



Invited Contribution

An organizational theoretic review of green supply chain management literature

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ABSTRACT

Green supply chain management (GSCM) has gained increasing attention within both academia and industry. As the literature grows, finding new directions by critically evaluating the research and identifying future directions becomes important in advancing knowledge for the field. Using organizational theories to help categorize the literature provides opportunities to address both the objectives of understanding where the field currently stands and identifying research opportunities and directions. After providing a background discussion on GSCM, we categorize and review recent GSCM literature under nine broad organizational theories, with a special emphasis on investigation of adoption, diffusion and outcomes of GSCM practices. Within this review framework, we also identify GSCM research questions that are worthy of investigation. Additional organizational theories which are considered valuable for future GSCM research are also identified with a conclusion for this review.

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1. Introduction

The cross-disciplinary field of green supply chain management (GSCM) has been growing in recent years with an interest from both academia and industry. A preponderance of special issues devoted to this topic in leading operations and supply chain management (SCM) journals attests to this trend. The continued academic growth of this inchoate field and its further development requires that new knowledge and insights be generated. Utilizing extant and emergent theory at the organizational level of analysis, organizational theory, provides ample opportunity for the advancement of this field. Alternatively, insights from GSCM literature will contribute to the growth and understanding of these and other organizational theories.

Organizational theory is in the early phases of broad introduction and applications into operations management and the SCM literature (Ketchem and Hult, 2007). In addition, sustainability and environmentally focused research in management disciplines (Etzion, 2007), and business disciplines traditionally outside an organizational management, e.g., marketing (Connelly et al., forthcoming), have also investigated organizational theory applications (Tang, 2010). To the best of our knowledge, there is a void of literature that has sought to review and integrate organizational theory with the GSCM research. It is our goal in this paper to review the applications of organizational theories in GSCM studies and identify opportunities for this research trend.

We provide an overview of a number of organizational theories that have seen applications in the nascent GSCM literature. Our review focuses on GSCM studies that have utilized an organizational theoretic lens to underpin their studies, especially with respect to adoption and diffusion of GSCM practices. The literature presented here has explicitly tested and expanded upon the organizational theories or utilized the theories for explanatory purposes with a strong focus on an adoption of GSCM and its performance outcomes. We also contribute by identifying particular GSCM adoption and practice phenomena or characteristics that can be tied to various organizational theories. Overall, we find that a substantial opportunity exists for an extension of GSCM research utilizing the myriad organizational theories. This paper can also serve as a useful reference for researchers in GSCM or other operations fields to advance organizational theory building and applications.

To help achieve these objectives, this paper begins with a brief overview defining the organizational theory. We then provide some background and a brief historical academic perspective on the topic of GSCM. The major portion of this paper is anchored on the use of a number of organizational theories which the literature has linked to GSCM. Within the introduction of these organizational theories, we briefly introduce basic elements of the individual theories, exemplary GSCM literature and the questions they investigated, and some possibilities for extending the investigation, using these theories. The final section before the conclusions will provide directions for integrating other organizational theories that have seen relatively less application in GSCM studies.

2. Background

2.1. Organizational theory

Organizational theory is not easily definable. Organizational theory within business and management research has been influenced from a variety of other fields and disciplines, including psychology, sociology, political science, engineering, and economics (Hatch, 2006; Pfeffer, 1997). We define organizational theory as a management insight that can help explain or describe

organizational behaviors, designs, or structures. Our primary focus with organizational theory is at the inter-organizational level, since we are considering the supply chain relationships amongst enterprises.

Organizational theory has introduced broad applications to a number of disciplines within management studies. The application of organizational theory to organizations and the natural environment (Etzion, 2007; Hoffman and Ventresca, 2002) as well as supply chain management (Ketchem and Hult, 2007) separately is becoming more established. However, organizational theory's influence and relationship to environmental management or GSCM has only seen initial investigations, with no established review of its potential for advancing the emergent GSCM research field. To help further develop this field, we present a review of the literature in GSCM within the context of various organizational theories. We also provide directions for future GSCM studies to integrate scarcely utilized organizational theories for the advancement of this research stream.

2.2. A brief history of GSCM

Historically, the study and management of industrial pollution has been a critical issue for society, since the early days of the industrial revolution. Part of the industrial revolution was sparked by Adam Smith's policies of the specialization of labor and also corporations. Out of this specialization grew the need to develop specific supplier and distribution channels (Lun et al., 2011). Thus, the implications of marketing and distribution channels, and subsequently an SCM, appear in the early economics literature.

Managing supply chains gained notoriety in practice as evidenced by the management and engineering literature in the early 20th century (Svensson, 2001; Askarany et al., 2010). Some of the initial best practices of modern supply chains, such as lean and just-in-time (JIT) manufacturing can be traced to Henry Ford's efforts to vertically integrate the automotive supply chain and organizational practices. The concept of JIT and SCM at that time focused on enhancing operational efficiency and minimizing waste (Bornholt, 1913; Faurote, 1928). The purpose of the minimization of waste was not for environmental, but economic reasons. Waste means greater economic loss (Lai and Cheng, 2009).

During these early periods, industrial pollution was not a major topic of investigation for management or economics scholars. In economics, the use of taxes for managing externalities such as an industrial pollution was proposed (Pigou, 1920). However, the debate of taxing for environmental pollution caused by industrial activities was essentially the limit of the discussion at the time. Philosophical developments during this period were occurring with discussion on whether the natural environment deserved its own rights and had its own intrinsic value (Leopold, 1933). The significance of environmental issues became evident to the public with Rachel Carson's *Silent Spring*. Carson's book, which criticized the chemical DDT and its influence on birds and humans, is credited with catalyzing the environmental movement in the U.S. in the 1960s and 1970s. Reaction to this book included additional regulations and the formation of the U.S. Environmental Protection Agency. Critics, especially the chemical industry, felt that these regulatory policies would greatly limit an economic growth (Lytle, 2007). Thus, both economics and environmentalism had started to mature on the role of industry, its outputs, and implications on the environment.

Some of the earliest work that can be tied to the today's greening of the supply chain, occurring even before the formation of the U.S. Environmental Protection Agency, can be traced to Ayres and Kneese (1969). This work presented some of the earliest issues related to reconciling industrial metabolism and material

balancing as well as the roles of production and consumption in the supply chain. Although their work focused on a linear relationship from an extraction to disposal, some loops were incorporated into the evaluation and there were concerns about the possibility of integrating 'residuals' back into the system. Interestingly, not only were solid and water pollution waste included in the discussion, but warnings of global climate change due to carbon and other greenhouse gas emissions was also prevalent in the argumentation on evaluating the roles of inter-organizational relationships. Further refinement of the industrial metabolism and material flow balance ideas occurred throughout the 1970s (Ayres, 1978). Discussion on how to utilize the mass balance for organizational and governmental decision making was also introduced in the early 1970s through "a process-chain evaluation model estimates the cumulative costs (direct and hidden) of various processes or steps that form 'chains' leading from a set of raw material inputs to a marketable output, such as semi-finished or consumer products". (Stern et al., 1973). This work incorporated inventories of pollutants and their impacts in the decision modeling software, not unlike most of the today's life cycle analytical tools.

