainable Customer Mgt Practices Model: Sustainability Performance in Aggregation)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ns not significant. R^2 values represent the explained variance for the endogenous variables.

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SCMP–Sustainable Customer Management Practices, SPerf- Sustainability Performance (in Aggregation).

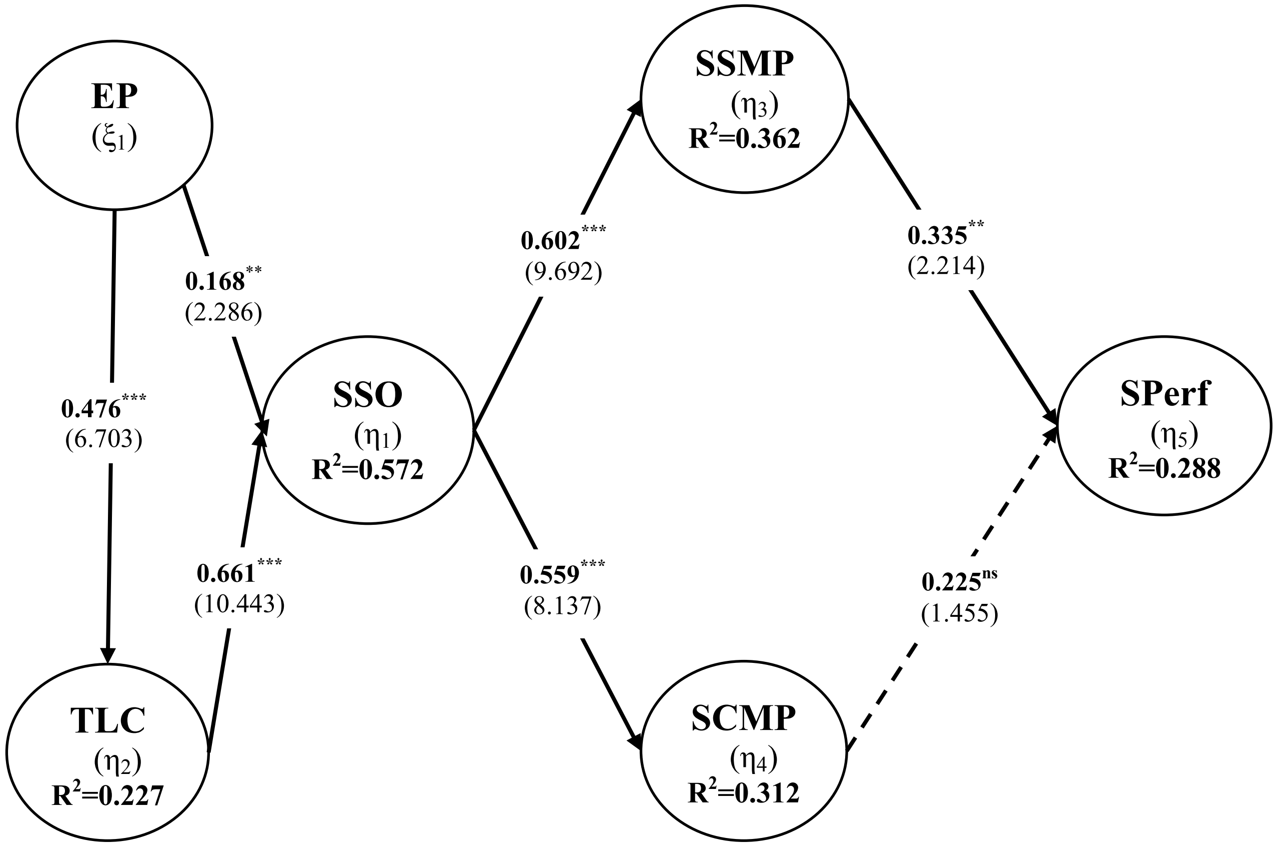
Figure 5-8. PLS Structural Results
(Sustainable Supplier/Customer Mgt Practices Model: Sustainability Performance in Separation)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ns not significant. R^2 values represent the explained variance for the endogenous variables.

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SCMP–Sustainable Customer Management Practices, EcP- Economic Performance, EvP- Environmental Performance, and ScP- Social Performance.

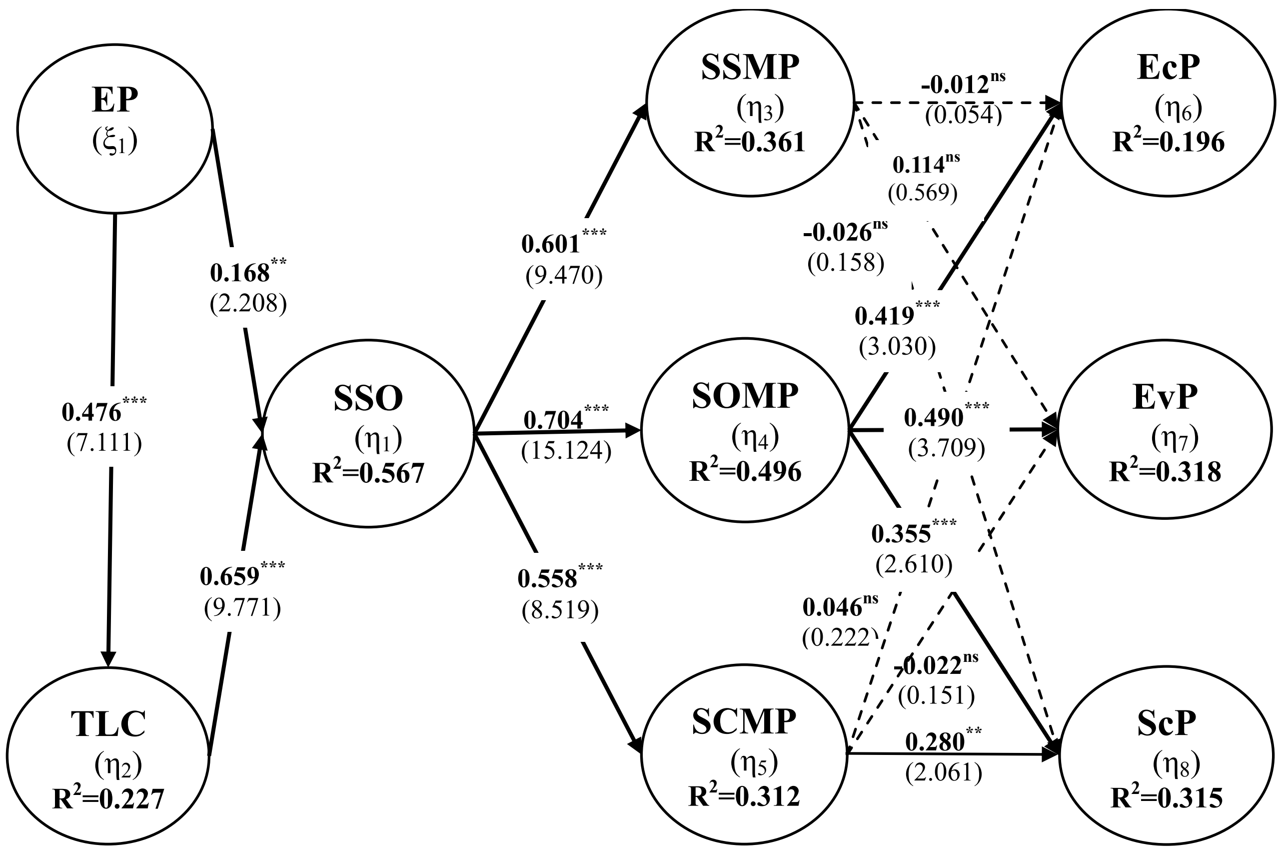
Figure 5-9. PLS Structural Results
(Sustainable Supplier/Customer Mgt Practices Model: Sustainability Performance in Aggregation)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ^{ns} not significant. R^2 values represent the explained variance for the endogenous variables.

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SCMP–Sustainable Customer Management Practices, SPerf- Sustainability Performance (in Aggregation).

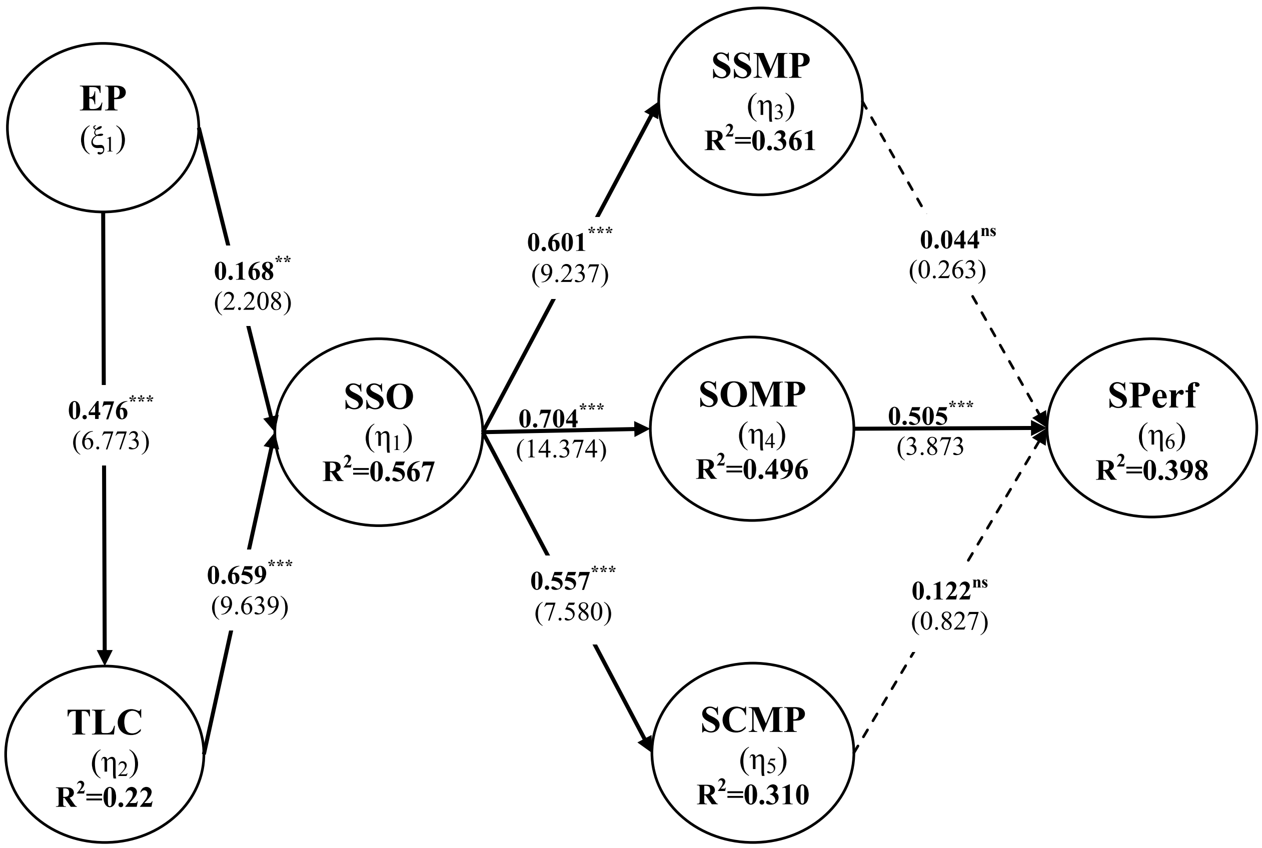
Figure 5-10. Initial PLS Structural Results
(Sustainable Supply Chain Mgt Practices Model: Sustainability Performance in Separation)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ns not significant. R^2 values represent the explained variance for the endogenous variables.

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SOMP- Sustainable Operations Management Practices, SCMP–Sustainable Customer Management Practices, EcP- Economic Performance, EvP- Environmental Performance, and ScP- Social Performance.

Figure 5-11. Initial PLS Structural Results
(Sustainable Supply Chain Mgt Practices Model: Sustainability Performance in Aggregation)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ns not significant. R^2 values represent the explained variance for the endogenous variables.

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SOMP- Sustainable Operations Management Practices, SCMP–Sustainable Customer Management Practices, SPerf-Sustainability Performance (in Aggregation).

5.3.3.2. Revised Structural Model

The breakdown of the original structural model revealed that paths from SSMP to EcP, EvP, and ScP (as well as sustainability performance in aggregate [SPerf]) and paths from SCMP to EcP and EvP (as well as SPerf) need to be revised. These nonsignificant paths are modified by adding new paths (e.g., SSMP to SOMP and SCMP to SOMP). The rationale for creating these two paths in the revised structural model is explained below. Note that four different revised models are displayed for completeness (see Figures 5-12 [model with all paths to individual sub-dimensions of sustainability performance estimated], 5-13 [model with only significant paths to sub-dimensions of sustainability performance estimated], 5-14 [model with all paths to aggregate sustainability performance estimated], and 5-15 [model with only significant paths to aggregate sustainability performance estimated]).

Path 1: SSMP to SOMP to EcP, EvP, and ScP (as well as SPerf)

The results did not support the original hypotheses that SSMPs directly effect EcP, EvP, and ScP (as well as SPerf) when SOMP is included in the model. To find the alternative model, an additional path was drawn from SSMP to SOMP (see Figures 5-12, 5-13, 5-14, and 5-15). The coefficient (0.408, 0.409, 0.409, and 0.411) of this path was found to be significant at $P < 0.01$. As such, an indirect path between the constructs of SSMP and SPerf (EcP, EvP, and ScP) through SOMP was found to be significant.

This revised model suggests that there is no direct effect of SSMP on sustainability performance outcomes when SOMP is included in the model. However, SSMP can indirectly influence the performance outcomes through SOMP. This indicates that SSMP needs to be integrated with SOMP to bring sustainability performance to a firm. Previous research suggests that supplier management practices (e.g., supplier evaluation, development, and close collaboration with suppliers) can play a crucial role in improving sustainability initiatives of a focal company, such as environmental programs (Klassen and Vachon, 2003; Vachon and Klassen, 2008; Yang et al., 2010). One study found that various supply chain activities such as supplier partnership can enhance a firm's sustainability program (Bowen et al., 2001). Collaboration with suppliers helps a firm's ability to identify and evaluate diverse options that address particular environmental challenges, leading to higher level of investment in sustainability iniativies of a focal firm (Bonifant et al., 1995; Klassen and Vachon, 2003).

Studies advocate that maintaining closer supplier–manufacturer relationships can improve environmental dimension of sustainability performance through implementing innovative material uses and processes (Rao and Halt, 2005; Vachon and Klassen, 2008; Yang et al., 2010). Evaluating and selecting suppliers who are aligned with sustainability standards (e.g., environmental strategy) enables firms to implement sustainability programs (e.g., environmental management programs) (Lippmann, 1999). Studies also provide evidence that higher levels of supplier partnerships lead to better implementation of initiatives such as enviornmental management (Angell and Klassen, 1999; Rothenberg et al., 2001; Vachon and Klassen, 2008).

In sum, the primary objective of a focal firm’s supplier management is to help a firm foster closer collaboration with suppliers. The nature of this program is strategic and long-term; therefore, it may be difficult to reap the short-term end-results of economic, environmental, and social performance. It is more feasible to be integrated with firms’ operations management practices (e.g., lean manufacturing, environmental management, and corporate social responsibility programs) to enhance collaborative relationships with manufactuers, through which the tangible end results are brought to the firm (Youn et al., 2012).

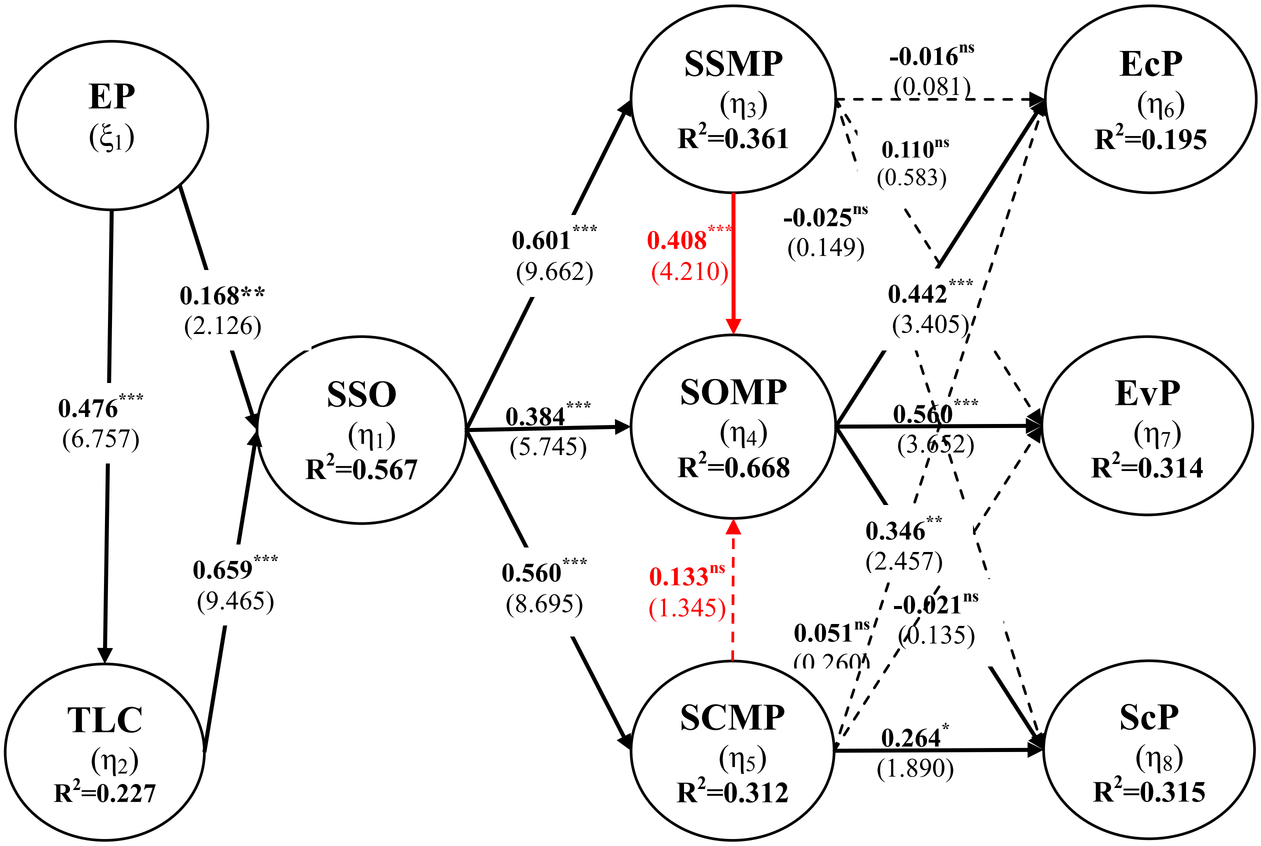
Path 2: SCMP to SOMP to EcP, EvP, and ScP (as well as SPerf)

The findings did not support the original hypotheses that SCMPs have positive influences on two dimensions of sustainability performance (i.e., EcP and EvP) when SOMP is included in the model. To search for the alternative model, the path from SCMP to SOMP was estimated (see Figures 5-12, 5-13, 5-14, and 5-15). Estimation of this relationship is based on logic supported by previous studies. Literature argues that collaborative activities with supply chain partners including a focal firm's customers can positively influence sustainability (e.g., environmental management) of a firm (Handfield et al., 1997; Geffen and Rothenberg, 2000; Klassen and Vachon, 2003). Contrary to expectation, the coefficient of this path (0.133, 0.131, 0.131, and 0.128) was found to be nonsignificant. This suggests that the data used in this analysis does not provide support to a direct relationship of SCMP with SOMP and thus there is inconclusive evidence of the indirect effects of SCMP on EcP, EvP, and ScP, as well as SPerf, through SOMP.

