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Manufacturers' Closed-Loop Orientation for Green Supply Chain Management

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Abstract: The concept of green supply chain management (GSCM) is still in its infancy and has been implemented only to a limited extent. Strategic orientation is an important factor affecting its implementation. No reliable and valid strategic orientation construct has been developed for greening a supply chain. This study proposes closed-loop orientation (CLO) as the appropriate strategic orientation to implement GSCM practices successfully and develops a valid measurement of CLO. Data collected from 296 Chinese manufacturers were analyzed using the structural equation modeling method to examine the relationships among CLO, GSCM practice and environmental and economic performance. The results show that both CLO and GSCM have positive effects on the environmental performance and economic performance and that CLO positively impacts the level of implementation of GSCM. The results also show that GSCM completely mediates the relationships between CLO and environmental and economic performance.

Keywords: closed-loop orientation; green supply chain management; closed-loop; strategic orientation; environmental performance; economic performance

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1. Introduction

Green supply chain management (GSCM) is a significant strategy for companies to improve their environment and economic performance concurrently by reducing environmental risks and increasing their ecological efficiency [1–4]. However, although proactive organizations, such as Dell, HP, and Sony, have adopted GSCM initiatives in their operational process [2], it is still a new concept and has not been widely adopted, particularly by small and medium sized firms [5]. For example, as global suppliers of manufactured products, most manufacturing firms in China [6] appear to be still at the early learning stage of environmental practices [7]. Even minor early adopters of GSCM practices are merely at the initial stages of implementation [8].

This comes as no surprise. It has been reported in the literature that firms face various internal and external barriers to the effective implementation of GSCM practices. Internal barriers are conceptualized as residing within organizations, whereas external barriers are conceptualized as residing outside organizations. Internal barriers include the costs associated with GSCM concerns [9,10], lack of resources [9], lack of legitimacy [9], lack of top management support [11,12], lack of stakeholder commitment [12], lack of training [10], lack of incentive systems [12], lack of belief on the part of purchasing personnel [10], and the newness of the concept of GSCM [13]. External barriers include industry specific barriers [3,9] differences in regulations [9,11], the risk of losing key supply chain partners [14], and lack of coordination of supply chain partners [9,12]. Consequently, it is imperative that the question as to how to implement GSCM practices successfully be addressed to create environmentally friendly supply chains [15]. In this study, we address this question from the perspective of the internal barriers faced by firms of trying to implement GSCM practices. This issue is important as internal barriers have been identified as the 'fundamental obstacle to the adoption of the environmental practices' [16] in previous studies [9,12,17,18], although external barriers can also hinder environmental progress.

Internally, in order to improve the implementation of GSCM, commitment is required, such as management support, awareness training, incentive systems, etc. [7,8,10,12,16–21]. In fact, commitment is necessary for implementing any new initiatives [22], particularly for the success of reduction, reuse, and recycling programs [19]. A "long-term business commitment" [23] represents the firm's strategic orientation. Roehrich et al. [24] highlighted that, in order to successfully implement sustainable management of supply chains, the firm requires a long-term orientation. A strategic orientation is a key direction that leads firms to take appropriate measures for the persistent improvement of their business performance [25,26].

GSCM is a new concept that integrates environmental concerns into supply chain management, including reverse logistics activities [2,27,28]. It requires firms to establish an appropriate strategic orientation which directs them to commit resources [28] primarily toward achieving the effective implementation of GSCM. Nevertheless, only a few studies have investigated how strategic orientations affect the implementation of GSCM practices in the context of greening the supply chain. To fill this gap, this study explores one specific strategic orientation for the successful implementation of GSCM, and further empirically tests its effects on the implementation of GSCM and performance improvement.

In this study, we offer three main contributions to the literature. The first is to propose a new framework for a process-based strategic orientation, i.e., Closed-Loop Orientation (CLO), in a GSCM context through a comprehensive and thorough analysis of the underlying concept of GSCM. The CLO can be used to facilitate the successful implementation of GSCM practices. The second contribution is the development of a reliable and valid measure of CLO to link the conceptual framework with empirical indicators. To the best of our knowledge, there is no previous research that has developed a valid measure of a proposed strategic orientation for greening supply chains. The operational measure proposed herein is expected to provide specific guidance for its implementation. The third contribution is to investigate the relationships between CLO, GSCM practices and organizational performance using survey data collected from manufacturers in China. This will provide empirical evidence as to whether CLO can influence the degree of implementation of GSCM practices and, thus, affect a firm's organizational performance.

The remainder of the paper is structured as follows. In the next section, we review the wider literature on environmental management, GSCM, strategy management and strategic orientation, before presenting the conceptual framework of CLO in the context of GSCM, and defining CLO and developing the dimensions of CLO in Section 3. In Section 4, we present the theoretical framework and develop the hypotheses. We then outline the research methods in Section 5, before presenting our empirical test results. We discuss the findings and highlight both theoretical and managerial implications, before outlining limitations and further research avenues, and conclusions.

2. Literature Review

2.1. Traditional SCM and Reverse Logistics

Traditional supply chain has been defined as "a set of three or more entities (organizations or individuals) involved directly in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer". As such, the supply chain is a one-way chain [29] and a linear process [13], such as a pipeline consisting basically of a supplier, a manufacturing company, and a customer [30]. Accordingly, traditional SCM is considered to be a set of management processes [30] handling the flow of materials from a supplier to the end user in a distribution channel [31]. In these processes, raw materials are transformed into the final products and delivered to consumers through distribution, retail, or both [29].

Reverse logistics is considered as a process allowing for the reuse and recycling of waste materials [12]. The direction of this process has been described as being the opposite of that of the traditional flows in the supply chain [32]. For example, Murphy and Poist [33] described it as the flow of products from the end user towards a producer in a distribution channel. Lately, the European Working Group on Reverse Logistics provided the following definition for reverse logistics by widening its scope: "the process of planning, implementing and controlling the backward flows of raw materials, in process inventory, packaging and finished goods, from a manufacturing, distribution or use point, to a point of recovery or point of proper disposal" [32]. In Figure 1, the solid lines illustrate a traditional SC, i.e., the scope of SCM, with reference to Beamon [29], and the dashed lines represent reverse logistics activities by referring to the definition by the European Working Group on Reverse Logistics.

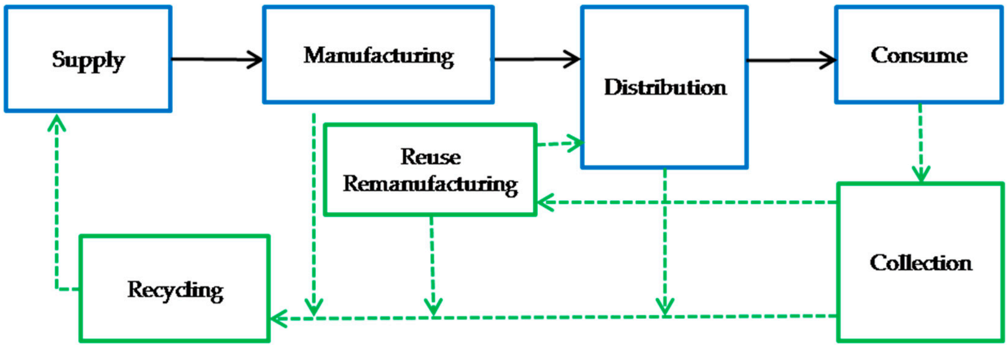

Figure 1. Traditional supply chain and reverse logistics.

2.2. GSCM

GSCM is a management strategy or an emergent environmental management philosophy, which takes into account the effects of the entire supply chain on environmental protection and economic development [8,34]. GSCM has its roots in both environmental management and supply chain management (SCM) literature [28] and has also been expressed as environmental SCM [35] as well as environmentally-friendly SCM [36]. With respect to its development history, GSCM began with an emphasis on specific aspects of SCM, e.g., logistics, purchasing, and reverse logistics [27]. Nowadays, it has been conceptually developed into a systematic approach by integrating specific aspects of SCM such as purchasing, operations, marketing, logistics, and reverse logistics [29,37]. GSCM is now the integration of environmental concerns and SCM practices, while incorporating reverse logistics, as described in Sarkis et al. [27].

Prior studies have argued the inevitability of the systematic development of GSCM, i.e., including both forward and reverse flow. Van Hoek [37] highlighted that environmentally friendly initiatives are much more than the reversed flow of goods. Thus, the partial contribution of reverse logistics is not enough and accordingly, greening initiatives should focus on the entire supply chain, instead of reverse logistics alone. For instance, for the disassembly operations in the reverse flow, proactive 'design for disassembly' in the initial product design stage is necessary. Beamon [29], in reverse, asserted that the first step of moving the production systems operating way towards sustainability is to extend the structure of traditional supply chains to include reverse logistics activities. From a life cycle management and industrial ecology perspective, reverse logistics activities are necessary to minimize waste and resource use to meet environmental challenges (e.g., resource depletion, overflowing waste sites, and water pollution). GSCM is a proactive business value-driven practices implemented through various Re-activities, i.e., reduce, reuse, remanufacture, recycle, etc., rather than a reactive general just being environment friendly management program [28,29,37].