Some initial technical advancements in this arena around various 'industrial ecology' principles occurred during the 1980s (Erkman, 1997) with concepts like life cycle assessment. A watershed was opened with the incorporation of gaining competitive advantages and economic benefits from environmental practices amongst organizations later in the decade (Frosch and Gallopoulos, 1989). Also, concurrently, the further refinement of the industrial eco-systems philosophy (Jelinski et al., 1992) and further acknowledgement of the supply chain concept as a strategic competitive weapon (Bhote, 1989) was occurring.

A more managerial, less technical, coverage of GSCM began with an emphasis on specific, deconstructive, aspects of SCM such as logistics (Murphy et al., 1994; Szymankiewicz, 1993), purchasing (Drumwright, 1994), and reverse logistics (Barnes, 1982; Pohlen and Farris, 1992). Eventually, some early efforts conceptually and systemically integrated purchasing, operations, marketing, logistics, and reverse logistics within an environmental focus (Sarkis, 1995a, 1995b).

These early developments were primarily anecdotal and conceptual developments introducing various concepts and practices related to GSCM. As the field matured, anecdotal case studies evolved into theoretical development investigations, and eventually theory testing empirical studies along with more advanced formal modeling tools for evaluating GSCM (Seuring and Müller, 2008b). We do not review many articles that appeared during these earlier periods, due to the difficulty of tying them in with various organizational theoretic perspectives. We will touch upon some of them, where a theory is mentioned or evaluated explicitly. Some reviews of the GSCM literature have provided useful non-theoretical (e.g., practice, systems, prescriptive) frameworks. These GSCM literature reviews typically begin at or around 1990 (e.g., Seuring and Müller, 2008b; Srivastava, 2007). At this point, we shall now present a general definition of GSCM to set the stage of our review and linkage to the organizational theories.

2.3. Defining GSCM

As is evidenced from the previous section regarding the GSCM concepts, and its many elements, there are many variations in its definition and terminology over the years. A comprehensive list includes some of the following terms characterizing this concept:

- sustainable supply network management (Cruz and Matsypura, 2009; Young and Kielkiewicz-Young, 2001);

- supply and demand sustainability in corporate social responsibility networks (Cruz and Matsypura, 2009; Kovács, 2004);
- supply chain environmental management (Sharfman et al., 2009);
- green purchasing (Min and Galle, 1997) and procurement (Günther and Scheibe, 2006);
- environmental purchasing (Carter et al., 2000; Zsidisin and Siferd, 2001);
- green logistics (Murphy and Poist, 2000) and environmental logistics (González-Benito and González-Benito, 2006); and
- sustainable supply chains (Linton et al., 2007; Bai and Sarkis, 2010a).

We will use the term GSCM and define it as integrating environmental concerns into the inter-organizational practices of SCM including reverse logistics.

3. Organizational theory and GSCM

This section forms the core of our paper. We introduce nine theories that have been utilized to investigate various issues related to GSCM. Our focus is on those theories that were mentioned or linked to at least two published articles. The references and publications for GSCM are primarily from peer reviewed archival journal publications. Many of the general organizational theories are referenced from books. The nine theories, in an alphabetical order, include: Complexity; Ecological Modernization; Information; Institutional; Resource Based View; Resource Dependence; Social Network; Stakeholder; and Transaction Cost Economics theories. A summary of our findings from this review is provided in Table 1, where we also identify the theory, some of its basic concepts, current GSCM related investigational propositions, and possible future theory applications for the GSCM research. We now provide an overview for each of the organizational theories and related GSCM literature in the next few subsections. The basic outline of each section begins with the theory definition, the GSCM literature relating to that particular organizational theory, and some potential additional questions and issues that may be addressed with the organizational theory.

3.1. Complexity theory

Complexity within an organizational context can be defined through heterogeneity or diversity in environmental factors such as customers, suppliers, government regulations, and technological advancements (Chakravarthy, 1997). As complexity increases, firms find it more difficult to plan and predict their organizational actions, e.g., the GSCM implementation. This theory suggests that firms operate in a system that includes both order and disorder (Prigogine, 1984), where interactions of the involved parties will determine the performance outcomes of the system. It is necessary for firms to be sensitive and responsive to their environments with co-evolution and interdependencies in adapting to the system (Crozier and Thoenig, 1976).

The implementation of GSCM involves numerous individual parties operating in the system. This situation is particularly evident for external GSCM practices on activities, such as providing design specification to suppliers involving environmental requirements, auditing suppliers' environmental management systems, cooperating with customers for eco-design, and handling product returns from customers. The GSCM implementation difficulties can be intensified by the complexities associated with broader organizational complexities such as size and relationships (Vachon and Klassen, 2006b), or specific activities such as product return, recycling, remanufacturing,

Table 1

Summary of organizational theories applied to GSCM related study questions and future research directions.

Theory	General conceptualization	Current GSCM related study and theory application	Future research and theory application
Complexity theory	As complexity increases, firms find it more difficult to plan and predict their organizational actions, e.g., GSCM implementation. It is necessary for firms to be sensitive and responsive to their environments with co-evolution and interdependencies in adapting to the system (Crozier and Thoenig, 1976).	<ol style="list-style-type: none"> 1) The difficulty for implementing GSCM can be intensified by the complexities associated with broader organizational complexities, such as size and relationships (Vachon and Klassen, 2006b). 2) Complexities inherent in closing the loop for a supply chain have been observed (Guide and Wassenhove, 2009; Matos and Hall, 2007). 3) For managing a supplier system, Choi and Krause (2006) identified supply base complexity as a key area of managerial consideration. 	<ol style="list-style-type: none"> 1) How to reduce the uncertainty that arises from implementing the GSCM activities and guide system function. 2) The adaptive complex systems relationship to an inter-organizational learning theory in GSCM
Ecological modernization (EMT)	As a systematic eco-innovation theory, an EMT is geared towards jointly achieving industrial development and environmental protection through innovation and technological development, or 'modernity' (Jänicke, 2008; Murphy and Gouldson, 2000). At least two dimensions of an EMT can influence GSCM research and practice, new politics of pollution and technological innovation.	<ol style="list-style-type: none"> 1) To motivate GSCM related practice, proper institutional arrangement and a legal framework by government are needed (Kassolis, 2007). 2) The practice of GSCM is consistent with the concept of environmental innovation from the EMT view (Zhu, Sarkis et al., 2010). 3) Innovation typically occurs in the upper echelon of a supply chain. 	<ol style="list-style-type: none"> 1) A consensus on theoretical foundation for EMT at the GSCM level is necessary. 2) Innovation diffusion mechanisms and relationships between large and smaller suppliers and customers for GSCM need further investigation.
Information theory (information asymmetry and signaling theory)	Unequal environmental information exists between industry and customers. Managing under this information asymmetry environment may require 'signaling' and other information theoretic approaches (Simpson et al., 2007).	<ol style="list-style-type: none"> 1) If the natural environmental influences occur further upstream in the supply chain, it becomes more important to collect information from suppliers (Erlandsson and Tillman, 2009). 2) Organizations are more likely to certify their practices such as ISO 14001 certification when information asymmetries with their stakeholders (e.g., customers and suppliers) are high (Jiang and Bansal, 2003). 	<ol style="list-style-type: none"> 1) Whether coordination, closeness, congruence, and collaboration result in reduced information asymmetry and improved environmental performance and image need further study. 2) There is significant opportunity to study satisficing and dynamic signaling theory application to GSCM practices.
Institutional theory	Institutional theory examines how external pressures influence organizational actions (Hirsch, 1975). Within institutional theory, three forms of isomorphic drivers exist namely, coercive, normative, and mimetic (DiMaggio and Powell, 1983).	<ol style="list-style-type: none"> 1) Coercive pressures mainly originated from governments are key drivers for environmental management practices (Kilbourne et al., 2002). 2) Normative pressure from consumers have driven the adoption of GSCM practices (Ball and Craig, 2010), while exports and sales to foreign customers are two important drivers that prompt manufacturers on the adoption of GSCM practices. 3) Imitation plays a significant role for companies in developed countries to implement GSCM practices (Aerts et al., 2006). 	<ol style="list-style-type: none"> 1) It is unclear how external and internal factors interactively promote GSCM practices? 2) How to identify core companies along supply chains and how can governments exert pressure on such companies? 3) Why do heterogeneous responses to GSCM implementation from institutional pressures exist?
Resource based view (RBV)	The resource-based model of competitive advantage suggests that competitive advantage may be sustained by harnessing resources that are valuable, rare, imperfectly imitable, and non-substitutable (Barney, 1991).	<ol style="list-style-type: none"> 1) Extension of RBV to the competitive advantages across the supply chain can also be applied to greening of supply chains (Gold et al., 2010). 2) Internal organizational resources mediate the relationship to external forces (institutional forces) and GSCM practices adoption (Sarkis et al., 2010). 	<ol style="list-style-type: none"> 1) Knowledge management and learning theoretical perspectives those focus on inter-organizational learning and knowledge sharing for GSCM practice diffusion. 2) The development of scales that are capable of measuring the various competitive dimensions of value, rarity, inimitability, and non-substitutability are still in need of development for GSCM.
Resource dependence theory(RDT)	RDT suggests that, in the supply chain, member firms should depend and collaborate to seek higher performance gains in the long-run instead of pursuing short-term benefits at the expense of others. One important assumption of the RDT is that firms cannot be fully self-sufficient with regards to strategically critical resources for survival.	<ol style="list-style-type: none"> 1) In GSCM, eco-design of products and materials recovery are exemplary organizational resources requiring supply chain partnership to effectuate performance benefits (Shang et al., 2010; Zhu and Sarkis, 2004; Zhu et al., 2005). 2) From the RDT perspective, customer and supplier relationships are important linkages for firms to reduce the uncertainty surrounding their operating environment (Carter and Rogers, 2008). 	<ol style="list-style-type: none"> 1) Relationship between resource dependency and GSCM performance is fertile for investigation. 2) It is not clear how to facilitate and improve GSCM resources acquisition process considering the dependency of upstream and downstream supply chain partners.

