



Sustainable Supply Chain Management with NGOs, NPOs, and Charity Organizations: A Systematic Review and Research Agenda

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Sustainable Supply Chain Management with NGOs, NPOs, and Charity Organizations: A Systematic Review and Research Agenda

Abstract:

With the gradually increased awareness of sustainability development, external organizations, including non-governmental organizations (NGOs), non-profit organizations (NPOs), and charity organizations, play an increasingly crucial role in sustainable supply chain management (SSCM). The participation of external organizations not only helps the firms to improve reputation, but also regulates and improves their SSCM. Based on this motivation, we identify the major research domains and examine each domain's evolution by using the objective review methods, including *Citation Network Analysis* and *Main Path Analysis* in this literature review paper. Five research domains are recognized, namely, “sustainable supply chain framework design”, “supply chain coordination/collaboration”, “closed-loop supply chain”, “regulation”, and “subsidy and donation”. We review the most influential papers in each research domain to show the evolution of these studies. Based on our review findings, we successfully propose four future research agendas with eight specific issues and innovatively establish a new research framework. The outputs of this review paper can guide the researchers on future search topics and contribute to the development of SSCM with the consideration of organizations.

Keywords: Sustainable supply chain management; sustainable development; NGO; NPO; not-for-profit; charity organization; literature review

1. Introduction

1.1 Research background

Sustainable supply chain management (SSCM) has been attracting increasing attentions in recent years (Gong et al., 2019; Khan et al., 2021). At the very beginning, the development of SSCM is mainly motivated by the economic and environmental challenges, which require the companies to manage the trade-off between short-term profitability and long-term environmental sustainability (Wu and Pagell, 2011; Hsueh 2015). With the gradually increased awareness of long-term development in companies and society, SSCM is now considered far more than the environmental aspect. In general, it is commonly involved in green product development (Hong and Guo, 2019), labor conditions (Lee, 2020; Xu et al., 2021b), disaster management (Shareef et al., 2020), etc. In 2015, *United Nations* (UN) had announced 17 Sustainable Development Goals (SDGs), which appealed to all countries to share a common goal of sustainable development by reducing inequality, enhancing health and education, and ending poverty.¹ Despite the strong “competitive advantage” that can be achieved by considering the concept of sustainability (Akdoğan and Coşkun, 2012; Khan et al., 2021), it is challenging for the company to address these social and environmental issues independently. In consequence, external organizations, including non-governmental organizations (NGOs), non-profit organizations (NPOs), and charity organizations, play an essential role in facilitating the SSCM.

The participation of external organizations in SSCM can be embodied in many ways. First, forming partnerships between organizations and corporations is widely considered, as the trustworthy image of NGOs and NPOs can help the corporation to improve its reputation and attract more consumers (Pahlevani et al., 2021). For example, *Uniqlo* has partnered with the *United Nations High Commissioner for Refugees* to help refugees requiring assistance; *GSK* has collaborated with *Save the Children* to address child mortality problems, etc. According to a report announced by a UK-based consultancy in 2018, more than 85% of corporations and NGOs admit the growing importance of corporate-NGO partnerships in SSCM (Mizar, 2019). Second, external organizations can participate in the supply chain process (e.g., recycling) to help the supply chain to reach a higher level of sustainability. In real-world cases, the charity organization *Oxfam* has been involved in *M&S*'s donation, reuse, and recycling process for many years, which is called the “Plan A” sustainability program (Cai et al., 2021). Third, working as a “monitor” is another potential role for external organizations in SSCM. The *World Health Organization* is one of the most well-known NGOs that

¹ Official website of United Nations: <https://www.un.org/en/exhibits/page/sdgs-17-goals-transform-world>.

monitors public health risks and improves companies' sustainable development by setting regulations for food security, vaccine development, etc. Meanwhile, the governance from external organizations can significantly enhance the firm's sustainability level and prevent the firm from false propaganda of sustainability, i.e., greenwashing (Blome et al., 2017).

As we mentioned, NGOs, NPOs, and charity organizations are important and helpful to SSCM. However, the research framework of SSCM with the consideration of these organizations is still unclear. In prior literature, there are a multitude of papers reviewing the development of SSCM (e.g., Carter et al., 2011; Rajeev et al. 2017; Cai and Choi, 2020; Khan et al., 2021.); some of them focus on modeling approach (Seuring, 2013), and some of them target on the role of technology (Birke and Müller, 2020; Paliwal et al., 2020). However, to our best knowledge, there is still no literature systematically reviewing the research issues regarding the SSCM with the consideration of organizations. To bridge this research gap, we conduct this review paper using objective methods, including *Citation Network Analysis* and *Main Path Analysis*, trying to identify and categorize the research domains of SSCM with organizations and figure out a comprehensive research framework accordingly.

1.2 Contribution statement

To our best knowledge, this is the first paper that uses an objective method to conduct a systematic review for SSCM considering organizations (including NGOs, NPOs, and charity organizations). The main contributions of our paper are as follows. (i) First, five key clusters (i.e., research domains) are identified and categorized based on *Citation Network Analysis*; which are: sustainable supply chain framework design, supply chain coordination/collaboration, closed-loop supply chain, regulation, and subsidy and donation, respectively. We show the relationships among five research domains and organizations by integrating them into an innovative knowledge framework (see Figure 5), which is the major output of *Citation Network Analysis*. (ii) Second, to describe the evolution of relevant studies, we conduct a descriptive analysis presenting the trend of SSCM with the statics of publication year, research area, and journal source. (iii) Then, we conduct *Main Path Analysis*, which gives a clear picture of literature development and inspires us to propose future research directions. We also summarize the major findings of the important role of organizations in SSCM from prior literature and list the identified research gaps for an overview (see Tables 2 and 3). In the end, we propose four future research agendas and construct an innovative new research framework (see Figure 11) by re-depicting the original knowledge framework based on our review findings. The new research framework can guide the researchers on future research topics and contributes to the

development of SSCM with the consideration of organizations.

2. Review Methodology

To conduct a comprehensive literature review, we adopt a four-stage systematic review methodology in this paper. The four-stage review methodology is developed based on the well-established three-stage review methodology (e.g., Tranfield et al., 2003; Choi et al., 2018; Cai and Lo, 2020), which comprises three stages named *planning*, *conducting*, and *reporting*. In our proposed four-stage systematic review methodology, we include a stage called *synthesizing* as the fourth stage. By adopting this method, we can comprehensively search, collect, and analyze target papers for in-depth analyses and provide significant implications and contributions to the research domain based on analyses.

After collecting the target papers, we conduct the review analyses based on *Citation Network Analysis* (CNA), which is a commonly adopted systematic review method that guides the researchers to identify the research domains scientifically (e.g., Colicchia and Strozzi, 2012; Fan et al., 2014, Cai and Lo, 2020). Then, for each identified domain, we follow Colicchia and Strozzi (2012) to use *Main Path Analysis* (MPA) to uncover the detailed knowledge development structure. The review results derived from CAN and MPA help us initiate the knowledge framework, identify the research gaps, and propose a future agenda for developing SSCM. The review methodology and our research structure are summarized in Figure 1.