Therefore, following previous studies, e.g., [2,27,28,38,39], this study defined GSCM using the following formula: "GSCM = green purchasing + green manufacturing/materials management + green distribution/marketing + reverse logistics" by adding the "green" component to supply chain management, but the scope of GSCM extended beyond traditional SCM through including reverse logistics. Figure 2 illustrates GSCM based on its definitions in the literature. The solid and dashed lines represent the greening of the traditional supply chain and the reverse logistics activities, respectively.

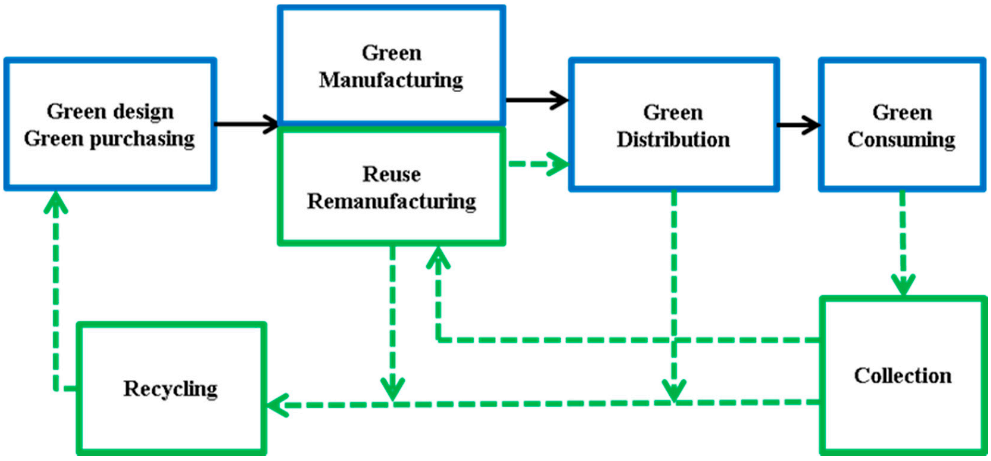

Figure 2. GSCM.

Environmental impacts occur at all stages of a product's life cycle [37,40]. To minimize the total environmental impact of a business, the scope of environmental management initiatives should be moved beyond individual companies to the whole supply chain and be evaluated from a total system perspective [37,41–43]. GSCM is a far-reaching, systemic and proactive environmental management approach [1,28,29,37]. It has been viewed as a significant strategy for companies to concurrently improve their environmental and economic performance [1–4]. The firms that adopt GSCM seek to manage their own environmental impacts, meanwhile, attend to affect the environmental behavior of their supply chain members [1,3], e.g., assess their suppliers' environmental performance and require suppliers' processes to be environment-friendly [1], while most other firms pursue the reduction of their direct environmental impact. In addition, GSCM is concerned with the effects of the entire supply chain on environmental protection and economic development [8,34], including both forward and reverse flow [27,28].

The pressures from customers, competitors and environmental groups, as well as the effects of regulations, globalization and concerns about their corporate reputation are some of the drivers that have contributed to the implementation of GSCM practices [5,7,9,13,24,44–48]. According to Amann et al. [49], firms per se are already aware of existing environmental policies and familiar with the use of environmental certificates and the integration of environmental management systems. Firms are increasingly preparing themselves for sustainability. However, GSCM is still a new concept and has only been implemented at the initial stage in practice [5,7,8]. Accordingly, it is imperative to address the question as to how to successfully implement GSCM and improve organizational performance by clarifying the antecedents in the implementation of GSCM.

2.3. Strategic Orientation

A strategic orientation has been described as strategic fit, strategic predisposition, strategic thrust, and strategic choice [50,51]. It has been defined as the strategic direction that leads firms to take appropriate measures for the persistent improvement of their business performance [25,26].

Literature views strategic orientations as one cultural element in nature [26,50,52] and suggests studying it within the broader context of organizational culture. Particularly, Noble et al. [50] offered a competitive culture approach to assessing a firm's strategic orientation. Competitive culture is the dimension of organizational culture that provides the organization's values and priorities in interactions with its marketplace and influences more specific strategies and tactics [50].

The competitive culture approach refers to using internal priorities and processes to assess a firm's strategic orientation [50]. In the competitive culture view, strategic orientation is treated as a sub-dimension of the culture construct [50]. Consistent with this, Deshpandé et al. [52] relates market orientation, one of several strategic orientations that a firm may possess [50], to culture.

Organizational culture refers to "the pattern of shared values and beliefs that help individuals understand organizational functioning and thus provide them norms for behavior in the organization" [53]. As a sub-dimension of the culture construct [26,50], strategic orientation creates shared value and behaviors throughout the entire firm [54]. Strategic orientation becomes a culture of the firm when it extends to all levels of the firm [54].

Firm managers select strategic orientation depending on what they wish to accomplish [54]. The strategic orientation of a firm is the reflection of the firm managers' perceptions of external environment and their reactions to environmental conditions [23,55]. In cultural view, firm may select several strategic orientations which reflect different managerial priorities for the firm [50]. The degree of a strategic orientation is largely a matter of choice and resource allocation [25,56,57]. For instance, with respect to market orientation, Ruekert [57] suggested that a firm can become more market oriented with the proper resources and focus on being responsive to customers' needs and wants.

According to the resource-based view (RBV), a firm gains a competitive advantage by exploiting its internal resources [58]. Resources include the assets, information, skills, knowledge, etc. of a firm that enable the firm to develop and implement strategies to improve its efficiency and effectiveness [58]. Strategic orientation guides the focused commitment of resources to achieve desired outcomes [54,59]. According to the selected strategic orientations, the firms are guided to focus resources toward the development of capabilities to achieve competitive advantage [38,50,58]. For example, Defee et al. [38], from a RBV, argued that a firm's closed-loop supply chain orientation will direct resources to developing a closed-loop supply chain capability to support closed-loop supply chain management to be a source of competitive advantage. Day [59] argued that the capabilities that enable the firm to outperform the competition must be managed with the focused commitment of resources.

Commitment refers to the focus of resources on developing distinctive capabilities that support firms to outperform the competition [59]. It represents the priority of the firm, and encompasses all levels of the organization [59–61]. Day [59] highlighted the critical importance of top management commitment for building a strategic orientation. For example, to enhance the market orientation of the firm, the top management must make a clear commitment to putting customers first [59]. The commitment should be demonstrated through deeds and time spent to reflect the real priorities, e.g., reshaping the culture by taking actions such as proposing a challenging vision of the culture or setting a major performance improvement [59]. The commitment of top management is essential because the "top-down direction" makes sure the participation, understanding, and acceptance of the strategic orientation across the firm [59]. In addition, the commitment is a long-term run which requires the firm to implement a set of consistent initiatives for a long period of time [23,59].

Therefore, commitment is a managerial willingness to allocate resources and take behaviors that lead to the development of capabilities consistent with the desired outcomes [50,59,62]. Strategic orientation provides a unifying organization-wide focus and guides the direction of the commitment [54,59,60].

2.4. GSCM and Strategic Orientation

The environmental sustainable management of a supply chain needs a strategic orientation. Sustainability is far more systemic process in nature rather than a linear process and, thus, need senior management commitment, employee support, time and resources [63]. Moreover, GSCM has strong internal and external linkages, possessing multidimensional, dynamic characteristics and complexity [64–67]. The characteristics of GSCM require special attention in terms of resource commitment within a firm [28]. Literature on GSCM suggests that top and middle manager support, promoting awareness amongst employees, introducing incentive systems, and stakeholder commitment to environmental concerns, which are the embodiment of a firm's strategic orientation, will directly affect the level of GSCM implementation [7,8,10,12,19,20]. Nevertheless, there is very little research that linked strategic orientation to the implementation of GSCM.

Hong et al. [23] and Defee et al. [38] are the only two studies found in the literature on the effects of strategic orientation on the environmental management of supply chains. Hong et al. [23] linked strategic green orientation to GSCM and reported that strategic green orientation directs firms to engage in both coordinative product development and collaboration with suppliers and customers, resulting in better green performance outcomes. Nevertheless, their study focused only on the product level, whereas a more holistic approach is needed to examine the processes in the supply chain for the purpose of identifying waste streams and potential long-term advantages [60,68]. Grosvold et al. [69] also argued that more systematic changes may lead to improved sustainability of supply chain.

Defee et al. [38]'s study is commendable, because they newly proposed the concept of a strategic closed-loop supply chain orientation (CLSCO) as a manifestation of a strategic emphasis on linking forward and reverse flows across the supply chain from a holistic viewpoint by extending the scope of the supply chain orientation. Their study is basically in line with our principal perception on the importance of a process-based strategic orientation for sustainability. Our study, however, is different from Defee et al. [38] mainly in four aspects as follows:

First, Defee et al. [38] and this study proposed CLSCO and CLO, respectively, in different contexts, i.e., closed-loop supply chains versus green supply chains, and for different purposes, i.e., development of closed-loop supply chain capability versus successful implementation of GSCM practices. Second, the two studies employed different conceptual development method, i.e., by extending the SCO concept versus on the basis of a comprehensive understanding of the management of a green supply chain. Third, CLSCO of Defee et al. [38] and CLO in this study are defined differently. CLSCO was defined as 'recognition of the strategic and environmental implications of activities and processes involved in managing and integrating the forward and reverse flows of closed-loop supply chains' [38], whereas CLO focuses on the recovery/recycling of materials/components/products and is defined as a firm's strategic orientation toward the maximization of recyclability of materials/components/products throughout the entire green supply chain loop, including the forward and reverse flows of materials. The conceptual framework for CLO in the context of GSCM and the definition and dimensions of CLO are presented in detail in the next section. Fourth, Defee et al. [38] did not develop and test the construct of CLSCO empirically although they suggested this empirical testing work as an avenue of new research direction, whereas our study not only proposed a strategic concept- CLO, but also developed a reliable and valid measure of CLO concept, and further empirically tested the relations between CLO, GSCM practices and organizational performance. The empirical test of this study makes significant contributions to the literature to warrant the further study.