Arguably, this result may represent a possibility that some sample firms have functional silos with regard to sustainability initiatives. In other words, customer management practices for sustainability, which are related to the front-end marketing initiatives of a firm are yet to inform their operational processes. While there is directional support for this relationship the current data does not indicate this to be significant.

Further, this insignificant relationship between SCMP and SOMP can be explained by methodological reasons. First, potential statistical reasons, such as low statistical power may result in this non-significance. Second, this non-significant relationship may reflect high variability in responses, i.e. the firms are are experiencing highly variable outcomes from such practices. As such, it could be difficult to detect significant outcomes from implementing sustainable customer management practices. Third, this insignificant relationship may be attributed to a bias caused by single item measurement issue. The SCMP constructs include two single item first-order latent variables (e.g., SCMP_Ec and SCMP_Sc). Single item measures were not able to correctly capture the complex phenomenon of SCMP, which can bias path results in the model.

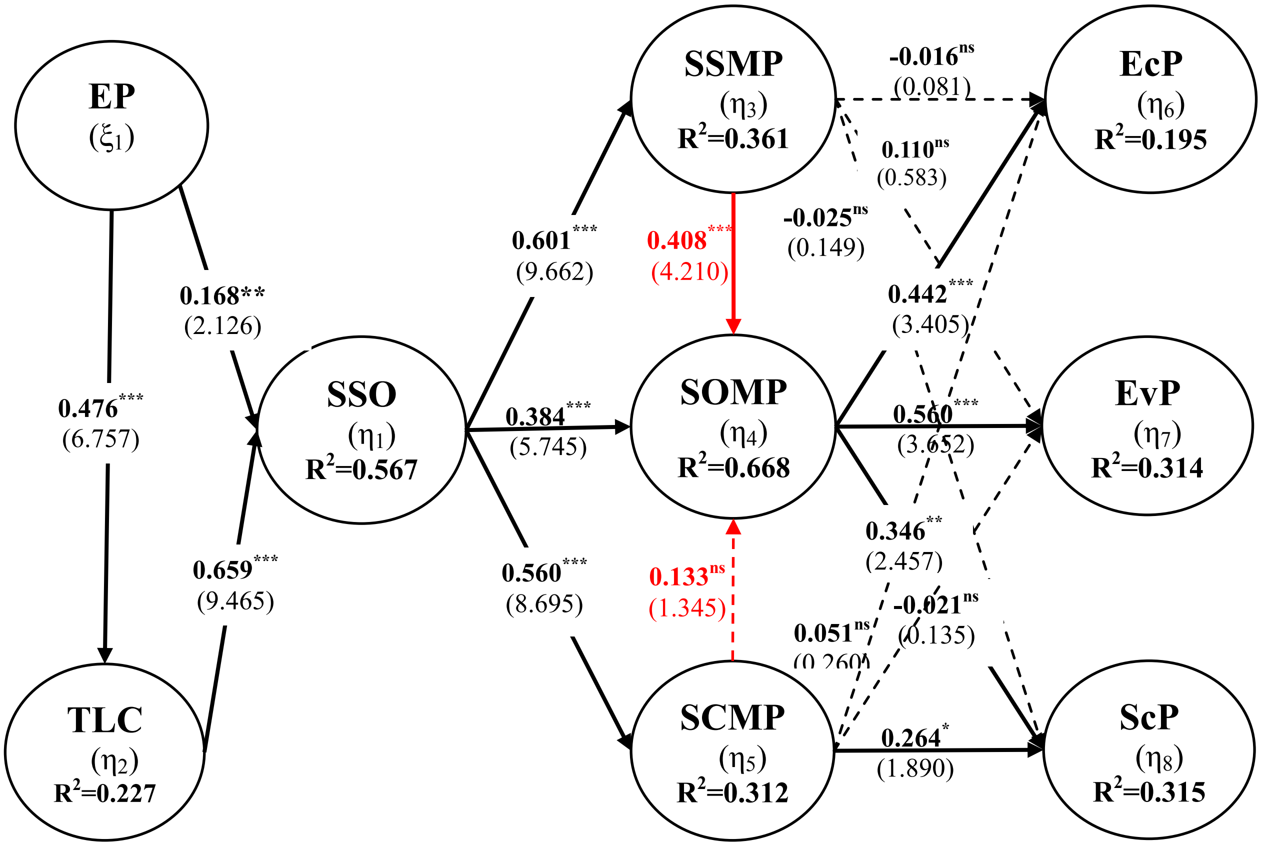
Figure 5-12. Revised PLS Structural Results
(Sustainability Performance in Separation including non-significant paths)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ns not significant. R^2 values represent the explained variance for the endogenous variables. **Paths in red represent revised paths.**

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SOMP- Sustainable Operations Management Practices, SCMP–Sustainable Customer Management Practices, EcP- Economic Performance, EvP- Environmental Performance, and ScP- Social Performance.

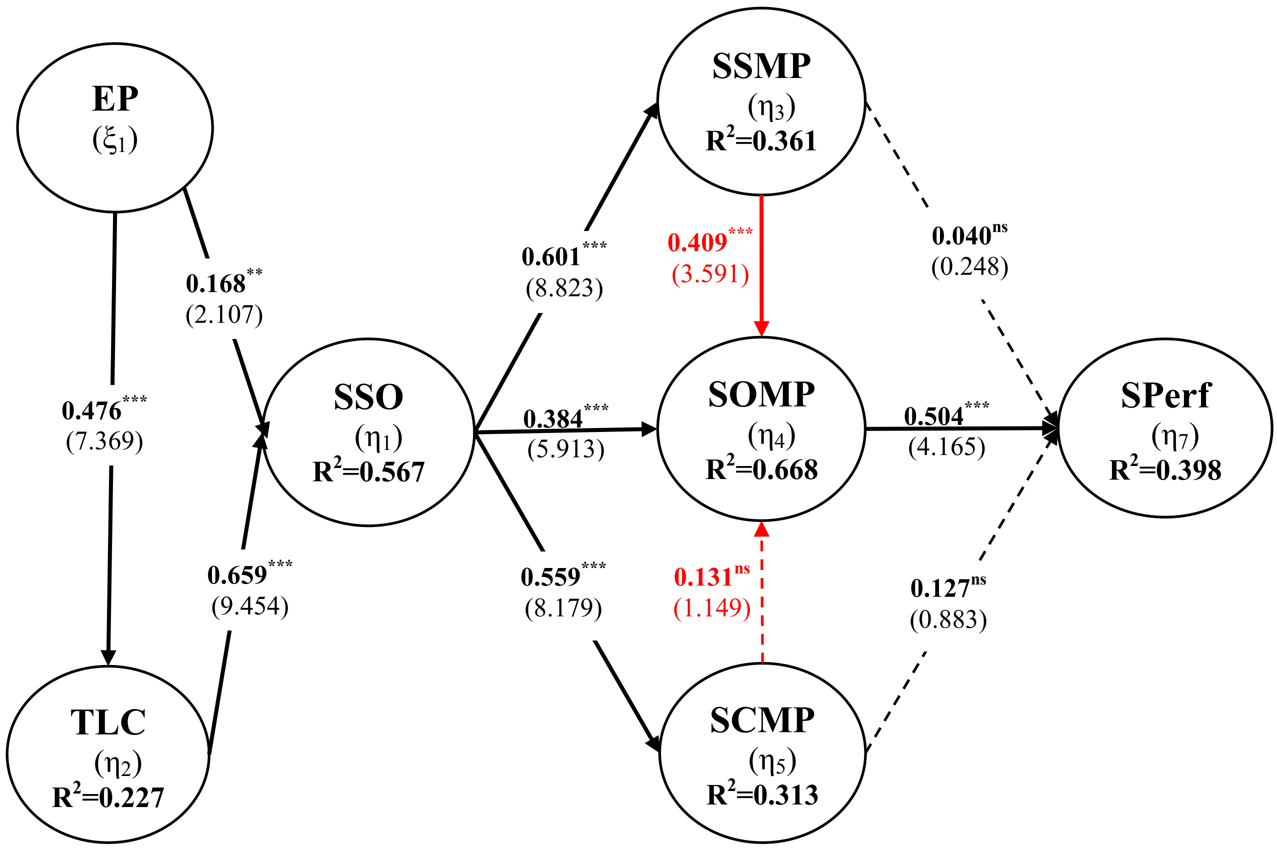
Figure 5-13. Revised PLS Structural Results
(Sustainability Performance in Separation including non-significant paths)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ns not significant. R^2 values represent the explained variance for the endogenous variables. **Paths in red represent revised paths.**

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SOMP- Sustainable Operations Management Practices, SCMP–Sustainable Customer Management Practices, EcP- Economic Performance, EvP- Environmental Performance, and ScP- Social Performance.

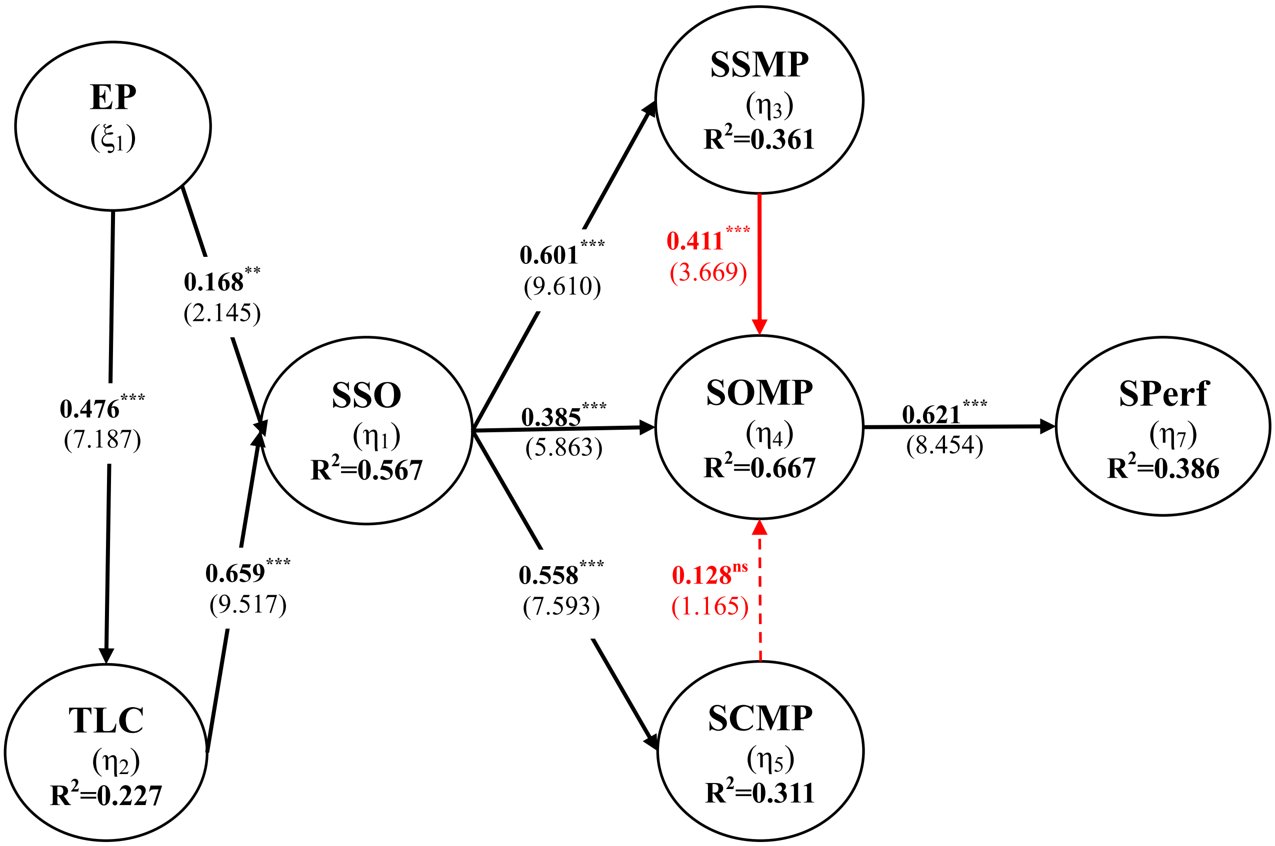
Figure 5-14. Revised PLS Structural Results
(Sustainability Performance in Aggregation including non-significant paths)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ns not significant. R^2 values represent the explained variance for the endogenous variables. **Paths in red represent revised paths.**

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SOMP- Sustainable Operations Management Practices, SCMP–Sustainable Customer Management Practices, SPerf-Sustainability Performance (in Aggregation).

Figure 5-15. Revised PLS Structural Results
(Sustainability Performance in Aggregation with significant paths only)



Note: Bold lines are significant paths; dotted lines represent non-significant paths; t-values are in parentheses. *** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ns not significant. R^2 values represent the explained variance for the endogenous variables. **Paths in red represent revised paths.**

Legends: EP–External Pressures, TLC–Top Leadership Culture, SSO–Strategic Sustainability Orientation, SSMP–Sustainable Supplier Management Practices, SOMP- Sustainable Operations Management Practices, SCMP–Sustainable Customer Management Practices, SPerf-Sustainability Performance (in Aggregation).

5.4. Controlling SDB

SDB occurs when respondents answer questions in an attempt to conform to social norms or expectations (Carter, 2000). To control the potential issue associated with SDB, this study adopted measurement items developed by Manning et al. (2009), added them to the survey instrument (see Table 4.5), and included these variables in the structural model to partial-out the effect of potential SDB (Handley and Benton, 2012). The results that include the social desirability construct are shown in Table 5.2.

In testing the structural model (the initial model, not the revised model), the results are the same as the model without the social desirability construct. Hypotheses 2, 3, 4, 5, 6, and 8 (8b) stay statistically significant at the $P < 0.01$ level, and consequently stay supported. Hypotheses 1, 8a, 8c, and 9c are statistically significant and consequently stays supported, but at the $P < 0.05$ level. Hypotheses 7 (H7a to H7c) and 9 (H9a and H9b) are not significant in the original model or in the model controlled for SDB. In sum, these results suggest that the hypothesized relationships remain supported when controlled for SDB.

Table 5.2. Summary of Structural model† results controlled for social desirability bias

Hypotheses: Path	Path coefficient (Control Model)	t-stats. (Control Model)	$R^{2\,a}$ (Control Model)	Path coefficient (Original Model)	t-stats. (Original Model)
H1: EP → SSO	0.169^{**}	2.269	0.585	0.168^{**}	2.208
H2: EP → TLC	0.402^{***}	5.338	0.334	0.476^{***}	7.111
H3: TLC → SSO	0.597^{***}	7.446	0.585	0.659^{***}	9.771
H4: SSO → SSMP	0.545^{***}	5.943	0.375	0.601^{***}	9.470
H5: SSO → SOMP	0.653^{***}	9.474	0.507	0.704^{***}	15.124
H6: SSO → SCMP	0.509^{***}	6.090	0.323	0.558^{***}	8.519
H7: SSMP → SPerf	0.006^{ns}	0.041	0.464	0.044^{ns}	0.263
H7a: SSMP → EcP	-0.045^{ns}	0.238	0.315	-0.012^{ns}	0.054
H7b: SSMP → EvP	0.113^{ns}	0.623	0.318	0.114^{ns}	0.569
H7c: SSMP → ScP	-0.056^{ns}	0.349	0.369	-0.026^{ns}	0.158
H8: SOMP → SPerf	0.420^{***}	3.759	0.464	0.505^{***}	3.873
H8a: SOMP → EcP	0.288^{**}	2.187	0.315	0.419^{***}	3.030
H8b: SOMP → EvP	0.486^{***}	4.164	0.318	0.490^{***}	3.709
H8c: SOMP → ScP	0.283^{**}	2.239	0.369	0.355^{***}	2.610
H9: SCMP → SPerf	0.112^{ns}	0.778	0.464	0.122^{ns}	0.827
H9a: SCMP → EcP	0.020^{ns}	0.104	0.315	0.046^{ns}	0.222
H9b: SCMP → EvP	-0.022^{ns}	0.158	0.318	-0.022^{ns}	0.151
H9c: SCMP → ScP	0.269^{**}	2.025	0.369	0.280^{**}	2.061
SDB [b]1: SD[b] →EP	-0.210^{ns}	1.230			
SDB2: SD → TLC	-0.339^{ns}	1.658			
SDB3: SD → SSO	-0.144^{ns}	1.190			
SDB4: SD → SSMP	-0.130^{ns}	1.058			
SDB5: SD → SOMP	-0.118^{ns}	1.069			
SDB6: SD → SCMP	-0.115^{ns}	1.033			
SDB7: SD → SPerf	-0.293^{ns}	1.573			
SDB8: SD → EcP	-0.398^{ns}	1.769			
SDB9: SD → EvP	-0.012^{ns}	0.143			
SDB10: SD → ScP	-0.255^{ns}	1.599			

*** significant at $p < 0.01$, ** significant at $p < 0.05$, * significant at $p < 0.10$, ^{ns} not significant.

[a] R^2 values represent the explained variance for the endogenous variables.