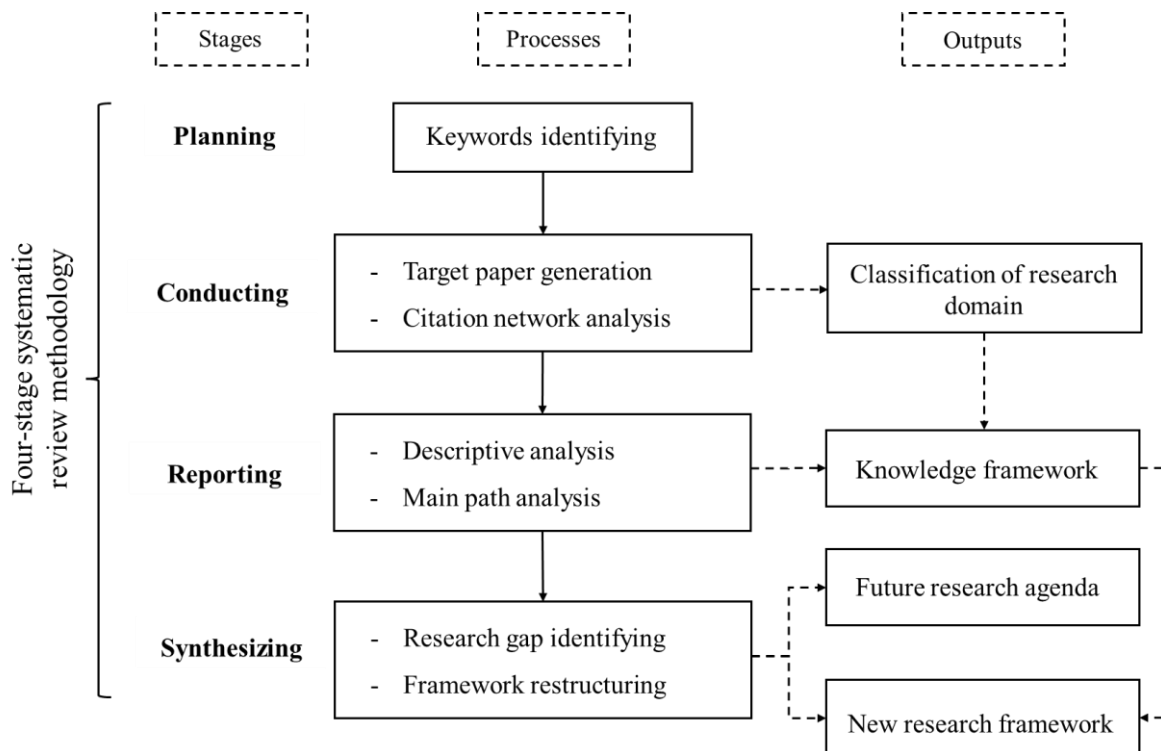


Figure 1. Summary of review methodology and research structure.

2.1 Planning stage

The major task in the planning stage is to identify the searching keywords that are relevant to our research. Since we mainly focus on SSCM with organizations in this study, we initially select the search keywords including “charity”, “NGO”, “not-for-profit”, and “non-profit”, and combine them with the keywords “supply chain” and “operations management” to ensure the papers are in operations management (OM) domain. Besides, as our topic is closely related to sustainable development, to avoid missing critical information, we check the UN’s 17 SDGs and supplement the keywords with the term “sustainable institution” (P.S.: see Goal 16. Peace, Justice and Strong Institutions)¹. We do not set a specific time range for paper searching; hence all the related papers will be included for review. Table 1 shows the details of our searching process, including search database, search keywords, criteria for inclusion and exclusion.

Table 1. The logic of the searching process.

Search Protocol	Details description
Search database	Web of Science
Search keywords	TS = (charity OR NGO OR not-for-profit OR non-profit OR sustainable institution) AND TS = (supply chain OR operations management)
Criteria for inclusion	Tracking the relevant references
Criteria for exclusion	(i) Papers related to agriculture, material, education, and health fields; (ii) proceeding papers, conference papers, and early access.

2.2 Conducting stage

The conducting stage consists of two processes: (i) target paper generation and (ii) citation network analysis (CNA). First, we search the keywords and generate the target papers for review according to the searching process shown in Table 1. Specifically, we enter the identified keywords in the *Web of Science* database, which generates thousands of papers. We select this database as it is one of the most well-established academic search engines, which is commonly used in review studies (e.g., Choi et al. 2018, Chung 2021). Then, we exclude those proceeding/conference/early access papers and irrelevant papers in agriculture, material, education, and health domains. Besides, we also manually check the papers and exclude those irrelevant ones that do not consider organizations in the supply chain, after which 187 papers are retained. Moreover, to ensure that all the closely related papers will not be ignored, we track the relevant references and include additional six papers during the searching process. Consequently, 193 papers are collected as the target papers for review. We completed the target paper generation process in September 2021.

Next, we use the software “CitNetExplorer” to conduct CNA. This tool visualizes the citation networks of the target papers (193 papers in this study) and categorizes the paper samples objectively. Following Van

Eck and Waltman's (2014, 2017) instructions, five key clusters (i.e., research domains) are found. We manually check the papers in each cluster and identify a name for each cluster; they are "sustainable supply chain framework design", "supply chain coordination/collaboration", "closed-loop supply chain", "regulation", and "subsidy and donation", respectively. We will conduct our review based on this classification of research domain in the following analyses.

2.3 Reporting stage

In the reporting stage, we conduct a descriptive analysis in Section 3, which uncovers the statics of searching results, including publication years, journal source titles, and research areas. Then, we proceed to reveal the clustering results and propose a knowledge framework with identified research domains accordingly in Section 4. The proposed framework in this stage is based on the prior research findings, which will be further extended in the *synthesizing stage*. In Section 5, we show the findings of MPA, which uncovers the evolution process and the potential development direction for each research domain.

2.4 Synthesizing stage

The goals of the synthesizing stage (i.e., Section 6) is to (i) identify the research gaps and propose future research agenda, and (ii) restructure the existing knowledge framework and synthesize a new research framework. The implications shown in this stage are all based on the review findings derived in the reporting stage. Our proposed future research agenda and new framework can provide useful research guidance and recommendations for the scholars.

3. Descriptive Analysis

3.1 Publication years

We depict the trend of publications related to SSCM with organizations by year in Figure 2. This research topic was first emerged in the Year 1997 and steadily developing in the following decades. Before 2014, the number of published papers on this topic is deficient (i.e., less than 10), which means that the relevant studies were under-explored at that time; after 2014, numerous studies sprang up and reached the peak in 2020 (i.e., 33 papers). This result is expectable and understandable because more and more companies have realized the importance of developing a sustainable supply chain to achieve long-term development and success (Barbosa-Póvoa et al., 2018; Jin et al., 2021). This is especially true since 2020, when the COVID-19 pandemic shocked the supply chains and business operations worldwide (Choi 2021, Xu et al. 2022). We believe that the related topic of SSCM with organizations remains important and is worthy of investigating

in the near future.

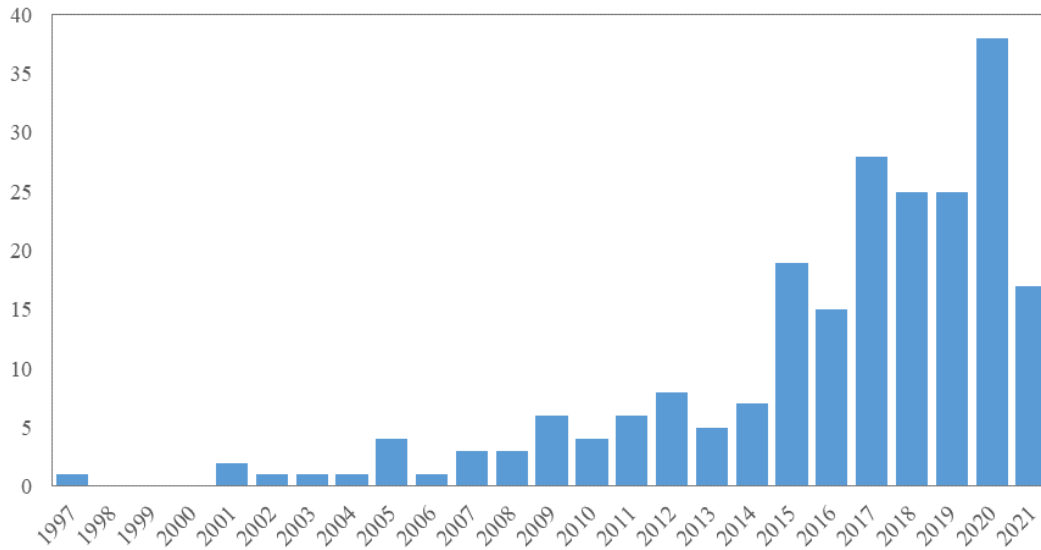


Figure 2. Statics of publication years.