3. Conceptual Development

3.1. Conceptualization of CLO

The conceptual framework of CLO in the context of GSCM is shown in Figure 3.

First, GSCM is defined as "GSCM = green designing/purchasing + green manufacturing/materials management + green distribution/marketing + reverse logistics" [2,27,28,39]. This shows that GSCM, through "a holistic system perspective" [37], helps organizations manage their environmental impact throughout a product's life cycle. The different phases of the product's life cycle include resource extraction, manufacturing, use and reuse, final recycling, or disposal, including both forward supply chain and reverse logistics activities. Therefore, to manage the environmental impact throughout the entire product cycle, GSCM explicitly includes the "circular and system philosophy" [13].

Second, reduction as an in-process practice and end-of-pipe practices, i.e., reuse, remanufacture and recycle, are the major "environmentally conscious business practices" from the perspective of a supply chain [65]. GSCM includes both the reduction of materials in the forward flow, and reuse, remanufacturing, and recycling of materials in the reverse flow. Moreover, reduction, reuse, remanufacturing, and recycling, which are the principles identified to realize the "closed loop of material flows" [70,71], are critical factors for achieving effective GSCM [2].

Third, every individual aspect of GSCM is essentially guided by awareness of material recycling. For example, green design is described as a tool for making products easier to reuse or recycle [72]. The principle of green purchasing is to procure materials that are easy to recycle or have already been recycled [65]. Another critical aspect of green purchasing is investment recovery, which occurs at the back end of a supply chain as a way of closing the supply chain loop [13,73]. Green manufacturing integrates the reusable or remanufactured components or recycled materials into the production line with the goal of realizing a zero-waste factory by recycling waste materials [65]. Green distribution not only involves the use of environment-friendly transportation, but also includes the transportation of packages back to the factory for reuse [74]. Green marketing has a significant impact on customer relationships, and an important part of this is providing consumers with detailed product information, such as the recyclability of the products and reusable components used, as this might go a long way towards improving green consumption [74]. Finally, reverse logistics activities involve the return of recyclable materials to the forward supply chain [65]. The concept of the totally green supply chain emphasizes the need for reverse activities to close the loop of the supply chain. From an overall perspective, GSCM itself can be considered as a closed loop.

In many studies, GSCM is considered to be "an unending logistics cycle" of using, reusing, and managing materials and products [67]. Beamon [29] described the cycle of materials or products as a semi-closed loop. If the flow of materials is considered as a loop in the context of a green supply chain, which opens with the generation of raw materials and closes with the re-entering of recycled materials/components/products as raw materials [37], the green supply chain then takes a closed-loop shape. Consequently, it is confirmed that the closed-loop is the fundamental concept of GSCM. In other words, the basic assumption of GSCM is that it is integrated into a closed-loop-oriented system of corporate management. Accordingly, the adoption of a strategic orientation toward the fundamental concept of the closed loop, i.e., CLO, will be the antecedent of making the integrated supply chain a green one. As a firm's strategic orientation, CLO is meant to have significant impacts on the implementation of complex and multidimensional GSCM.

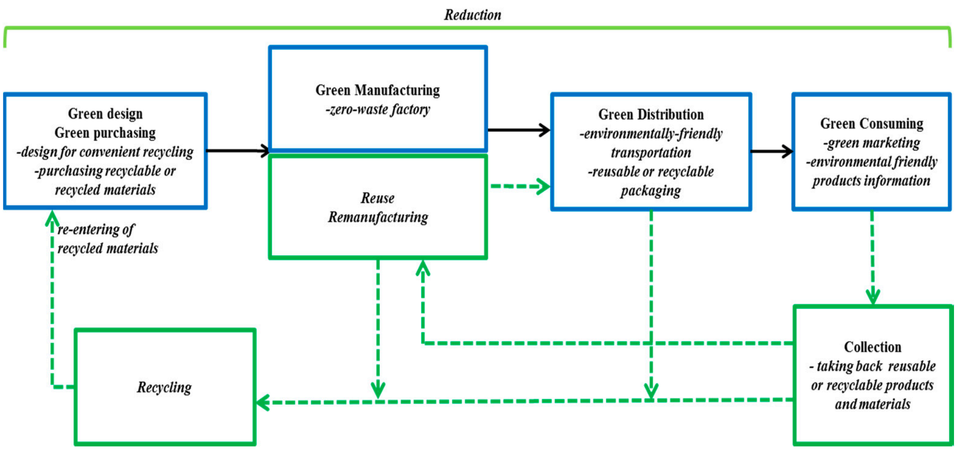

Figure 3. Closed-loop orientation in the context of GSCM.

3.2. Definition of CLO

To further clarify the concept of CLO, we define it as a firm's strategic orientation toward the recyclability of materials/components/products throughout the entire supply chain loop, including the forward and reverse flows of materials/components/products, to achieve the maximization of materials/components/products recycling. In other words, with a CLO, a firm is able to view used products, components, and waste as a valuable source of secondary raw materials and attempt to maximize material recycling, thereby enabling it to design products for the environment that reuse, remanufacture, or recycle waste materials easily, and create awareness about material recycling among consumers throughout its purchasing, manufacturing, and distribution activities. In the end, the firm takes back used products from consumers to reuse, recycle, remanufacture, or sell as useful input or recycled materials.

Therefore, CLO uses the life cycle approach, and not the end-of-pipe approach. CLO does not focus simply on waste recycling at the end-of-life stage of products through waste-based closed loops [71]. Instead, it requires firms to prepare for the recycling of products/components/materials from the initial stages of design and development, so that all activities in the supply chain are in line with the product recovery, making it a green supply chain. This means that closed-loop-oriented firms tend to develop a holistic view of the product life cycle within the framework of a fully integrated supply chain to develop a green environmental and economic model, thereby gaining a sustainable competitive advantage.

3.3. Dimensions of CLO

Based on the definition of CLO, we conceptualize CLO as a second-order construct composed of three dimensions, i.e., holistic perspective, resource commitment, and management support, as described in the following.

Firstly, CLO is defined based on the concept of closed-loop in the context of a green supply chain. Previous literature on GSCM, closed-loop supply chain, and logistics management [12,29,37,67,73,75–81] revealed that the essential factors of a closed-loop approach are recyclability, the flow of materials/products in the whole channel including both the forward and the reverse stages, entire life cycle perspective, etc. That is to say, the closed-loop oriented firms manage their materials/products from a holistic life cycle perspective to achieve the maximization of materials/components/products recycling. For instance, they regard recyclability as an important indicator of product quality, evaluate products from the entire life cycle perspective, view recovery rate of end-of-life products as an important measure of performance, and emphasizes the importance of recyclability throughout the whole supply chain process.

In addition, CLO is a strategic orientation. Previous literature on strategy management and strategic orientation [23,25,26,50,51,54,82–86] highlighted two critical aspects from which a strategic orientation should be established, i.e., resources commitment and management support. That means, when the closed-loop oriented firms allocate resources to various programs within the business unit, they will invest in technologies for the processing of used materials/components/products, establish environmental management systems towards the recycling of materials/components/products, provide employees with recycling training programs, and etc. Meanwhile, as critical decision makers, top and middle level managers will emphasize the importance of recycling of materials/components/products in the closed-loop oriented firms.

Therefore, we identity that CLO are composed of three dimensions: the holistic perspective on recirculation of materials/components/products, the commitment of resources for material/components/products recycling, and managers' support for the recycling of materials/components/products.

4. Theoretical Framework and Hypotheses Development

4.1. Theoretical Framework

The framework in Figure 4 was developed to investigate the relationships between CLO, GSCM practices and organizational performance. We posit that CLO has a positive relationship with both GSCM practices and organizational performance. We also hypothesize that CLO improves the level of GSCM practices implementation which, in turn, improves organizational performance.

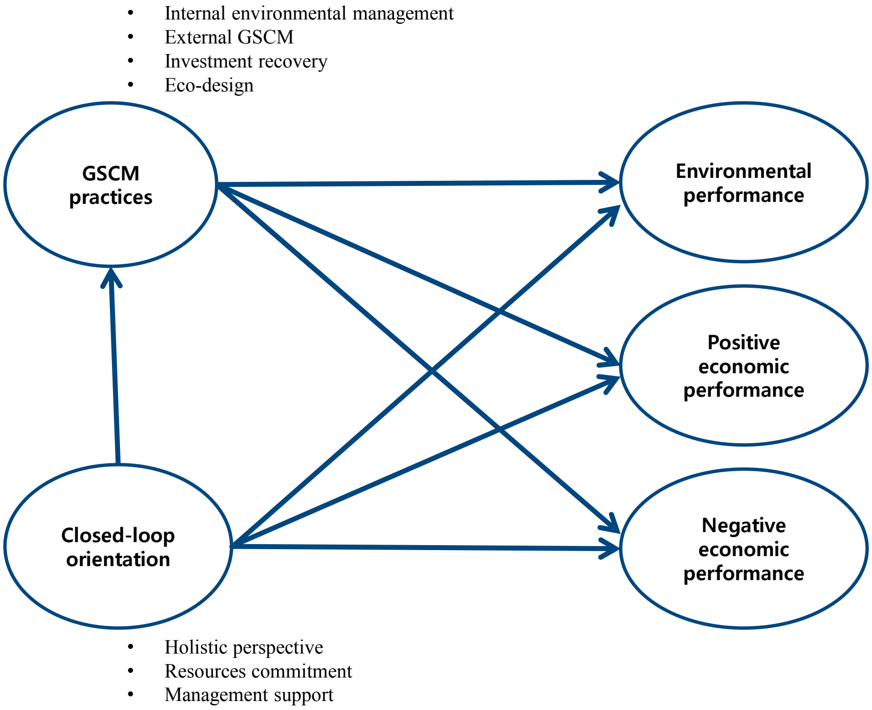

Figure 4. Theoretical framework.