[b] SDB refers to social desirability bias test; SD refers to social desirability construct.

† This test is based on the *initial* structural model, not the *revised* model.

Chapter 6

Summary, Implications, Limitations, and Future Research

This concluding chapter provides a summary of contributions and research findings (6.1), implications for research (6.2), implications for practitioners (6.3), and limitations and future research (6.4).

6.1. Summary

The objective of this study is to explore the extent to which sustainable supply chain management (SSCM) practices trigged by drivers and strategic orientation lead to a higher level of sustainability performance. These relationships are reported in the literature, but in most cases, the results are fragmented and anecdotal. Arguably, the overall framework that explains sustainability in the supply chain has not been well understood, because large-scale survey-based empirical research on this subject is seldom available in the supply chain literature (Kleindorfer et al., 2005; Linton et al., 2007; Carter and Rogers, 2008). The paucity of empirical-based SSCM research framework makes it difficult for both managers and researchers to understand the issues and thus prevents them from fruitfully undertaking SSCM in practice and research (Seuring and Muller, 2008).

Filling this gap, the current research was intended to explicate and broaden knowledge of SSCM by providing empirical evidence on how contemporary U.S. manufacturing firms implement sustainability initiatives. More specifically, the purpose of this study is to address what factors affect a corporation's decision to focus on the triple bottom line, and to what extent those influences ultimately result in tangible performance outcomes in regards to sustainability in the context of focal firms' supply chains. Toward this end, this study benchmarked the industry practices of SSCM using 212 large-scale surveys from U.S. manufacturing firms.

Given the dearth of empirical research on SSCM, this study represents one of the first large-scale empirical investigations of this subject. The key research questions that this research aimed to answer are: (1) Do external pressures (EPs) and the culture created by top leadership positively influence strategic sustainability orientation (SSO)? (2) How does SSO influence the supply chain management practices adopted by firms? (3) What supply chain management practices do firms implement to bring about favorable sustainability performance? (4) Do SSCM practices positively influence corresponding sustainability performance outcomes?

These research quesitons are examined through testing fifteen hypotheses (H1 to H9c). The original hypothesized relationships are tested using PLS structural equation modeling. The results showed that ten hypotheses (H1 to H6, H8a to H8c, and H9c) are significant, whereas five hypotheses (H7a to H7c and H9a and H9b) are found to be not supported. To explore alternative explainations, the original model was revised by estimating two additional relationships (SSMPs to SOMPs and SCMPs to SOMPs). The summary of the finings below is based on these revised models (See Figures 5.3.3.2.1, 5.3.3.2.2, 5.3.3.2.3, and 5.3.3.2.4).

The first research question is examined by hypotheses 1 to 3. The results revealed that institutional pressures have a direct effect on a firm's SSO but this direct effect is maginal. However, the indirect effect of institutional pressures on SSO through top leadership culture (TLC) is stronger. Institutional pressures represented by coercive, normative, and mimetic pressures change the structural responses by top management, the primary engine for sustainability. This top management-initiated leadership culture is a vehicle that helps a firm to form SSO. The finding thus suggests that while experiencing pressures from divergent stakeholders, firms must continue cultivating proactive and committed TLC for sustainability.

The second research question is examined by hypotheses 4 to 6. The findings of this research suggest that strategic orientation significantly stimulates firms' readiness to implement sustainability practices throughout the supply chain. This finding indicates that having strong SSO is a key for firms to mobilize the entire supply chain. In the presence of higher levels of SSO, firms are willing to share risks posed by sustainability by developing close relationships among supply chain partners, including suppliers and customers. At the same time, higher SSO enables firms to continue to optimize their internal operations processes to be conducive to sustainability.

To examine the third research question, the relevant practice variables are developed through comprehensive literature review, and their direct and indirect effects on economic, environmental, and social performance outcomes are extensively examined. This study builds on a significant number of previous studies on supply chain practices and their potential effects on operational, business, and environmental performance outcomes: supplier management practices (Klassen and Vachon, 2003; Krause et al., 2007; Modi and Mabert, 2007; Zhou and Benton, 2007), customer management practices (Klassen and Vachon, 2003; Li et al., 2005; Zhou and Benton, 2007), lean manufacturing practices (King and Lenox, 2001; Rothenberg et al., 2001; Shah and Ward, 2003, 2007; Yang et al., 2011), environmental management practices (Melnyk et al., 2003; Sroufe, 2003; Zhu and Sarkis, 2004; Montabon et al., 2007; Sarkis et al., 2010), corporate social responsibility practices (Carroll, 1979, 1991; Orlitzky et al., 2003; Carter, 2004; Hutchins and Sutherland, 2008; Pagell and Gobeli, 2009; Pullman et al., 2009; Jacobs et al., 2010), and corporate sustainability reporting practices (Jenkins and Yakovleva, 2006; Montabon et al., 2007; Brown et al., 2009).

However, this study not only confirms the previous results in those areas but also extends and broadens the knowledge into a focal firm's sustainable supply chain context. First, this study develops constructs for supplier management practices that measure economic, environmental, and social dimensions of sustainability and examines the indirect effect of these practices on operational, business, environmental, and social performance outcomes through a firm's operations management practices. Second, this study confirms that lean manufacturing practices (e.g., quality management [QM] and just-in-time [JIT] practices) are precursors of bringing positive benefits in operational, business, and environmental performance and that they can also improve social performance. Third, this research validates that firms' environmental management practices are contributable to the improvement of economic and environmental performance and that they are also of use to enhance social performance. Fourth, through this study, the positive relationships between corporate social responsibility practices and economic, environmental, and social performance are confirmed and examined. Fifth, the components of corporate sustainability reporting practices are developed and examined to determine whether they improve economic, environmental, and social performance. Sixth, this study extends a firm's customer management practices into the sustainability context and examines how they can contribute to improve operational, business, environmental, and social performance.

Finally, the fourth research question is examined by hypotheses 7 (H7a to H7c) through 9 (H9a to H9c). The research findings indicate that pooling supply chain capabilities in the form of concrete programs and practices in areas of operations management can accelerate improvement of economic, environmental, and social performance altogether. Findings suggest that firms cannot expect direct improvements in sustainability performance fromimplementing sustainability initiatives with suppliers. Rather there is an indirect effect because such initiatives help them to implement sustainable practices in internal operations which translate to better performance. The result also indicates a lack of support for the association between a firm's sustainable customer management practices and sustainable operations management practices. Customer management programs, however, have a direct effect on a firm's social performance such as corporate social image. In sum, when these supply chain practices are correctly aligned, they can bring advantages that are difficult for competitors to replicate and can add to the competitive advantage of the organization.

In providing an integrated framework based on existing literature and new conceptualizations and then conducting a large-scale survey, this research suggests that firms that seek to gain a sustainable competitive advantage from sustainability need to resolve the challenges by formulating the right kind of SSO from EPs and TLC through which firms use SSCM practices. This research also provides evidence of the direct positive potentials of sustainable operations management practices (SOMPs) along with the indirect positive influences of sustainable supplier/customer management practices. Therefore, it presents a first step in recognizing the implications of SSCM with sustainability performance objectives. The following sections will discuss the implications for academia and practitioners.

6.2. Implications for Research

This study draws on diverse theoretical perspectives, such as triple bottom line perspective, institutional theory, strategic choice theory, strategic orientation, and resource-based view of a firm (RBV). The empirical findings are mostly consistent with these theoretical views, and thus this study offers the theoretical contributions of triple bottom line, institutional theory, strategic choice theory, strategic orientation, and RBV to the study of sustainability within the operations management and supply chain literature.

First, this study tested the integrated model of a focal firm's SSCM, which was based on the triple bottom line perspective. Triple bottom line has been popularized as a useful lens to view sustainability and is thus conceptually well-established in the sustainability literature but is seldom investigated in the empirical research (Elkington, 1997; Kleindorfer et al., 2005; Carter and Rogers, 2008). By adopting triple bottom line as a primary theoretical base, this study examined the complex interrelationships among drivers, strategic orientation, practices, and performance in an inclusive way. Such an endeavor can contribute to the literature of triple bottom line by providing the overall nomological network of SSCM framework based on the large-scale survey.

Second, the results of this study provide synthesizing views on institutional theory (DiMaggio and Powell, 1983) and strategic choice theory (Child, 1972) for examining the complex business reality surrounding sustainability. Although institutional theory explains why firms adopt sustainability practices under certain pressures (Jennings and Zandbergen, 1995; King and Lenox, 2000; Lounsbury, 2001; Delmas, 2002), it does not explain why some firms take proactive actions under low EPs, whereas other firms remain passive even under high EPs (Delmas and Toffel, 2004). Strategic choice theory complements this gap by explaining the significant role of managerial discretion, interpretation, and perspective of top management in making strategic choices in the course of shaping sustainability actions (Child, 1972). Thus, the results of this study can contribute to both theories by offering a mediating role of TLC in the relationship between institutional pressures and strategic orientation in sustainability and supply chain literature.

Third, strategic orientation has been well-recognized in strategic management and marketing literature as a theoretical lens to examine the extent to which firms adapt or align their strategy to the external environment (Venkatraman, 1989; Kohli and Jaworski, 1990; Manu and Sriram, 1996; Morgan and Strong, 1998; Voss and Voss, 2000). A few scholars extended this theoretical view to environmental management (Klassen and Whybark, 1999; Defee et al., 2009). However, this theory has received little attention in studies on SSCM. Its inclusion in the theoretical framework developed for this study takes into account three factors of sustainability: economic, environmental, and social orientation. This study examines the direct influence of SSO on implementing supply chain practices adopted by firms along with the mediating role of SSO on the association between drivers and supply chain practices. This provides new insights into how SSO can play an important role in institutionalizing sustainability in the fabric of a focal firm's supply chain.

Fourth, this study broadens the knowledge of RBV by exploring the dynamics of relationships between SSCM practices and sustainability performance. RBV has been well-recognized in a variety of disciplines, such as management (Barney, 1991; Barney et al., 2001), strategic management (Rugman and Fouts, 1997; Capaldo, 2007; Amit and Schoemaker, 1993), operations management (Corbett and Claridge, 2002), information technology (Bharadwaj, 2000; Sambamurthy et al., 2003), and supply chain literature (Rai et al., 2006; Wu et al., 2006). Recently, studies on sustainable supply chains have adopted RBV as a theoretical base (Kleindorfer et al. 2005; Lee and Klassen, 2008; Pullman et al., 2009). Building on this line of research, this study can enrich the RBV literature by offering insights into how firms' intra- and interorganizational capabilities for sustainability can bring competitive advantages to the firm: (1) the direct effect of operations management programs on sustainability performance (economic, environmental, and social performance) and (2) the indirect effect of supplier/customer management programs on sustainability performance through operations management programs.

Fifth, this study provides a set of reliable and valid instruments for evaluating a focal firm's sustainable supply chain performance based on benchmarking firms' industry practices of supplier management, operations management, and customer management for sustainability. The constructs include EPs, TLC, SSO, sustainable supplier management practices (SSMPs), SOMPs, sustainable customer management practices

(SCMPs), and economic, environmental, and social performance. From a research standpoint, these empirically validated constructs will be useful and valuable tools to facilitate future studies of SSCM.

6.3. Implications for Practitioners

First, this study suggests that organizations do not fully integrate economic, environmental, and social components of sustainability into supply chain decision-making activities. This seems particularly obvious when it comes to implementing supplier management and customer management practices. Firms see differences in priority from the strategic level, but most often profit is placed ahead of the welfare of people and the planet during the implementation stage. For example, few firms fully engaged in evaluating and developing their key suppliers based on environmental and social criteria. Economic information, such as delivery schedule for products and order status, is shared far more often than environmental (i.e., environmental regulations and availability of new environmental safe components) or social information (i.e., fair labor practices and local community outreach initiatives). This result indicates that, although firms recognize the strategic importance of realizing sustainability in their entire supply chains, many are not fully integrating environmental and social components with economic profitability in managing suppliers. The discrepancy in integrating environmental and social components with economic sustainability is also true in a firm's customer management practices. Therefore, managers who engage in supply chain initiatives to improve sustainability performance should look for alternative ways to integrate all three dimensions of sustainability in their supply chains.

Second, the result of this study suggests that institutional pressures exerted on firms do not only directly influence their SSOs but also do positively affect their TLC. It also shows that institutional pressures indirectly influence firms' SSO through TLC. Combining these results, this study offers some important implications to managers: (1) proactive and committed TLC dedicated to improving sustainability becomes a critical precursor in relating EPs to strategic orientation for sustainability initiatives, (2) achieving sustainability performance does not occur as a result of short-run efforts; rather, it requires successful long-range planning, which requires top leadership's proactive managerial responses to EPs, and (3) stakeholder pressures alone cannot sufficiently drive firms to make real commitments to sustainability; top leaders whose strategy is clearly communicated, who support the organization, and who encourage employees to commit themselves to sustainability will create an environment that fosters sustainability (Epstein, 2008).

Third, this study indicates that SSO is a key intervening mechanism to transfer from the strategic level of sustainability to the operational level of sustainability implementation details. Strategic orientation to achieve sustainability pushes companies to change the design of products and processes to reduce waste and environmentally harmful effects and enhances corporate image in terms of social responsibility. Having such orientation helps managers create an idea of paying to be sustainable, and being sustainable is good for profit as well as for the planet (by doing little harm to the environment) and for people. Therefore, it would be worthwhile for corporations that are adopting sustainability initiatives to create SSO.

Fourth, this study implies that traditional operations management practices (e.g., lean manufacturing, environmental management system, corporate social responsibility practices) are more effective in improving each dimension of sustainability (economic, environmental, and social performance). In the complexity of the focal firm's supply chain, implementing operations management programs positively affects the firm's sustainability performance. These results suggest that companies can create economic profits, improve environmental performance, and enhance social legitimacy from organizational initiatives that eliminate waste and reduce variations from operations processes. Environmental management practices (e.g., environmental design, environmental recycling, and environmental management systems) also bring positive sustainability performance. This also proves that practices to release corporations' sustainability reports are valuable to firms in terms of profit, environment, and the society. Firms' social responsibility practices (e.g., employee wellbeing and equity practices, corporate social involvement practices) positively influence sustainability performance. Thus, managers can be convinced that benchmarking these practices to use in their firms will improve sustainability.

Fifth, managers may need to be cautious in implementing supplier management and customer management practices in their supply chains. Fostering supplier relationships requires strategic long-term commitment (Chen and Paulraj, 2004) and thus does not guarantee the short-term benefits of profitability, environmental improvement, and improved social legitimacy. Developing relationships with key customers also demands strategic and top-executive efforts. Therefore, firms that want to achieve a sustainable competitive advantage through supply chain practices need to find constant interactive communications with both upstream initiatives and internal operational processes.

6.4. Limitations and Future Research

As with all research endeavors, this research is not without limitations. The results of this study must be interpreted with caution in light of these limitations, and future investigations may extend this work by accounting for them. First, the primary respondents of this study come from small- and medium-sized companies (65%), whereas 35% of respondents came from large corporations. Thus, the results of this study are likely to cause some bias, because environmental management system and corporate social responsibility initiatives are mainly adopted by large organizations because of the high costs involved and the availability of resources. Large OEMs have well-developed supplier management systems (supplier certification, supplier audit for workplace practices) and polices for sustainability, but small- and medium-sized OEMs do not. Future studies may examine the research framework developed in this study surveying large organizations, such as Fortune 500 companies.

Second, this dissertation uses data from a single respondent (i.e., CEO, vice president, president, general manager, supply chain manager, etc.) in manufacturing industries (SIC 30 to 38) to test the complex supply chain issues in a single firm. Therefore, there is a potential for method bias in single respondent studies. To mitigate this common method bias caused by single respondents, this study adopted a social desirability measurement and included this construct in the measurement models and structural model to partial out this bias. In addition, in the beginning of the survey, all participants were asked whether they understand the supply chain of their firms, and if they are not qualified to answer questions related to sustainability issues in the supply chain, they are asked to withdraw from the survey. However, it is often ideal, although difficult, to collect data from multiple respondents or by multiple methods. Future research that replicates these results using multiple respondents or methods will be fruitful.

Third, each construct in the research model is carefully developed to ensure the triple bottom line perspective of sustainability. This effort could make the research model more complex than it should be. In light of this, some constructs (i.e., for SCMP, CMP_Ec and CMP_Sc) have single items. The model has a number of higher-order factors (e.g., second-order and third-order constructs), which can cause model identification and convergence issues because of the increased total number of parameter estimates (Peng and Lai, 2012). The problem of the complexity of the research model was alleviated by using PLS methodology. However, future studies may consider complementing these limitations by having more items for customer management practices as well as using other appropriate methodologies.

Fourth, the data is cross-sectional in nature. Therefore, it cannot differentiate statistically between short-term and long-term implications. One may conjecture that the nonsignificant implications of sustainable supplier/customer management practices are more short-term in nature and that the indirect positive implications are realized over a longer period. Longitudinal assessment with secondary data may help distinguish these effects and add to the body of knowledge regarding SSCM.

Fifth, this study considered only two drivers for adopting sustainability: EPs and TLC. Future studies may examine other factors (e.g., cultural differences, R&D readiness, information technology, and others) that antecede firms' sustainability strategies.

Sixth, the framework of this study was tested under U.S. manufacturing firms.