3.2 Research areas

According to the data provided by *Web of Science*, the 193 collected papers are involved in 7 main research areas, namely, *Business Economics*, *Operations Research Management Science*, *Engineering*, *Environmental Sciences Ecology*, *Computer Science*, *Transportation*, and *Information Science Library Science*. We demonstrate the statics of research areas in Figure 3. As shown in the figure, the research area of *Business Economics* dominates the other areas in the topic of SSCM with organizations (60.428%). Meanwhile, it is also well developed in the research areas like *Operations Research Management* (28.342%) and *Engineering* (27.273%). For the other areas, there are still substantial gaps for future research.

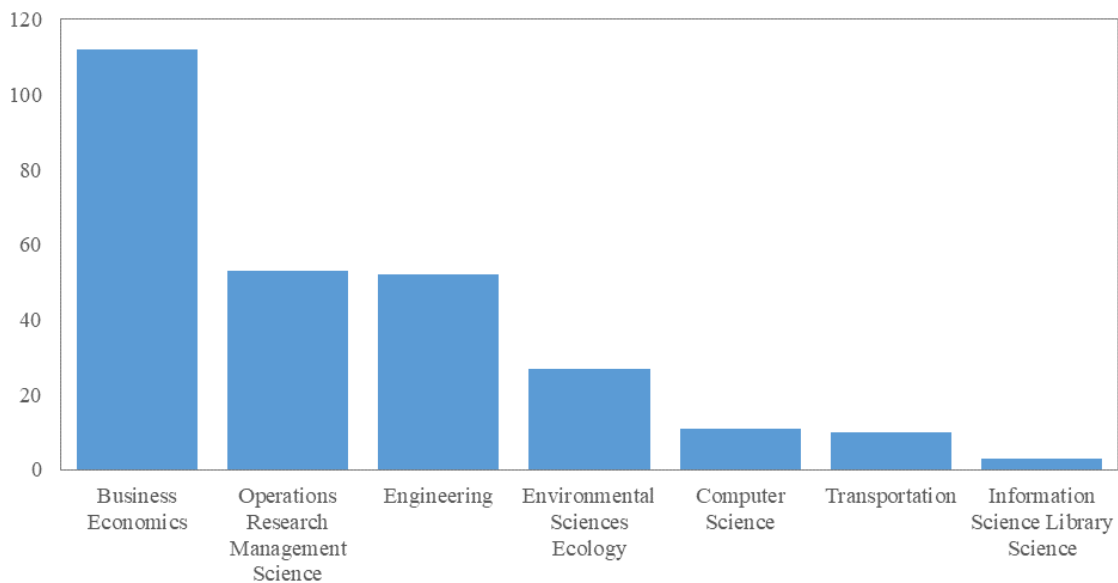


Figure 3. Statics of research areas.

3.3 Top 5 journals

Various international journals publish papers related to SSCM, including management science, logistics, planning, etc. Figure 4 illustrates the top 5 journal sources of the selected papers, which are: *Production and Operations Management*, *Resources Conservation and Recycling*, *Annals of Operations Research*, *International Journal of Production Economics*, and *Journal of Humanitarian Logistics and Supply Chain Management*. *Production and Operations Management* ranks highest, which has published 11 related articles on the topic of SSCM with organizations. The other four journals published 6-7 related papers similarly.

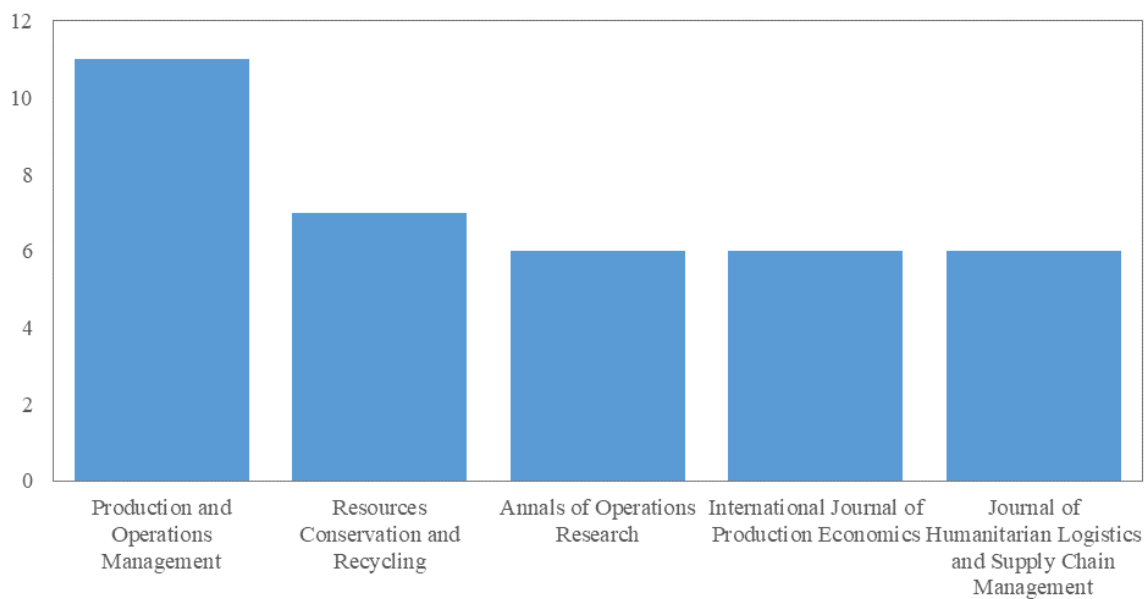


Figure 4. Statics of journal source titles.

4. Knowledge Framework

To better understand the knowledge framework of the SSCM with organizations, we adopt the software “CitNetExplorer” to classify the research domains of the 193 selected papers. We set the minimum cluster size as three articles². Finally, we found five main clusters containing 79 articles (The screenshot of clustering results derived by CiNetExplorer can be checked in Figure A1 in Appendix.). Some papers do not belong to any cluster (e.g., Chowdhury, 2017; Bai et al., 2019; Bian et al., 2021.), because their works are relatively new and thus only received limited citations comparatively. In other words, only those mainstream and most influential studies will be more likely to be included in a particular cluster. The relatively low

² The reason why we chose 3 as the minimum cluster size depends on the clustering results. We have also tried some other data for minimum cluster sizes including 5,8, and 10, but failed to get a better result.

clustering rate (40.9%) implies that this research area has many new ideas that are not yet influential enough to form a research domain. In the anear future, when more relevant studies are published, the connections among papers will be strengthened and eventually contribute to a larger citation network. To identify the name of each research domain (i.e., cluster) and propose an innovative knowledge framework based on it, we carefully check the papers in each cluster and summarize the research domains as RD1-5 in Figure 5. As a remark, the five identified research domains are shown in *italic* in the figure; they are: sustainable supply chain framework design (RD1), supply chain coordination/collaboration (RD2), closed-loop supply chain (RD3), regulation (RD4), and subsidy and donation (RD5).

According to the statistics provided by CiNetExplorer, we find that the research domain of supply chain coordination/collaboration (i.e., RD2) is the most popular domain in the topic of SSCM with organizations, which includes 36 relevant papers. Then, RD1 and RD4 are under the similar exploration level with 18 and 14 publications, respectively. Finally, we notice that RD3 and RD5 gain the least attention in the SSCM topic with only 3 and 8 articles, which means that they are still under-explored and have sufficient research space in the future. The details of each cluster and corresponding papers are listed in Table A1 in Appendix.