4.2. Hypotheses Development

4.2.1. CLO and GSCM

Strategic orientation is the guiding principle that influences a firm's strategy-making activities [50]. An organization should reorient its attitudes and behaviors so as to be committed to achieving new goals [87]. Particularly, a dedication to sustainability is indispensable at a strategic level as the foundation of the sustainable management of supply chains [88]. The lack of commitment from the organization, especially from top management and suppliers will constrain the implementation of sustainable management initiatives otherwise [24]. The literature suggests that a firm's strategic orientation plays an important role in the success of both traditional supply chain management practices [30,82,89] and environmental supply chain management practices [23,63,90].

According to resource-based view, a firm gains a competitive advantage by exploiting its internal resources and capabilities [58]. From a resource based viewpoint, Richey et al. [91] stressed the importance of committing resources to the development of innovative reverse logistics capabilities, especially for firms which can commit greater resources. Defee et al. [38] claimed that organizations that possess a closed-loop supply chain orientation will be more likely to develop a closed-loop supply chain capability. Roehrich et al. [24] argued that a long-term commitment to sustainable management of supply chain can help build capabilities necessary for the implementation of sustainable initiatives. The term capability here refers to processes and routines that represent the way in which the firm operates in its competitive environment [38,92]. Applying a resource based viewpoint to GSCM, a closed-loop oriented firm will be more inclined to direct its resources to developing a GSCM capacity for achieving a competitive advantage. The firm will institutionalize process and routines that are centered on the effective recovery or recycling of materials/components/products for the purpose of achieving the maximization of materials recovery in terms of closing the entire supply chain loop from the initial purchasing of materials to the re-entering of recycled materials. By supporting its products' eco-design, green purchasing, cleaner production, green distribution, green marketing, reuse, remanufacturing, recycling, or recovery of end-of-products or materials, the firm will also cooperate more closely with its suppliers and customers. Therefore, we propose that:

Hypothesis 1. *CLO positively impacts the implementation level of GSCM practices.*

4.2.2. CLO and Environmental and Economic Performance

A firm's strategic orientation is a significant indicator of its performance [25]. As the strategic direction, strategic orientation provides firms with a foundation of guidelines on which the firm take appropriate measures for the persistent improvement of their business performance [25,26,55]. Strategic orientation has been conceptualized as a key antecedent to superior performance [59,60]. A firmly entrenched strategic orientation creates a long-term superior value or advantage which is difficult to match for the competition [50,51,61].

The literature posits that a firm's strategic orientation has a direct effect on its organizational performance. Narver and Slater [26] studied the effect of market orientation, i.e., one of several strategic orientations that a firm may possess [50], on business performance. They found that a market orientation has a substantial positive effect on the profitability of both commodity products businesses and non-commodity businesses. Noble et al. [50] found that competitor orientation has a significantly positive impact on performance. According to Kohli and Jaworski [60], strategic orientation leads to superior performance, because the strategic orientation can clarify a firm's strategic focus and vision and provide a unifying focus for the efforts and projects across the firm.

Closed-loop oriented firms place strategic emphasis on reducing, reusing, remanufacturing, recycling or recovering materials/end-of-life products throughout the supply chain. The literature suggests that waste reducing and recycling initiatives are precisely those that have "the best direct potential" to make the use of materials more efficient and achieve cost reduction by limiting the purchase of raw materials and cutting the cost of waste disposal, thus improving both the environmental and economic performance [10,93–96]. However, CLO will also lead firms to design and develop products using nonhazardous materials at a higher price in order to minimize waste disposal [93]. CLO may also guide firms to invest in technology, establish environmental management systems and train employees, thus increasing the corresponding costs. In summary, CLO provides firms the direct potential ways to efficiently use materials and reduce costs through maximization of materials' reduction, reusing, remanufacturing, and recycling. Meanwhile, CLO requires firms to increase their investment in advanced technologies. However, in the long run, this initial investment will bring large benefits to closed-loop orientated firms. Therefore, we propose that:

Hypothesis 2 (2a). *CLO positively impacts a firm's environmental performance.*

Hypothesis 2 (2b). *CLO positively impacts a firm's positive economic performance.*

Hypothesis 2 (2c). *CLO positively impacts a firm's negative economic performance.*

4.2.3. GSCM and Environmental and Economic Performance

Previous research has explored the relationships between GSCM practices and a firm's performance, including its environmental and economic performance. The literature suggests that GSCM practices contribute to improving environmental performance [4,5,13,97], whereas the research results related to the effects of GSCM practices on economic performance are mixed, including positive impacts [13,74,98], negative impacts [99], and ambiguous effects [4,5]. We reexamine the relationship between GSCM practices and organizational performance, including both environmental performance and economic performance.

First of all, according to previous studies, GSCM will significantly improve a firm's environmental performance by minimizing waste [4,5,13].

Technological advancement and innovation are the basic requirements for achieving competitiveness [62]. Han et al. [100] argued that a positive relationship exists between innovation and performance. As an environmentally technological innovation, GSCM is supposed to be positively related to the improvement of a firm's performance. Moreover, waste leads to economic loss [101]. Economic profitability is the original purpose of minimizing waste [27]. The reduction of waste contributes to cost savings for the company in the long run [13,74,98,102]. Bowman [103] noted that firms recognize that environmentally responsible practices can have a positive impact on their bottom line, even if they were forced to undertake such green initiatives initially through legislation. According to these previous research results, a firm's GSCM practices positively affect its economic performance.

However, potential trade-offs may exist between environmental improvement and economic profitability. As Roehrich et al. [24] highlighted, conflicting priorities with respect to the economic, social and environmental principles is a key constraint on the decision to implement sustainable supply chain management practices. Concerns about increased costs are a critical barrier to the implementation of GSCM practices [9,10,47]. Compliance with internal and external procedures for adopting GSCM practices may increase operational costs and, thus, have a negative impact on a firm's economic performance. In summary, regarding the effects of GSCM practices on economic performance, previous research results are mixed, including positive impacts [13,74,98], negative impacts [99], and ambiguous effects [4,5]. Hence, to clarify the relation between GSCM practices, we viewed positive economic performance and negative performance as two distinct constructs, as did in Zhu, Q. and Sarkis, J [13]. Therefore, we present the following three hypotheses:

Hypothesis 3 (3a). *GSCM practices positively impact a firm's environmental performance.*

Hypothesis 3 (3b). *GSCM practices positively impact a firm's positive economic performance.*

Hypothesis 3 (3c). *GSCM practices positively impact a firm's negative economic performance.*

4.2.4. CLO, GSCM, and Environmental and Economic Performance

The direct impact of strategic orientations on performance has been highlighted, e.g., [26,50]. Many studies, however, have shown the indirect impact of strategic orientation on performance. Literature suggests that strategic orientations guide the firms to allocate resources toward the development of capabilities or innovativeness and then achieve competitive advantage [3,25,38,50,54,59,91,104,105]. Strategic orientation has been closely tied to innovativeness and capabilities [25,50,59] and ultimately business performance. Gatignon and Xuereb's study [25] revealed that strategic orientation of the firm leads to superior performance through developing a new products innovation superior to the competition. According to Grawe et al. [54], customer- and competitor orientation also allows firms to develop a service innovation capacity, and then result in improvement of market performance. Aragón and Gregorio [104] revealed that a strategic orientation affects the firm's performance by influencing its management characteristics including innovation. Richey et al. [91] reported that only when the resources are used in such a manner as to develop innovative capabilities of handling returns, the commitment of resources makes reverse logistics programs more efficient and more effective. Sinkovics and Roath [55] argued that strategic orientation can improve the potential of the "right" capabilities (e.g., operational flexibility), thereby contributing to enhanced performance. Defee et al. [38] argued that a firm's closed-loop supply chain orientation leads the firm to develop a closed-loop supply chain capability to improve its competitive position.

GSCM, as an emergent environmentally sustainable innovation [8], brings the firm benefits in terms of both environmental and economic performance [1–4]. We assume that the firm with a CLO will direct its resources to develop a GSCM capacity to improve organizational performance. In other words, GSCM practices will mediate the relationship between CLO and performance. Therefore, we derive the following hypothesis by putting CLO, GSCM practices, and performance into a single network:

Hypothesis 4. *The relationship between CLO and organizational performance is mediated by GSCM practices.*

5. Research Methods

5.1. Survey Questionnaire Development

A survey questionnaire was developed to collect the data. It was first developed in English and then translated into Chinese. The questionnaire in Chinese was sent to seven native Chinese industry experts. After they reviewed the questionnaire, in-depth interviews were conducted through video conferences. Based on their responses, some questions were reworded and some of the response formats were changed to ensure the clarity and understandability of the wording, as well as making it more user-friendly [106].