Future studies may examine how the sustainable supply chain framework developed in this study can be differently applied to different countries, because business environment, cultural backgrounds (e.g., employment standards or working conditions), and competitive pressures or regulations vary from country to country. Companies may need to adapt diverse corporate strategies and practices to reflect those differences. In light of this, future research can conduct a comparative study between developing countries, such as China and South Africa, and developed countries, such as the United States and countries in Europe.

Seventh, given the growing importance of studies on the role of governance in the supply chain, future studies may consider how different governance systems or structures can change the environment for organizational approaches to improve sustainability. For example, researchers may conduct a study on how setting standards for governance, including management responsibility and corporate culture, can change companies' sustainability strategies.

Eighth, this study did not consider the effect of collaboration and partnership on sustainability (Youn et al., 2012). Future studies may consider the effect of collaboration with nongovernmental organizations and partnerships with government on firms' sustainability performances.

References

ACCA, 2004. CorporateRegister.com. Towards transparency: progress on global sustainability reporting, London: Certified Accountants Educational Trust.

Allen-Gil, S., Walker, L., Thomas, G., Shevory, T., Elan, S., 2005. Forming a community partnership to enhance education in sustainability. International Journal of Sustainability in Higher Education 6(4), 392-402.

Amit, R., Schoemaker, J.H., 1993. Strategic assets and organizational rent. Strategic Management Journal 14(1), 33-46.

Anderson, J.C., Gerbing, D.W., 1988. Structural equation modeling in practice: a review and recommended two-step approach. Psychological Bulletin 103(3), 453-460.

Andersson, L., Bateman, T., 2000. Individual environmental initiative: Championing natural environmental issues in U.S. business organizations. Academy of Management Journal 43, 548–570.

Angell, L. C., Klassen, D., 1999. Integrating environmental issues into the mainstream: an agenda for research in operations management. Journal of Operations Management 17(5), 575-598.

Antonides, G., Raaij van, W.F., 1998. Consumer behavior from a European perspective. John Wiley and Sons.

Aragon-Correa, J., Sharma, S., 2003. A contingent resource-based view of proactive corporate environmental strategy. Academy of Management Review 28, 71-88.

Arts, B., 2002. Green alliances' of business and NGOs. New styles of self-regulation or 'dead-end roads'? Corporate Social Responsibility and Environmental Management 9(1), 26 - 36.

Autry, C.W., Grawe, S.J., Daugherty, P.J., Richey, R.G., 2010. The effects of technological turbulence and breadth on supply chain technology acceptance and adoption. Journal of Operations Management, 28(6), 522-536.

Awasthi, A., Chauhan, S.S., Goyal, S.K., 2010. A fuzzy multicriteria approach for evaluating environmental performance of suppliers. International Journal of Production Economics 126(2), 370-378.

Bai, C., Sarkis, J., 2010. Integrating sustainability into supplier selection with grey system and rough set methodologies. International Journal of Production Economics 124(1), 252-264.

Barney, J., 1991. Firm resources and sustained competitive advantage. Journal of Management 17 (1), 99–120.

Barney, J., Wright, M., Ketchen, D.J., 2001. The resource-based view of the firm: Ten years after 1991. Journal of Management 27(6), 625–641.

Barney, J., 1986. Organizational Culture: Can It Be a Source of Sustained Competitive Advantage? Academy of Management Review 11(3), 656-665.

Bass, B.M., Riggio, R.E., 2006. Transformational Leadership, 2nd ed. Lawrence Erlbaum Associates Publishers, Mahwah, NJ.

Baum, J.A.C., Oliver, C., 1991. Institutional linkages and organizational mortality. Administrative Science Quarterly 36, 187–218.

Beamon, B.M., 1999. Designing the green supply chain. Logistics Information Management 12(4), 332-342.

Beske, P., Koplin, J., Seuring, S., 2008. The use of environmental and social standards by German first-tier suppliers of the Volkswagen AG. Corporate Social Responsibility and Environmental Management 15(2), 63–75.

Bharadwaj, A.S., 2000. A resource-based perspective on information technology capability and firm performance: an empirical investigation. MIS Quarterly 24(1), 169-196.

Bowen, F.E., Cousins, P.D., Lamming, R.C., Farukt, A.C., 2001. The Role of Supply Management Capabilities in Green Supply. Production and Operations Management 10(2), 174-189.

Brown, H.S., de Jong, M., Levy, D.L., 2009. Building institutions based on information disclosure: lessons from GRI's sustainability reporting. Journal of Cleaner Production 17(6), 571-580.

Brown, K.A., 1996. Workplace safety: A call for research. Journal of Operations Management 14(2), 157-171.

Bunch, 2008: http://www.triplepundit.com/2008/11/postcard-from-beijing-insights-into-wal-mart%E2%80%9Aaos-sustainability-initiative/

Campbell, D.T., Fiske, D.W., 1959. Convergent and discriminant validation by the multitrait-multimethod matrix. Psychological bulletin, 56(2), 81.

Capaldo, A., 2007. Network structure and innovation: The leveraging of a dual network as a distinctive relational capability. Strategic Management Journal 28, 585-608.

Carroll, A.B., 1979. A three-dimensional conceptual model of corporate social performance. Academy of Management Review 4(4), 497–505.

Carroll, A.B., 1991. The pyramid of corporate social responsibility: toward the moral management of organizational stakeholders. Business Horizons 34(4), 39-48.

Carter Cerdan, C., Gazulla, C., Raugei, M., Martinez, E., Fullana-i-Palmer, P., 2009. Proposal for new quantitative eco-design indicators: a first case study. Journal of Cleaner Production 17(18), 1638-1643.

Carter, C.R., 2000. Ethical issues in international buyer–supplier relationships: a dyadic examination, Journal of Operations Management, 18, 191-208.

Carter, C.R., 2004. Purchasing and Social Responsibility: A Replication and Extension. Journal of Supply Chain Management, Fall 2004.

Carter, C.R., Rogers, D.S., 2008. A framework of sustainable supply chain management: moving toward new theory. International Journal of Physical Distribution and Logistics Management 38(5), 360-387.

Carter, J.R., Narasimhan, R., 1996. Purchasing and supply management: future directions and trends. Journal of Supply Chain Management 32(4), 2-12.

Chen, I.J., Paulraj, A., 2004. Towards a theory of supply chain management: the constructs and measurement. Journal of Operations Management 22(2), 119–150.

Chen, I.J., Paulraj, A., Lado, A.A., 2004. Strategic purchasing, supply management, and firm performance. Journal of Operations Management 22(5), 505-523.

Chin, W.W., 1995. Partial Least Squares is to LISREL as principal components analysis is to common factor analysis. Technology analysis 2, 315-319.

Chin, W.W., 1998. Issues and opinion on Structural Equation Modeling. MIS Quarterly 22(1), 7-16.

Chin, W.W., Marcolin, B.L., Newsted, P.R., 2003. A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo

Simulation Study and an Electronic-Mail Emotion/ Adoption Study, Information Systems Research, 14(2), 189-217.

Churchill, G.A., 1979. A Paradigm For Developing Better Measures Of Marketing Constructs. Journal of Marketing Research, 16(1), 64-73.

Clemens, B., Douglas, T.J., 2006. Does coercion drive firms to adopt 'voluntary' green initiatives? Relationships among coercion, superior firm resources, and voluntary green initiatives. Journal of Business Research 59 (4), 483-491.

Corbett, C.J., Klassen, R.D., 2006. Extending the Horizons: Environmental Excellence as Key to Improving Operations. Manufacturing & Service Operations Management 8(1), 5-22.

Corbett, L.M., Claridge, G.S., 2002. Key manufacturing capability elements and business performance. International Journal of Production Research 40(1), 109–131.

Cua, K.O., McKone, K.E., Schroeder, R.G., 2001. Relationships between implementation of TQM, JIT, and TPM and manufacturing performance. Journal of Operations Management 19(6), 675-694.

Dacin, M.T., Goodstein, J., Scott, W.R., 2002. Institutional theory and institutional change: Introduction to the special research forum. Academy of Management Journal 45, 45–57.

Daily, B.F., Huang, S., 2001. "Achieving sustainability through attention to human resource factors in environmental management," International Journal of Operations and Production Management 21(12), 1539-1552.

Darnall, N. et al., 2008. Do environmental management systems improve business performance in an international setting? Journal of International Management, 14, 364-376.

Darnall, N., Edwards Jr., D., 2006. Predicting the cost of environmental management system adoption: the role of capabilities, resources and ownership structure. Strategic Management Journal 27, 301–320.

Darnall, N., Jolley, G. J., Handfield, R., 2008. Environmental management systems and green supply chain management: complements for sustainability? Business Strategy and the Environment 17(1), 30 - 45.

Das, A., Narasimhan, R., Talluri, S., 2006. Supplier integration—Finding an optimal configuration. Journal of Operations Management 24(5), 563-582.

Das, A., Pagell, M., Behm, M., Veltri, A., 2008. Toward a theory of the linkages between safety and quality. Journal of Operations Management, 26(4), 521-535.

Daub, C., Ergenzinger, R., 2005. Enabling sustainable management through a new multi-disciplinary concept of customer satisfaction. European Journal of Marketing 39(9-10), 998-1012.

Daub, C., 2007. Assessing the quality of sustainability reporting: an alternative methodological approach. Journal of Cleaner Production 15(1), 75-85.

Defee, C. C., Esper, T., Mollenkopf, D., 2009. Leveraging closed-loop orientation and leadership for environmental sustainability. Supply Chain Management: An International Journal 14(2), 87-98.

Delmas, M., Toffel, M.W., 2004. Stakeholders and environmental management practices: An institutional framework. Business Strategy and the Environment 13(4), 209-222.

Devaraj, S., Krajewski, L., Wei, J.C., 2007. Impact of eBusiness technologies on operational performance: The role of production information integration in the supply chain. Journal of Operations Management, 25(6), 1199-1216.

Dias-Sardinha, I., Reijnders, L., 2005. Evaluating environmental and social performance of large Portuguese companies: a balanced scorecard approach. Business Strategy and the Environment 14(2), 73 - 91.

Dillman, Smyth, and Christian, 2009. Internet, mail, and mixed-mode surveys. The Tailored Design Method, Third Edition.

DiMaggio, P.J., Powell, W.W., 1983. The Iron Cage Revised: Institutional Isomorphism and Collective Rationality in Organizational Fields, American sociological review 48(2), 147-160.

Diniz, Janaina D.A.S., Fabbe-Costes, Nathalie., 2007. Supply Chain Management and Supply Chain Orientation: key factors for sustainable development projects in developing countries? *International Journal of Logistics: Research & Applications*, 10(3), 235-250.

Dobrzykowski, D.D., 2010. Linking Antecedents and Consequences of Value Density in the Healthcare Delivery Supply Chain, Doctoral dissertation, University of Toledo, Manufacturing and Technology Management.

Drumwright, M.E., 1994. Socially responsible organizational buying: environmental conc ern as a noneconomic buying criterion. Journal of Marketing 58(3), 1-19.

Dutton, J., Jackson, S., 1987. Categorizing strategic issues: Links to organizational action. Academy of Management Review 12, 76-90.

Dyllick, T., Hockerts, K., 2002. Beyond the business case for corporate sustainability.

Business Strategy and the Environment 11(2), 130–141.

Elkington, J., 1994. Towards the sustainable corporation: Win-win-win business strategie s for sustainable development. California Management Review 36 (2), 90-100.

Elkington, J., 1997. Cannibals with Forks: the Triple Bottom Line of Twenty First Century Business. Oxford: Capstone.

Elkington, J., 1998. Partnerships from cannibals with forks: The triple bottom line of 21st-century business. Environmental Quality Management 8(1), 37-51.

Emtairah, T., 2002. Corporate Environmental Reporting; Review of Action Policy in Europe, report prepared for the International Institute for Industrial Environmental Economics, Lund University.

Enander, R.T., Pannullo, D., 1990. Employee involvement and pollution prevention. The Journal for Quality and Participation, 50-53.

Epstein, M.J., 2008. Making sustainability work. Sheffield, UK: Greenleaf Publishing.

Erlandsson, J., Tillman, A., 2009. Analysing influencing factors of corporate environmental information collection, management and communication. Journal of Cleaner Production 17(9), 800-810.

Florida, R., 1996. Lean and green: the move to environmentally conscious manufacturing. California Management Review 39(1), 80-105.

Flynn, B.B., Flynn, E.J., 2004. An exploratory study of the nature of cumulative capabilities. Journal of Operations Management, 22(5), 439-457.

Flynn, B.B., Sakakibara, S., Schroeder, R.G., Bates, K.A., Flynn, E.J., 1990. Empirical research methods in operations management. Journal of Operations Management. 9(2), 250-284.

Flynn, B.B., Schroeder, R.G., Sakakibara, S., 1995. The Impact of Quality Management Practices on Performance and Competitive Advantage. Decision Sciences, 26(5), 659–691.

Forza, C., 2002. Survey research in operations management: a process-based perspective. International Journal of Operations Production Management, 22(2), 152-194.

Friedman, M., 1970. The social responsibility of business is to increase its profits. New York Times Magazine. 33 (Sept. 13).

Fullan, M., 2005. Leadership & Sustainability: system thinkers in action. Thousand Oaks, Calif. Corwin Press.

Fullerton, R.R., McWatters, C.S., Fawson, C., 2003. An examination of the relationships between JIT and financial performance. Journal of Operations Management 21(4), 383-404.

Gatignon, H., Xuereb, J.M., 1997. Strategic Orientation of the Firm and New Product Performance. Journal of Marketing Research 34(1), 77-90.

Gelderman, C. J., Semeijn, J., De Zoete, R., 2008. The use of coercive influence strategies by dominant suppliers. Journal of Purchasing and Supply Management 14(4), 220-229.

Gladwin, T.N., Kennelly, J.J., Krause, T.S., 1995. Shifting Paradigms for Sustainable Development: Implications for Management Theory and Research. Academy of Management Review 20(4), 874-907.

Goldberg, R.A., Yagan, J.D., 2007. McDonald' s Corp: Managing a Sustainable supply chain. Harvard Business Review.

Gordon, G., 1991. Industry determinants of organizational culture. Academy of Management Review 16(2), 396-415.

Graafland, J.J., 2002. Sourcing ethics in the textile sector: the case of C&A. Business Ethics: A European Review 11(3), 282–94.

Graham, G., Hardaker, G., 2000. Supply chain management across the Internet. International Journal of Physical Distribution & Logistics Management 30 (3-4), 286-295.

Grewal, R., Dharwadkar, R., 2002. The role of the institutional environment in marketing channels. Journal of Marketing 66, 82–97.

Gu, X., 2010. Toyota recalls: revealing the value of secure supply chain. Doctoral dissertation from Massachusetts Institute of Technology. Engineering Systems Division. [Online]. Available: http://hdl.handle.net/1721.1/59241.

Guide, D.R., van Wassenhove, L.N., 2001. Managing product returns for remanufacturing. Production & Operations Management 10(2), 142-155.

Gupta, A.K., Govindarajan, V., 1984. Business unit strategy, managerial characteristics, and business unit effectiveness at strategy implementation. Academy of Management Journal 27(1), 25-41.

Hair, J.F., Anderson, R.E., Tatham, R.L., Black, W.C., 1998. Multivariate data analysis. 5th ed. Upper Saddle River: Prentice Hall.

Hall, J. 2000. Environmental supply chain dynamics. Journal of Cleaner Production, 8(6), 455-471.

Hambrick, D.C., Mason, P.A., 1984. Upper Echelons: The organization as a reflection of its top managers. Academy of Management Review 9(2), 193-206.

Hamel, G., Prahalad, C.K., 2005. Strategic Intent. Harvard Business Review 83(7-8), 148-160.

Handfield, R.B., Walton, S.V., Seegers, L.K., Melnyk, S.A., 1997. 'Green' value chain practices in the furniture industry. Journal of Operations Management 15(4), 293-315.

Handfield, R.B., Walton, S.V., Sroufe, R., Melnyk, S.A., 2002. Applying environmental criteria to supplier assessment: A study in the application of the Analytical Hierarchy Process. European Journal of Operational Research 141(1), 70-87.

Handley, S.M., Benton, W.C., The influence of exchange hazards and power on opportunism in outsourcing relationships, Journal of Operations Management, 30, 55-68.

Hanna, M.D., Newman, W.R., Johnson, P., 2000. Linking operational and environmental improvement through employee involvement. International Journal of Operations & Production Management 20(2), 148-165.

Hannon, A., Callaghan, E.G., 2011. Definitions and organizational practice of sustainability in the for-profit sector of Nova Scotia. Journal of Cleaner Production 19(8), 877-884.

Harris, L.C., Crane, A., 2002. The greening of organizational culture: Management views on the depth, degree and diffusion of change. Journal of Organizational Change Management 15(3), 211-231.

Hart, S.L., 1995. A natural-resource-based view of the firm. The Academy of Management Review 20(4), 986-1014.

Hart, S.L., 2007. Capitalism at the crossroads: aligning business, earth, and humanity. Upper Saddle River, NJ: Wharton School Publishing.

Haunschild, P.R., Miner, A.S., 1997. Modes of Inter-organizational Imitation: The Effects of Outcome Salience and Uncertainty. Administrative Science Quarterly 42(4), 472-500.

Henriques, I., Sadorsky, P., 1996. The Determinants of an Environmentally Responsive Firm: An Empirical Approach. Journal of Environmental Economics and Management 30(3), 381-395.

Henriques, I., Sadorsky, P., 1999. The relationship between environmental commitment and managerial perceptions of stakeholder importance. Academy of Management Journal 42(1), 87-99.

Hervani, A. A., Helms, M. M., Sarkis, J., 2005. Performance measurement for green supply chain management. Benchmarking: An International Journal 12(4), 330-353.

Heugens, P.P., Lander, M.W., 2009. Structure! Agency! (And Other Quarrels): A Meta-Analysis of Institutional Theories of Organization, Academy of Management Journal 52(1), 61-85.

Hill, T., 2000. Manufacturing Strategy—Text and Cases, Palgrave: Hampshire, UK.