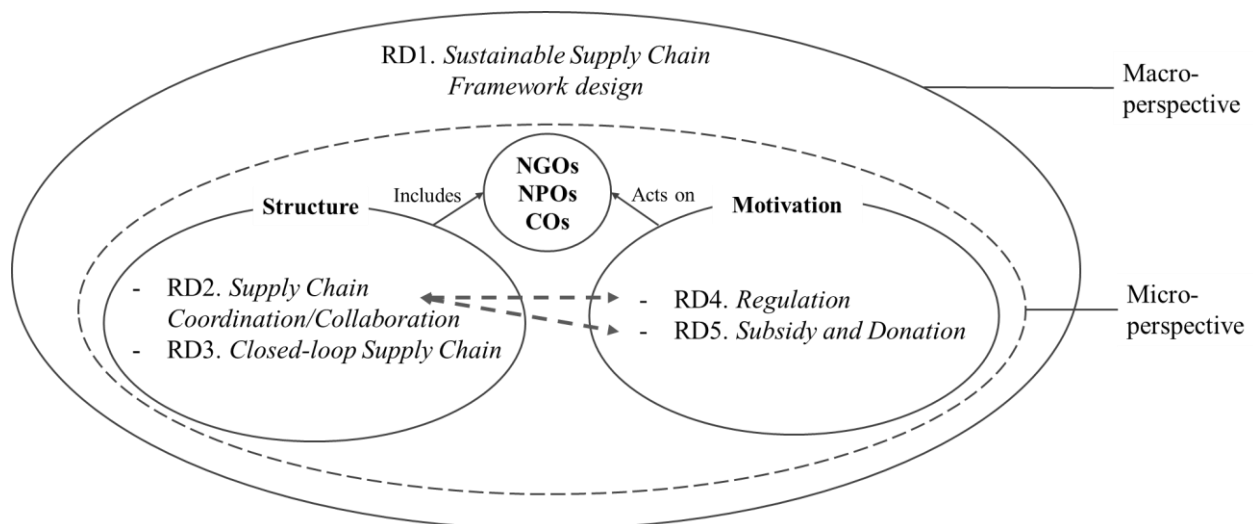


Figure 5. Knowledge framework of the research domain.

Moreover, Figure 5 shows the connections among different research domains. Specifically, the five identified research domains can be classified into two perspectives: macro-perspective and micro-perspective. The research domain *sustainable supply chain framework design* is from the macro-perspective, which introduces the concept and provides fundamentals of SSCM with organizations (Carter and Rogers, 2008). The other four domains, i.e., *supply chain coordination/collaboration*, *closed-loop supply chain*, *regulation*, and *subsidy and donation*, are from the micro-perspective, related to the more detailed issues in

the SSCM, e.g., supply chain structure, social factor in the supply chain. More specifically, supply chain coordination/collaboration and closed-loop supply chain are the two research domains that belong to the supply chain structure. At the same time, the regulation and subsidy and donation can be regarded as two major motivations for SSCM.

Furthermore, observing the cluster results shown by CiNetExplorer (see Figure A1 in Appendix), we interestingly notice that the research domains in supply chain structure and motivation can affect each other. Particularly, both regulation (DR4) and subsidy and donation (DR5) can directly influence the supply chain coordination/collaboration (DR2). For example, the government's subsidy may impact on the performance of supply chain coordination (Zhao and Zhu, 2017; Ma et al., 2021); the use of coordination mechanisms will influence the company's donation quantity decision (Tat et al., 2021). Interestingly, Figure A1 in Appendix shows that group 5 is independent of others, which means that the research domain of the closed-loop supply chain (RD3) is not well connected with other topics in prior literature. However, the design of a closed-loop supply chain with organizations is helpful to optimize various social-related decisions, e.g., government regulation and subsidy schemes (Devika et al., 2014; Zhalechian et al., 2016). Hence, we suggest that the researchers consider examining how regulation, subsidy, and donation affect the motivations and operations in a closed-loop supply chain, which may help the sustainable institutions better improve their SSCM and achieve the sustainable goals.

5. Main Path Analysis

Based on the knowledge framework identified in Section 4, we conduct the main path analysis (MPA) for each research domain in this section. We use the software "Pajek5.14" for MPA, which is an efficient tool to weight the citations and identify the key citation path (De Nooyetal., 2005; Colicchia and Strozzi, 2012). We follow the instructions in Colicchia and Strozzi (2012) and depict the main path for each research domain as shown in the following subsections. The MPA results can help us tease out the evolution process and knowledge structure. We would also propose potential future research directions according to the MPA findings, which can contribute to the research development in SSCM with organizations. As a remark, not all the selected papers will be included in MPA because only the key routes (i.e., the most important links of each cluster) are presented for analysis.

5.1 Sustainable supply chain framework design (RD1)

Figure 6 presents the main path of the cluster "sustainable supply chain framework design". From the figure,

we can see that the development starting point of this domain is relatively late, i.e., starting from the year 2008. This finding is understandable because this research domain is from the macro-perspective, which gives the fundamental elements of SSCM with organizations. Thus, it can only be formed when the whole SSCM system is relatively well developed. In this research domain, Carter and Rogers (2008) introduce the concept of SSCM and organize the factors, including environmental, social, and economic performance, into a conceptual framework. In their research, the authors claim that targeting actions by NGOs could be a feasible way for the sustainable supply chain to engage stakeholders and reduce potential risks.

Similarly, Seuring and Müller (2008) also offer a conceptual framework for SSCM, while the authors highlight the importance of addressing inter-organizational issues. They particularly raise two strategies: “supplier management for risks and performance” and “supply chain management for sustainable product”. Then, Ageron et al. (2012) and Gopalakrishnan et al. (2012) establish and examine the SSCM frameworks based on real-world practices. Ageron et al. (2012) conduct an empirical study with the collected data of French companies to validate a proposed theoretical framework. Their empirical results indicate that the pressure from those external supply chain members such as government institutions or NGOs is one of the reasons for the companies to improve their sustainability. Gopalakrishnan et al. (2012) develop two resultant frameworks for the British Aerospace (BAe) Systems, which presents the essentialities of SSCM and the relationship among various elements. Their case study results show that the collaboration with NGOs and conducting charity programs are both effective ways for the BAe to increase sustainability. Bag et al. (2018) adopt institutional theory and resource-based view theory to investigate the relationship between innovation and sustainable supply chains. Their findings emphasize the important role of coercive pressures (from external organizations) in moderating the relationship between innovation and sustainability. Most recently, Zhang et al. (2021) emphasize the technology adoption (e.g., big data) in SSCM. The authors claim that the use of big data technology is an effective way to improve the efficiency of SSCM, as it benefits the information flow and creates active mobilization for stakeholders and organizations. We summarize the major implications derived from prior literature in Table 2.

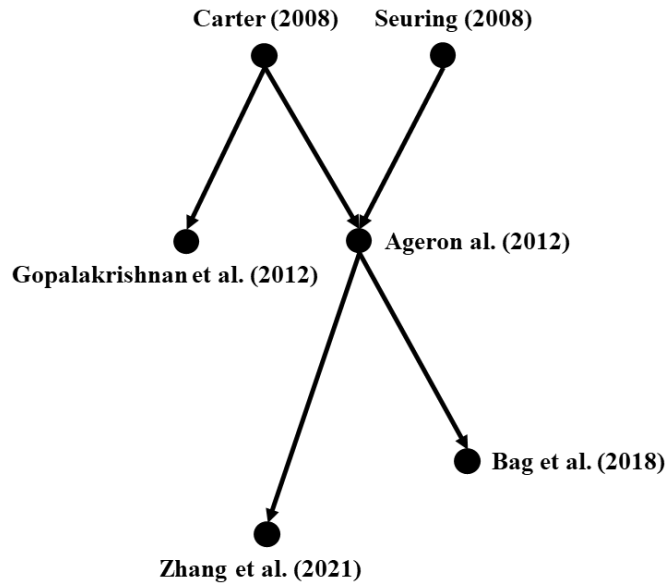


Figure 6. The main path of RD1.

The above analyses for RD1 indicate the important role of external organizations in the SSCM. The MPA results reveal that the development tendency of sustainable supply chain framework design lies on the innovation and technology adoption. This trend is understandable as we are now in the era of Industry 4.0, where the supply chains are focusing on the digital innovation and transformation of operations (Ivanov et al., 2019; Luo and Choi, 2021). Thus, for future research, it is recommended to integrate the emerging domain of technology adoption into the SSCM framework and explore the value of more different technologies, e.g., blockchain, 3D-printing, additive manufacturing.