The revised Chinese version questionnaires were sent to managers at manufacturing companies in China for a pilot test. At this stage, 35 usable surveys were returned. Four in-depth field interviews were held with top or middle managers of manufacturers selected from the 35 usable surveys. This stage confirmed the understandability of the wording and completeness of the questionnaire. Subsequently, the final survey questionnaire was developed which included four parts. In the first part, 19 statements with a five-point Likert scale (1-strongly disagree, 3-neutral, 5-strongly agree) were used to measure the responses of CLO. The second part included statements measuring the implementation of GSCM practices modified from [13] with a five-point scale, i.e., 1-not considering it, 2-planning to consider it, 3-currently considering it, 4-initiating its implementation, 5-successfully implemented, as described by [13]. The third part included items for the measurement of performance modified from [13] with a five-point scale, i.e., 1-not at all, 2-a little bit, 3-to some degree, 4-relatively significant, 5-significant, as conducted in [13]. Questions related to the respondent and company characteristics were included in the final part of the survey questionnaire.

5.2. Data Collection

The link to the online questionnaire was distributed to manufacturers in the list of Chinese manufacturing on the basis of the Strategic Business Unit level by e-mail. In the mails, an introduction to the survey's purpose was included and the respondents were asked to answer all the questions based on the actual situation of their firms. We targeted managers as the respondents to ensure that the survey questions were answered based on accurate knowledge of the strategic orientation and supply chain management of the firms. One week after the initial mailing, reminder mails were sent to all potential respondents, which were followed up by phone calls. Of the 1600 surveys mailed, 296 valid responses were received, presenting an effective response rate of 18.5%.

Non-response bias was tested by comparing the responses of the early and late waves of responses received. The responses were spilt into two groups based on the time they were received. The early and late groups consisted of 180 and 116 responses, respectively. The t-tests performed on the responses of the two groups yielded no statistically significant differences among the demographic variables (see Appendix A).

Social desirability bias is identified as an issue because respondents may have the tendency to present themselves in a favorable way regardless of their true feelings [107]. To minimize social desirability bias, we stated all the questions in the firm in general, rather than concentrating on the individual managers [108].

The same respondent/rater provided answers for all constructs in our study. Therefore, one can suppose that common method bias might have a potential influence on our study results, but we ensured that our study is not the case as follows:

First, we controlled the common method bias through procedural remedies related to questionnaire and item design, i.e., eliminating item ambiguity, protecting respondent anonymity, and reducing evaluation apprehension [107]. We developed the questionnaires in English and then translated them into Chinese. Then, we asked seven native Chinese industry experts to review the Chinese questionnaire, followed by in-depth interviews with the industry experts. Based on their responses, we reworded some questions and changed some response formats. This process ensured the clarity and understandability of the wording. In the preface of our questionnaire, we guaranteed that the respondents' answers will be anonymous and will only be used for academic research. Moreover, we clearly stated that there is no right or wrong answer and that the respondents should answer the questions as honestly as possible. In addition, we tried to minimize the social desirability. The minimization of social desirability is also one way of controlling for common method bias, since social desirability is a potential source of common method variance [107].

Second, we used Harman's single-factor test to assess the impact of common method bias on our study results [107]. All of the variables used in our model were included in an exploratory factor analysis, and no any general factor accounted for the majority of the covariance in these variables (7 factors emerged and variance explained by the seven factors were 22%, 13%, 12%, 10%, 9%, 7%, and 4%, respectively). Therefore, common method bias did not have a significant impact on our analysis.

Table 1 shows the profiles of the respondents and their firms. The final sample included 171 private (57.8%), 90 foreign-investment (30.4), 14 state-owned (4.7%), and 21 other types of firms (7.1%). The eight typical industries listed in the questionnaire make up a little more than 50% of the firms. A broad range of industries is included in the sample, and no one industry was predominant. This provided a guarantee of the generalizability of the results [25]. The respondents have 7 years of working experience on average in their current company, indicating that they have sufficient knowledge of their firms. The firms have 881 employees and have been established for about 17 years on average.

Table 1. Respondent and company profiles.

	Count	**Percent**		**Count**	**Percent**
Industry			Ownership		
Electrical and electronic	53	17.9	Private	171	57.8
Food	43	14.5	Foreign-invested	90	30.4
Textile and apparel	29	9.8	State-owned	14	4.7
Machinery	28	9.5	Others	21	7.1
Chemical	20	6.8	Total	296	100.0
Toy	16	5.4			
Automobile	13	4.4			
Pharmaceutical	7	2.4		Mean	S.D.
Furniture	7	2.4	Years of working	7.197	5.5687
Steel and metal	11	3.7	Export percentage	51.78	34.727
Petroleum	1	0.3	Firm size (employees)	880.86	1561.441
Others	68	23.0	Firm age (years)	16.63	19.304
Total	296	100.0			

The descriptive statistics of the items used to measure the constructs investigated in the study is shown in Table 2. CLO is a newly developed second-order construct composed of three dimensions, i.e., holistic perspective, resources commitment, and management support. The construct of GSCM practices is also a second-order factor comprising four dimensions, i.e., internal environmental management (IEM), external GSCM (EG), eco-design (ED), and investment recovery (IR), with items modified from [13]. Organizational performance includes environmental performance and both positive and negative economic performance to capture not only harm, but also regeneration [15], with items also modified from [13].

Table 2. Descriptive statistics for CLO, GSCM practices, and organizational performance.

Dimensions	Items	Mean	S.D.
Holistic perspective	In our firm, the recovery rate of end-of-life products is an important component in performance measures.	3.40	1.020
	In our firm, the maximization of materials recycling is an important goal to be achieved.	3.56	1.033
	Our firm regards recyclability as an important indicator of product quality.	3.54	1.031
	Our firm attaches importance to recyclability when designing products, selecting materials, manufacturing products, and distributing products.	3.73	0.940
	Our firm evaluates products from the entire life cycle perspective throughout the stages of purchasing materials, designing, manufacturing and distributing products, and recycling end-of-life products.	3.66	0.951
Resource commitment	Our firm invests in technologies (e.g., disassembly technology, cleaning type systems) for the processing of used materials.	3.44	1.088
	Our firm has a specially-assigned person to manage the function of taking back end-of-life products.	3.96	0.943
	Our firm has established an environmental management system toward the recycling of materials.	3.60	1.020
	We communicate information about the recyclability of our products across all business functions.	3.69	0.960
	Our firm has information and know-how relating to materials recycling in our industry.	3.52	0.967
	Our firm has recycling training programs for employees.	3.56	0.993
Management support	Our top management emphasizes the importance of recovery of the company's waste materials.	4.17	0.955
	Our middle level management emphasizes the importance recovering the company's waste materials.	4.01	0.937
Internal	Commitment to GSCM by senior managers	3.23	0.955
environmental	Cross-functional cooperation for environmental improvements	3.23	0.937
management	Total quality environmental management	3.47	0.967
	Environmental compliance and auditing programs	3.36	0.993
External	Cooperation with suppliers for environmental objectives (eco-design, waste reduction, packaging eliminate, etc.)	3.02	0.960
GSCM	Environmental audit for suppliers' internal management	3.05	0.943
	Cooperation with customers for eco design	2.95	1.088
	Cooperation with customers for cleaner production	3.16	1.020
Eco-	Design of products for reduced consumption of material/energy	3.43	0.951
design	Design of products for reuse, recycle, recovery of material, component parts	3.37	0.940
	Design of products to avoid or reduce the use of hazardous products and/or their manufacturing process	3.55	1.031
Investment	Investment recovery of excess inventories/materials	3.44	1.160
recovery	Sale of scrap and used materials	3.64	1.144
	Sale of excess capital equipment	3.23	1.211
Environmental	Reduction of air emission	3.31	1.189
performance	Reduction of waste water	3.33	1.182
	Reduction of solid wastes	3.38	1.152
	Decrease of consumption of hazardous/harmful/toxic materials	3.43	1.236
Positive	Decrease of cost for materials purchasing	3.32	1.084
economic	Decrease of cost for energy consumption	3.36	1.087
performance	Decrease of fees for waste treatment	3.26	1.103
	Decrease of fees for waste discharge	3.29	1.136
Negative	Increase of investment	3.28	1.102
economic	Increase of operational cost	3.21	1.050
performance	Increase of training cost	3.16	1.095

5.3. Measurement of CLO

Because CLO is a newly developed construct, the development of the procedure used for its measurement will be described in detail. We followed Churchill's [109] paradigm for construct development and measurement and also consulted other studies [73,83,89,110,111] to develop the measurement of CLO.

5.3.1. Developing Measurement Items

We generated the initial list of items through an exhaustive literature review of research on GSCM, closed-loop supply chain, logistics management, environment management, and strategy management and strategic orientation.

The initial list was reviewed by several academic experts in the field of logistics management and business administration. After gaining a clear understanding of the closed-loop orientation and its definition, they rated each item in terms of its consistency with this concept. Moreover, they evaluated the items based on the criteria of representativeness, readability, and ambiguity. According to their recommendations, some of the items were removed or modified, while others were added. This left us with 19 items for further analysis using the survey data.