Ho., D.C.K., Au, K.F., Newton, E. (2002). Empirical research on supply chain management: a critical review and recommendations. International Journal of Production Research 40(17), 4415-4430.

Hoffman, A., 2000. Competitive Environmental Strategy: a Guide to the Changing Business Landscape. Island Press, Washington, D.C.

Holcomb, T.R., Hitt, A., 2007. Toward a model of strategic outsourcing. Journal of Operations Management 25(2), 464-481.

Hubbard, G., 2009. Measuring organizational performance: beyond the triple bottom line. Business Strategy and the Environment 18(3), 177-191.

Hutchins, M.J., Sutherland, W., 2008. An exploration of measures of social sustainability and their application to supply chain decisions. Journal of Cleaner Production 16(15), 1688-1698.

ISO, 2006, 2007. The ISO survey of certification.

Jacobs, B.W., Singhal, V.R., Subramanian, R., 2010. An empirical investigation of environmental performance and the market value of the firm. Journal of Operations Management 28(5), 430-441.

Jaworski, B.J., Kohli, A.K. (1993). Market orientation: antecedents and consequences. Journal of Marketing 57(3), 53-70.

Jenkins, H., Yakovleva, N., 2006. Corporate social responsibility in the mining industry: Exploring trends in social and environmental disclosure. Journal of Cleaner Production 14(3-4), 271-284.

Jennings, P.D., Zandbergen, P.A., 1995. Ecologically sustainable organizations: An Institu tional Approach. Academy of Management Review 20(4), 1015-1052.

Jiménez, J.d.B., Lorente, J.J.C., 2001. Environmental performance as an operations objective. International Journal of Operations & Production Management 21(12), 1553-1572.

John, C.H.S., Cannon, A.R., Pouder, R.W., 2001. Change drivers in the new millennium: implications for manufacturing strategy research. Journal of Operations Management 19, 143–160.

Joreskog, K.G., 1971. Simultaneous Factor analysis in several populations. Psychometrika 57, 409–426.

Jørgensen, K.,2008. A systematic use of information from accidents as a basis of prevention activities. Safety Science 46(2), 164-175.

Kahneman, D., Tversky, A., 1979. Prospect theory: An analysis of decision under risk. Econometrica 47(2), 263-291.

Kaler, J., 2002. Responsibility, accountability and governance. Business Ethics: A European Review 11(4), 327-334.

Keeble, J.J., Topiol, S., Berkeley, S., 2003. Using Indicators to Measure Sustainability Performance at a Corporate and Project Level. Journal of Business Ethics 44(2), 149-158.

Ketokivi, M.A., Schroeder, R.G., 2004. Strategic, structural contingency and institutional explanations in the adoption of innovative manufacturing practices. Journal of Operations Management 22(1), 63-89.

Khanna, M., Anton, W.R.Q., 2002. What is Driving Corporate Environmentalism: Opportunity or Threat? Corporate Environmental Strategy 9(4), 409-417.

King, A.A, Lenox, M.J., 2000. Industry self-regulation without sanctions: the chemical industry's responsible care program, Academy of Management Journal 43(4), 698-716.

King, A.A., Lenox, M.J., 2001. Lean and Green? An Empirical Examination of the Relationship between Lean Production and Environmental Performance. Production and Operations Management 10(3), 244-256.

Kitazawa, S., Sarkis, J., 2000. The relationship between ISO 14001 and continuous source reduction programs. International Journal of Operations & Production Management 20(2), 225-248.

Klassen, R.D., Vachon, S., 2003. Collaboration and Evaluation in the Supply Chain: The Impact on Plant-Level Environmental Investment. Production and Operations Management 12 (3), 336-352.

Klassen, R.D., Whybark, D.C., 1999, Environmental Management in Operations: The Selection of Environmental Technologies. Decision Sciences 30(3), 601–631.

Klassen, R.D., McLaughlin, C.P., 1996. The impact of environmental management on firm performance. Management Science 42(8), 1199-1214.

Kleindorfer, P.R., Singhal, K., Van Wassenhove, L.N., 2005. Sustainable Operations Management. Production and Operations Management 14(4), 482-492.

Knight, P., Jenkins, O., 2009. Adopting and applying eco-design techniques: a practitioners perspective. Journal of Cleaner Production 17(5), 549-558.

Kohli, A.K., Jaworski, B.J., 1990. Market Orientation: The Construct, Research Propositions, and Managerial Implications. Journal of Marketing 54, 1-18.

Koplin, J., Seuring, S., Mesterharm, M., 2007. Incorporating sustainability into supply management in the automotive industry – the case of the Volkswagen AG. Journal of Cleaner Production 15, 1053-1062.

Kornbluh, H., Crowfoot, J., Cohen-Rosenthal, E., 1989. Worker Participation In Energy and Natural Resource Conservation. International Labour Review 124(6), 737-754.

Kostova, T., Roth, K., 2002. Adoption of an Organizational Practice by Subsidiaries of Multinational Corporations: Institutional and Relational Effects. Academy of Management Journal, 45(1), 215-233.

Kotler, P., Lee, N., 2005. Corporate Social Responsibility: Doing the Most Good for Your Company and Your Cause, John Wiley and Sons, New York, pp. 21.

Kotter, J.P., 1990. A force for change: How leadership differs from management. New York, NY: Free Press.

Kotter, J.P., 2007. Leading change. Harvard Business Review 85(1), 96-103.

Kotter, J.P., Cohen, D.S., 2002. The Heart of Change, Harvard Business School Press, Cambridge, MA.

Koufteros, X.A., Vonderembse, M.A., Doll, W.J., 1998. Developing measures of time-based manufacturing. Journal of Operations Management 16(1), 21-41.

Kovács, G., 2008. Corporate environmental responsibility in the supply chain. Journal of Cleaner Production 16 (15), 1571-1578.

KPMG, 2008. International Survey of Corporate Responsibility Reporting. Retrieved May 07, 2011 from http://www.kpmg.com/LU/en/IssuesAndInsights/Articlespublications/Documents/KPMG-International-Survey-on-Corporate-Responsibility-Reporting.pdf

Krasnikov, A., Jayachandran, S., Kumar, V., 2009. The Impact of Customer Relationship Management Implementation on Cost and Profit Efficiencies: Evidence from the US Commercial Banking Industry. Journal of Marketing 73(6), 61-76.

Krause, D.R., 1999. The antecedents of buying firms' efforts to improve suppliers. Journal of Operations Management 17(2), 205-224.

Krause, D.R., Handfield, R.B., Tyler, B.B., 2007. The relationships between supplier development, commitment, social capital accumulation and performance improvement. Journal of Operations Management 25(2), 528-545.

Krause, D.R., Pagell, M., Curkovic, S., 2001. Toward a measure of competitive priorities for purchasing. Journal of Operations Management. 19(4), 497-512.

Krikke, H., Bloemhof-Ruwaard, J., van Wassenhove, L.N., 2003. Concurrent product and closed-loop supply chain design with an application to refrigerators. International Journal of Production Research 41(16), 3689-3719.

Kristal, M., Huang, X., Roth, A., 2010. The effect of an ambidextrous supply chain strategy on combinative competitive capabilities and business performance. Journal of Operations Management 28(5), 415-429.

Kroes, J., Ghosh, S., 2010. Outsourcing congruence with competitive priorities: Impact on supply chain and firm performance. Journal of Operations Management 28(2), 124-143.

Kurk, F., Eagan, P., 2008. The value of adding design-for-the-environment to pollution prevention assistance options. Journal of Cleaner Production 16(6), 722-726.

Larsen, L.B., 2000. Strategic Implication of Environmental Reporting. Corporate Environmental Strategy 7(3), 276-287.

Lee, H.L., So, K.C., Tang, C.S., 2000. Value of information sharing in a two-level supply chain. Management Science 46 (5), 626-643.

Lee, S., Klassen, D., 2008. Drivers and Enablers That Foster Environmental Management Capabilities in Small- and Medium-Sized Suppliers in Supply Chains. Production and Operations Management 17(6), 573-586.

Li, S., Lin, B., 2006. Accessing information sharing and information quality in supply chain management. Decision Support Systems 42(3), 1641-1656.

Li, S., Rao, S.S., Ragu-Nathan, T.S., Ragu-Nathan, B., 2005. Development and validation of a measurement instrument for studying supply chain management practices. Journal of Operations Management 23(6), 618-641.

Linderman, K., Schroeder R. G., Choo A.. 2006. Six Sigma: The role of goals in improvement teams. Journal of Operations Management 24(6), 779-790.

Linton, J. D., Klassen, R., Jayaraman, V., 2007. Sustainable supply chains: An introduction. Journal of Operations Management 25(6), 1075-1082.

Lippmann, S., 1999. Supply chain environmental management: elements for success. Environmental Management, 6 (2), 175–182.

Liu, H., Ke, W., Wei, K.K., Gu, J., Chen, H., 2010. The role of institutional pressures and organizational culture in the firm's intention to adopt internet-enabled supply chain management systems. Journal of Operations Management 28(5), 372-384.

Lounsbury, M., 2001. Institutional sources of practice variation: staffing college and university recycling programs. Administrative Science Quarterly 46(1), 29-56.

Lubin, D., Esty, D.C., 2010. The Sustainability Imperative. Harvard Business Review 88(5), 42-50.

Luo, X., Bhattacharya, C.B., 2006. Corporate Social Responsibility, Customer Satisfaction, and Market Value. Journal of Marketing 70(4), 1-18.

Luo, X., Bhattacharya, C.B., 2009. The debate over doing good: Corporate social performance, firm marketing levers and firm-idiosyncratic risk. Journal of Marketing 73(6), 198-213.

Majumdar, S.K., Marcus, A.A., 2001. Rules versus discretion: the productivity consequences of flexible regulation. Academy of Management Journal 44(1), 170-179.

Manning, K.C., Bearden, W.O., Tian, K., 2009. Development and validation of the Agent's Socially Desirable Responding (ASDR) scale. Marketing Letters 20(1), 31-44.

Manu, F.A., Sriram, V., 1996. Innovation, Marketing Strategy, Environment, and Performance. Journal of Business Research 35(1), 79-91.

Mason-Jones, R., Naylor, B., Towill, D.R., 2000. Engineering the leagile supply chain. International Journal of Agile Management Systems 2(1), 54-61.

Matos, S., Hall, J., 2007. Integrating sustainable development in the supply chain: The case of life cycle assessment in oil and gas and agricultural biotechnology. Journal of Operations Management 25(6), 1083-1102.

McFadden, K.L., Henagan, S.C., Gowen, C.R., 2009. The patient safety chain: Transformational leadership's effect on patient safety culture, initiatives, and outcomes. Journal of Operations Management 27(5), 390-404.

McFadden, K.L., Hosmane, B.S., 2001. Operations safety: an assessment of a commercial aviation safety program. Journal of Operations Management, 19(5), 579-591.

McKone, K.E., Schroeder, R.G., Cua, K.O., 1999. Total productive maintenance: a contextual view. Journal of Operations Management 17(2), 123-144.

Melnyk, S.A., Sroufe, R.P., Calantone, R.J., 2003. Assessing the impact of environmental management systems on corporate and environmental performance. Journal of Operations Management 21(3), 329-351.

Menor, L.J., Kristal, M.M., Rosenzweig, E.D., 2007. Examining the influence of operational intellectual capital on capabilities and performance. Manufacturing & Service Operations Management 9(4), 559-578.

Mentzer, J.T., Min, S., Zacharia, Z.G., 2000. The nature of interfirm partnering in supply chain management. Journal of Retailing 76(4), 549-568.

Min, H., Galle, P., 2001. Green purchasing practices of US firms. International Journal of Operations & Production Management 21(9), 1222-1238.

Modi, S.B., Mabert, V.A., 2007. Supplier development: improving supplier performance through knowledge transfer. Journal of Operations Management. 25(1), 42-64.

Monczka, R.M., Trent, R.J., Callahan, T.J., 1993. Supply base strategies to maximize supplier performance. International Journal of Physical Distribution and Logistics Management 23(4), 42–54.

Montabon, F., Sroufe, R., Narasimhan, R., 2007. An examination of corporate reporting, environmental management practices and firm performance. Journal of Operations Management 25(5), 998-1014.

Morgan, R.E., Strong, C.A., 1998. Market orientation and dimensions of strategic orientation. European Journal of Marketing 32(11/12), 1051-1073.

Morhardt, J.E., Baird, S., Freeman, K., 2002. Scoring corporate environmental and sustainability reports using GRI 2000, ISO 14031 and other criteria. Corporate Social Responsibility and Environmental Management 9(4), 215–233.

Mukherjee, A., Muga, H., 2010. An integrative framework for studying sustainable practices and its adoption in the AEC industry: A case study. Journal of Engineering and Technology Management 27(3), 197-214.

Nakano, K.,Hirao, M., 2011. Collaborative activity with business partners for improvement of product environmental performance using LCA. Journal of Cleaner Production 19(11), 1189-1197.

Narasimhan, R., Jayaram, J., 1998. Causal linkages in supply chain management: an exploratory study of North American manufacturing firms. Decision Sciences 29(3), 579-605.

Narasimhan, R., Kim, S.W., 2002. Effect of supply chain integration on the relationship between diversification and performance: Evidence from Japanese and Korean firms. Journal of Operations Management 20(3), 303–323.

Narasimhan, R., Mahapatra, S., Arlbjørn, J., 2008. Impact of relational norms, supplier development and trust on supplier performance. Operations Management Research 1(1), 24–30.

Narasimhan, R., Swink, M., Kim, S.W., 2006. Disentangling leanness and agility: An empirical investigation. Journal of Operations Management 24(5), 440-457.

Nawrocka, D., Brorson, T., Lindhqvist, T., 2009. ISO 14001 in environmental supply chain practices. Journal of Cleaner Production 17(16), 1435-1443.

Nidumolu, R., Prahalad, C.K., Rangaswami, M.R., 2009. Why Sustainability Is Now The Key Driver Of Innovation. Harvard Business Review 87(9), 56-64.

Nutt, P.C., 1984. Types of organizational decision processes. Administrative Science Quarterly 29(3), 414-450.

Ohnsman, A., Green, J., Inoue, K., 2010. The Humbling of Toyota. Business Week. [Online]. Available: http://www.businessweek.com/magazine/content/10_12/b4171032583967.htm

Oliver, C., 1997. Sustainable competitive advantage: Combing institutional and resource-based views. Strategic Management Journal 18(9), 697-713.

Orlitzky, M., Schmidt, F.L., Rynes, S.L., 2003. Corporate social and financial performance: A meta-analysis. Organization Studies 24(3), 403–441.

Pagell, M., Gobeli, D., 2009. How Plant Managers' Experiences and Attitudes Toward Sustainability Relate to Operational Performance. Production and Operations Management 18(3), 278-299.

Pagell, M., Wu, Z., 2009. Building a More Complete Theory of Sustainable Supply Chain Management Using Case Studies of 10 Exemplars. Journal of Supply Chain Management 45(2), 37-56.

Park, J., Brorson, T., 2005. Experiences of and views on third-party assurance of corporate environmental and sustainability reports. Journal of Cleaner Production 13(10-11), 1095-1106.

Peng, D.X., Lai, F., 2012. Using partial least squares in operations management research: A practical guideline and summary of past research, Journal of Operations Management, 30, 467-480.

Perez-Batres, L.A, Miller, V.V., Pisani, M.J., 2011. Institutionalizing sustainability: An empirical study of corporate registration and commitment to the United Nations global compact guidelines. Journal of Cleaner Production 19(8), 843-851.

Pil, F.K., Rothenberg, S., 2003. Environmental Performance as a Driver of Superior Quality. Production and Operations Management 12(3), 404–415.

Plambeck, E., 2007. The Greening of Wal-Mart’s Supply Chain. Supply Chain Management Review, 11(5), p. 18.

Podsakoff, P.M., MacKenzi, S.B., Lee, J.Y., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. Journal of Applied Psychology 88(5), 879–903.

Prahinski, C., Benton, W., 2004. Supplier evaluations: communication strategies to improve supplier performance. Journal of Operations Management 22 (1), 39-62.

Preston, L., 2001. Sustainability at Hewlett-Packard. California Management Review 43(3), 26-37.

Preuss, L., 2001. In dirty chains? Purchasing and greener manufacturing. Journal of Business Ethics 34(3–4), 345–59.

Pullman, M. E., Maloni, M. J., Carter, C. R., 2009. Food For Thought: Social versus Environmental Sustainability Practices and Performance Outcomes. Journal of Supply Chain Management 45(4), 38-54.

Purdy, L., Safayeni, F., 2000. Strategies for supplier evaluation: a framework for potential advantages and limitations. IEEE Transactions on Engineering Management 47(4), 435-443.

Quak, H., de Koster, M., 2007. Exploring retailers' sensitivity to local sustainability policies. Journal of Operations Management 25(6), 1103-1122.

Rai, A., Patnayakuni, R., Seth, N., 2006. Firm performance impacts of digitally enabled supply chain integration capabilities. MIS Quarterly 30(2), 225-246.

Rao, P., Holt, D., 2005. Do green supply chains lead to competitiveness and economic performance? International Journal of Operations & Production Management 25(9), 898-916.

Reed, M.S., Fraser, E.D., Dougill, A.J., 2006. An adaptive learning process for developing and applying sustainability indicators with local communities. Ecological Economics 59(4), 406-418.

Reed, K.E., 2002. Everyone Takes the Field: How 3M Encourages Employee Involvement in Promoting Sustainable Development. Corporate Environmental Strategy 9(4), 383-389.

Roberts, P.W., Greenwood, R., 1997. Integrating transaction cost and institutional theorie s: Toward a constrained-efficiency framework for understanding organizational desi gn adoption. Academy of Management Review 22(2), 346-373.

Rogers, K.W., Purdy, L., Safayeni, F., Duimering, P.R., 2007. A supplier development program: Rational process or institutional image construction? Journal of Operations Management 25(2), 556-572.