5.2 Supply chain coordination/collaboration (RD2)

Supply chain coordination/collaboration is a crucial topic in supply chain management and has been developed for decades. It is especially critical when considering the SSCM with organizations that the supply chain structure is more complex. Figure 7 shows the main path of supply chain coordination/collaboration research domain. Using the qualitative research method proposed by Eisenhardt (1989), two streams of studies are developed. The first stream mainly works on coordination/collaboration among different organizations. Following Van Wassenhove (2006), which highlights that the ability of information flow coordination is a core competency for humanitarian organizations, Day et al. (2009) collect data of Gulf Coast in the United States in late 2005 from government agencies, profit and non-profit organizations (NPOs), trying to overcome the barrier of slow information flow in organizations and coordinate the resources allocation by proposing designed principles. The authors emphasize the importance of implementing a system to support the flow of information among organizations. Al Adem et al. (2018) analyze the supply chain collaboration between international and local NGOs during disaster relief. Their

findings show that the collaboration between NGOs in a humanitarian context is primarily influenced by contextual factors (e.g., governmental policies, social-economic setting). Similar to Al Adem et al. (2018), Oloruntoba and Banomyong (2018) consider the collaboration between NGOs as a special issue on humanitarian logistics; additionally, the authors also mention the essential role of humanitarian organizations for donations and local procurement.

The second stream examines coordination/collaboration between supply chain members and organizations. Parmigiani and Rivera-Santos (2015) realize the problem of institutional voids in multinational companies, and try to provide implications for the multinational company about how to partner with non-profit organizations (NPOs) to address institutional voids in the supply chain. Rodríguez et al. (2016) conduct a case study and establish a theoretical framework that provides guidance for both NGOs and companies on choosing collaborative partners. Their study aims at alleviating poverty and enhancing sustainability in the supply chain. Quarshie and Leuschner (2020) investigate the collaborations between the government and NPOs in humanitarian operations and logistics, and summarize the key roles of the government as “organizer”, “facilitator”, and “supply network member”. Based on publicness theory, Seepma et al. (2021) conduct an empirical study that explores the impact of publicness on the cooperation mechanisms in a criminal justice supply chain with public organizations.

By summarizing the above analyses, we first notice that the contextual factors, including governmental policies, social-economic setting, publicness are worthy of consideration in both streams. We hence suggest that in future research, the scholars can extend their SSCM studies by considering these contextual factors in the research domain of supply chain coordination/collaboration. Besides, as mentioned in the prior literature (e.g., Van Wassenhove, 2006; Day et al., 2009), the information flow among organizations should be paid great attention to; thus, for future research, it may be interesting to work on how to eliminate the information asymmetry as well as how to speed up the information flow in the supply chain, e.g., by using blockchain technology (Kraft et al., 2020).

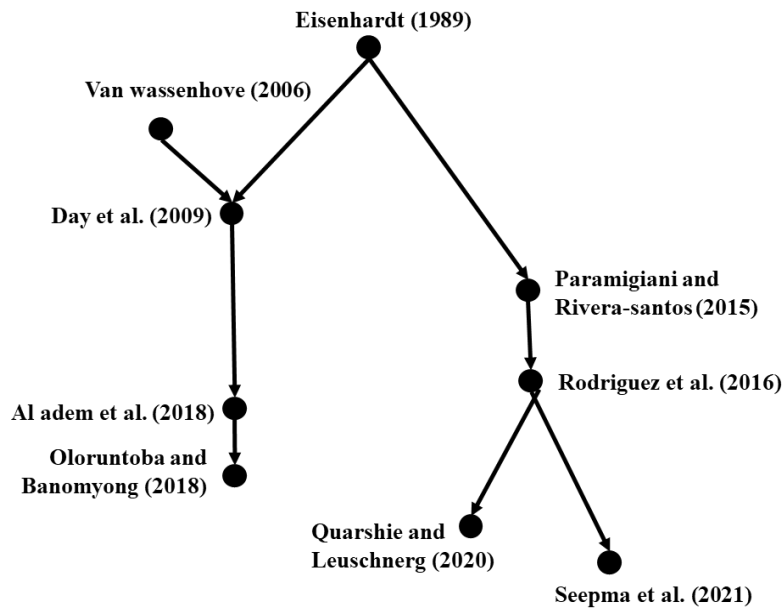


Figure 7. The main path of RD2.

5.3 Closed-loop supply chain (RD3)

Closed-loop supply chain is commonly considered and well explored in terms of sustainable manufacturing (e.g., Savaskan et al., 2004; Kenné et al., 2012; He et al., 2019); while when considering the SSCM with organizations, it is relatively under-explored. As presented in Figure 8, the main path of related studies for closed-loop supply chain is clear and simple. The related topic is first examined by Kumar and Malegeant (2006), in which the authors uncover the advantages of forming an alliance between manufacturers and NPOs in a closed-loop supply chain. They conclude that it is more valuable for the manufacturer to build a strategic alliance with NPOs for collection work instead of having its own network. Inspired by Kumar and Malegeant (2006), Hong and Yeh (2012) construct a theoretical model to investigate the SSCM in a closed-loop supply chain with NPOs who are responsible for the product collection. Their results analytically prove the superiority of using NPOs in a closed-loop supply chain, which is consistent with the findings proposed by Kumar and Malegeant (2006). Then, Neto and Walther (2014) further extend their attention to the not-for-profit closed-loop supply chain, where the emphasis should be put on social and environmental factors rather than profit only. The authors highlight that in such supply chains, NPOs heavily rely on donations and face the challenge of quality problems.

Notably, the exploration for closed-loop supply chain with organizations is inadequate, and it stops developing for a few years. However, there should be some interesting issues that can be explored. Based on the above analyses, future research direction can be considered as: (i) the government's incentive mechanism that encourages the closed-loop supply chain to use NPOs for collection, and (ii) the measures that can help NPOs to regulate and control the product quality in the closed-loop supply chain.

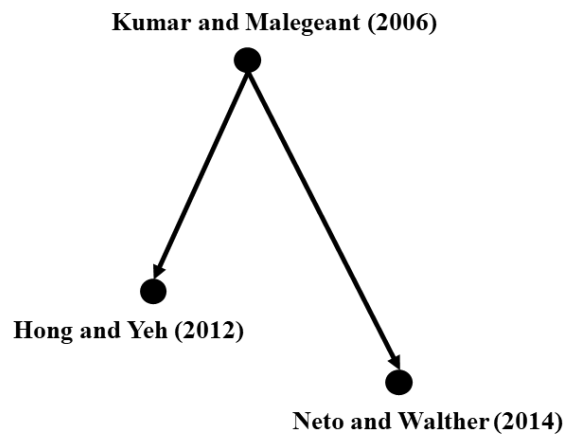


Figure 8. The main path of RD3.

5.4 Regulation (RD4)

The regulation is usually regarded as an efficient way to stimulate the company’s awareness of sustainability (Ji et al., 2014). The main path of the research domain of regulation is shown in Figure 9, which is relatively easy to follow. In literature, DiMaggio (1983) first mentions the importance of isomorphic pressure from the government’s regulation, which motivates the company to work with NPOs and NGOs to meet requirements. Based on DiMaggio (1983)’s implication, several studies examine the value of regulation in SSCM. For instance, realizing the importance of regulation in the organizational field, Pedersen (2009) pays attention to the SSCM of small- and medium-sized companies and highlights the decisive role of regulation (i.e., forming partnerships with NGOs is one of the forms of regulation) in managing corporate social responsibility (CSR) in their SSCM. Similarly, Carbone and Moatti (2011) regard CSR as one of the perspectives of SSCM, while it is commonly criticized as “green-washing” by NPOs as lots of companies tend to show their sustainability by posturing instead of action. Their research findings reveal that different regulations will significantly affect the SSCM behavior. That is, a strict regulation will lead to a cost reduction- and optimization-oriented supply chain, while a lax regulation contributes to an innovative and differentiated supply chain. Furthermore, Christ (2014) focuses on the SSCM in water usage for wine production. Their empirical results indicate that the regulatory pressure from NGOs can drive the “water management accounting use” and improve the sustainability of the supply chain.