Table 1 (continued)

Theory	General conceptualization	Current GSCM related study and theory application	Future research and theory application
Social network theory (SNT)	An SNT considers organizational outcomes as a function of the social relationships between organizations or individuals in an organization (Jones et al., 1997). An SNT has been described as having two major elements namely, density and centrality (Rowley, 1997).	<ol style="list-style-type: none"> 1) GSCM studies on buyer–supplier relationships for performance improvement can be explained or constructed around using an SNT lens (Seyfang, 2006). 2) Using the notion of density from an SNT, it is observed that organizations with a greater number of locations, customers, suppliers, and general awareness in the public are likely to be under greater pressures to adopt GSCM practices and have less control on whether to adopt or not to adopt (Maignan and McAlister, 2003). 	<ol style="list-style-type: none"> 1) The role of an SNT on the diffusion of GSCM from proactive companies to lagging companies. 2) Whether employees in an organization accept, understand, and implement GSCM, across organizational boundaries, is important.
Stakeholder theory	Stakeholder theory suggests that companies produce externalities that affect many parties (stakeholders), which are both internal and external to the firm. Externalities often cause stakeholders to increase pressures on companies to reduce negative impacts and increase positive ones.	<ol style="list-style-type: none"> 1) Specific stakeholder influences on green purchasing (Björklund, in press; Maignan and McAlister, 2003); life cycle analysis (Matos and Hall, 2007); environmentally oriented reverse logistics (Sarkis et al., 2010); ‘closing the loop’ for GSCM (Zhu et al., 2008) and general GSCM or green logistics practices (Chien and Shih, 2007; González-Benito and González-Benito, 2006). 2) Identifying and investigating roles of various stakeholders within GSCM practices has also been studied (de Brito et al., 2008; Gunther and Scheibe, 2005). 	<ol style="list-style-type: none"> 1) Significant investigational opportunities still exist with respect to the roles stakeholder theory and pressures have on GSCM technology and innovation diffusion (Vachon, 2007). 2) Internationally focused stakeholder theory may also be more relevant as the globalization of supply chains has caused the stakeholder sphere to continue expanding, implications for environmental standardization along supply chains may be investigated.
Transaction cost economics	Transaction cost economics focuses on how much effort and cost is required for two entities, buyer and seller, to complete an activity (economic exchange or transaction) (Williamson, 1981).	<ol style="list-style-type: none"> 1) Formal modeling study utilizing transaction costs and dynamics within mathematical programming and optimization model frameworks occurs in a number of environmental supply chain studies (Cruz, 2008, 2009; Cruz and Matsypura, 2009; Cruz and Wakolbinger, 2008; Sheu et al., 2005; Yang et al., 2009). 2) Whether voluntary environmental initiatives standards are more likely to diffuse across a supply chain, if it improves the transaction costs of a relationship (Rosen et al., 2002). 3) The use of the asset specificity and organizational action related to GSCM is another explanatory dimension of transaction cost economics (Delmas and Montiel, 2009). 	<ol style="list-style-type: none"> 1) Exchange hazards investigation with GSCM may also be fertile ground for future investigation. 2) Many dimensions of this theory will help to investigate relationships, investments, and organizational structure decisions in GSCM.

inspection, and quality checking. These complexities inherent in closing the loop for a supply chain have been recognized in previous studies (Guide and Wassenhove, 2009; Matos and Hall, 2007). Due to the bounded rationality of individual parties, the performance outcome of a GSCM activity cannot be accurately predicted without knowing the actual contributions by other involved parties in the system. There will be exacerbated complexities for implementing GSCM if the broader environmental, economic, regulatory, social, and political factors are considered with a larger number of parties interacting with others (Bai and Sarkis, 2010a).

When a complex system expands with an increasing number of interacting parties, or systems, it becomes difficult to infer the behaviors and estimate the interaction outcomes of the system. For managing a supplier system, Choi and Krause (2006) identified supply base complexity as a key area of managerial consideration, which is conceptualized in three dimensions: (1) the number of suppliers in the supply base, (2) the degree of differentiation among these suppliers, and (3) the level of inter-relationships among the suppliers. They refer to complexity as how the members of a system (e.g., suppliers in a base) are varied and interact with one another.

Through understanding the complexity of a system, matters relating to the transaction costs, supply risk, supplier responsiveness, and supplier innovation in a supply base can be better managed (Choi and Krause, 2006). This idea has also been linked to social network theory (SNT) and its implications to GSCM (Miao and Xi, 2007). Complex adaptive systems have been used to also explain the emergence and management of eco-industrial parks (Shi et al., 2010).

One implication of complexity theory for GSCM is that some activities, e.g., customer cooperation for product returns, involve a dynamic network of relationships in the system. Supplier integration in product development (e.g., for an eco-design in GSCM) will also determine performance in product innovation and quality in a system (Koufteros et al., 2007; Vachon and Klassen, 2006b). It is the interaction among the involved parties that allows for the sharing of knowledge and creation of meaning (Yang, 2010). In doing so, it will help reduce the uncertainty that arises from implementing the GSCM activities and guide the functioning of the system. The adaptation aspect of complex systems may also relate to the interorganizational learning theory.