Rosenzweig, E.D., Roth, A.V., Dean Jr, J.W., 2003. The influence of an integration strategy on competitive capabilities and business performance: An exploratory study of consumer products manufacturers. Journal of Operations Management 21(4), 437-456.

Rothenberg, S., Pil, F.K., Maxwell, J., 2001. Lean, Green, and the Quest for Superior Environmental Performance. Production and Operations Management 10(3), 228-243.

Rugman, A.M., Verbeke, A., 1998. Corporate strategies and environmental regulations: An organizing framework. Strategic Management Journal 19(4), 363-375.

Russo, M.V., Fouts, P.A., 1997. A resource based perspective on corporate environmental performance and profitability. Academy of Management Journal 40(3), 534–559.

Saha, D., 2009. Empirical research on local government sustainability efforts in the USA: gaps in the current literature. Local Environment 14(1), 17-30.

Sahin, F., Robinson, E.P., 2002. Flow Coordination and Information Sharing in Supply Chains: Review, Implications, and Directions for Future Research. Decision Sciences 33(4), 505-536.

Sahin, F., Robinson, E.P., 2005. Information sharing and coordination in make-to-order supply chains. Journal of Operations Management 23(6), 579-598.

Sambamurthy, V., Bharadwaj, A., Grover, V., 2003. Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. MIS Quarterly 27(2), 237-263.

Sarkis, J., Gonzalez-Torre, P., Adenso-Diaz, B., 2010. Stakeholder pressure and the adoption of environmental practices: The mediating effect of training, Journal of Operations Management 28(2), 163-176.

Sarkis, J., Talluri, S., 2002. A Model for Strategic Supplier Selection. Journal of Supply Chain Management 38(1), 18–28.

Sarkis, J., 2001. Manufacturing's role in corporate environmental sustainability - Concerns for the new millennium. International Journal of Operations & Production Management 21(5-6), 666-686.

Sawyer, A.G., 1982. Statistical Power and Effect Size in Consumer Research. in Advances in Consumer Research Volume 09, eds. Andrew Mitchell, Advances in Consumer Research Volume 09 : Association for Consumer Research, Pages: 1-7.

Scott, W.R., 1987. The adolescence of institutional theory, Administrative Science Quarterly 32, 493–511.

Scott, W.R., 1995. Institutions and Organizations. Sage, Thousand Oaks, CA.

Scott, W.R., Meyer, J.W., 1983. The organization of societal sectors' in organizational environments: ritual and rationality. John W. Meyer and W. Richard Scott (eds.), 129-153. Beverly Hills, CA: Sage.

Segalà, S,J., Ferrer-Balas, D., Mulder, K. (2010). What do engineering students learn in sustainability courses? The effect of the pedagogical approach. Journal of Cleaner Production 18(3), 275-284.

Seuring, S., Muller, M., 2008. From a literate review to a conceptual framework for sustainable supply chain management. Journal of Cleaner production 16(15), 1699-1710.

Sezen, B., 2008. Relative effects of design, integration and information sharing on supply chain performance. Supply Chain Management: An International Journal 13(3), 233-240.

Shah, R., Ward, P.T., 2003. Lean manufacturing: context, practice bundles, and performance. Journal of Operations Management 21(2), 129-149.

Shah, R., Ward, P.T., 2007. Defining and developing measures of lean production. Journal of Operations Management 25(4), 785-805.

Sharfman, M.P., Shaft, T.M., Anex, R.P., 2009. The road to cooperative supply-chain environmental management: trust and uncertainty among pro-active firms. Business Strategy and the Environment 18(1), 1-13.

Sharma, S., 2000. Managerial interpretations and organizational context as predictors of corporate choice of environmental strategy. Academy of Management Journal 43(4), 681–697.

Sharma, S., Henriques, I., 2005. Stakeholder influences on sustainability practices in the Canadian forest products industry. Strategic Management Journal 26(2), 159-180.

Shrivastava, P., 1995. The Role of Corporations in Achieving Ecological Sustainability. Academy of Management Review 20(4), 936-960.

Simison, R.L., White, J., 1999. Honda, Toyota to introduce hybrid' cars in U.S. *Wall Street Journal* - Eastern Edition 234, (66), A39C. 1999.

Spekman, R.E., Kamauff, J., Spear, J., 1999. Towards more effective sourcing and supplier management. Journal of Purchasing and Supply Management 5(2), 103-116.

Spicer, A., Johnson, M., 2004. Third-party demanufacturing as a solution for extended producer responsibility. Journal of Cleaner Production 12(1), 37-45.

Sroufe, R., 2003. Effect of environmental management systems on environmental management practices and operations. Production and Operations Management Journal 12(3), 416-431.

Starik, M., Rands, G.P., 1995. Weaving an Integrated Web: Multilevel and Multisystem perspectives of Ecologically Sustainable Organizations, Academy of Management Review 20(4), 908-935.

Stenson, J., 2006. Disaster management as a tool for sustainable development: a case study of cyanide leaching in the gold mining industry. Journal of Cleaner Production 14(3-4), 230-233.

Swink, M., Narasimhan, R., Kim, S. W., 2005. Manufacturing Practices and Strategy Integration: Effects on Cost Efficiency, Flexibility, and Market-Based Performance. Decision Sciences 36(3), 427-457.

Székely, F., Knirsch, M., 2005. Responsible Leadership and Corporate Social Responsibility. European Management Journal 23(6), 628-647.

Tan, J., Peng, H.W., 2003. Organizational slack and firm performance during economic transitions: two studies from an emerging economy. Strategic Management Journal 24, 1249–1263.

Teo, H.H., Wei, K.K., Benbasat, I., 2003. Predicting Intention to Adopt Inter-organizational Linkages: An Institutional Perspective, MIS Quarterly 27(1), 19-49.

Tsai, W., Chou, Y., 2008. Governmental policies on hydrochlorofluorocarbons (HCFCs) mitigation and its cleaner production measures – case study in Taiwan. Journal of Cleaner Production 16(5), 646-654.

Tu, Q., Vonderembse, M.A., Ragu-Nathan, T.S., Sharkey, T.W., 2006. Absorptive capacity: Enhancing the assimilation of time-based manufacturing practices. Journal of Operations Management 24(5), 692-710.

Vachon, S., Klassen, R.D., 2008. Environmental management and manufacturing performance: The role of collaboration in the supply chain. International Journal of Production Economics 111(2), 299-315.

Vachon, S., Mao, Z., 2008. Linking supply chain strength to sustainable development: a country-level analysis. Journal of Cleaner Production 16(15), 1552-1560.

van Bommel, W.H., 2011. A conceptual framework for analyzing sustainability strategies in industrial supply networks from an innovation perspective. Journal of Cleaner Production 19(8), 895-904.

Venkatraman, N., 1989. Strategic Orientation of business enterprises: The construct, dimensionality, and measurement. Management Science 35(8), 942-962.

Voss, G.B., Voss. Z.G., 2000. Strategic Orientation and Firm Performance in an Artistic Environment. Journal of Marketing 64(1), 67-83.

Vredenburgh, A.G., 2002. Organizational safety: Which management practices are most effective in reducing employee injury rates? Journal of safety Research 33(2), 259–276.

Waheed, B., Khan, F. I., Veitch, B., Hawboldt, K., 2011. Uncertainty-based quantitative assessment of sustainability for higher education institutions. Journal of Cleaner Production 19(6-7), 720-732.

Walley, N., Whitehead, B., 1994. It's not easy being green. Harvard Business Review 72(3), 46–52.

Womack, J., Jones, D., Roos, D., 1990. The Machine That Changed the World. Macmillan, New York.

Wood, D.J., 1991. Corporate social performance revisited. Academy of Management Review, 16(4), 691-718.

World Business Council for Sustainable Development (WBCSD), 2002. Sustainable development reporting: striking the balance, WBCSD: Geneva, Switzerland, p.7.

World Commission on Environment and Development (WCED). 1987. Our Common Future. Brussels. Brundtland Report.

Wu, F., Yeniyurt, S., Kim, D., Cavusgil, S.T., 2006. The impact of information technology on supply chain capabilities and firm performance: A resource-based view. Industrial Marketing Management 35(4), 493-504.

Yang, C., Lin, S., Chan, Y., Sheu, C., 2010. Mediated effect of environmental management on manufacturing competitiveness: An empirical study. International Journal of Production Economics 123(1), 210-220.

Yang, M., Hong, P., Modi, S.B., 2011. Impact of lean manufacturing and environmental management on business performance: An empirical study of manufacturing firms. International Journal of Production Economics 129(2), 251-261.

Youn, S., Yang, M., Hong, P., and Park, K., 2012 (In Press). Strategic Supply Chain Partnership, Environmental Supply Chain Management Practices, and Performance Outcomes: An Empirical Study of Korean Firms. Journal of Cleaner Production. http://dx.doi.org/10.1016/j.jclepro.2011.09.026.

Zhang, X., Shen, L., Wu, Y., 2011. Green strategy for gaining competitive advantage in housing development: a China study. Journal of Cleaner Production 19 (2-3), 157-167.

Zhu, Q., Sarkis, J., 2004. Relationships between operational practices and performance among early adopters of green supply chain management in Chinese manufacturing enterprises. Journal of Operations Management 22(3), 265-289.

Zhu, Q., Sarkis, J., Geng, Y., 2005. Green supply chain management in China: pressures, practices and performance. International Journal of Operations & Production Management 25(5), 449-468.

Zhu, Q., Sarkis, J., Lai, K., 2008. Confirmation of a measurement model for green supply chain management practices implementation. International Journal of Production Economics 111(2), 261-273.

Zhu, Q., Sarkis, J., 2007. The moderating effects of institutional pressures on emergent green supply chain practices and performance. International Journal of Production Research 45(18-19), 4333-4355.

Zohar, D., Luria, G., 2005. A multilevel model of safety climate. Cross-level relationships between organization and group-level climates. Journal of Applied Psychology 90(4), 616–628.

Zsidisin, G.A., Melnyk, S.A., Ragatz, G.L., 2005. An institutional theory perspective of business continuity planning for purchasing and supply management. International Journal of Production Research 43(6), 3401-3420.

Appendix A

Measurement Items [Pilot Study]

SUSTAINABILLITY DRIVERS

External Pressures (EP)
Coercive Pressures (CP)
CP1 Government regulations obligate us to comply with environmental preservation.
CP2 Government regulations compel us to abide by social justice.
CP3 Our main customers require us to improve cost performance.
CP4 Our key customers require us to improve environmental performance.
CP5 Our primary customers require us to improve social performance.
CP6 Our parent company demands that we adopt productivity initiatives.
CP7 Our parent company requires that we adopt environmental initiatives.
CP8 Our parent company compels that we adopt social initiatives.

Normative Pressures (NP)
NP1 Economic initiatives [a] have been widely influenced by our important suppliers.
NP2 Economic initiatives [a] have been widely influenced by labor unions.
NP3 Economic initiatives [a] have been widely influenced by trade associations.
NP4 Economic initiatives [a] have been widely influenced by local communities.
NP5 Economic initiatives[a] have been widely influenced by environmental interest groups.
NP6 Economic initiatives [a] have been widely influenced by employees' suggestions.
NP7 Environmental initiatives [b] have been widely influenced by our important suppliers.
NP8 Environmental initiatives [b] have been widely influenced by labor unions.
NP9 Environmental initiatives [b] have been widely influenced by trade associations.
NP10 Environmental initiatives [b] have been widely influenced by local communities.
NP11 Environmental initiatives [b] have been widely influenced by environmental interest groups.
NP12 Environmental initiatives[b] have been widely influenced by employees' suggestions.
NP13 Social initiatives [c] have been widely influenced by our important suppliers.
NP14 Social initiatives [c] have been widely influenced by labor unions.
NP15 Social initiatives [c] have been widely influenced by trade associations.
NP16 Social initiatives [c] have been widely influenced by local communities.
NP17 Social initiatives [c] have been widely influenced by environmental interest groups.

NP18 Social initiatives [c] have been widely influenced by employees' suggestions.

[a] Economic initiatives (e.g., quality or productivity improvement program)
[b] Environmental initiatives (e.g., recycling or pollution control program)
[c] Social initiatives (e.g., employee development or charity to the local communities)

Mimetic Pressures (MP)

MP1 When our main competitors adopt economic initiatives [a], they benefit greatly.
MP2 When our main competitors adopt economic initiatives [a], they are perceived favorably by customers.
MP3 When our main competitors adopt economic initiatives [a], they are more competitive.
MP4 When our main competitors adopt environmental initiatives [b], they benefit greatly.
MP5 When our main competitors adopt environmental initiatives [b], they are perceived favorably by customers.
MP6 When our main competitors adopt environmental initiatives [b], they are more competitive.
MP7 When our main competitors adopt social initiatives [c], they benefit greatly.
MP8 When our main competitors adopt social initiatives [c], they are perceived favorably by customers.
MP9 When our main competitors adopt social initiatives [c], they are more competitive.

[a] Economic initiatives (e.g., quality or productivity improvement program)
[b] Environmental initiatives (e.g., recycling or pollution control program)
[c] Social initiatives (e.g., employee development or charity to the local communities)

Top Leadership Culture (TLC)

Managerial Attitude and Perspective (MAP)

MAP1 Our top management believes that our firm is likely to gain by implementing initiatives for productivity enhancements.
MAP2 Our top management considers environmental preservation to be important.
MAP3 Our top management gives high priority to social responsibility for strategic decision making.
MAP4 considers improving the quality of life in respective local communities to be important.

Top Management Support (TMS)

TMS1 Our top management is supportive of our efforts to improve operations productivity.
TMS2 Our top management assigns adequate resources to environmental programs.
TMS3 Our top management supports employee development programs with the resources we need**.**
TMS4 Our top management actively participates in local community outreach programs.

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Employee Motivation (EM)

EM1 Our top management rewards shop-floor employees for their productivity improvement. **EM2** Our top management encourages shop-floor employees' efforts to reduce harmful environmental wastes.

EM3 Our top management motivates shop-floor employees to make suggestions on reducing rework.
EM4 Our top management provides incentives to shop-floor employees for reducing scraps.
EM5 Our top management involves shop-floor employees in quality of life improvement initiatives.

SUSTAINABLITY ORIENTATION

Economic Orientation (EcO)
EcO1 Our firm's mission statement communicates the importance of financial performance.
EcO2 Our firm is committed to improving market share.
EcO3 Our financial priorities are communicated to all employees.
EcO4 Our firm uses short-term productivity outcomes for operational decision making.

Environmental Orientation (EvO)
EvO1 Our firm's mission statement communicates the importance of environmental performance.
EvO2 Our firm is committed to pollution control.
EvO3 Our ecological priorities are communicated to all employees.
EvO4 Our firm evaluates the environmental impact of operational decision.

Social Orientation (ScO)
ScO1 Our firm's mission statement communicates the importance of employees' wellbeing**.**
ScO2 Our firm is committed to support social philanthropy.
ScO3 Our firm is committed to enhancing social responsibility.
ScO4 Our employees understand the importance of social responsibility.
ScO5 Our firm evaluates social implications of our operational decisions.

SUSTAIANBILITY PRACTICES

Sustainable Supplier Management Practices
Supplier Evaluation Practices (SEP)
SEP1 Our firm uses formal evaluation system to assess suppliers' environmental performance.
SEP2 Our firm assesses the quality standard of suppliers through ISO 9000 series certification.
SEP3 Our firm evaluates suppliers' environmental commitment through ISO 14000 series certification.
SEP4 Our firm assesses the quality of suppliers' social responsibility initiatives.
SEP5 Our firm emphasizes cost targets for our suppliers.

Supplier Development Practices (SDP)
SDP1 Our firm offers training for suppliers' personnel to improve quality performance.
SDP2 Our firm visits suppliers' sites to help improve environmental performance.

SDP3 Our firm educates suppliers about social responsibility.
SDP4 Our firm offers technical assistance to suppliers for pollution control.
SDP5 Our firm has a supplier development team.

Information Sharing Practices with Suppliers (ISS)
ISS1 Our major suppliers share delivery schedule for our products with us.
ISS2 Our major suppliers share order status information with us.
ISS3 Our major suppliers share environmental regulations information with us.
ISS4 Our major suppliers share availability of new environmentally safe components information with us.
ISS5 Our major suppliers share fair labor practices information with us.
ISS6 Our major suppliers share local community outreach initiatives with us.

Sustainable Operations Management Practices
Quality and Process Improvement Practices
Quality Management Practices (QM)
QM1 Our firm implements continuous quality improvement program.
QM2 Our firm is ISO 9000 certified.
QM3 Our firm uses statistical process control techniques to reduce process variance.
QM4 Our firm schedules a portion of everyday to maintain equipment productivity.
QM5 Our firm undertakes preventive maintenance programs to maximize equipment effectiveness.

Just-in-time Practices (JIT)
JIT1 Our firm uses set-up time reduction in our plant.
JIT2 Our firm adopts continuous flow production in operations.
JIT3 Our firm uses a “Pull” production system.
JIT4 Our firm implements cellular manufacturing in our plant.
JIT5 Our firm orders in small lot sizes from our suppliers.

Corporate Environmental Management Practices
Environmental Design Practices (EDP)
EDP1 Life Cycle Analysis (LCA) is employed for product design.
EDP2 Our products are designed for reduced consumption of energy.
EDP3 Our products are designed for reuse, recycle, recovery of material/component parts.
EDP4 Our products are designed to reduce the use of hazardous products and their manufacturing process.
EDP5 Our firm designs eco-packaging to help reduce our carbon footprint.
EDP6 Our firm designs an eco-labeling scheme for products and processes.

Environmental Recycling Practices (ERP)
ERP1 Our products/materials are reused.
ERP2 Our solid waste is recycled in all production processes.
ERP3 Our products/materials are recycled in all production processes.
ERP4 Our products/materials are remanufactured in fabrication stages.

Environmental Management System (EMS)
EMS1 Our firm has a formal department that is responsible for monitoring environmental affairs.
EMS2 Our environmental performance is formally tracked and reported.
EMS3 Our environmental achievements are regularly reported.
EMS4 Our environmental impact is periodically reported.
EMS5 Our environmental procedures are included in training.