From the above analyses, we notice that the research domain of regulation has encountered the bottleneck since 2014. There is still no analytical study analyzing the value of regulation in SSCM. Therefore, we strongly encourage the researchers to build a theoretical model to investigate the specific impacts of regulation on the supply chain’s partnership with organizations in the future.

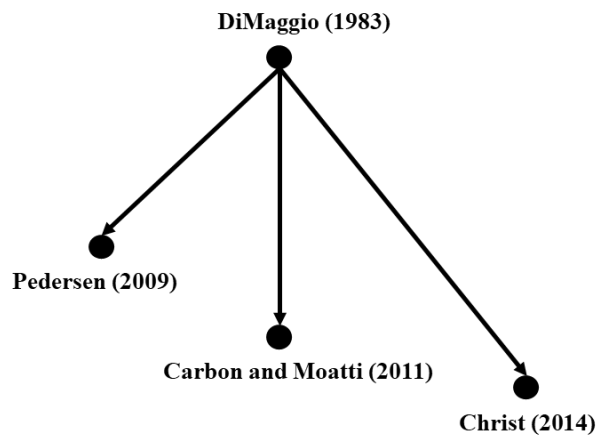


Figure 9. The main path of RD4.

5.5 Subsidy and donation (RD5)

The last research domain is subsidy and donation, which is another commonly-adopted measure that helps motivate the supply chain member's initiative in SSCM. To show the evolution of this research domain, we conduct the MPA and illustrate the main path in Figure 10. As we can see, the subsidy and donation is a relatively new research domain in SSCM with organizations, which started in 2014. Specifically, Toyasaki and Wakolbinger (2014) construct theoretical models to investigate the impacts of different donation models (i.e., earmarked donations or unearmarked donations) on donors', NGOs', and policy makers' decisions under humanitarian emergencies. Their results indicate that earmarked donations tend to have a negative impact on NGOs with low fundraising costs while have a positive impact on NGOs with high fundraising costs. After Toyasaki and Wakolbinger (2014), a few papers started to work on fundraising decisions in SSCM. For example, Berenguer et al. (2017) explore the value of subsidy programs for both for-profit agencies and NPOs in a newsvendor setting. The authors interestingly discover that the incentive effect of subsidy programs is stronger for NPOs than those for-profit counterparts. Chakravarty (2018) follows Arya and Mittendorf (2016) to consider the relationship among donors and charity organizations (COs), and derives similar findings with Toyasaki and Wakolbinger (2014), that is, a high fundraising cost will weaken the effect of post-disaster funding for NGOs. Moreover, their findings also highlight the important role of pre-disaster actions such as building levees, which will directly impact on NGO's post-disaster fundraising decisions.

The prior literature in this research domain mainly put emphasis on analyzing the influence of subsidy and donations on fundraising decisions; while none of them studies how to design a mechanism (e.g., subsidy amount decision, cost-sharing agreement.) to eliminate the negative impact brought by the high fundraising cost on NGOs, which can be considered as one of the future research directions. Besides, subsidy

and donation are usually adopted to increase social welfare (Berenguer et al., 2017) in SSCM, whereas there is still no relevant study aiming at maximizing the social welfare in the model, which could be another direction for future research.

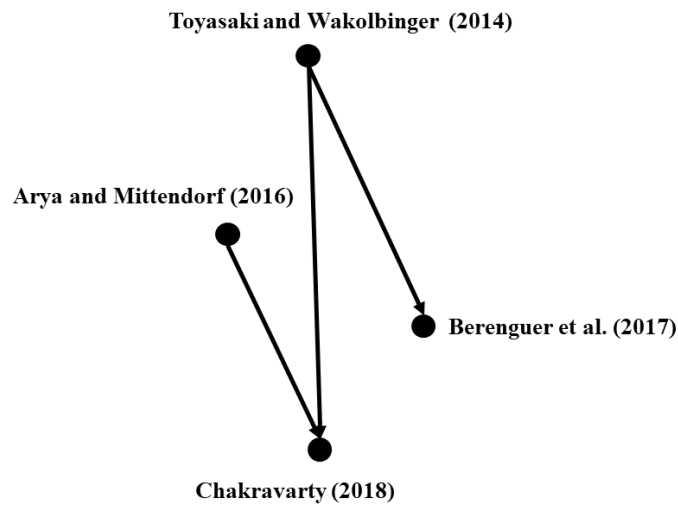


Figure 10. The main path of RD5.

Table 2. Summary of implications in each research domain.

Research domain	Important implications	Related organizations
Sustainable supply chain framework design	<ul style="list-style-type: none"> - Targeting actions by NGOs can reduce potential risks in supply chain. - Coercive pressures from external organizations can (i) impose the supply chain to improve its sustainability and (ii) moderate the relationship between innovation and sustainability. - Big data technology can help improve the efficiency of SSCM. 	NGO, CO
Supply chain coordination/collaboration	<ul style="list-style-type: none"> - The ability of information flow coordination is a core competency for humanitarian organizations, which can be improved by implementing system. - The collaboration between NGOs is primarily influenced by the contextual factors, e.g., governmental policies, social-economic setting, publicness. - Collaboration with non-profit organizations (NPOs) can help (i) address institutional voids in the supply chain and (ii) alleviate poverty. 	NPO, NGO
Closed-loop supply chain	<ul style="list-style-type: none"> - It is superior to form alliance with NPOs for collection work instead of having its own collection network in the closed-loop supply chain. - NPOs in the closed-loop supply chain heavily rely on donations and face the challenge of quality problem. 	NPO
Regulation	<ul style="list-style-type: none"> - The government's regulation motivates the company to work with NPOs. - Regulation plays a decisive role in managing corporate social responsibility and company's SSCM behaviour. 	NPO, NGO
Subsidy and donation	<ul style="list-style-type: none"> - A high fundraising cost will weaken the effect of post-disaster funding for NGOs. - The incentive effect of subsidy program is stronger for NPOs than those for-profit counterparts. 	NPO, NGO, CO

6. Discussion and Implication

6.1 Future research agenda

The results of CNA and MPA derived in Sections 4 and 5 have provided numerous useful implications for SSCM with organizations. However, we still identify some research gaps that are under-explored. We first summarize the identified research gaps in each section in Table 3 and then propose four future research agendas with eight specific issues accordingly to guide the scholars for future research directions.

Table 3. Research gap with related research domain.

Method	Research gap	Research domain
CNA (Section 4)	<ul style="list-style-type: none"> - Few papers are working on the “closed-loop supply chain” and “subsidy and donation” research domain. - The “closed-loop supply chain” research domain is not well connected with other topics. 	RD3, RD5
MPA (Section 5)	- Insufficient technology adoption.	RD1
	- Less exploration in contextual factors. - No exploration in information asymmetry.	RD2
	- Absence of incentive mechanism in the closed-loop supply chain. - Ignorance of quality control problem.	RD3
	- No analytical study analyzing the value of regulation in SSCM.	RD4
	- Lack of mechanism design to address the high fundraising cost problem. - Ignorance of maximizing the social welfare in the model.	RD5

- ***Technology adoption:*** In the present era of Industry 4.0, firms should make full use of technologies for their SSCM (Saberli et al., 2019; Esmailian et al., 2020; Raut et al., 2021), especially when collaborating with NGOs, NPOs, and COs. Since 2016, IBM has launched a program called “Science for Social Good”, which encourages NGOs and other public sector agencies to use technologies like artificial intelligence (AI) to improve society (Varshney and Mojsilovic, 2019). Additionally, an NPO called New Story has utilized 3D-printing technology to construct homes with low prices, which helps transform slums into sustainable communities³. Thus, for future research, we suggest the scholars to (i) integrate the emerging domain of technology adoption into the SSCM framework as well as explore the value of more different technologies, e.g., blockchain, 3D-printing, additive manufacturing, and AI.; (ii) explore how to use technologies (e.g., blockchain) to eliminate the information asymmetry and speed up the information flow in the supply chain collaboration/cooperation. A recent Harvard Business Review article also highlights that the biggest potential benefits of the blockchain technology is to design more efficient

³ See more details in: <https://unfoundation.org/blog/post/3d-printing-for-good-how-one-nonprofit-is-printing-homes-for-families-in-need/>.

contracts by matching buyers and sellers (Gaur, 2021); (iii) consider the use of technology to help NPOs regulate and control the product quality in the closed-loop supply chain. Until 2020, the fashion retailer Index has teamed up with 45 different NPOs and invested USD 3.5 million to develop new recycling technology, improving the quality for those collected materials and creating a closed-loop production cycle⁴.