3.2. Ecological modernization

Ecological modernization theory (EMT) has its underpinnings in sociological theory and has been further developed into policy and organizational theories (Spaargaren and Mol, 1992). As a systematic eco-innovation theory, an EMT is geared towards jointly achieving industrial development and environmental protection through innovation and technological development, or 'modernity' (Jänicke, 2008; Murphy and Gouldson, 2000). An EMT has been widely used to explain environmental planning by governments and the restructuring of production by major manufacturers (Murphy, 2000). With multiple dimensions and levels of analysis, sometimes it is difficult to determine how effective and focused a theory it is (York and Rosa, 2003). Even though it exists with many dimensions and characterizations, one view of an EMT has at least two dimensions, which can influence GSCM research and practices. The first dimension concerns the new politics of pollution, which examines the evolution of regulations and policies and their effects on an environmental innovation. The other dimension concerns technological innovation, which suggests that manufacturers can overcome barriers to innovation and thus gain operational opportunities for performance improvements (Murphy and Gouldson, 2000).

New politics is concerned with environmental policy choices and changes (Gouldson and Murphy, 1998). In this dimension, an EMT suggests that ecological regulations and policies can motivate GSCM practices amongst manufacturers. To promote GSCM related practices, proper institutional arrangement and a legal framework by government are needed (Kassolis, 2007). Some researchers have argued that an EMT is the basis of an environmental policy integration (Gibbs, 2000), and such environmental policy is necessary for the GSCM development (Berger et al., 2001).

Alternatively, the practice of GSCM is consistent with the concept of environmental innovation from the EMT view, i.e., manufacturers implement GSCM through hard (e.g., cleaner production equipment) and soft (e.g., increased supplier collaboration in an eco-design) technological innovations (Zhu et al., forthcoming). Industrial ecology, of which GSCM is an important aspect, can help to achieve sustainable development as an important ecological modernization concept (Huber, 2000). Practical proof that the GSCM is related to an EMT has included a study of the Danish textile industry with observations that environmental innovation among enterprises builds new competencies with their enterprises as well as in their supply chains (Søndergård et al., 2004). Using EMT as an explanatory theory, an empirical study among German companies shows that technological environmental innovation most often occurs at the upstream of a supply chain, but not the downstream side (Huber, 2008b). Thus, an enterprise should mainly work with suppliers rather than customers to improve its performance. In addition, at a broader country-level analysis with supply chain globalization, developed countries contribute to the global development and diffusion of technological environmental innovation (Huber, 2008a).

EMT-based GSCM studies explain how an environmental policy can promote the adoption of GSCM and demonstrate that GSCM can bring both economic and environmental performances. However, several questions still remain for further research. A consensual theoretical foundation for an EMT at the GSCM level is necessary. It is a relatively broad theory that requires further refinement at the GSCM and organizational level of analysis. From the EMT view, investigation of how GSCM works at the global level, or any level, to address environmental crises, such as climate change is required. For example, a carbon labeling system of products has been emphasized to help consumers' environmental decisions in the supply chain (Roberts, 2008). The implication is that an effective mechanism to encourage green cooperation along the supply chains still needs to be developed.

EMT's 'win-win' theoretical foundation needs to be further evaluated and investigated. Governments urge companies to undertake environmental practices voluntarily based on the assumption that it is beneficial for business performance. However, an environmental innovation such as GSCM may not bring financial benefits for all organizations (Revell, 2007). This observation leads to the question of what EMT and GSCM aspects cause 'win-win' to occur. The motivation of core large companies in a supply chain is a key to green its suppliers and customers (Hall, 2001). However, it is still unclear what kind of diffusion mechanism (political, social, economic) should be developed to motivate core large companies and then diffuse environmental modernity innovations to smaller suppliers and customers. An EMT is an inchoate theory with significant research potential to help further refine its relationship with an explanatory power for GSCM.

3.3. Information theory (information asymmetry and signaling theory)

Companies may seek to communicate their environmental performance to outside stakeholders, but may not always find this easy to do since they may lack full knowledge of the products, processes, and materials flowing through their supply chains. Typically, suppliers may hold more information about their environmental performance and the performance impact is to be experienced by the customers. This situation is defined as an information asymmetry. A major advantage of greening supply chains is derived from the capability to market and sell green products. Such capability potentially develops new products and hence builds competitive advantages for enterprises. Yet, companies may not be able to reap this image benefit due to the information asymmetry arising from consumers' inability to discern how green the products or materials from the supply chain are (Delmas and Montiel, 2009). Greater interaction reduces information asymmetry (Simpson, 2010). Yet, closer relationships may not necessarily reduce information asymmetry when issues of an asset specificity are considered (Delmas and Montiel, 2009). Another antecedent to an increased information asymmetry is the distance, be it physical, social or cultural, among supply chain partners (Simpson et al., 2007). This situation is more likely to occur as supply chains become more globally oriented. These proximal, social, and cultural dissociations create problems of firms communicating one another's environmentally focused supply requirements, and thus the conditions for high information asymmetry and possible opportunism exist.

The role of information sharing is critical for coordinating a supply chain (Wong et al., 2009). The control and sharing of the information is important not only for issues related to image, but also for international regulatory requirements. For example, an RoHS regulation bans certain materials from an import into Europe. Enterprises are thus heavily dependent on suppliers to disclose environmental information about raw materials, semi-manufactured products, and other resources needed, e.g., energy and water. One of the current issues is that information from the upper echelon in the supply chain is required. If the environmental influences from further upstream in a supply chain occur, it becomes more important to collect the information from suppliers (Erlandsson and Tillman, 2009). Overall, it is easier for firms with greater power and closer relationships to acquire this information. Thus, with more power, greater trust, or coordination, the likelihood of high information asymmetry is lessened (Lai, 2009). Sometimes enterprises seek to maintain information asymmetry to develop power within the supply chain, but whether this benefits environmental supply chain performance is still in need of an investigation. Whether or not coordination, closeness, congruence,

and collaboration result in reduced information asymmetry and improved environmental performance and image are also critical and open questions with respect to the information theory.

Another relationship to the information theory that mitigates information asymmetry is the signaling theory. Signaling theory suggests mechanisms for the transfer of information to another party with the target to resolve information asymmetries (Spence, 1973). An example of signaling that a supply chain is environmentally sound is to have the ISO 14001 certification standard implemented among supply chain partners (González et al., 2008). Research has shown that enterprises are more likely to certify their practices when information asymmetries with their stakeholders (e.g., customers and suppliers) are high (Jiang and Bansal, 2003). This certification is a signal to the market that firms within the supply chain operate with recognized environmental management practices. However, it has been found that a significant portion of an ISO 14001 certification is not awarded to the best environmentally performing enterprises. Thus, the idea of 'satisficing signaling' has been proposed, where poorly performing multi-plant enterprises adopt an ISO 14001 to signal to the market that they are improving operations, but this is usually confined to well-performing units (Terlaak, 2007). Recently, some work on how signaling from the adoption of environmental management systems has changed, because green practices become more prevalent as revealed by the recent investigation (Etzion, 2009).