The content validity of the measurement was established through an exhaustive literature review of research into a broad range of research fields (e.g., GSCM, reverse logistics, strategy management) and in-depth interviews with experts [73,110].

5.3.2. Factor Analysis

According to Flynn et al. [106], comparing the dimensions and loadings from factor analyses and previously-developed dimensions and items will help to establish the construct validity. An exploratory factor analysis (EFA) with a varimax rotation was conducted on the 19 items pertaining to CLO, in order to test the already-developed dimensions of CLO. After conducting the EFA, two items (i.e., "We communicate information about the recyclability of materials with suppliers" and "Our firm views end of life products, components, and other waste as valuable sources of secondary raw materials".) were eliminated due to cross-loading problems. The three factors extracted through the EFA are in line with our three previously-developed dimensions, as stated above. Accordingly, we titled these three factors, holistic perspective, resources commitment, and management support, respectively.

5.3.3. Testing Reliability and Validity

Based on the results of the EFA, a 17-item three-dimensional CFA was performed using AMOS17.0 to check the reliability and validity of the three-dimensional measurement of CLO. According to Hair et al. [112] and Shah and Goldstein [113], χ^2/df, the standardized root mean square residual (SRMR), and confirmatory fit index (CFI) were utilized to assess the overall fit of the measurement model.

The fit indices for the initial model were χ^2/df = 4.32, SRMR = 0.0709, and CFI = 0.922. These relatively poor fit indices revealed potential problems with the measurement scale. Based on the recommendation of Byrne [114] and Hair et al. [112], modification indices were used to identify the problematic measurement items in the initial model.

Accordingly, one item (i.e., "Our firm honors and rewards individuals or groups that have made a great contribution to the development of recycling procedures".) in the third dimension was removed from the measurement model, due to cross-loading problems. In addition, the modification indices also suggested that, due to inter-correlation problems, if the three items, "Our firm tracks the entire life cycle of ours products from manufacturing to recycling", "In our firm, the volume of recycled materials used in products is an important component in performance measures", and "In our firm, the recovery of waste materials is an important strategy for enhancing performance", in the first factor were deleted, the parameter estimates would be improved. Only one item was deleted each time based on Byrne [114]'s suggestion. A chi-square difference test was repeated after deleting a single item, and the test results revealed all the chi-square differences to be significant. Therefore, the modified model obtained by deleting the above four items was considered to be more appropriate [112,114].

These procedures led to acceptable fit indices, as shown in Table 3, with χ^2/df = 2.68, which is less than the benchmark of 3.0 [115], SRMR = 0.03, which is less than the benchmark of 0.05 [114], and CFI = 0.97, which is larger than the benchmark of 0.90 [116], all of which suggest that the model represents a good fit to the data and indicates its unidimensionality.

Table 3. Model fit indices.

Model Fit Indices	Values	Benchmark	References	Indication
χ^2/df	2.68	3.00	[115]	good fit
Standardized SRMR	0.03	0.05	[114]	good fit
CFI	0.97	0.90	[116]	good fit

The reliability and construct validity of the measurement scale with the remaining 13 items in the modified model were also verified.

As shown in Table 4, first, the R^2 values are all above 0.30, which is considered to be an acceptable cut-off value [110] and thus, the item reliability is satisfied. The scale reliability is also confirmed, because the Cronbach's α values of the factors are above 0.90, their composite reliability values are all above the cut-off value of 0.60 [117], and the average variance extracted (AVE) values are all greater than the cut-off value of 0.50 [117]. The convergent validity is also satisfied, because the factor loadings ranged from 0.759 to 0.984, which are higher than the benchmark of 0.70 [118], and their C.R. values are all significant at the $p < 0.001$ level.

Table 4. Reliability and validity test results.

Factor	Cronbach's α	AVE	Composite Reliability	R^2	Factor Loading
F1. Holistic perspective	0.944	0.773	0.944	0.691–0.821	0.831–0.906
F2. Resources commitment	0.914	0.642	0.915	0.576–0.737	0.759–0.858
F3. Management support	0.928	0.872	0.931	0.775–0.968	0.880–0.984

We evaluated the discriminant validity of the factors by conducting chi-square difference tests through a series of pairwise CFAs [119]. We ran each two-factor confirmatory model twice using AMOS 17.0: first constraining the covariance of the two factors to unity and then freeing it. In all cases, the χ^2 statistics were higher in the constrained models and the χ^2 difference statistics for each pair of factors all exceed 10.827, as shown in Table 5, indicating that discriminant validity is successfully achieved between each pair of factors [120].

Table 5. χ^2 differences.

	F1	F2
F1		
F2	22.813	
F3	49.771	40.133

Note: χ^2 differences between the unconstrained measurement model and the constrained measurement model, df = 1; $\chi^2 > 11$, $p < 0.001$.

5.3.4. Second-Order Factor (CLO)

In the previous discussion, CLO is conceptualized and operationalized as a second-order construct composed of three dimensions, i.e., the holistic perspective, resources commitment, and management support. The results of the second-order factor model estimation confirm that the fit indices represent an acceptable fit for the second-order model. The χ^2 statistic is 233.03 at 63 degrees of freedom (χ^2/df = 3.70), the CFI is higher than the benchmark of 0.90 and the SRMR is 0.05. The factor loadings from the measurement item to the corresponding first-order construct range from 0.770 to 0.979 and are significant at the 0.001 level. The factor loadings from the first-order construct to the second-order construct, i.e., CLO, are 0.938 for holistic perspective, 0.858 for resources commitment, and 0.747 for management support. CLO explains 88%, 74%, and 56% of the variation of holistic perspective, resources commitment, and management support, respectively. Therefore, CLO can be conceptualized and operationalized as a multidimensional construct consisting of holistic perspective, resources commitment, and management support. Even though the fit indices for the second-order model are not as good as those for the first-order model (in Table 3), we decided to conceptualize and operationalize CLO as a second-order construct, because of the better conceptual meaning of this construct and in consideration of the complexity of the strategy concept.

In summary, the 13-item three-dimensional CLO measurement is reliable and valid. Therefore, CLO can be represented by three factors. Factor 1, titled "holistic perspective", comprises five items, which are related to product management and the evaluation of outcomes from a circular and systematic perspective within the scope of the entire green supply chain. Factor 2, titled "resources commitment", is composed of six items, which are related to the firm's resources. The commitment of resources to recycling activities, especially its investment in technologies and the establishment of environmental management for the recycling of materials/components/products, represent a long-term view. The third factor, titled "management support", consists of the attention paid to material recovery by top and middle managers.

5.4. Measurement Model Analysis

Prior to testing the structural models relating to the hypotheses, a factor analysis was conducted to assess the reliability and validity of the measures and measurement models.

5.4.1. First Order Factors

All of the ten first-order factors were included in one CFA. The CFA produced a good fit with a χ^2/df of 1.997, CFI of 0.943, and SRMR of 0.038. The test results for the reliability and validity of the measures of the first-order factors are shown in Tables 6 and 7, respectively.

Table 6. Reliability and convergent validity.

Factor	Cronbach's α	AVE	Composite Reliability	Factor Loading
HP	0.944	0.773	0.944	0.834–0.905
RC	0.914	0.642	0.915	0.753–0.860
MS	0.928	0.869	0.930	0.895–0.968
IEM	0.910	0.720	0.911	0.791–0.895
EG	0.895	0.694	0.900	0.758–0.904
ED	0.927	0.817	0.930	0.835–0.937
IR	0.835	0.626	0.834	0.759–0.835
EP	0.946	0.816	0.947	0.860–0.941
PEP	0.936	0.786	0.936	0.875–0.906
NEP	0.930	0.824	0.933	0.854–0.955

Note: HP = holistic perspective, RC = resources commitment, MS = management support, IEM = internal environmental management, EG = external GSCM practices, ED = eco-design, IR = investment recovery, EP = environmental performance, PEP = positive economic performance, NEP = negative economic performance.

Note that in Table 6, the Cronbach's α values of the factors are above the benchmark of 0.70 [121], the composite reliability values are all above the cut-off value of 0.60 [117], and the AVE values are all greater than the cut-off value of 0.50 [117]. Thus, the scale reliability is satisfied. The convergent validity is also satisfied, because all of the factor loadings are higher than the benchmark of 0.70 [118], and significant at the 0.001 level. According to [117], discriminant validity exists when the squared correlations between the constructs are below the respective constructs' AVE. Table 7 shows that the squared correlations between the factors are below the respective AVE, except for two. The squared correlation of holistic perspective and resources commitment slightly exceeds the AVE of holistic perspective and resource commitment. However, this is merely an expression of the strong relationship between these two constructs [122]. The chi-square difference tests of the three CLO dimensions, i.e., holistic perspective, resources commitment, and management support, indicated the successful discrimination between all of the constructs in the model. In addition, the distinct meaning of the measurement items for each of these two constructs provides support for their distinct character through their content validity [122]. Therefore, overall, the discriminant validity is satisfied.

Table 7. Discriminant validity.