- **Contextual factors:** The implementation of SSCM should be complicated instead of solely considering simplistic indicators (Beske and Seuring, 2014). Referring to the prior literature (e.g., Al Adem et al., 2018; Seepma et al., 2021), we suggest that the researcher can consider extending their SSCM studies by including contextual factors such as governmental policies, social-economic setting, and publicness. when examining the issue of supply chain coordination/collaboration. This issue is especially crucial in those places with the geographical vastness and socio-cultural diversity like India, in which (i) the existence of the poor and the disadvantaged calls for the development of confidence and equality by continuous dialogue between NGOs and different levels of bureaucracy (Garain, 1994); (ii) NGOs receiving foreign funding may face the challenges of local support, as Indian society is fundamentally xenophobic (Doane, 2016). Hence, considering these contextual factors can contribute to more practical and insightful research.
- **Mechanism design:** As we find in the MPA, the absence of incentive mechanism is a common gap faced by both RD3 and RD5. To bridge this research gap, we emphasize the importance of mechanism design for future research directions. To be specific, the following two issues can be further explored: (i) the government's incentive mechanisms (e.g., regulation, subsidy and donation) that encourage the closed-loop supply chain to use NPOs for collection. For instance, until 2021, the Hong Kong government has earmarked \$2 billion for the Recycling Fund, which provides funding support for the individual enterprises' waste recycling operations and NPOs that assist the local recycling industry⁵. (ii) How to design a mechanism (e.g., subsidy amount decision, cost-sharing agreement.) to eliminate the negative impact brought by the high fundraising cost on NGOs.
- **Theoretical modeling approach:** Theoretical modeling is a quantitative approach being applied to resolve a specific problem with specific solutions. The mathematical results can provide a concise preview of a model's behavior and is easy for the scholars to conduct analysis. Nevertheless, as we

⁴ See more details in the Index official website: <https://www.inditex.com/our-commitment-to-the-environment/closing-the-loop/collect-reuse-recycle>.

⁵ See more details in the Hong Kong Recycling Fund official website: <https://www.recyclingfund.hk/en/overview.php>.

uncovered in Section 5, the theoretical modelling approach is less frequently used than empirical and case studies. Hence, considering the superiority of this research methodology, we hope that more researchers can consider to (i) theoretically investigate the specific impacts of regulation on the supply chain's partnership with organizations, and (ii) build the model with the objective of optimizing the social welfare rather than simply minimizing the cost or maximizing the profit.

6.2 New research framework

Recall that in Section 4, we have already proposed a knowledge framework (i.e., Figure 5), which illustrates the existing and well-established research domain of SSCM with organizations based on the CNA. In this section, we plan to propose a new research framework that includes more critical and emerging research issues according to our literature review findings. For example, we realize the significant impact of contextual factors on supply chain structures, the potential connections between subsidy program and supply chain structures, the essential role of technology adoption to improve supply chain collaboration and regulation. By synthesizing and integrating these important findings into the existing framework, we obtain Figure 11 as a new research framework of SSCM with organizations. As a remark, the contents in blue color shows the differences between the new framework and the original one, and the arrow refers to the existence of connections and interactions among different domains.

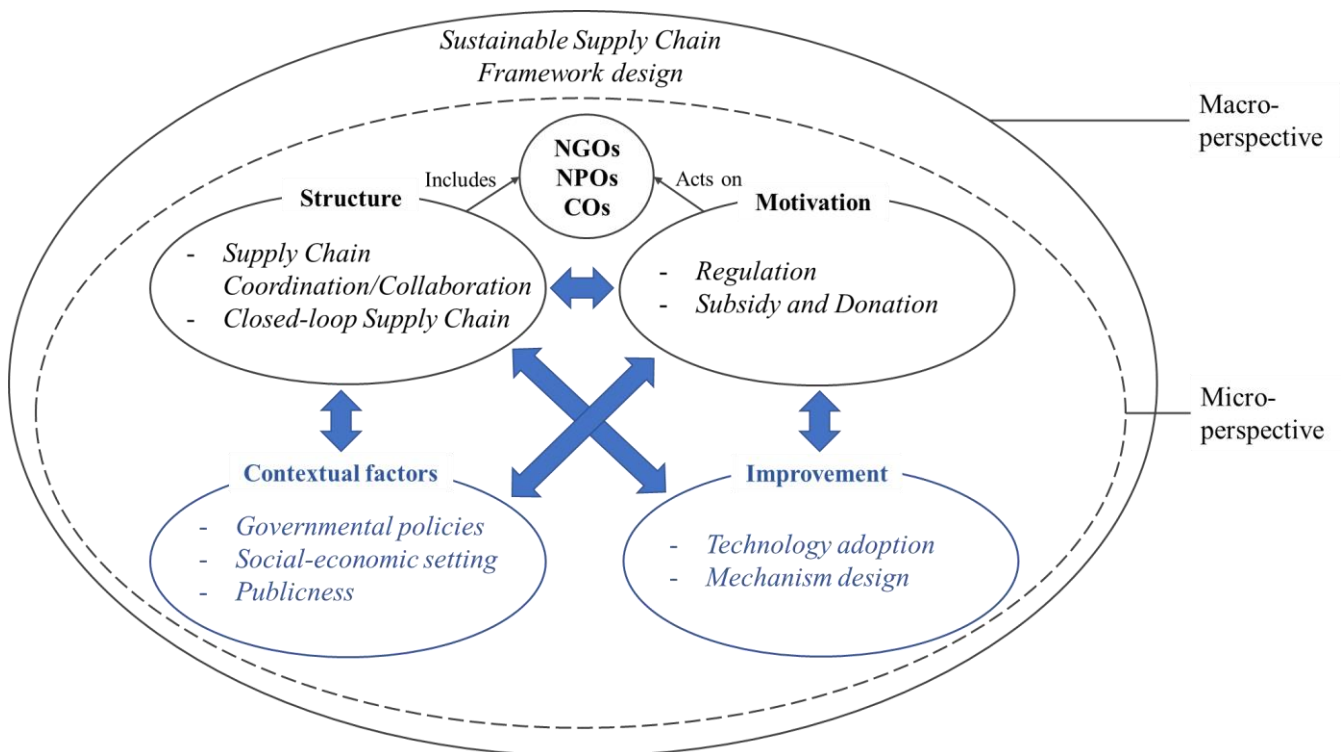


Figure 11. New research framework of SSCM with organizations.

As we can observe in Figure 11, two crucial elements are supplemented in the new research framework,

namely, “contextual factors” and “improvement”. Both these two newly added research issues can be connected with the existing issues (i.e., supply chain structure and motivation issues), e.g., the contextual factors will have impacts on supply chain coordination between supply chain members and organizations (Al Adem et al., 2018), the technology adoption is helpful to improve NPO’s collection work in a closed-loop supply chain, the regulation will influence the mechanism design while the use of technology can help strength the regulation. According to a report announced by the *World Health Organization (WHO)*, AI technology is adopted to support the public health regulation and enhance the health systems management (WHO News, 2021). This example well reflects the vital role of technology adoption in regulation in NGOs. More particularly, we want to highlight the newly added connection between the contextual factors and motivation, which is under-explored in the extant literature while should be emphasized in the framework for future research. For instance, it should be realistic that the economic setting will impact the consumer’s donation behavior (Albinsson and Perera, 2009) and the government’s subsidy strategy (Xu et al., 2021a). Besides, compared with the original framework, which neglects the connections of “closed-loop supply chain” with other topics, the new research framework illustrates all the possible interactions among different research issues. We hope this new research framework can work as an “instructor” for researchers. Referring to it, the researchers can choose to focus on one of the research domains or examine the research questions with multi-domain. They can also explore the interactions among different domains and how they can affect the performance of SSCM with organizations.