One important aspect of the signaling theory, that is also related to institutional and stakeholder theories, is concerned with sending signals to various stakeholders and institutions reinforcing the organization's legitimacy. Part of the signaling may be the sending of 'false signals' to institutions and stakeholders and living with these consequences. In the GSCM context, the adopters might adopt GSCM practices for legitimacy, but they might not seek to successfully implement it, which results in a decoupling between superficial adoption and genuine implementation. Organizations may use various "Green washing" strategies to shape a socially responsible image to customers and the public, but will have to respond to future legitimacy concerns (Laufer, 2003). There is significant opportunity to study satisficing and dynamic signaling theory applications to GSCM practices and the performance implications.

3.4. Institutional theory

Institutional theory examines how external pressures influence a company to adopt an organizational practice (Hirsch, 1975; Lai et al., 2006). Within the institutional theory, there are three forms of isomorphic drivers namely, coercive, normative, and mimetic (DiMaggio and Powell, 1983). Coercive isomorphic drivers occur from influences exerted by those in power. The institutional theory can be used to study how a company addresses green issues due to external pressures (Jennings and Zandbergen, 1995), and thus the institutional theory has become a major research direction to explain environmental related practices (Lounsbury, 1997). Government agencies are an example of powerful institutions that may coercively influence the actions of an organization through, for example, fines and trade barriers (Rivera, 2004). Normative isomorphic drivers cause enterprises to conform in order to be perceived as having legitimate organizational activities. Social normative pressures can explain environmental management practices among enterprises (Ball and Craig, 2010). Mimetic isomorphic drivers occur when enterprises imitate the actions of successful competitors in the industry, in an attempt to replicate the path of their success (Aerts et al., 2006).

Coercive pressures are crucial to drive environmental management (Kilbourne et al., 2002). Previous studies show that

governments are key groups to promote voluntary environmental management practices (Rivera, 2004). In the developed countries such as the U.S.A., coercive pressures through laws and regulations were demonstrated to improve environmental awareness, and thus drive environmental management practices. Coercive pressures by governments were shown to drive enterprises to adopt voluntary green initiatives, while such pressures become weaker for those rich in organizational resources for environmental strategies (Clemens and Douglas, 2006). Regulations in developed countries have also caused an increase in institutional pressures for improved environmental management by enterprises in developing countries, many typically surpassing local requirements. For example, the European Community Directive on Waste Electrical and Electronic Equipment (WEEE) now requires all manufacturers in developing countries to take back used products or pay premiums when these manufacturers export electrical and electronic equipment to Europe (Yu et al., 2006). At the same time, developing countries such as China have enacted increasingly strict environmental regulations, which drive manufacturers to implement GSCM practices (Zhu and Sarkis, 2007).

Socially related requirements such as those from the customer and the market and their increasing environmental expectation form the core normative pressure for manufacturers to implement GSCM. In developed countries, consumers have increasing environmental awareness. For example, it is estimated that 75% of U.S. consumers made their purchasing decisions with the enterprises' environmental reputation in mind and 80% of the consumers were willing to pay more for environmentally friendly products (Carter et al., 2000). Thus, normative social pressures in developed countries such as England and Canada are found to be mainly originated from consumers' ethical values and ecological thinking (Ball and Craig, 2010). Previous studies show that consumers in developing countries have increasingly heightened environmental awareness and are starting to opt for green products (Harris, 2006). In addition to normative pressures from consumers, exports and sales to foreign customers are two more important drivers that prompt manufacturers to adopt GSCM practices for developing countries such as China (Christmann and Taylor, 2001).

Enterprises may follow or 'mimic' competitors merely because of their success, where such behavior in operations and manufacturing is typically defined as the competitive benchmarking. The rationale is simply to follow the actions of successful competitors to replicate their successful paths. Imitation plays a significant role for enterprises in developed countries such as Canada, France, and Germany to implement GSCM related practices (Aerts et al., 2006). Globalization has created opportunities for manufacturers in developing countries such as China to learn from their foreign competitors to implement environmental management practices (Christmann and Taylor, 2001). Joint ventures in a developing country may implement GSCM practices such as eco-design by imitating their parent companies, and then diffuse their experiences to other enterprises in the developing country (Zhu and Liu, 2010).

Institutional theory may explain how external drivers promote GSCM practices. However, there are still some remaining questions. First, it was shown that both external drivers and internal resources drive environmental management practices (Clemens and Douglas, 2006), but it is unclear how external and internal factors interactively promote GSCM practices. Second, it is demonstrated that the motivation of a core company in a supply chain is a key to green its suppliers and customers (Hall, 2001). Governmental regulations can be key drivers for enterprises to implement environmental management practices (Rivera, 2004). However, what kinds of enterprises can be considered to be core companies in supply chains, and what kinds of mechanisms should be established to motivate such core companies still need further studies. Third, a previous study on developed countries such as Canada and England

shows that normative pressures drive enterprises to be more environmentally aware, but the study also argues that new institutional theory, integrating new perspectives such as ethical values and ecological thinking, is needed to understand organizational response to environmental issues (Ball and Craig, 2010). With the development of global supply chains, mimetism provides opportunities for encouraging cooperation among enterprises from different countries operating under the same supply chain (Daniels and Perez, 2007), but the diffusion mechanism for such cooperation needs further research. Finally, there are issues related to the linkage of external pressures from institutional theory to internal capabilities such as those proposed by the resource based-view that needs to be further investigated in GSCM (Sarkis et al., 2010).

One interesting relationship to the institutional theory is whether the 'logic' and 'rules' of GSCM can themselves become institutional rules, similar to that proposed for life cycle thinking and life cycle analysis (Heiskanen, 2002). Already through the supply chain, the expectations of normative forces are beginning to play this role (Zhu et al., 2008).

3.5. Resource based-view

The resource-based model of competitive advantage suggests that competitive advantage may be sustained by harnessing resources that are valuable, rare, imperfectly imitable, and non-substitutable (Barney, 1991). Firms resources have been defined as all assets, capabilities, organizational processes, firm attributes, information, and knowledge controlled by an enterprise that enable the firm to conceive of and implement strategies with the goal to improve its efficiency and effectiveness (competitiveness) (Barney, 1991; Daft, 1983). The extension of the resource based-view has included the integration of dynamic capabilities (Helfat and Peteraf, 2003) and natural resources (Hart, 1995).

The development of resources and capabilities may be exemplified through improvements in various organizational performance metrics. As an example, green project partnership with customers was positively linked to quality, flexibility, and environmental performance, while partnership with suppliers was associated with better delivery performance (Vachon and Klassen, 2006b). Building these operational capabilities through greening of supply chains further supports the value, rarity, inimitability, and non-substitutability aspects of the RBV (Carter and Carter, 1998; Förstl et al., 2010). Studies and conceptualizations have found and argued for the improvement of reputation and image, which is considered a significant resource overall (Barney, 1991), and is evident in the business value of GSCM (Förstl et al., 2010; Sarkis, 2009). Interestingly, when considering the values associated with greening the supply chain, the competitive advantages are not necessarily in the upstream (supplier management) stages of the supply chain as they could even be larger in the downstream (customer) stages with green marketing capabilities and resources (Shang et al., 2010).