	HP	RC	MS	IEM	EG	ED	IR	EP	PEP	NEP
HP	**0.773**									
RC	0.796	**0.642**								
MS	0.372	0.479	**0.869**							
IEM	0.401	0.365	0.190	**0.720**						
EG	0.386	0.381	0.131	0.656	**0.694**					
ED	0.311	0.256	0.169	0.504	0.686	**0.817**				
IR	0.235	0.192	0.213	0.353	0.429	0.593	**0.626**			
EP	0.175	0.198	0.074	0.253	0.271	0.231	0.168	**0.816**		
PEP	0.295	0.305	0.146	0.366	0.469	0.349	0.248	0.533	**0.786**	
NEP	0.187	0.204	0.118	0.215	0.223	0.230	0.189	0.389	0.311	**0.824**

Note: Bold type figures are the respective constructs' AVEs, while other figures are the squared correlations between constructs in columns and constructs in rows. HP = holistic perspective, RC = resources commitment, MS = management support, IEM = internal environmental management, EG = external GSCM practices, ED = eco-design, IR = investment recovery, EP = environmental performance, PEP = positive economic performance, NEP = negative economic performance.

5.4.2. Second-Order Factor (GSCM)

As described above, the construct of GSCM practices was operationalized as a second-order construct. The fit indices indicate an acceptable fit for the second-order measurement model of GSCM practices. The χ^2 statistic is 238.913 at 73 degrees of freedom, the CFI is higher than the benchmark of 0.90 and the SRMR is 0.049. The factor loadings from the measurement item to the corresponding first-order construct range from 0.761 to 0.939 and are significant at the 0.001 level. The factor loadings from the first-order construct to the second-order construct, i.e., GSCM practices, are 0.823 for IEM, 0.921 for EG, 0.905 for ED, and 0.769 for IR. The second-order construct of GSCM practices explains 68%, 85%, 82%, and 59% of the variation of IEM, EG, ED, and IR, respectively. Therefore, the second-order factor model shows that GSCM practices is a four-dimensional construct consisting of IEM, EG, ED, and IR.

6. Results

Structural equation modeling (SEM) was performed using AMOS 17.0 to test the hypotheses. SEM is a multivariate technique that enables a series of observed variables to be related to the latent variables [20,112]. It involves both the measurement model and the structural model in one analysis [112]. On the basis of the empirically measured variances and covariances of observed variables, the relationships between latent constructs are inferred [122]. The SEM method has been recommended as a good technique to test mediation [123] and has been used in previous studies, e.g., Sarkis et al. [20]. Regression analysis is an alternative method which can be employed for mediation tests. The regression approach, however, may cause measurement error problems in mediator variable scores [20,123]. In contrast, SEM can reduce measurement errors by applying latent variables [20]. Two SEM models were proposed. Model 1 focuses on the direct relationship between CLO and organizational performance, while Model 2 incorporates GSCM practices as a mediating factor. Evidence of mediation exists when all of the following conditions are satisfied [20].

First: The relationship is significant between the independent variable and the dependent variable. Second: The relationship is significant between the independent variable and the mediator. Third:

The relationship is significant between the mediator and the dependent variable. Fourth: The influence of the independent variable diminishes or becomes non-significant while controlling for the effects of the mediator. If all of the first three conditions are satisfied and the influence of the independent variable becomes non-significant in the presence of the mediator, the effects of the independent variable on the dependent variable are "completely" mediated by the mediator. If all of the first three conditions are satisfied and the influence of the independent variable diminishes, but remains significant, in the presence of the mediator, the effects of the independent variable on the dependent variable are "partially" mediated by the mediator [20].

As can be seen in Table 8, the structural model (Model 1) developed to test the direct relationship between CLO and performance is acceptable (χ^2/df = 3.070, CFI = 0.926, RMSEA = 0.084). The structural model incorporating GSCM practices as a mediator (Model 2) fits well (χ^2/df = 2.334, CFI = 0.920, RMSEA = 0.067). The hypotheses testing results are shown in Figures 5 and 6.

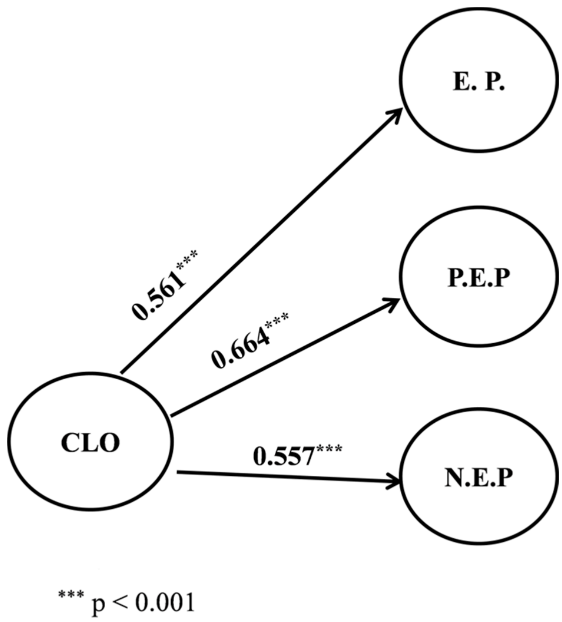

Figure 5. Results of the direct relationship between CLO and performance SEM.

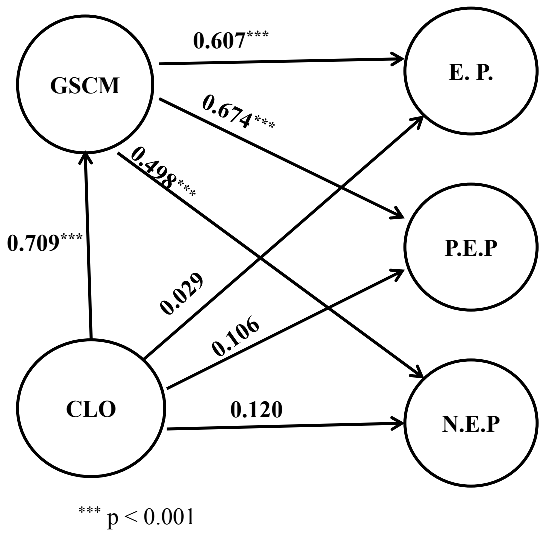

Figure 6. Results of the GSCM practices mediation SEM.

Table 8. Goodness of fit indices of the models (Model 1 and Model 2).

Indices	Benchmark	Model 1	Model 2
χ^2		758.317	1521.949
df		247	652
χ^2/df	3 [114]	3.070	2.334
CFI	0.90 [116]	0.926	0.920
RMSEA	0.10 [124]	0.084	0.067

First, as shown in Figure 5, all of the direct relationships between CLO (independent variable) and each of the three performance factors (dependent variable) are significant at the $p < 0.001$ level. Thus, Hypothesis 2a–c are supported. CLO positively impacts both a firm's environmental performance and positive economic performance and negative economic performance.

Second, as shown in Figure 6, the relationship between CLO (independent variable) and GSCM practices (mediator variable) is significant at the $p < 0.001$ level. Thus, Hypothesis 1 is supported. CLO positively impacts the level of implementation of GSCM practices.

Third, as also shown in Figure 6, GSCM practices (mediator variable) has significant relationships with each of the three performance factors (dependent variable) at the $p < 0.001$ level. Thus, Hypothesis 3a–c are supported. GSCM practices positively impacts both a firm's environmental performance and its positive and negative economic performance.

Fourth, in Figure 6, all of the direct relationships between CLO (independent variable) and each of the three performance factors (dependent variable) are statistically insignificant. That is, all of the effects of CLO on the organizational performance became insignificant after controlling for the effects of GSCM practices. Overall, the test results show that: (1) CLO influences a firm's organizational performance; (2) CLO influences the level of implementation of GSCM practices; (3) the level of implementation of GSCM practices influences a firm's organizational performance; (4) the effect of CLO on a firm's organizational performance becomes insignificant in the presence of GSCM practices. These results present strong evidence that the relationship between CLO and a firm's organizational performance is mediated by GSCM practices. That is to say, CLO positively influences the level of implementation of GSCM practices and this, in turn, significantly affects a firm's organizational performance. Thus, Hypothesis 4 is supported.

7. Discussion

7.1. CLO, GSCM and Organizational Performance

According to the empirical test results in this study, CLO, GSCM and organizational performance have very close relationships as follows. First, CLO influences the adoption of GSCM practices. Firms with higher levels of CLO have higher levels of implementation of GSCM practices. This empirical test result is in accordance with our conceptual framework, that is, CLO is the antecedent of making a supply chain environmentally friendly. The existing literature posited that GSCM practices are related to strong internal and external linkages, possessing multidimensional, dynamic characteristics and complexity [65,66,73]. Zhu et al. [73] empirically confirmed that the implementation of GSCM practices should be multifaceted, and at least include internal environmental management, green purchasing, cooperation with customers, eco-design and investment recovery. Owing to the complexity of GSCM practices, firms should adopt it from simple programs and then expand to other areas after accumulating experience [8,125]. From the perspective of ecological modernization, Zhu et al. [8] argued that to adopt GSCM practices, the immediate objectives are waste reduction and resource recovery, while the long-term objectives relate to resource conservation and clean production. The recovery of used products has a relatively high influential impact on the whole system of GSCM [2]. Hence, in order to improve GSCM implementation, firms should pay attention to the recycling of materials/components/products. We set closed-loop-oriented activities as the starting point for the implementation of GSCM practices, and expect them to be expanded to other GSCM initiatives gradually.