7. Conclusion

Motivated by the increasingly important role of external organizations (i.e., NGO, NPO, and charity organization) in sustainable supply chain management (SSCM), we conduct a systematic literature review on the topic of SSCM with the consideration of external under-explored organizations. In this review paper, we adopt objective review methods, including *Citation Network Analysis (CNA)* and *Main Path Analysis (MPA)*, which help us to identify and categorize the research domains and present the evolution of each domain, respectively. Five major research domains are identified and reviewed. They are: “sustainable supply chain framework design”, “supply chain coordination/collaboration”, “closed-loop supply chain”, “regulation”, and “subsidy and donation”. To show the connections and interactions among these domains, we first innovatively construct a knowledge framework based on the prior literature (see Figure 5) and then upgrade it to a new research framework based on the review findings from CNA and MPA (see Figure 11).

Two emerging research domains, namely, “contextual factors” and “improvement” are supplemented into the new research framework, which can guide the researchers on potential search topics and contribute to the development of SSCM with the consideration of organizations. Besides, four future research agendas with eight specific issues are proposed to bridge the identified research gaps. We believe that the innovative framework and implications derived in this paper can instruct the researchers to further explore the topic of SSCM with the consideration of organizations, which will contribute to the development of SSCM and enhance the sustainability of the whole society.

In the end, we admit that there exist some limitations in this review paper. First, to make our paper more focused on OM field, we exclude the research areas such as agriculture, material, education, and health, which may result in the ignorance of some interesting findings. Besides, we only use the software “CiNetExplorer” to identify the clusters. Note that, “CiNetExplorer” is a software focusing on the individual publications in analysis, which may lead to a relatively limited clustering result. Therefore, in the future, more different clustering approaches that focuses on the aggregate level (e.g., VOS viewer and CiteSpace) can be used to check the robustness of our cluster result. Finally, it should be interesting to conduct a case study to support our review findings, which may provide more practical implications for the scholars and the industrialists interested in the SSCM issues with organizations.

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Appendix — Supplementary Tables and Figures

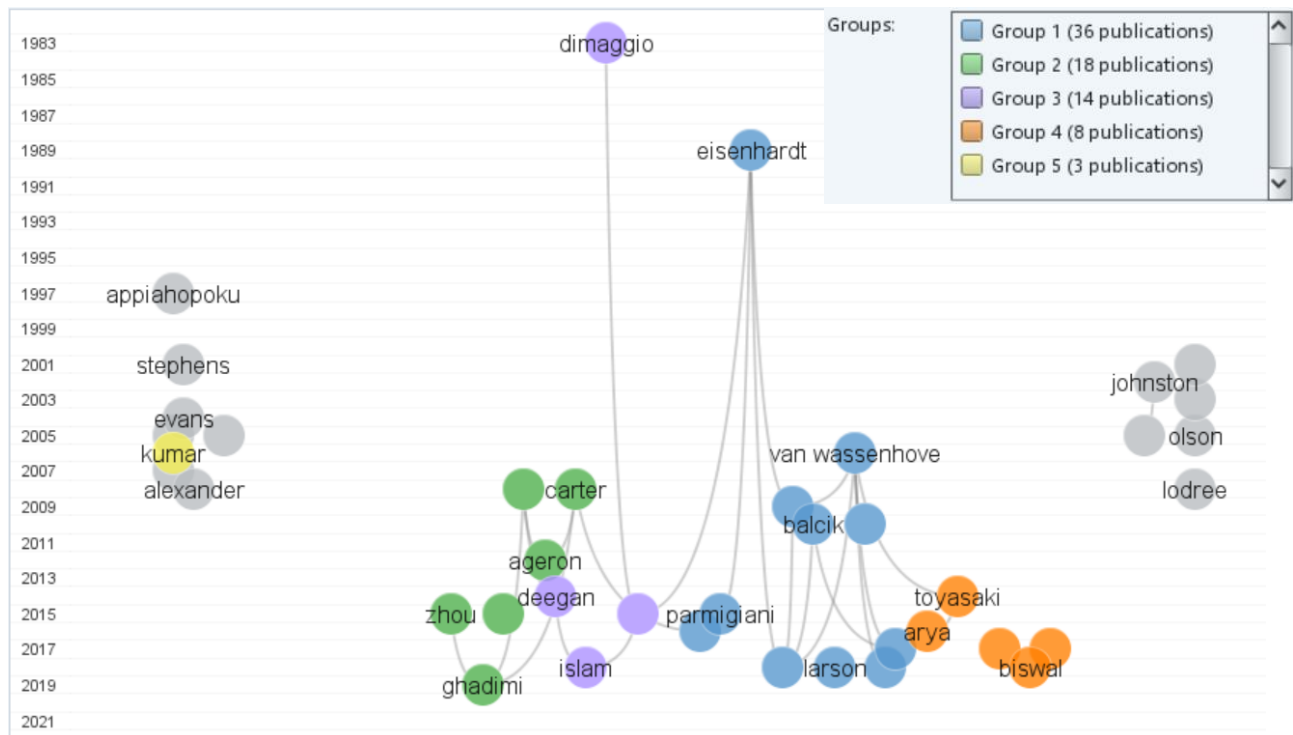


Figure A1. Cluster results derived by CiNetExplorer.

(Remarks: Group 1 corresponds to RD2, Group 2 corresponds to RD1, Group 3 corresponds to RD4, Group 4 corresponds to RD5, and Group 5 corresponds to RD3.)

Table A1. Details of each cluster and papers.

Research domain	References
Sustainable supply chain framework design (RD1)	Seuring (2008), Carter (2008), Gopalakrishnan et al. (2012), Ageron et al. (2012), De marchi and Grandinetti (2013), Zhou and Zhou (2015), Li et al. (2015), Khurana and Ricchetti (2016), Abidi et al. (2017), Ocicka and Razniewska (2018), Kaur et al. (2018), Bag et al. (2018), Scavarda et al. (2019), Ghadimi et al. (2019), De giacomo et al. (2019), Darbari et al. (2019), Hardy et al. (2020), Zhang et al. (2021)
Supply chain coordination/collaboration (RD2)	Elsenhardt (1989), Van wassenhove (2006), Walker and Harland (2008), Smith et al. (2009), Day et al. (2009), Scholten et al. (2010), Balcik (2010), Adivar et al. (2010), Wild and Zhou (2011), Parmigiani and Rivera-santos (2015), Hume and Hume (2015), Adekabi et al. (2015), Rodriguez et al. (2016), Tavella and Papadopoulos (2017), Fan et al. (2017), Eftekhari et al. (2017), Cozzolino et al. (2017), Sandberg et al. (2018), Oloruntoba and Banomyong (2018), Larson and Foropon (2018), Fianu and Davis (2018), Baron et al. (2018), Ataseven et al. (2018), Al adem et al. (2018), Sarma et al. (2019), Chatain and Plaksenkova (2019), Bao et al. (2019), Azmat and Kummer (2019), Awasthy et al. (2019), Turrini et al. (2020), Quarshie and Leuschner (2020), Medel et al. (2020), Fathalikhani et al. (2020), Cannas et al. (2020), Ataseven et al. (2020), Seepma et al. (2021)
Closed-loop supply chain (RD3)	Kumar and Malegeant (2006), Hong and Yeh (2012), Neto and Walther (2014)

Social influence (RD4)	Dimaggio (1983), Pedersen (2009), Carbone and Moatti (2011), Deegan and Islam (2014), Christ (2014), O'sullivan and O'dwyer (2015), Islam and Van staden (2018), Aziz et al. (2018), Silvestre et al. (2020), Negash and Lemma (2020), Ahmed et al. (2020), Rana and Sorensen (2021), Islam et al. (2021), Altura et al. (2021)
Subsidy and donation (RD5)	Toyasaku and Wakolbinger (2014), Arya and Mittendorf (2016), Nair et al. (2017), Liao and Chen (2017), Berenguer et al. (2017), Chakravarty (2018), Biswal et al. (2018), Biswal et al. (2020)