Extension of an RBV to competitive advantages across the supply chain, e.g., supply chain versus supply chain rather than organization versus organization, has also been a research direction within the greening of supply chains (Gold et al., 2010). Thus, having the knowledge and capabilities for a whole supply chain to be green is a resource that falls well within the RBV dimensions (Lai et al., 2010). Dynamic capabilities also relate to organizational learning, which is meant to build knowledge resources within the organization. These capabilities can be developed through internal systems. Supply chain mechanisms can aid environmentally oriented learning by sharing resources (Carter and Rogers, 2008; González et al., 2008; Zhu et al., 2008). Inter-organizational learning is meant to greatly enhance the resources of organizations throughout the supply chain. Yet,

investigation of green supplier development programs, theoretically and empirically, is still limited (Bai and Sarkis, 2010b).

Environmentally oriented reverse logistics dimensions of greening supply chains have also seen investigation of how internal organizational resources mediate the relationship to external forces (institutional forces) (Sarkis et al., 2010). For example, it is difficult to substitute and imitate training, which is an important investment in internal capabilities that allow organizations to respond to various supply chain pressures. Alternatively, a lack of capabilities and resources make the implementation of environmentally oriented reverse logistics practices difficult (González-Torre et al., 2010). This research further supports the suggestion that these resources are difficult to come by, and thus may be strategically advantageous to firms which have implemented these GSCM practices.

Possible directions for this theoretical perspective are to incorporate additional knowledge management and learning theoretical perspectives which focus on inter-organizational learning and knowledge sharing. The development of scales that is capable of measuring the various competitive dimensions of value, rarity, inimitability, and non-substitutability are still in need of development for GSCM. Some linkages to other organizational theories has been completed, additional possibilities, with many of the other theories proposed here may also be investigated.

3.6. Resource dependence theory

Resource dependence theory (RDT) suggests that, in the supply chain, member firms should be dependent and collaborate to seek higher performance gains in the long-run instead of pursuing short-term benefits at the expense of others. According to the RDT, firms are dependent on resources provided by others in order to sustain growth, as well as other organizations that may be dependent on them (Pfeffer and Salancik, 1978). One important assumption of the RDT is that firms cannot be fully self-sufficient with regards to strategically critical resources for survival. They need to depend on resources from outside parties to compete (Heide, 1994) and carefully manage this dependency with other firms to strive for sustainable development (Ulrich and Barney, 1984). The relationships to institutional theory and stakeholder theory have also been characterized in the literature (Paloviita and Luoma-aho, 2010).

In GSCM, eco-design of products and materials recovery is exemplary organizational resources requiring supply chain partnership to effectuate performance benefits (Shang et al., 2010; Zhu and Sarkis, 2004; Zhu et al., 2005). These resources can also be converted to relationship-specific assets, similar to those identified in transaction cost economics, on which partner firms depend to generate sources of advantages. On the other hand, firms need to control or access critical resources, e.g., standards, procedures, enabling technologies, materials sources, and distribution channels, to implement GSCM practices and fully realize the potential gains. The interdependency of supply chain partners as well as the quality and effectiveness of their collaboration that determine the success of implementing GSCM should not be ignored. One important insight from RDT is that firms lacking the required resources to attain their goals are likely to develop relationships with others for acquisition of the resources. This perspective considers customer and supplier relationships as important linkages for firms to reduce the uncertainty surrounding their operating environment (Carter and Rogers, 2008; Cao and Zhang, 2010). In many instances, inter-organizational relationship is essential for managing the internal and external coordinations for GSCM to gain the performance outcomes (Zhu et al., 2010b), where partner coordination and resources sharing are beneficial for

environmental and productivity improvements. The power development aspect of resource dependence argues for the diffusion of environmental practices through the supply chain. For example, it has been found that larger firms, given their power over smaller firms, will require environmentally sound practices to be adopted by small supplier firms (González et al., 2008).

There is also an empirical evidence showing a positive relationship between resources dependency in the form of relational resources and supply chain performance (Yang et al., 2008). Though there is a void of studies relating RDT to GSCM, this theory is valuable for extending this line of research in understanding inter-organizational behaviors in the GSCM implementation. For instance, it helps to predict organizational responses for implementing GSCM with respect to the level and nature of dependence of partner firms and their relative power in the supply chain. In adopting GSCM practices, e.g., green purchasing and customer cooperation, this theory provides insights on how to facilitate and improve the resources acquisition process considering the dependency of upstream and downstream supply chain partners.

3.7. Social network theory

Social network theory (SNT) has been suggested as a suitable theory to help understand general sustainability developments (Connelly et al., forthcoming). This theory considers organizational outcomes as a function of the social relationships between organizations or individuals in an organization (Jones et al., 1997). Organizations make decisions according to information and influence from their social network (Wuyts et al., 2004). SNT further examines the network structures and its role in the diffusion of management practices. An organization can gain benefits by bridging structural holes in a social network (Ahuja, 2000). This theory has been described as having two major elements, density, and centrality (Rowley, 1997). Density measures the relative number of ties in the network that link actors together. Network centrality refers to the position of an individual organization in the social network and its ability to control the flow of information (Wasserman and Galaskiewicz, 1994). There are two issues related to managing external pressures that arise from these characteristics. As density increases, the ability to resist external pressures from network members decreases. As network centrality increases, the ability to resist external pressures increases.

Few studies within the GSCM research stream have explicitly utilized SNT. However, GSCM studies on buyer–supplier relationships for performance improvement can be explained or constructed around using the SNT lens. For example, at least three types of environmentally related dimensions between customer and supplier relationships have been studied. One is the environmental requirements in industrial buyer–supplier relationships such as purchasing requirements, employee training, and certification under the ISO 14000 series requirements (Green et al., 1996). Consumers' requirements are also SNT-related such as requirements for organic foods, which can green the whole supply chain (Seyfang, 2006). A second dimension for potential investigation concerns environmental information sharing for organizational practices such as new product development (Zhu and Liu, 2010). A third possible dimension is more cooperatively focused, such as environmental collaboration for co-developing recyclable products and cleaner processes (Walton et al., 1998). Social networks are multidimensional, since organizations that cooperate with customers tend to cooperate with suppliers, showing greater potential for achieving an environmental success (Theyel, 2001).

Using the notion of density from the SNT, it is observed that organizations with a greater number of locations, customers, suppliers, and general awareness in the public are likely to be

under greater pressures to adopt GSCM practices and have less control on whether to adopt or not to adopt (Maignan and McAlister, 2003). Using the notion of centrality, it is observed that organizations can control pressures to adopt GSCM practices much more effectively, leaving the choices of adoption more in the control of the organization. These two issues should receive greater attention for research investigation.

Overall, relatively few studies investigating GSCM on the theoretical basis of SNT. First, the SNT posits that relationship extent is important for an organization to gain benefits (Wuyts et al., 2004). Thus, ample opportunity exists for green supplier development, which has been rarely investigated, within the scope of the SNT (Seuring and Müller, 2008a). Another opportunity for investigating the role of the SNT is on the diffusion of GSCM from proactive companies to lagging companies. One such dimension, even within the same organization, was investigated on how eco-design experiences can be diffused from a parent company in a developed country to a subsidiary company in a developing country (Zhu and Liu, 2010). Third, another level of analysis for the SNT is the individual. According to this theory, there are network learning effects for directors who sit on other boards that have adopted a certain management practice (Beckman and Haunschild, 2002). Investigating whether an adoption of GSCM practice diffuses through this social network among the top executives and directors can be studied through the number of interlocks of the board. In addition, whether employees in an organization accept, understand, and implement GSCM, across organizational boundaries, is important. Whether personal philosophies and linkages across a social network play a role can be fertile ground for investigation.