Corporate Social Responsibility Practices (CSRP)
Employee Wellbeing and Equity Practices (EWEP)
EWEP1 Our firm supports employees' initiatives to improve health (e.g., subsidizes gym membership).
EWEP2 Our firm commits to safe work environment.
EWEP3 Our firm's management is quite culturally diverse.
EWEP4 Our firm provides fair compensation.
EWEP5 Our senior management reflects gender equality.

Corporate Sustainability Reporting Practices (CSRP)
CSRP1 Our firm discloses information related to productivity.
CSRP2 Our firm discloses information related to market share.
CSRP3 Our firm discloses information related to employees' health and safety.
CSRP4 Our firm discloses information related to employees' human right.
CSRP5 Our firm discloses information related to environmental performance.
CSRP6 Our firm discloses information related to contribution to the local communities.

Corporate Social Involvement Practices (CSIP)
CSIP1 Our firm contributes to charitable causes through our employees.
CSIP2 Our firm volunteers for social causes.
CSIP3 Our firm promotes corporate codes of conduct.
CSIP4 Our firm has volunteers supporting local charities.
CSIP5 Our firm donates to community organizations.

Sustainable Customer Management Practices
Customer Management Practices (CMP)
CMP1 Our firm provides our customers with assistance for recycling-related problem solving.
CMP2 Our firm evaluates the quality-related complaints of our customers.
CMP3 Our firm gives feedback to our customers for environmental concern.
CMP4 Our firm evaluates our customers' satisfaction for socially responsible initiatives.
CMP5 Our firm determines future customer consumption patterns for environmentally-friendly products.

Information Sharing Practices with Customers (ISC)
ISC1 Our major customers share changes in purchase order information with us.
ISC2 Our major customers share planned order information with us.

ISC3 Our major customers share their existing environmental policies with us.
ISC4 Our major customers share changes in eco-design products information with us.
ISC5 Our major customers share their employees' wellbeing and equity policy with us.
ISC6 Our major customers share their policy initiatives for local community outreach with us.

SUSTAINBILITY PERFORMANCE

Economic Performance (EP)
Operational Performance (OP)
OP1 Conformance quality
OP2 Product reliability
OP3 Production costs
OP4 Inventory turns
OP5 Delivery speed
OP6 Delivery reliability
OP7 Ability to rapidly change production volumes
OP8 Ability to rapidly change product mix

Market Performance (MP)
MP1 Market share
MP2 The growth of market share
MP3 The growth of sales

Financial Performance (FP)
FP1 Return on investment (ROI)
FP2 Return on asset (ROA)
FP3 Profit margin on sales

Environmental Performance (EP)
Pollution Control (PC)
PC1 Air emission
PC2 Waste water
PC3 Solid wastes
PC4 Consumption for toxic materials
PC5 Frequency for environmental accidents

Environmental Management (EvM)
EvM1 Reduction of solid waste
EvM2 Reduction of energy consumption
EvM3 Reduction of emissions
EvM4 Recycling of waste materials
EvM5 Recycling of products
EvM6 Reuse of waste
EvM7 Reuse of products

<u>Social Performance (SP)</u>
Employee-Oriented Outcomes (EOO)
EOO1 Employee quality of life
EOO2 Employee health and safety
EOO3 Employee fair compensation
EOO4 Fair employee opportunity
EOO5 Employment gender equality

Community-Oriented Outcomes (COO)
COO1 Corporate reputation/image
COO2 Social commitment
COO3 Reportable contributions to communities
COO4 Engagement with government officials
COO5 Investor relations
COO6 The relationship with local communities
COO7 The relationship with NGOs (Non-Governmental Organizations)

Appendix B

The Survey Questionnaire [Large-Scale Survey]

A Benchmarking Survey of Firm's Sustainable Supply Chain Management Practices

The current global pressures related to climate change, resources constraints, and public health and safety increasingly require firms to develop a sustainability strategy. As such, many firms have started to pursue a triple bottom line approach, which calls for balancing economic, environmental and social priorities, in their strategic decision making.

The objective of this survey is to benchmark current industry practices and critical success factors related to sustainability initiatives of manufacturing firms. This benchmarking effort is part of a doctoral dissertation at the University of Toledo and we request your participation by filling out this survey. Completing this survey will take approximately 25 minutes of your time. In appreciation for your participation in this research, we will send you $5 Starbucks card by mail upon completion of the survey. We will also provide you with executive benchmarking report based on the survey results via e-mail upon request. Please provide your mail address at the end of this survey for the compensation.

All of your responses will be kept confidential and your participation in this survey is voluntary. This survey will solely be used for academic research purposes. Your participation is very important for our study and we thank you for taking the time to complete this survey.

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Section 1. About External Pressures of Your Firm

The following statements describe *the perceived external pressures of your firm* in regard to sustainability (i.e., economic viability, environmental preservation and social responsibility). Please click on the appropriate bubble to indicate the extent to which you agree or disagree with each statement as applicable to your firm.

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

[Coercive Pressures]

Government regulations obligate us to comply with environmental preservation.	1	2	3	4	5
Government regulations compel us to abide by social justice.	1	2	3	4	5
Our main customers require us to improve cost performance.	1	2	3	4	5
Our key customers require us to improve environmental performance.	1	2	3	4	5
Our primary customers require us to improve social performance.	1	2	3	4	5
Our parent company demands that we adopt productivity initiatives.	1	2	3	4	5
Our parent company requires that we adopt environmental initiatives.	1	2	3	4	5
Our parent company compels that we adopt social initiatives.	1	2	3	4	5

[Normative Pressures]

Economic initiatives (e.g., quality management or productivity improvement programs) have been widely influenced by:

our important suppliers	1	2	3	4	5
local communities	1	2	3	4	5
Non-Governmental Organizations (NGOs)	1	2	3	4	5
employees' suggestion	1	2	3	4	5

Environmental initiatives (e.g., recycling or pollution control program) have been widely influenced by:

our important suppliers	1	2	3	4	5
local communities	1	2	3	4	5
Non-Governmental Organizations (NGOs)	1	2	3	4	5
employees' suggestion	1	2	3	4	5

Social initiatives (e.g., employee development or charity to the local communities) have been widely influenced by:

our important suppliers	1	2	3	4	5
local communities	1	2	3	4	5

Non-Governmental Organizations (NGOs)	1	2	3	4	5
employees' suggestion	1	2	3	4	5

[Mimetic Pressures]

When our main competitors adopt **economic initiatives** (e.g., quality management or productivity improvement program)

they benefit greatly.	1	2	3	4	5
they are perceived favorably by customers.	1	2	3	4	5
they are more competitive.	1	2	3	4	5

When our main competitors adopt **environmental initiatives** (e.g., recycling or pollution control program),

they benefit greatly.	1	2	3	4	5
they are perceived favorably by customers.	1	2	3	4	5
they are more competitive.	1	2	3	4	5

When our main competitors adopt **social initiatives** (e.g., employee development or charity to the local communities),

they benefit greatly.	1	2	3	4	5
they are perceived favorably by customers.	1	2	3	4	5
they are more competitive.	1	2	3	4	5

Section 2. About Top Leadership Culture in Your Firm

The following statements describe *top leadership culture for sustainability* in your firm. Top leadership culture is defined as the extent to which your top/ senior management creates an environment that is proactive and committed to sustainability. Please click on the appropriate bubble to indicate the extent to which you agree or disagree with each statement as applicable to your firm.

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

[Managerial Attitude and Perspective]

Our top management …

believes that our firm is likely to gain by implementing initiatives for productivity enhancements.	1	2	3	4	5
considers environmental preservation to be important.	1	2	3	4	5
gives high priority to social responsibility for strategic decision making.	1	2	3	4	5
considers improving the quality of life in respective local communities to be important.	1	2	3	4	5

[Top Management Support]

Our top management ...					
is supportive of our efforts to improve operations productivity.	1	2	3	4	5
assigns adequate resources to environmental programs.	1	2	3	4	5
supports employee development programs with the resources we need.	1	2	3	4	5
actively participates in local community outreach programs	1	2	3	4	5

[Employee Motivation]

Our top management …					
rewards shop-floor employees for their productivity improvement.	1	2	3	4	5
encourages shop-floor employees' efforts to reduce harmful environmental wastes.	1	2	3	4	5
motivates shop-floor employees to make suggestions on reducing rework.	1	2	3	4	5
provides incentives to shop-floor employees for reducing scraps.	1	2	3	4	5
involves shop-floor employees in quality of life improvement initiatives.	1	2	3	4	5

Section 3. About Strategic Sustainability Orientation in Your Firm
The following statements describe *each dimension of sustainability orientation* in your firm. Strategic sustainability orientation is the extent to which your firm is proactive and committed to economic, environmental, and social priorities in decision making. Please click on the appropriate bubble to indicate the extent to which you agree or disagree with each statement as applicable to your firm.

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

[Economic Orientation]

Our firm's mission statement communicates the importance of financial performance.	1	2	3	4	5
Our firm is committed to improving market share.	1	2	3	4	5
Our firm's financial priorities are communicated to all employees.	1	2	3	4	5
Our firm considers short-term productivity outcomes for operational decision making.	1	2	3	4	5

[Environmental Orientation]

Our firm's mission statement communicates the importance of environmental performance	1	2	3	4	5
Our firm is committed to pollution control.	1	2	3	4	5
Our firm's ecological priorities are communicated to all employees.	1	2	3	4	5
Our firm evaluates the environmental impact of operational decisions.	1	2	3	4	5

[Social Orientation]

Our firm's mission statement communicates the importance of employees' wellbeing.	1	2	3	4	5
Our firm is committed to support social philanthropy.	1	2	3	4	5
Our firm is committed to enhancing social responsibility.	1	2	3	4	5
Our employees understand the importance of social responsibility.	1	2	3	4	5
Our firm evaluates social implications of our operational decisions.	1	2	3	4	5

Section 4. About Sustainable Supplier Management Practices in Your Firm

The following statements describe *your firm's supplier management practices* to evaluate and collaborate with your major suppliers to improve their sustainability performance. Consider sustainability performance as the concurrent achievement of economic, environmental, and social performances. Please indicate the extent to which your firm implements the following practices.

1	2	3	4	5
Not at all	To a small extent	To a moderate extent	To a considerable extent	To a great extent

[Supplier Evaluation Practices]

Our firm uses formal evaluation system to assess suppliers' environmental performance.	1	2	3	4	5
Our firm assesses the quality standard of suppliers through ISO 9000 series certification.	1	2	3	4	5
Our firm evaluates suppliers' environmental commitment through ISO 14000 series certification.	1	2	3	4	5
Our firm assesses the quality of suppliers' social responsibility initiatives.	1	2	3	4	5

Our firm emphasizes economic excellence for our suppliers.	1	2	3	4	5

[Supplier Development Practices]

Our firm offers training for suppliers' personnel to improve quality performance.	1	2	3	4	5
Our firm visits suppliers' sites to help improve environmental performance.	1	2	3	4	5
Our firm educates suppliers about social responsibility.	1	2	3	4	5
Our firm offers technical assistance to suppliers for pollution control.	1	2	3	4	5
Our firm has a supplier development team.	1	2	3	4	5

[Information Sharing with Suppliers]

Our major suppliers share the following information with us:

Delivery schedule for our products	1	2	3	4	5
Order status	1	2	3	4	5
Environmental regulations	1	2	3	4	5
Availability of new environmentally safe components	1	2	3	4	5
Fair labor practices	1	2	3	4	5
Local community outreach initiatives.	1	2	3	4	5

Section 5.1. About Sustainable Operations Management Practices in Your Firm

The following statements describe *your firm's quality management (QM) and just-in-time (JIT) practices* to improve economic performance of your internal operations. Please indicate the extent to which your firm implements the following practices.

1	2	3	4	5
Not at all	To a small extent	To a moderate extent	To a considerable extent	To a great extent

[Quality Management Practices]

Our firm implements continuous quality improvement program.	1	2	3	4	5
Our firm is ISO 9000 certified.	1	2	3	4	5
Our firm uses statistical process control techniques to reduce process variance.	1	2	3	4	5
Our firm schedules a portion of everyday to maintain equipment productivity.	1	2	3	4	5
Our firm undertakes preventive maintenance programs to maximize equipment effectiveness.	1	2	3	4	5

[Just-In-Time Practices]

Our firm uses set-up time reduction (i.e., Single Minute Exchange of Die or SMED).	1	2	3	4	5
Our firm adopts continuous flow production in operations.	1	2	3	4	5
Our firm uses a "Pull" production system.	1	2	3	4	5
Our firm implements cellular manufacturing in our plant.	1	2	3	4	5
Our firm orders in small lot sizes from our suppliers.	1	2	3	4	5

Section 5.2. About Sustainable Operations Management Practices in Your Firm

The following statements describe *your firm's environmental management practices* to improve environmental performance of your internal operations. Please indicate the extent to which your firm implements the following practices.

1	2	3	4	5
Not at all	To a small extent	To a moderate extent	To a considerable extent	To a great extent

[Environmental Design Practices]					
Life Cycle Analysis (LCA) is employed for product design.	1	2	3	4	5
Our products are designed for reduced consumption of energy.	1	2	3	4	5
Our products are designed for reuse, recycle, recovery of material/component parts.	1	2	3	4	5
Our products are designed to reduce the use of hazardous materials in their manufacturing process.	1	2	3	4	5
Our firm designs eco-friendly packaging.	1	2	3	4	5
Our firm designs eco-friendly labeling for products and processes.	1	2	3	4	5
[Environmental Recycling Practices]					
Our firm reuses production materials whenever possible.	1	2	3	4	5
Our manufacturing scrap is recycled in production processes whenever possible.	1	2	3	4	5
Our products have recycled raw material content.	1	2	3	4	5
Our firm engages in remanufacturing of products.	1	2	3	4	5
[Environmental Management System]					
Our firm has a formal department that is responsible for monitoring environmental affairs.	1	2	3	4	5

Our environmental performance is formally tracked and reported.	1	2	3	4	5
Our environmental achievements are regularly reported.	1	2	3	4	5
Our environmental impact is periodically reported.	1	2	3	4	5
Our environmental procedures are included in employee training programs.	1	2	3	4	5

Section 5.3. About Sustainable Operations Management Practices in Your Firm

The following statements describe *your firm's social responsibility practices* to improve social performance of your internal operations. Please indicate the extent to which your firm implements the following practices.

1	2	3	4	5
Not at all	To a small extent	To a moderate extent	To a considerable extent	To a great extent

[Employee Well-being and Equity Practices]

Our firm supports employees' initiatives to improve health (e.g., subsidizes gym membership).	1	2	3	4	5
Our firm is committed to safe work environment.	1	2	3	4	5
Our firm's management is quite culturally diverse.	1	2	3	4	5
Our firm provides fair compensation.	1	2	3	4	5
Our senior management reflects gender equality.	1	2	3	4	5

[Corporate Sustainability Reporting Practices]

Our firm discloses information related to …

productivity	1	2	3	4	5
economic performance	1	2	3	4	5
employees' health and safety.	1	2	3	4	5
employee relations.	1	2	3	4	5
environmental performance	1	2	3	4	5
contribution to the local communities.	1	2	3	4	5

[Corporate Social Involvement Practices]

Our firm contributes to charitable causes	1	2	3	4	5
Our firm volunteers for social causes.	1	2	3	4	5
Our firm promotes corporate codes of conduct.	1	2	3	4	5
Our firm has volunteers supporting local charities.	1	2	3	4	5

Our firm donates to community organizations.	1	2	3	4	5

Section 6. About Sustainable Customer Management Practices in Your Firm
The following statements describe *your firm's customer management practices* to collaborate with your major customers to improve sustainability performance of both parties. Please indicate the extent to which your firm implements the following practices.

1	2	3	4	5
Not at all	To a small extent	To a moderate extent	To a considerable extent	To a great extent

[Customer Management Practices]					
Our firm provides our customers with assistance for recycling-related problem solving.	1	2	3	4	5
Our firm evaluates the quality-related complaints of our customers.	1	2	3	4	5
Our firm gives feedback to our customers for environmental concern.	1	2	3	4	5
Our firm evaluates our customers' satisfaction for socially responsible initiatives of our firm.	1	2	3	4	5
Our firm determines future customer consumption patterns for environmentally-friendly products.	1	2	3	4	5
[Information Sharing with Customers]					
Our major customers share the following information with us:					
Changes in purchase order.	1	2	3	4	5
Planned orders.	1	2	3	4	5
Their existing environmental policies.	1	2	3	4	5
Changes in eco-design products.	1	2	3	4	5
Their employees' wellbeing and equity policy	1	2	3	4	5
Their initiatives for local community outreach	1	2	3	4	5

Section 7.1. About Economic Performance of Your Firm
Please click on the appropriate bubble that best indicates the amount of change of *your firm's economic (operational, market and financial) performance dimensions* over the last three years.

1	2	3	4	5
Strongly deteriorated (>20%)	Deteriorated (1-20%)	Stayed the same	Improved (1-20%)	Strongly improved (>20%)

[Operational Performance]					
Conformance quality.	1	2	3	4	5
Product reliability.	1	2	3	4	5
Production costs	1	2	3	4	5
Inventory turns	1	2	3	4	4
Delivery speed	1	2	3	4	5
Delivery reliability	1	2	3	4	5
Ability to rapidly change production volumes.	1	2	3	4	5
Ability to rapidly change product mix.	1	2	3	4	5
[Market Performance]					
Market share.	1	2	3	4	5
The growth of market share.	1	2	3	4	5
The growth of sales.	1	2	3	4	5
[Financial Performance]					
Return on investment (ROI).	1	2	3	4	5
Return on asset (ROA).	1	2	3	4	5
Profit margin on sales.	1	2	3	4	5

Section 7.2. About Environmental Performance of Your Firm

Please click on the appropriate bubble that best indicates the amount of change of *your firm's environmental performance dimensions* over the last three years.