Second, CLO has positive direct impacts on the improvement of the firm's environmental performance and economic performance. The implementation of CLO may significantly reduce air pollution emissions, waste water, solid wastes, and the consumption of hazardous/harmful/toxic materials. In addition, the introduction of CLO may decrease the costs of materials purchasing, energy consumption and waste treatment, while increasing investment and operational costs. Nevertheless, the test results demonstrated that CLO has stronger effects on the positive economic performance than on the negative economic performance. It seems that closed-loop oriented initiatives enable firms to offset the increasing costs of investment, operation, and training, while contributing to resource efficiency and energy savings. Even though CLO requires the continuous improvement of technology and significant capital investments, the initial cost may be offset by the cost reductions afforded over the lifetime of the manufacturing processes [47,126].

In addition, GSCM practices impact the improvement of the firm's environmental performance and economic performance positively (both positive and negative economic performance). As mentioned previously, implementing GSCM practices can contribute to reducing air pollution emissions, wastes, and harmful materials, thereby improving the firm's environmental performance. In addition, adopting GSCM practices can decrease the cost of purchasing materials, energy consumption, and waste treatment. On the other hand, the adoption of GSCM practices may incur an increase of investment, operational and training costs. This supports the existing literature which reported that manufacturers may suffer short-term economic losses when adopting environmental practices and seeking to improve their environmental performance, due to increased investments and shifting of resources (e.g., [127]). Moreover, implementing GSCM practices may bring significant economic benefits in the long term [10,127,128] and, hence, improve the firm's competitiveness [74].

Last, the implementation of GSCM practices completely mediates the relation between CLO and both environmental and economic performances. This result reveals that in order to improve a firm's performance through initiatives of materials/components/products recycling or recovery, GSCM practices should first be in place. CLO is a strategic orientation of one individual firm, but it concerns the whole supply chain from a holistic perspective. The maximization of materials recovery is a systematic issue which needs the coordination of multiple supply chain partners, rather than an individual firm's internally focused issues. Under GSCM, firms cooperate with their supply chain partners, e.g., cooperate with their suppliers for the purpose of purchasing environmentally friendly materials, and with their customers for the eco-design and recovery of materials. Thus, without GSCM practices which advocate coordination between suppliers, producers, and customers, CLO may lose efficacy.

Overall, the implementation of GSCM practices needs the guidance of CLO, whereas CLO impacts the improvement of organizational performance positively only if the GSCM practices are in effect. Accordingly, CLO and GSCM practices appear complementary to each other, and neither can exist effectively without the other. Therefore, firms considering the recovery management of materials/used products should implement GSCM practices and CLO simultaneously. In this way, the implementation of CLO along with GSCM practices by firms can have positive effects on their environmental and economic performances.

7.2. Theoretical and Managerial Implications

Conceptually, this study offers the first important contribution by proposing CLO as an appropriate strategic orientation in the context of greening the supply chain, based on the fundamental closed-loop concept of GSCM and established theories of strategic orientation. The link between a process-based strategic orientation and the implementation of GSCM practices was firstly established.

This study offers the second contribution by developing a reliable and valid measurement tool for CLO through an exhaustive literature review, in-depth interviews with experts and the employment of both EFA and CFA. The clear illustration of the indicators of CLO may provide specific guidance for its operational implementation in practice and a fundamental basis for researchers to further refine the measures of the construct and investigate its effect on other constructs.

The third contribution of this study is to investigate the relationships between CLO, GSCM practices and organizational performance using survey data collected from manufacturers in China. This provides empirical evidence as to whether CLO can influence the implementation of GSCM and, hence, affect a firm's organizational performance, as our theoretical framework has suggested.

The empirical study results offer the following managerial implications:

First, in order to adopt GSCM practices effectively, mangers should possess a CLO. GSCM are related to strong both internal and external linkages, possessing multidimensional, dynamic characteristics and complexity [65,66,73]. Its implementation should start with closed-loop oriented activities, e.g., waste reduction and resource recovery [8], thereby influencing the whole system of GSCM [2].

Second, in order to possess a CLO, managers should make a clear commitment to putting the maximization of materials/components/end-of-life products recycling first. Managers must view the entire supply chain including forward and reverse flow as a closed-loop from a holistic perspective, e.g., attaching importance to recyclability when designing products, selecting materials, manufacturing products and distributing products. In addition, managers should have a willingness to focus resources on developing materials/components/products recycling capabilities, e.g., investing in technologies for the processing of used materials/components/end-of-life products, specially assigning person to manage the function of taking back end-of-life products, etc.

Third, to improve the performance associated with these closed-loop oriented activities, managers should consider the adoption of GSCM practices. Our results suggest that GSCM completely mediates the relationship between CLO and organizational performance. In practice, product recovery management has become a very important business activity [2,129]. Recycling has been accepted as a viable alternative to the increasing costs of landfill as well as a waste management solution since the 1980s [130]. Moreover, closed-loop oriented environmental guidelines, regulations and law, e.g., the end of life vehicle (ELV) directive and Circular Economic Law in China, have been established to protect limited resources [131]. Therefore, as either taking a proactive environmental approach or just reacting to regulations, in order to make closed-loop oriented activities yield good effects on performance, the implementation of GSCM is needed.

Finally, managers should build CLO and adopt GSCM practices from a long-term view. Both CLO and GSCM practices have positive impact on the firms' environmental and economic performance, meanwhile they may incur an increase of investment, operational and training costs, which in turn result in economic losses, because substantial commitment and investment is required in the short-term [24]. Nevertheless, managers should not consider sustainable management such as CLO and GSCM as a costly investment, but as a way of improving their business performance and even whole supply chain performance and improving profits in the medium-to-long term, as suggested by Amann et al. [49], because a trade-off exists between current investments and long-term payoffs in the form of market shares and customer retention [24]. Investing resources to build CLO and support GSCM practices now will pay off manifold in the future. In general, firms do not have all the capabilities and resources in house [24]. Coordination with supply chain network is suggested as a solution [24], and also the coordination with supply chain partners is necessary for the supply chain-wide engagement in a closed-loop orientation and sustainable management of supply chain.

7.3. Limitations and Further Research Avenues

This study developed CLO as the appropriate strategic orientation that leads firms to effectively implement GSCM practices for the improvement of their performance. This study, however, is still at an exploratory stage. The CLO construct was newly proposed in our study. Considerable effort was made in developing its measurement scales for the first time. Further refine and test of the measurement scales of CLO is needed, even though it was developed based on extensive literature review and experts' opinions and was tested for reliability and validity, because ongoing validation and refinement is imperative process for developing valid and reliable measurement scales [132]. The CLO construct provides an avenue for further research in the field of GSCM and strategic management, thus allowing for more investigation and generalization.

The sample used in this study was collected from manufacturers in China. Chinese manufacturers have very different characteristics compared to firms in other countries [13]. Future research should test our conceptual framework across different countries.

Our sample included a couple of firm types, a broad range of firm sizes and industries. Some questions can arise: Whether there are differences in the level or pattern of CLO across various industries?; Whether the relationships between the constructs, i.e., CLO, GSCM and performance vary across different industries?; How it differs in the firms of different size or ownership? Further disaggregated analysis such as an inter-sectoral comparison is helpful to address these issues in the future.

The literature contends that short-term financial indicators are negatively linked to the improvement of environmental performance. Firms with a strong commitment to the environment perform well on long-term measurers [95,133]. In this study, we used economic performance measures at a more operational level because GSCM practices are operationally focused [13]. A longitudinal study of the effects of CLO and GSCM on performance measures using long-term financial indicators would help to complement this study. We examined positive and negative economic performance as two separated constructs. Linking CLO and GSCM practices to one single outcome variable which accounts for net positive economic impacts by calculating both the costs saved and incurred, can make the relationships between CLO, GSCM, and economic performance clearer.

Finally, this study focused on investigating the influences of CLO and GSCM practices on performance at the level of individual companies. The literature suggests that the implementation of GSCM practices is also likely to affect supply chain performance [134,135]. Besides, CLO is proposed in the context of a green supply chain. It essentially concerns an entire supply chain. Research into the influences of CLO along with GSCM practice on supply chain performance should be further conducted. In addition, sustainability accounting can provide a set of tools for environmental, social and economic aspects of corporate activities [136]. As in the work of Burritt and Schaltegger [136], future research can use sustainability accounting approach to measure and assess the (un-)sustainability effects of CLO and GSCM. Moreover, future research should address some of the issues proposed by [137]. They surveyed studies on green procurement in the private sector between 1996 and 2013 and suggested an avenue of new research direction such as increasing theoretical papers, further addressing positive relationship between GSCM and economic performance, performance of suppliers after adopting GSCM and dyadic view between buyer and seller.

8. Conclusions

This study is one of the first empirical explorations of the connection between a process-based strategic orientation and the implementation of GSCM practices. We proposed CLO as the appropriate and necessary strategic orientation which can facilitate the successful implementation of GSCM practices. Further, this study advances prior research by developing a reliable and valid measurement of CLO, and empirically investigating the relationships between CLO, GSCM, and organizational performance. Our empirical test results support our conceptual framework that CLO can significantly facilitate the implementation of GSCM practices and, hence improving organizational performance.

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Appendix A

Table A1. Non-response bias test results.

Variables	*t*-Value [a]
Position	1.662
Department	−0.141
Years of working	−1.001
Ownership	1.509
Industry type	−0.054
Annual sales	1.081
Export percentage	0.773
Firm size	−0.371
Firm age	−1.131

[a] All *t*-values are not significant at $p < 0.05$ level.

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