3.8. Stakeholder theory

A stakeholder is “any group or individual who can affect or is affected by the achievement of an organization's objectives” (Freeman, 1984). Stakeholder theory suggests that companies produce externalities that affect many parties (stakeholders) which are both internal and external to the firm. Externalities often cause stakeholders to increase pressures on companies to reduce negative impacts and increase positive ones. Various categorizations have been used to group stakeholders and include direct or indirect, primary and secondary, or based on multiple dimensions of legitimacy (Delmas, 2001; Delmas and Toffel, 2004; Delmas, 2002), urgency, and power (Mitchell et al., 1997). Thus, many developments and directions for the stakeholder theory do exist, but the basic premise is that internal and external groups will influence organizational practices. Environmental externalities may be internalized through these stakeholder pressures within and between supply chain members. Stakeholders are usually closely aligned with social institutions, and thus confounding relationships with institutional theory may also exist, especially if there are norms and legitimacy aspects of stakeholder theory that overlap institutional theory. Yet there are some differences, such as internal to the supply chain (i.e., supply chain partners) or organizational stakeholders may exist.

The supply chain as an entity also has a variety of stakeholders, even more so than individual enterprises with an expansion of these stakeholder groups particularly when environmental issues are introduced (de Brito et al., 2008). Stakeholder analysis for GSCM is especially pertinent as there are views that not all GSCM practices are conducive for generating competitive advantages for enterprises and are absolutely necessary due to pressures from stakeholders. The stakeholder theory is usually introduced as an explanatory theory related to antecedents or contingencies for adoption of various GSCM practices. Specific stakeholder influences

on green purchasing (Björklund, in press; Maignan and McAlister, 2003); life cycle analysis in the supply chain (Matos and Hall, 2007); environmentally oriented reverse logistics (Sarkis et al., 2010); 'closing the loop' for greening supply chains (Zhu et al., 2008), and general GSCM or green logistics practices have received research attention (Chien and Shih, 2007; González-Benito and González-Benito, 2006). Identifying and investigating the roles of various stakeholders within GSCM practices has also been an application approach by researchers utilizing the stakeholder theory (de Brito et al., 2008; Gunther and Scheibe, 2005).

Much of the GSCM research have investigated stakeholder theory from a multi-theoretic (Sarkis et al., 2010) or general explanatory theory perspective to explain specific phenomenon (Sarkis et al., 2010; Tate et al., 2010). Yet, the advancement of stakeholder theory through GSCM research has not occurred. Even though unique perspectives have been implemented through other theories such as 'sphere of influence' theory, where the organization's sphere of influence may impact supply chain partner environmental initiatives and innovations (Hall, 2001).

Significant investigational opportunities still exist with respect to the roles of stakeholder theory and pressures on GSCM technology and innovation diffusion (Vachon, 2007) as well as the various management practices mentioned above. Internationally focused stakeholder theory may also be more relevant as the globalization of supply chains have caused the stakeholder sphere to continue expanding.

3.9. Transaction cost economics

Transaction cost economics focuses on how much effort and cost is required for two entities, buyer and seller, to complete an activity (economic exchange or transaction) (Williamson, 1981). Suppliers and buyers seek to minimize the cost of their transaction (Lai et al., 2005). Transaction costs are the costs of activities beyond the cost of a product or service that are required to exchange a product or service between the two entities. Transaction cost economists say entities are 'rationally bounded' and use an analysis of 'exchange hazards' to explain why buyers and suppliers choose particular governance structures for assets and practices (Rosen et al., 2000). An example exchange hazard includes the lack of information access such that the full understanding of the transaction is not available to either side giving rise to self-interest seeking behavior or opportunism. Transactions, in general, include dimensions of uncertainty, transaction frequency, and asset specificity. Asset specificity includes site specificity, physical asset specificity, and human resource specificity (Zsidisin and Siferd, 2001). Characteristics of a transaction will determine the responses to various activities by both sides of the transaction.

Ample opportunity exists for investigation of the various dimensions of transaction cost economics in GSCM studies. A direct example is evaluating actual costs of decisions and practices on different types of transactions within a GSCM environment. Formal modeling study utilizing transaction costs and dynamics within mathematical programming and optimization model frameworks occurs in a number of environmental supply chain studies (Cruz, 2008, 2009; Cruz and Matsypura, 2009; Cruz and Wakolbinger, 2008; Sheu et al., 2005; Yang et al., 2009). In addition, modeling transaction costs with game theoretic approaches for GSCM is one avenue that researchers view as fertile ground for investigation (Carter and Jennings, 2002).

Another direct transaction cost evaluation may occur on whether voluntary environmental initiatives standards are more likely to diffuse across a supply chain, if it improves the transaction costs of a relationship (Rosen et al., 2002). One of the more traditional topics within SCM is the 'make or buy' decision. Essentially, if the internal

transaction costs are greater than the relationship transaction costs, it would make an economic sense to outsource functions and activities (Zsidisin and Siferd, 2001). For example, firms may find that some processes are environmentally damaging, where outsourcing may reduce liability, cleanup, and image costs, but the monitoring and control costs for this type of outsourcing may increase. Whether or not certain environmental expertise exists within an enterprise may also play a role (where developing this expertise internally rather than outsourcing involves a transaction cost). These types of decisions can be modeled and evaluated both quantitatively and qualitatively.

The use of the asset specificity and organizational actions related to GSCM is another explanatory dimension of transaction cost economics. For example, one such investigation argues that firms engaged in transactions involving highly asset-specific investments, and therefore greater dependency on their current customers than firms with lower asset specificity, are more likely to adopt an ISO 14001 (Delmas and Montiel, 2009). The integration of environmental technology across the supply chain may also be explained by the role of asset specificity and inter-organizational relationships (Vachon and Klassen, 2006a). The asset specificity issue can also be investigated from one of the three types of asset specificity. In addition to the direct relationships of GSCM implementation with the level of asset specificity, relationship-specific investments and their potential moderations and mediations are also promising research topics. One such approach found a moderating effect of asset specificity between a supplier's environmental commitment and a customer's environmental performance requirements (Simpson et al., 2007).

Exchange hazards investigation with GSCM may also be fertile ground for future studies. There are at least five forms of exchange hazard: expropriation, appropriability, measurement related, intertemporal, and institutional weakness hazards (Williamson, 1996). As an example, some of these hazards have been investigated using the case study approach to understand supply chain relationships that required suppliers to invest in design for environment and environmental management system practices (Rosen et al., 2000). Whether or not these types of hazards are prevalent with respect to other GSCM practices would be an interesting investigation. How to manage GSCM relationships with their existence and whether they are barriers to GSCM diffusion are also concerns that should warrant research attention. The existence of power and trust in GSCM relationships may also fit within the exchange hazards discussion (Zhu et al., 2010a).

Ample opportunity exists for the application, testing, and development of transaction cost economics. The GSCM research with this theory has spanned qualitative case study to analytical formal modeling. Many dimensions of this theory will help to investigate relationships, investments, and organizational structure decisions in GSCM.

4. Promising organizational theories for GSCM research

Even though numerous additional organizational theories exist, we identify a few that show some promise for helping to further understand and explain GSCM. Further investigation of these theories is clearly necessary due to the paucity of GSCM-based research that has sought to investigate their applicability. The four organizational theories we introduce here include: (1) Diffusion of Innovation; (2) Path Dependency; (3) Social Embeddedness; and (4) Structuration theories. We provide just a brief description of potential research questions that may be investigated in GSCM with each of these theories.