1	2	3	4	5
Significant decrease	Decrease	Same as before	Increase	Significant increase

[Pollution Control]					
Air emission.	1	2	3	4	5
Waste water.	1	2	3	4	5
Solid waste.	1	2	3	4	5
Consumption for toxic materials.	1	2	3	4	5
Frequency for environmental accidents	1	2	3	4	5
[Environmental Management]					
Reduction of energy consumption	1	2	3	4	5
Recycling of waste materials	1	2	3	4	5
Recycling of products	1	2	3	4	5
Reuse of waste	1	2	3	4	5
Reuse of products	1	2	3	4	5

Section 7.3. About Social Performance of Your Firm
Please click on the appropriate bubble that best indicates the amount of change of *your firm's social performance dimensions* over the last three years.

1 Significant decrease	2 Decrease	3 Same as before	4 Increase	5 Significant increase

[Employee-oriented Outcomes]					
Employee quality of life.	1	2	3	4	5
Employee health and safety	1	2	3	4	5
Employee fair compensation.	1	2	3	4	5
Fair employment opportunity.	1	2	3	4	5
Employment gender equality	1	2	3	4	5
[Community-oriented Outcomes]					
Corporate reputation.	1	2	3	4	5
Social commitment.	1	2	3	4	5
Reportable contributions to communities.	1	2	3	4	5
Engagement with government officials	1	2	3	4	5
Investor relations	1	2	3	4	5
The relationship with local communities	1	2	3	4	5
The relationship with NGOs	1	2	3	4	5

Section 8. About General Information of Your Firm
The following questions are about general information of your firm. Please click on the appropriate bubble that that best indicates your firm's situation.

1. **Please click on the specific organization-wide "Sustainability initiatives i.e., Sustainable Supply Chain Management Practices" if your organization has been implementing (mark all that apply).**
   - o Supplier evaluation based on either environmental or social criteria
   - o Recycling programs
   - o Employee development programs (e.g., health and safety, equity)
   - o Corporate social involvement programs (e.g., charity to the local communities)
   - o Sustainability reporting initiatives
   - o Other (please specify): _______________

2. **What certification have you attained (mark all that apply)?**
   - o ISO 9000
   - o ISO 14001
   - o ISO 27000
   - o SA 8000
   - o None

- Other (please specify): _______________

3. **As a Social Auditing, Accounting, and Reporting (SAAR) scheme, which sustainability reporting initiatives do your companies adopt and implement (mark all that apply)?**
   - GRI (Global Reporting Initiative)
   - ISEA (Institute of Social and Ethical AccountAbility)
   - AA (Account Ability) 1000 Series
   - None
   - Other (Please specify): _______________

4. **Please select the union status of your company.**
   - Unionized
   - Non-Unionized
   - Do not know

5. **Please indicate the number of employees of your company?**
   - < 100
   - 101-250
   - 251-500
   - 501-1000
   - > 1000

6. **Please indicate the annual revenues $ (in Millions) of your firm.**
   - < $10
   - $10 -50
   - $51-100
   - $101-500
   - > $500

7. **Please indicate the Standard Industrial Classification (SIC) code that best describes your primary business.**

   - SIC 30: Rubber and miscellaneous plastic products
   - SIC 34: Fabricated Metal Products
   - SIC 35: Industrial machinery and equipment
   - SIC 36: Electronic and other electric equipment
   - SIC 37: Transportation equipment
   - SIC 38: Instruments and Related Products
   - Other (Please specify): ______________________________

8. **Please select the type of manufacturing operations that best describe your division/company.**
   - Job shop
   - Assembly line
   - Batch processing

- Projects (one-of-a-kind production)
- Continuous flow process
- Flexible manufacturing
- Manufacturing cells

9. Your present job title (Please check the closest title which applies):
- Chief Executive Officer (CEO)
- Chief Operating Officer (COO)
- President
- Vice president
- Director
- Manager – General Manager
- Manager – Supply Chain Manager
- Manager – Purchasing Manager
- Other (please specify): _________________

10. Your present job function (Please check the closest function which applies):
- Corporate Executive
- Manufacturing Engineering
- Quality Assurance/Control
- Product Design/ R&D
- Purchasing
- Manufacturing Production
- Sales/ Marketing
- Human Resource
- Finance/Accounting
- Transportation/Logistics/Distribution
- Retail/Warehouse
- Other (please specify): ________________

11. How many years did you work in your field/ in the company?
- _______ (field)
- _______ (company)

[STATISTICAL CONTROL QUESTIONS]

The following questions are used for statistical control purposes only. While they may or may not be associated with your survey answers, they are very important in validating this research from a statistical perspective. YOUR ANSWERS WILL NOT BE RELEASED UNDER ANY CIRCUMSTANCES.

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

None of the managers at my firm feel dissatis	1	2	3	4	5

fied with their jobs.					
Different functional areas within my firm, such as marketing and production, sometimes lack cohesion or unity.	1	2	3	4	5
At my company, all of the employees are outstanding performers.	1	2	3	4	5
Sometimes my firm fails to exercise good judgment.	1	2	3	4	5
Managers at my firm are sometimes afraid to voice their disagreement with a higher level manager's ideas.	1	2	3	4	5
Employees at my company are always trustworthy.	1	2	3	4	5
At my company, hiring decisions have always been based only on qualifications.	1	2	3	4	5
My firm has downplayed an event that customers might view as negative.	1	2	3	4	5

Congratulations! Thank you again for your participation in this important study of sustainability! Your time and effort to answer this survey is greatly valued. If you would like to receive the executive summary of this research, please provide your e-mail address.

E-mail: ____________________

Appendix C

Glossary of Key Terms and Variables*

Coercive Pressure (CP)	Sustainability-related political influences exerted by governmental regulations and/or the other firms on which your firm depends, such as important customers and parent company.
Community-oriented Outcomes (COO)	The extent to which a firm enhances the community in which it operates.
Corporate Social Involvement (CSIV)	The extent to which a firm makes philanthropic commitment within a community and to a greater society.
Corporate Sustainability Reporting (CSRP)	The extent to which a firm discloses quantitative and qualitative information on economic, environmental, and social performance.
Customer Management (CM)	The extent to which an organization manages its main customers to improve their overall satisfaction in regards to sustainability.
Economic Orientation (EcO)	The extent to which a firm is proactive and committed to positive market and financial priorities in its decision making.
Employee Motivation (EM)	The extent to which top/senior management inspires shop-floor employees to actively participate in sustainability initiatives.
Employee Wellbeing and Equity (EWE)	The extent to which a firm promotes and improves the overall quality of employees' health/safety and human rights.
Employee-oriented Outcomes (EOO)	The extent to which a firm improves the employees' well-being/equity and addresses human rights concerns.
Environmental Design Practices (EDP)	The extent to which an organization systematically integrates environmental issues into product and process design.
Environmental Management (EvM)	The extent to which a firm reduces, reuses, and recycles waste/products/energy.

Environmental Management System (EMS)	The extent to which an organization conforms to the ISO 14001 standard aimed at improving environmental performance.
Environmental Orientation (EvO)	The extent to which a firm is proactive and committed to positive ecological or green priorities in its decision making.
Environmental Recycling Practices (ERcP)	The extent to which an organization reuses, recycles, and remanufactures materials, components, and/or returned products.
Financial Performance (FP)	The extent to which a firm achieves profit-oriented outcomes such as ROI and ROA.
Information Sharing with Customers (ISC)	The extent to which an organization receives critical and proprietary information from major customers in regards to sustainability.
Information Sharing with Suppliers (ISS)	The extent to which a firm receives critical and proprietary information from major suppliers in regards to sustainability.
Just-in-Time (JIT)	The extent to which a firm manages or streamlines the flow of production.
Managerial Attitude and Perspective (MAP)	The extent to which top or senior management views sustainability issues as opportunities rather than as threats.
Market Performance (MP)	The extent to which a firm achieves market-valued outcomes such as sales and market growth.
Mimetic Pressure (MP)	The demands that arise when your main competitors successfully adopt sustainability initiatives.
Normative Pressure (NP)	The demands that stem from collective societal expectations, such as important suppliers, labor unions, trade associations, local communities, and non-governmental organizations, with regard to sustainability.
Operational Performance (OP)	The extent to which a firm improves outcomes in regards to cost, quality, delivery, and flexibility compared to last year's performance.
Pollution Control (PC)	The extent to which a firm reduces environmental pollution.
Quality Management (QM)	The extent to which a firm improves the quality of products/processes and maintains equipment productivity.
Social Orientation (ScO)	The extent to which a firm is proactive and committed to positive employee and communal priorities in its decision making.
Supplier Development Practices (SDP)	The extent to which a firm endeavors to improve its suppliers' performance or capabilities in regards to sustainability.
Supplier Evaluation	The extent to which a firm assesses or monitors

Practices (SEP)	suppliers' sustainability performance.
Supply Chain Management (SCM)	SCM is defined as the set of activities undertaken by an organization to promote effective management of its supply chain.
Sustainability	Sustainability is grounded in the concept of the triple-bottom line (TBL), a firm's simultaneous pursuit of achieving profits, preserving the planet, and enhancing society including employees.
Sustainable Supply Chain Management (SSCM)	SSCM is defined as a focal company's intra- and inter-organizational practices to manage upstream efforts, internal operations, and downstream activities in order to simultaneously achieve economic, environmental, and social performance.
Top Management Support (TMS)	The extent to which top or senior management is involved in sustainability programs.
Triple-bottom line (TBL)	The TBL defines sustainability as concurrent achievement of three objectives—economic viability, environmental stewardship, and social well-being.

* Arranged by alphabetical order.

Appendix D

Telemarketing Script (Sustainability Research Study)

May I please speak to [name on record]?

Good Morning Mr./Mrs. [name on record]. This is [rep name] calling on behalf of Doctoral candidate Ma Ga Yang of the University of Toledo.

I'm sure you're busy so I'll be brief — the reason for this call is quite special. Professor Yang is conducting a survey for his degree regarding current industry sustainability practices of US manufacturing companies. As someone in the field, we are hoping we can include you in the study through a brief on-line survey taken at your convenience. It will take approximately 25 minutes of your time.

All we need is your e-mail address and Professor Yang will send you a link to the on-line survey. [If needed: Your email address will be used only for this academic research study.]

Upon request you will receive a summary report of the research with survey results comparing your organization to others in your region. Also, those who complete the survey will receive $5 Starbucks Card via mail as a token of our thanks!

So what is your email address, please? Thank you and you will receive an email with the subject "Sustainability Research" within 24 hours. Have a great day.

NOTE: Use the information sheet included to answer any questions. For questions, they may contact Ma Ga Yang directly at any time at either myang5@rockets.utoledo.edu or at 419/787-3453.

Appendix E

Call Reports (Sample)

RCS Response Technologies - Daily Call Report	Campaign/contact:	Doctoral research survey (Ma Ga Yang)		
	Job Type:	gain email	Start Date:	1/4/2012
	Goal:	250-300	**Call Date:**	**1/4/2012**
DAILY	**Daily Totals**	**SME file**		
LEADS:	5000	5000	0	0
Total Emails:	**44**	**44**	**0**	**0**
Refusals:	107	107	0	0
Bad Numbers:	25	25	0	0
Total Calling Hours:	28	28	0	0
Total Contacts:	151	151	0	0
Total Complete:	176	176	0	0
Emails Per Hour:	1.57	1.57	#DIV/0!	#DIV/0!
Completes Per Hour:	6.29	6.29	#DIV/0!	#DIV/0!
Conversion Rate:	29.14%	29.14%	#DIV/0!	#DIV/0!
Cost Per Email:	**$14.00**	**$14.00**	**$0.00**	**$0.00**
Callback:	164	164	0	0
Answering Machine:	260	260	0	0
Not Available:	10	10	0	0
Talk to Contact:	10	10	0	0
Busy:	3	3	0	0
Complete:	176	176	0	0
Total Dials:	623	623	0	0
Dials per Hour:	22.25	22.25	#DIV/0!	#DIV/0!
CUMULATIVE	**Cum. Totals**	**SME file**		
Leads Remaining:	4824	4824	0	0
Total Emails:	**44**	**44**	**0**	**0**
Refusals:	107	107	0	0
Bad Numbers:	25	25	0	0
Total Calling Hours:	28	28	0	0
Total Contacts:	151	151	0	0
Total Complete:	176	176	0	0
Emails Per Hour:	1.57	1.57	#DIV/0!	#DIV/0!

Completes Per Hour:	6.29	6.29	#DIV/0!	#DIV/0!
Conversion Rate:	29.14%	29.14%	#DIV/0!	#DIV/0!
Completion %:	3.52%	3.52%	#DIV/0!	#DIV/0!
Cost Per Email:	**$14.00**	**$14.00**	**$0.00**	**$0.00**
Total Cost:	$616.00	$616.00	$0.00	$0.00
Callback:	164	164	0	0
Answering Machine:	260	260	0	0
Not Available:	10	10	0	0
Talk to Contact:	10	10	0	0
Busy:	3	3	0	0
Complete:	176	176	0	0
Total Dials:	623	623	0	0
Dials per Hour:	22.25	22.25	#DIV/0!	#DIV/0!

Appendix F

E-Mail Notes

From: Ma Ga Yang [myang5@rockets.utoledo.edu]
Sent: Wednesday, January 4, 2012
To: Each participant
Subject: Sustainability Research Study [Survey]

Dear Mr/Ms. [Participant's name],

Thank you again for indicating your willingness to participate in this survey. Your response to this survey is very important. Below is the brief description of what this survey is about. I encourage you to look over this summary before you partake in the survey.

Please click on the link below to go to the survey website and to begin the survey. https://www.surveymonkey.com/s/Sustainability_SupplyChain

TITLE OF THE SURVEY:
A Benchmarking Survey of Firm's Sustainable Supply Chain Management Practices

PURPOSE OF THIS SURVEY:
You are invited to participate in a University of Toledo Doctoral dissertation research survey which explores the "current industry sustainability practices" exerted by manufacturing companies in the United States. This study is about a benchmarking survey of a focal firm's sustainable supply chain management practices. The purpose of the study is to identify best practices related to sustainability in your firm's supply chains and test interrelationships among drivers, strategy, supply chain practices, and performance outcomes. This survey will produce meaningful findings capable of helping you to improve the performance of your organization in regard to sustainability.

You are selected as someone who may want to take part in this study because I believe that you are familiar with sustainability practices in your organizations as well as in your supply chains.

RESEARCH PROCEDURES:
If you decide to take part in this study, you are to complete an online survey requiring approximately 25-30 minutes.

COMPENSATIONS:
All participants will receive *$5 Starbucks Card* via mail as a small token of appreciation within a week or so. Also, upon request you can receive *a benchmarking summary of the research based on survey results* comparing your organization to others in your region. Please provide your name and mailing address for $5 Starbucks Card and please also indicate whether you would like to receive a summary report of this survey's results.

CONFIDENTIALITY & VOLUNTARINESS:
Your participation in this survey is entirely voluntary and all of your responses will be kept confidential and this survey will solely be used for academic research purposes.

QUESTIONS:
Should you have any further questions or comments regarding this research or survey, please feel free to contact me at myang5@rockets.utoledo.edu or 419-787-3453.

I appreciate your time and consideration in completing the survey. Thank you for participating in this study.

Sincerely,

Ma Ga Yang, MBA, Doctoral Candidate
The University of Toledo
Myang5@rockets.utoledo.edu
(419) 787-3453

Appendix G

Thank You E-Mail: Appreciation of Completing The Survey

Dear [participant's name],

Thank you so much for completing the survey of sustainability. As indicated, I will send a $5 Starbucks Card as a small token of appreciation. It will be delivered to your mailing address as you indicated in the survey.

Your participation in this survey is important and I believe it will reflect the contemporary situation of sustainability endeavor of manufacturing companies in the US and thus will produce meaningful findings capable of helping you to improve the performance of your organization in regard to sustainability.

I hope our relationship may be continued as I keep on pursuing the study of sustainability.

Best regards,

Ma Ga Yang, MBA, Doctoral Candidate
University of Toledo
Myang5@rockets.utoledo.edu
419-787-3454

Appendix H

Follow-Up E-Mails

Email #1

Dear [participant's name],

I recently sent you an email asking you to respond to a survey about sustainability, which is part of a doctoral dissertation at the University of Toledo. This survey aims to benchmark current industry practices and critical success factors related to sustainability practices of manufacturing firms in the US. Your responses to this survey are important and will help in assessing the current state of sustainability.

If you have already completed the survey, I appreciate your participation. If you have not yet responded to the survey or if you could not complete the survey for various reasons, I encourage you to take approximately 25 minutes of your time and complete the survey.

Please click on the link below to go to the survey website and to begin the survey. https://www.surveymonkey.com/s/Sustainability_SupplyChain

Please note that you will receive a $5 Starbucks Card upon survey completion and a benchmarking summary report upon your request.

Your response is very important. Getting direct feedback from an industry expert like you is crucial to take a first step in developing a better strategy for sustainability, not to mention enabling me to finish the doctoral dissertation. Thank you for your help by completing the survey.

Sincerely,
Ma Ga Yang

Email #2

Dear [participant's name],

Winter is a busy time for you, and I understand how valuable your spare time is during this period. I am hoping you may be able to give about 25-30 minutes of your time before this week to help me collect important information by completing this survey.

If you have already completed the survey, I really appreciate your participation. If you have not yet responded, I would like to urge you to complete the survey. I plan to end this study next week, so I wanted to email everyone who has not responded to make sure you had a chance to participate.

Please click on the link below to go to the survey website and to begin the survey.
https://www.surveymonkey.com/s/Sustainability_SupplyChain

You will receive a $5 Starbucks Card upon survey completion and a benchmarking summary report upon your request.

Thank you in advance for completing the survey. Your responses are important and the best source of information to make this study of sustainability successful.

Sincerely,
Ma Ga Yang

Email #3

Dear [participant's name],

Spring is around the corner! I hope your business may go well. This is a friendly reminder of a sustainability survey. I hope you may have a final chance to participate in this survey. If you have not yet completed the survey, please do so by this week.

Please click on the link below to go to the survey website and to begin the survey.
https://www.surveymonkey.com/s/Sustainability_SupplyChain

Thank you so much,
Ma Ga Yang