4.1. Diffusion of innovation theory

Diffusion of innovation suggests that an innovation is communicated through particular channels, over time, among the members of a social system (Rogers, 2003). Innovations arise to address organizational or technological challenges and the adoption of innovations is most likely for those firms encountering pressures to address those challenges (Kraatz and Zajac, 1996). One important note is that even where adoption of the innovation yields limited results among early adopters, rapid increases may still be observed among other firms facing similar pressures. In the GSCM implementation, these pressures can arise from customer requests, regulatory requirements, and the need for performance improvement on an eco-efficiency (Zhu et al., 2007). This theory also suggests that the diffusion of GSCM as an innovation can be viewed as a process of initiation, persuasion, planning, adoption, and confirmation. Researchers can extend this theory by studying the diffusion of GSCM in different stages and if the proactive, early adopters can garner larger performance gains as posited by aspects of this theory.

4.2. Path dependency theory

The focus of path dependency is based on the idea that the initial choices made by decision makers result in an increasing return (Pierson, 2000). As there are larger rather than smaller benefits to reinforce activity, other choices are prohibitive and thus restricting the decision makers' future choice options to the choice previously made (David, 1985). Even though original applications were for technology, social programs may also be explained by path dependency. Even though at the organizational level, path dependency has been well articulated for organizational change, the expansion to inter-organizational change has also occurred. For example, previous experiences with partner firms are more likely to lead to strategic alliances by these firms (Gulati and Gargiulo, 1999; Chou et al., 2010). Firms implementing a management initiative, e.g., GSCM, in a particular way will yield an effect leading them to do something next time in a similar manner. The implication is that once partner firms in the supply chain have chosen to adopt GSCM, they become "locked in" to its implementation due to many potential reasons such as the initial large set-up costs involved, learning effects, coordination effects, or adaptive expectation that result from its implementation. Path dependency would argue that implementing GSCM can be self-reinforcing and improve as there are more adopters to gain experience that guides further development. This link is a positive-feedback loop: the more people that adopt a technology or a management approach such as GSCM, the more it improves and the more attractive it is for further adoption. Following the insights by North (1990) with his introduction of the institutional matrix, further research can extend this path dependency perspective by examining the implementation of GSCM as a self-reinforcing mechanism contingent on initial conditions, supply chain relationships, commitment of partner firms, and the sequence of implementing different GSCM dimensions.

4.3. Social embeddedness theory

Firms are embedded in ongoing networks of social relationships (Granovetter, 1985). This social embeddedness perspective enables us to understand the embeddedness of partner firms in a supply chain on implementing GSCM. Embeddedness is a process of becoming part of the structure such as GSCM. Such embeddedness can be characterized by the strength of the social ties of a firm with its immediate social context, which is useful for enterprises to

identify social resources. In the embedding process, firms need to understand the nature of the structure, e.g., the different dimensions of GSCM. Then, they will enact and reenact this structure which forges new ties and subsequently maintains both the link and the structure. A highly embedded supply chain allows access to support for environmental management initiative and increases partner cooperation in pursuit of GSCM. Alternatively, the embeddedness can also be a liability constraining organizational actions (Uzzi, 1997). For instance, the unforeseeable exit of a core partner, e.g., a major supplier, can disrupt the efforts on the eco-design of products to serve the supply chain. The relationships of social embeddedness to the social network theory may also be investigated.

4.4. Structuration theory

Structuration theory (Giddens, 1984) can be a useful framework to better understand the nexus of implementing GSCM and the driving forces as it theorizes the interdependence of the actor (agent) and the context (structure). Structuration theory specifies a reciprocal relationship between agency and structure with the view on duality, where they co-evolve to shape environmental management approaches such as GSCM to strive for environmental and productivity gains. This structuration view is useful for explaining complex social interactions, and specifically in GSCM, the interaction of the different actors (agent) including customers and suppliers in the GSCM implementation (structure) should be understood collectively. Within a structuration framework, the involved actors are conceptualized as agents acting with social and economic systems that engender potentially rewarding opportunities through GSCM. Insights can be obtained on how these actors apply rules, knowledge, and resources in interaction, and as such guide the actions of enterprises on GSCM implementation in adapting to their requirements.

4.5. Agency theory

Agency theory focuses on scenarios that one entity, the principal, authorizes a second, the agent, to act on the principal's behalf (Eisenhardt, 1989). The theory focuses on the costs arising from conflicts of interests between managers and stockholders (for example, over the amount of effort to be exerted, risk being borne, shirking, perquisites tradeoffs between the pursuit of sales versus profits). Part of this tension arises when *environmental and financial goals within organizations may potentially conflict*. There are situations where agents often behave in ways that benefit them, not principals. For example, a CEO may exploit his/her role as an agent by adopting a particular management practice in order to improve their own compensation, regardless of the actual benefit of the management practice to the company. It has also been argued that Agency theory offers a natural fit with supply chain management research (Ketchen and Hult, 2007).

Some research has investigated agency theory as a lens to explain the adoption of general environmental management practices (Cordeiro and Sarkis, 2008; Berrone and Gómez-Mejía, 2009). The issue of compensation, incentives, and general motivation of upper level management has been a major focus of agency theory applications to corporate environmental management. In one of the few studies in this area pertinent to GSCM, Kogg (2003) argues that greening the supply chain can be achieved through the use of power leverage and incentives. Thorough investigations of the role of agency theory in motivating managers in dyadic or supply chain situations (for example, as a benefit to the relationship versus a benefit to specific organizational stockholders) are clear areas for research. Specifically, future research on this topic could investigate how individual level (e.g., CEO and senior executives) and firm level

(e.g., contractors and suppliers) reward structures promote the adoption of GSCM. Whether multi-level, and cross-organizational, congruencies exist in compensation and reward systems and the impact on an adoption of GSCM practices, and their performance are additional questions that can be evaluated.

5. Conclusions

In this paper, we review the literature on GSCM with a focus on identifying applicable and explanatory organizational theories that have been utilized to expand understanding and knowledge of this research field. We find that researchers in GSCM have started to apply a number of organizational theories in explicit ways. Some of the research has also helped to further understand and strengthen some of these theories. We also expound on future possibilities for organizational theory development and linkages.

We can make a number of observations of this initial review and integration of the literature. First, the organizational theory provides a very valuable source of theoretical underpinnings for investigating and furthering research in GSCM. Second, there are ample opportunities for future research and investigation with theories that have already been applied. Significant questions still exist that require investigation. Third, there is also an ample room for new theories examining the GSCM management, introduction, and diffusion that have not seen significant investigations. Fourth, much of the literature on the applications and uses of theory in GSCM research has been relatively recent. This observation means that we are at the growth stages of GSCM and organizational theory linkage. Fifth, additional and emergent organizational theories may exist that can help address unforeseen and nascent GSCM issues. Finally, even though we identify some additional theories, researchers in GSCM could be able to develop theories that may explain other organizational phenomena.

We believe that this paper can serve as a good foundation for those seeking to develop theories and broaden research in GSCM. We did not discuss various methodologies and tools that could be used to investigate the linkage of GSCM and the organizational theory. Methodological developments and application for supply chain and GSCM research are also promising areas for future studies. We believe that significant growth and opportunities to understand our world exist at the nexus of these important environmental-based organizational research fields.

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